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The governance capacity of Dutch municipalities in governing heat stress

MSc Thesis Urban Environmental Management

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Summary

This thesis investigates the governance capacity of Dutch municipalities in governing heat stress. Heat stress can be described as the negative consequences and discomfort felt due to exposure to extreme heat (Klok & Kluck, 2018). The longer the period of extreme warm days, the more people will experience heat stress (RIVM, 2019b). Since the past two summers have been increasingly warm in the Netherlands, it is urgent that Dutch cities adapt to heat stress.

The aim of this research is to contribute to the current understanding of the governance capacity of Dutch municipalities in governing heat stress. It examines responsibilities of different levels of government, and the factors that influence the governance capacity regarding heat stress governance: internal dynamics and coordination, resource availability and institutional context. Besides, concepts such as 'wicked climate adaptation problems' and multi-level governance are used in this research. Hence, the main question of this research is: *what factors influence the governance capacity of Dutch municipalities with regard to heat stress?*

To answer this main question, first the sample was selected: the 25 largest municipalities in the Netherlands. Second, a document study on the Delta Plan on Spatial Adaptation and on municipal documents was conducted. Third, a survey was sent to the selected sample. The survey is regarded as the main data collection method of this thesis. Lastly, two semi-structured interviews were held for extra in-depth information.

From the results can be concluded that the governance capacity of Dutch municipalities in governing heat stress is negatively influenced by the complexity and intangibility of the problem, and positively influenced by the existence of an institutional context such as the Delta Plan on Spatial Adaptation. Comparing this with the theory, it shows that the problem of heat stress can be regarded as a 'wicked problem', as stated by Termeer, Dewulf, and Breeman (2013). Besides, having an institutional context plays a more important role in the governance capacity of Dutch municipalities regarding heat stress governance, than other researched elements.

Based on this conclusion, it is recommended that more research becomes available. Clarity on the efficiency of measures and the consequences of heat stress are needed, especially on the local level. The national government can play an important role in this. For the municipalities, it would be recommended to assign a heat stress coordinator or manager within the municipality, who is able to link the actors and the policy domains. This will lead to a more specified heat stress problem and structure. Lastly, what is important is that the Delta Plan on Spatial Adaptation remains accessible and updated.

Acknowledgements

This thesis is written as part of completion of the Master programme Urban Environmental Management at the Wageningen University. I chose this topic, as I am personally not a big fan of extreme warm weather and I was curious how we are dealing with this issue here in the Netherlands. The news items on extreme heat gathered my attention during the past summer and inspired me to write my thesis.

Writing the 'acknowledgements' means the end of my thesis writing period. I did not expect this to be over so quickly. Next week I will start my internship in Utrecht, to finish my master. I am curious what the coming half year will bring, and I am excited to start my internship. However, I will miss the coffee breaks during the library sessions.

I want to thank my respondents for taking the time to fill in my survey and my interviewees for expressing their thoughts and experiences to me. Moreover, I want to thank Madeleen Helmer from Klimaatverbond for providing me the information I needed, to be able to collect the data. Without them, my thesis could not have been completed. Lastly, I want to thank my supervisor Sanneke Kloppenburg for always reading my written parts and providing me with valuable feedback. I appreciated how you let me think of what I wanted to research and how I could achieve that.

I hope you find this thesis enjoyable and informative

Sophie Herwig

Wageningen, 5th of March 2020

Picture frontpage: WUR. (2018). De hittebestendige stad - kwantificeren van verkoeling op stadsschaal. Retrieved February 7, 2020, from: https://www.wur.nl/nl/Onderzoek-Resultaten/Onderzoeksprojecten-LNV/Expertisegebieden/kennisonline/De-hittebestendige-stad-kwantificeren-van-verkoeling-op-stadsschaal-1.htm

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1. Introduction

1.1 Problem statement

According to the IPCC (2018), climate change causes an increase in average temperatures and the intensity of extreme heat events. In the previous two years, the Netherlands has been facing an increasing number of these extreme heat events during summer. The heat in July 2019 has never been experienced before and several 'heat records' have been broken (KNMI, 24-07-2019). This extreme warm weather carries various negative consequences, such as excess deaths, decreased work productivity, air pollution, extra energy demand for cooling and increased water demand. Moreover, people experience 'heat stress', which affects health, as well as liveability in cities (Klok & Kluck, 2018). Heat stress can be described as the negative consequences and discomfort felt due to exposure to extreme heat (Klok & Kluck, 2018). The longer the period of extreme warm days, the more people will experience heat stress (RIVM, 2019b). These negative consequences can range from disturbed rest to life threatening diseases. Especially, older people, people with poor health and very young children are vulnerable to heat stress (RIVM, 2019a).

During an extreme hot day, cities might experience an even higher temperature than their surrounding rural areas, which is known as the 'urban heat island' effect (Figure 1). This difference can go up to 5-8 degrees (RIVM, 2019b). During the night, the urban heat island is even stronger, because heat is retained in the city. Consequently the city cannot cool down (RIVM, 2019b). However, the effect differs per city and weather circumstances. Several factors, amongst others wind, geometry, the amount of concrete areas and building materials determine the severity of the urban heat island (KNMI, 2010). Furthermore, anthropogenic heat and air pollution play a role in the formation of an urban heat island effect (KNMI, 2010). Therefore, it is not surprising that the heat records in the Netherlands were mainly measured in cities. In Eindhoven for example, the temperature even reached a value of 39,3 °C (KNMI, 24-07-2019).

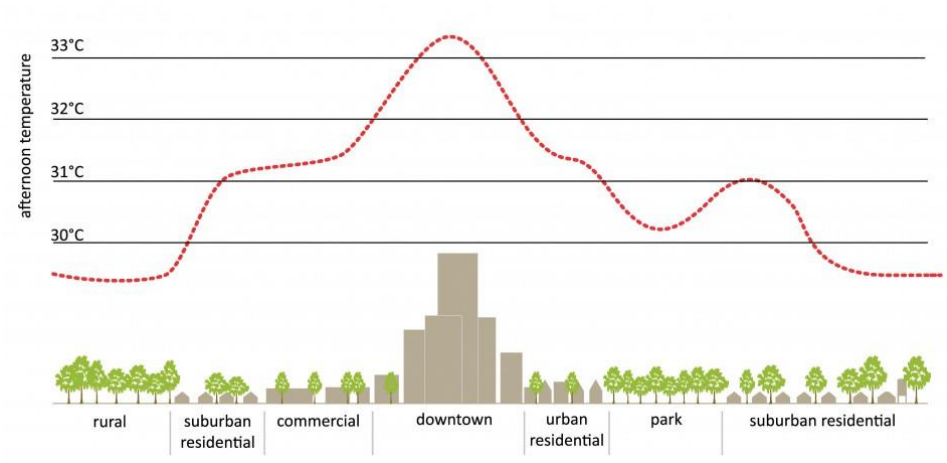


Figure 1: *Urban Heat Island*
Reprinted from: "Heat Island Compendium", by Environmental Protection Agency (EPA), 2018. Retrieved from: https://www.epa.gov/heat-islands/heat-island-compendium

As it is expected that extreme heat events occur more often in the future in the Netherlands, it is important that policy-makers recognise the issues of extreme heat, to be able to make their city more liveable and climate-proof. In such a climate-proof city, the spatial design, public spaces, water systems and the built environment are adapted to climate change, which makes the city more liveable and protected against disruptive damages due to climate change in the long term (TNO, 2019). The aim of climate-proof cities is to decrease their vulnerability to climate change and increase their adaptive capacity to tackle the effects of climate change (TNO, 2019). This entails anticipating on the effects of climate change and taking action to prevent or minimise the negative consequences (European Commission, 2019). It also entails taking advantage of the opportunities which can arise. Examples of such adaptation measures are: raising dyke levels, create drought tolerant crops and adapting buildings to future extreme weather events (European Commission, 2019).

The Delta Plan on Spatial Adaptation is one of the programmes that aims at moving towards a 'climate-proof Netherlands'. The plan includes climate adaptation strategies for four weather extremes: waterlogging, heat stress, droughts and urban flooding. In the plan, several tasks and responsibilities are defined for municipalities, provinces, water boards and the national government. For example: municipalities should conduct a 'stress test' before the start of 2020, and between 2017-2020, risk dialogues should be held (Delta Commissioner, 2017).

Looking at the implementation of the Delta Plan on Spatial Adaptation, it is often mentioned that municipalities do not take enough action to reduce heat stress in their region. There are some practical initiatives, but most of these are still under development (Hofgärtner & Zijlstra, 2018). Many people experience hot weather as quite 'enjoyable and lovely', but these hot days also have a downside, especially for vulnerable citizen groups (RIVM, 2019a). Heat stress is a relatively new problem and the urgency of it is not felt yet. Consequently, the problem remains at a 'low-priority' status. Moreover, more recent versions of the Delta Plan state that not all municipalities have yet completed their tasks regarding extreme weather (Delta Commissioner, 2017). However, an exact overview of which municipalities are working on heat stress and what progress has been made is not available.

Similarly, from a scientific point of view, it is argued that heat stress is a difficult issue to govern. Although climate change is a global issue, its effects are mainly felt locally (Bulkeley & Betsill, 2005; Termeer et al., 2013; Wälti, 2010). A national plan to reduce heat stress in cities is therefore inconvenient, since every city is different, and the impact of heat differs per location (Vedeld, Coly, Ndour, & Hellevik, 2016). Hence, heat stress policies should operate on the local level. Besides, the issue demands a multi-level governance framework, because many actors and governmental levels are involved (Bulkeley & Betsill, 2005).

At the same time, literature states that the involvement of multiple levels of government does not imply that there is perfect collaboration between these levels (Kokx & Van Kempen, 2010). Municipalities are for example dependent on the processes taking place at higher governmental levels, which can affect their capacity to act (Vedeld et al., 2016). Besides, there might be differences in priorities defined by the municipalities and the national government (Leck & Simon, 2013). This may cause mismatches or unclarity and influence the governance capacity of the municipalities.

The concept of governance capacity can be best described as the ability of actors to solve collective problems by working together, depending on the actors, wider institutional settings, governance processes and structures, and resources (Dang et al., 2016; Plummer & Armitage, 2010). Factors such as internal dynamics, coordination, resource availability and institutional context may influence the extent to which municipalities are able to govern issues such as heat stress.

At the moment, an overview of the governance capacity of municipalities in governing heat stress in the Netherlands does not exist. It is therefore unknown whether municipalities actually have the capacity to govern this issue, and which constraints and opportunities they experience. Given the issues named before and the fact that cities are considered key actor in climate governance, it is important that an overview of how municipalities govern heat stress will become available. Besides, adapting to heat stress is necessary, as extreme heat will more occur in the future in the Netherlands (Klok & Kluck, 2018). An overview of the current practices can contribute to that.

1.2 Research aim and objective

The aim of this research is to contribute to the current understanding of the governance capacity of Dutch municipalities in governing heat stress, by providing insights into responsibilities of different levels of government. Additionally, it provides insights into the factors that influence the governance capacity regarding heat stress governance, such as: internal dynamics and coordination, resource availability and institutional context. Furthermore, it contributes to scientific literature on governance capacity in the Netherlands. As mentioned before, an overview of the governance capacity regarding heat stress is missing. This research may serve as a starting point for other research regarding the governance capacity of Dutch municipalities, not only for heat stress governance, but also for other climate adaptation components.

1.3 Research questions

Main question: What factors influence the governance capacity of Dutch municipalities with regard to heat stress?

Sub question 1: What are responsibilities of municipalities and the national government in governing heat stress in the Netherlands, according to the Delta Plan on Spatial Adaptation?

Sub question 2: To what extent is the Delta Plan on Spatial Adaptation currently integrated in municipal policy plans on heat stress in the Netherlands?

Sub question: 3 To what extent is the governance capacity of Dutch municipalities with regard to heat stress influenced by internal dynamics and coordination within the municipal organisation?

Sub question: 4 To what extent is the governance capacity of Dutch municipalities with regard to heat stress influenced by resource availability and institutional context?

Sub question: 5 What expectations do Dutch municipalities have regarding their and the national government's role in governing heat stress in the future?

1.4 Outline of this thesis

In the second chapter of this thesis, the theoretical framework will be discussed. In here the following concepts are elaborated: wicked problem theory, multi-level governance and governance capacity. Also, the importance of cities in governing governmental issues will be discussed here. In the third chapter, the methods used in this research are described: a document study, a survey and semi-structured interviews. The fourth chapter serves as background information on the Delta Plan on Spatial Adaptation, which is needed for understanding the other chapters and necessary to answer the first sub question. Moreover, by using the Delta Plan on Spatial Adaptation, it could be analysed to what extent the municipalities are working on adaptation to heat stress. In chapter 5, 6, and 7, the results of the document study, survey and interviews are described. The results are presented in figures and tables, with supporting explanation, so that this thesis provides the reader a clear overview of the collected data. These chapters will contribute to answering sub question 2 until 5. Thereafter, the results will be evaluated against the theory and discussed in chapter 8, to see whether the results are in line with the theory. In here limitations of the research are discussed as well. Lastly, in chapter 9 the main questions of this research will be answered and recommendations for further research and policy development will be given.

2. Theoretical framework

This chapter discusses the key concepts of this research, to provide clarity on the terminology used. First, the theory of wicked problems is discussed. In here the focus will mainly be on wicked environmental problems. Second, the concept multi-level governance is explained, in which is also the importance of cities will be stressed. Besides, frequently occurring multi-level governance problems will be described. Third, the term governance capacity is explained, together with the factors and elements which determine the governance capacity. The framework to determine governance capacity, as described in paragraph 2.3, is compiled by using the views of different authors. These authors mainly used the same concepts to determine governance capacity, but a framework on this was missing. Therefore, the views of these authors are combined to create an 'own' framework, which could be used in this research to determine the governance capacity of Dutch municipalities in governing heat stress.

2.1 Wicked problems

According to Termeer et al. (2013), it is well-known that there is a need for societies to adapt to climate change impacts. Climate adaption can be defined as "anticipating the adverse effects of climate change and taking appropriate action to prevent or minimise the damage they can cause, or taking advantage of opportunities that may arise" (European Commission, 2019, "Adaptation to climate change," para. 1). However, regarding the many uncertainties converging around climate change, policy-makers are facing numerous challenges in implementing environmental policies. Therefore, climate change can be regarded as a 'wicked problem' (Termeer et al., 2013). The wicked problem finds it origin in the 1970s, when critique on approaches to complex social and public issues was raised (Alford & Head, 2017). Since then, many scholars have used this concept when explaining difficulties in defining societal policies.

Wicked problems are characterised as 'hard to define', because there is a lack of consensus on framing the exact problem or solution. Additionally, wicked problems involve multiple scales and time frames, as these exist of various connections and dimensions between actors and political scales. New solutions to the problem, create even more problems, which makes the initial problem resistant to solutions (Termeer et al., 2011). These complications are also experienced when governing heat stress: not one solution will solve the problem immediately and there are different interpretations of the causes, severity and urgency of the issue (Leck & Simon, 2013). Moreover, no clear organisation or individual can be held responsible (Keskitalo, Juhola, Baron, Fyhn, & Klein, 2016). Therefore, governing heat stress requires the involvement of multiple levels of government (Termeer et al., 2013).

According to Alford and Head (2017), knowledge availability is an important condition for wicked problems. Often, the nature of the problem and its solution are 'unknowable'. Additionally, there is knowledge fragmentation and framing, which may lead to less interest in solving the problem. Wicked problems require action to discover information that is hidden or intangible, and the information consist of serval linkages and outcomes (Alford & Head, 2017). For example, according to Hofgärtner and Zijlstra (2018), the consequences of extreme heat are not clearly visible. There is not enough knowledge on what the exact consequences are, and which measures are efficient for reducing heat stress.

Besides, Alford and Head (2017) argue that power and interest play an important role. Wicked problems are prone to conflicts related to power and interest. More powerful actors can overwhelm less powerful actors and diverging interests may cause that the problem does not receive enough attention. Heat stress is not the number one priority of municipalities in the Netherlands, the focus is more on water drainage and extreme precipitation (Hofgärtner & Zijlstra, 2018). Moreover, the urgency of the problem is often not experienced. Examples which indicate urgency are needed to convince policy-makers to start working on adapting to heat stress (Klok & Kluck, 2018).

2.1.1 Specific wicked climate adaptation problems

According to Termeer et al. (2013), the 'governance of adaptation' faces some specific challenges and dilemmas, next to the common wicked problem difficulties. This is mainly due to the fact that climate change is a new or recent problem, and can be governed by several governmental levels. Termeer et al. (2013), defined the following specific challenges for climate adaptation problems:

- *Fragmentation*: many actors are involved in determining climate adaptation strategies. These actors come from different policy domains, as climate change has an influence on many different domains. Climate change demands that these actors collaborate, instead of designating climate change into one domain. Heat stress for example, does not only play a role in the environmental department, but also in public health and in spatial planning. Moreover, although the impact of climate change is mainly felt locally, it also requires that national and international levels are involved.
- *Not well-structured policy domain:* climate change is a new and upcoming issue. Therefore, some basic governance aspects have to be redirected: responsibility for the problem, existing responsibilities, urgency, long-term visions and available knowledge, play a key role in the 'climate change domain'. In the case of heat stress, it might be more effective to establish one policy domain, directed at reducing heat stress. However, others argue that mainstreaming the issue in other domains is more necessary.
- *Uncertainty and knowledge intensity:* decision-making related to climate change requires knowledge on the risks and the effectiveness of solutions. Heat stress is a relatively new issue, and policy-makers often lack the knowledge on the related consequences and solutions (Hofgärtner & Zijlstra, 2018). Moreover, the more actors involved in solving the heat stress, the more perspectives on the issue are present. In addition, the data on climate change or heat stress is mainly gathered at a higher scale, which makes it difficult to apply to the local scale.

2.2 Multi-level governance

As mentioned before, realising a successful heat stress policy demands the collaboration between multiple levels of government. Governing climate change requires to move away from the 'traditional' division of governmental levels towards governance. This can be explained by an example: although the decisions to reduce greenhouse gas emissions are made at the higher governmental levels, local levels are quite important to consider. The source of these emissions can mainly be found at the local level and the involvement of local actors is thus needed (Betsill & Bulkeley, 2006). This dependency requires relations between different actors at different governmental levels, which is also known as 'governance', (Fröhlich & Knieling, 2013). This is different from the 'traditional' division of governmental levels, as the boundaries between these levels are blurred. In literature, the terms 'local levels' or 'local governments' are often used. In this research the term 'municipalities' is used, when referring to local governments or local levels.

Furthermore, Termeer et al. (2011) argue that only operating from a central government, results in less capability of anticipating on unexpected situations and risks. Being less able to anticipate is not beneficial in the case of climate change. Yet, local governance is not a discrete scale. It depends on several relations and influences between actors and different levels of government (Betsill & Bulkeley, 2006). Besides, taking a multi-level governance perspective does not necessarily mean that the authority of the state is weak or insufficient, it is more a redefinition of the scope and scale of the activities of the national government. However, this creates a struggle across governmental levels on who is responsible for what, and who has authority for making decisions (Betsill & Bulkeley, 2006).

Multi-level governance is built up of two terms: first, the term 'governance' can be defined as, the processes through which collective goals are defined and operated, in which the national government is not necessarily the most important actor (Betsill & Bulkeley, 2006). According to Plummer and Armitage (2010), another definition of governance is: "the whole of public as well as private interactions taken to solve societal problems and create social opportunities" (p. 4). It consists of the rules, systems and actors at different levels of society.

The second term, 'multi-level governance' can be defined as negotiated, non-hierarchical exchanges between institutions at transnational, national and local level (Kokx & Van Kempen, 2010). It is a layering of governance processes, based on interdependency. Multi-level governance is not controlled from above, but complementary (Kokx & Van Kempen, 2010). In this way, multi-level governance differs from the 'traditional hierarchy', as the different levels are interdependent (Yi, Huang, Chen, Xu, & Liu, 2019). Multi-level governance according to Keskitalo et al. (2016) is defined as: "the negotiated exchange between institutions on multiple levels, including the local, regional and national organisation of the state and other actors" (p. 2). In here it is important that balance and collaboration is ensured between the different governmental levels (Yi et al., 2019). The definition of Keskitalo et al. (2016) will be used in this research, because this is the most elaborative definition.

The concept of multi-level governance provides a framework in which the relations between local, regional and national governments, across different mitigation and adaptation policy issues, can be understood (Corfee-Morlot et al., 2009). There is a difference between vertical and horizontal relationships. Vertical governance refers to the relation and interaction between municipalities and their higher governing authorities on regional, national and global level. Their interaction is necessary to effectively implement climate policies. Horizontal governance refers to the collaboration between a government and other authorities on a certain level. Different actors and networks are involved when working on the climate change issue in collaboration with municipalities (Corfee-Morlot et al., 2009). For example, a city can interact with neighbouring cities and create partnerships for technical support (den Exter et al., 2015). However, for the scope of this research, the focus will only be on vertical relationships.

2.2.1 The role of cities in governing heat stress

Although there is quite a lot of national interest in heat stress policies, the impacts of extreme heat are mainly felt locally and call for a local governmental approach. Environmental policies are mainly developed at the global level, but the variety of local conditions and impacts of climate change emphasise the importance of local actors (Termeer et al., 2013, 2011). This is also argued by Wälti (2010): although policies are national, implementation tend to call for subnational involvement to

target the regions which suffer from environmental damage. Bulkeley and Betsill (2005), agree upon this point. Climate policies tend to be separated into different levels: global, national and local. They argue however, that a climate policy requires blurred boundaries, and multi-level governance gives the opportunity for that.

Consequently, cities play an important role adapting to climate change, which is also stressed by the Brundtland Report from 1987 (Bulkeley & Betsill, 2005). Cities are a concentration of economic activity and people, and thus a source of energy, waste and greenhouse gas emissions (Corfee-Morlot, Cochran, Hallegatte, Teasdale, & Cochran, 2011). Due to trends of rapid urbanization, cities are vulnerable to climate change in terms of flooding, extreme heat and water shortages. In the Netherlands, heat stress causes discomfort, because heat is retained between buildings and in dark surfaces. A densely built city is therefore vulnerable to heat stress. Heat stress causes lower sleep quality, less labour productivity and more heat-related diseases and mortality (Kokx & Van Kempen, 2010). Finally, extreme heat may also cause disruptions in infrastructures, as asphalt can melt and bridges and railways can overheat (Kokx & Van Kempen, 2010).

Municipalities are able to adapt to climate change by education and information and address the effects of climate change through urban planning. Moreover, municipalities are the closest to the citizens, and are therefore in the best position to develop adaptation policies which directly affect citizens (den Exter et al., 2015). Nevertheless, cities are complex systems with cross-scale interactions and transboundary urban connections, which complicate environmental policies. Under a multilevel governance framework, it is important to consider at which level policies should be operated, what influence decisions have on other levels, and through which mechanisms policy should be implemented. Moreover, considering how multi-level decisions are linked is vital in this form of governance (Leck & Simon, 2013).

2.2.2 Multi-level governance problems

Although multi-level governance requires the collaboration between different levels of government, a perfect collaboration between these levels is not completely self-evident (Kokx & Van Kempen, 2010). In the literature on multi-level governance, problems within this collaboration are often identified. One example is that, national policies developed by the national government mainly fit national priorities. Nevertheless, municipalities have their own priorities and concerns, so policy goals might not be shared between distinct levels. This may cause tension (Kokx & Van Kempen, 2010). Additionally, there are substantial differences in priorities and policies among governmental levels (Leck & Simon, 2013). For example, the national government set the goal of having a climate-proof Netherlands in 2050 in the Delta Plan on Spatial Adaptation (Delta Commissioner, 2018). Municipalities might deviate from this goal, depending on the situation in their region. It is therefore not self-evident that municipalities take on this goal immediately.

Another problem reoccurring problem is that the impacts of climate change are experienced differently by each level of government (Vedeld et al., 2016). Di Gregorio et al. (2019) argue that climate change predominantly has a global character, but the impacts are felt locally, which poses challenges on the multi-level governance for climate policy integration. This may cause mismatches between the national government and municipalities in climate adaptation problems, as identified by Hanssen, Mydske and Dahle (2013). Municipalities often feel there is a lack of precisely formulated

goals and national goals are frequently contradicting. Therefore, climate change governance requires governance that can resolve conflicts of interests across multiple scales and among diverse policy actors.

Besides, municipalities have different expectations on the support they receive from higher governmental levels. For example, they expect to receive more information from higher levels on climate change and its effects on the people and the environment, in the form of climate models and prognoses. Yet, this is often not the case (Hanssen et al., 2013). In the case of heat stress, it appeared that municipalities do not have the knowledge needed to be able to fully integrate heat stress policies (Hofgärtner & Zijlstra, 2018).

Furthermore, according to (Vedeld et al., 2016), multi-level governance places constraints on the capacity to act of municipalities, as these depend on the processes taking place on the national level. Municipalities might feel pressure or influence of higher-level governments in making decisions (Yi et al., 2019). On the other hand, through subsidies, legal support and policy guidance, municipalities depend on the levels above. The margins in which municipalities can act and the extent to which local government have capacity to act, are influenced by the national state, as national decisions are mostly binding for municipalities (van der Heijden, Patterson, Juhola, & Wolfram, 2019). Besides, higher levels of government also influence the extent to which municipalities autonomously operate (Corfee-Morlot et al., 2009; van der Heijden et al., 2019). In here issues of budget, responsibility, capacity and accountability are important (Leck & Simon, 2013).

2.3 Governance capacity

The above-named problems can be evaluated with the help of the concept 'governance capacity', which is a frequently returning concept in urban governance literature. Originally, this term was used in natural sciences to research the capacity of ecosystems to adapt to changes (Plummer & Armitage, 2010). However, currently the term is used within studies on environmental governance and institutional changes as well. According to Dang et al. (2016), governance capacity can be defined as the ability of actors to solve collective problems by working together. This collaboration depends on individual actors and wider institutional settings. Moreover, governance capacity is determined by governance processes and structures, as well as available resources around these processes (Plummer & Armitage, 2010). Examples of resources can be the access to human and financial resources, flexible and suitable institutions and strong networks of actors. According to Plummer and Armitage (2010), defining governance capacity in this way emphasises the 'wicked problem' around environmental governance, with its complexity, discontinuity and changes. It builds upon the need to create resilience within a city among different levels of government (Plummer & Armitage, 2010).

2.3.1 Factors that determine governance capacity

Several factors that influence the governing capacity of municipalities are defined in literature, of which mainly three categories can be distinguished (Alford & Head, 2017; Bulkeley, 2010; Dang et al., 2016; Measham et al., 2011; Ryan, 2015). Table 1 shows these three categories and their constituent elements. Table 1 is compiled by combining the views and information given by the before-mentioned authors and gives a summary of the important factors that determine governance capacity. According to Ryan (2015), these factors are necessary for climate policy implementation. If one of the factors is performing less, governments might be unable to implement policies. On the other hand, even when

all factors are present, this does not imply that implementation cannot be delayed of influenced by other actors in the process (Ryan, 2015).

The factors and corresponding elements in table 1 are used in this research to analyse the governance capacity of Dutch local government in governing heat stress. With these factors, it can be researched how heat stress is managed internally within the municipal organisation. Furthermore, it can be researched which resources are available and which are needed to implement a heat stress policy. Lastly, it can be determined to what extent the institutional context influences the governance capacity of municipalities in governing heat stress.

Table 1: *Factors that determine governance capacity of municipalities regarding heat stress and constituent elements*

Factors:	***Elements:***
Internal dynamics and coordination	Responsibility
	Coordination
	Interests and power
Resource availability	Human resources
	Financial resources
	Availability of knowledge and information
	Time
Institutional context	Rules and tasks
	Priorities and goals
	Support

Table self-compiled, based on: Alford & Head (2017); Bulkeley (2010); Dang et al. (2016); Measham et al. (2011); Ryan (2015)

The first factor is internal dynamics and coordination. Environmental issues can be managed differently across municipalities. Some municipalities have a special environmental department, while others manage environmental issues from a broader range of departments. Similarly, some municipalities assign a special environmental coordinator, while others do not. According to Bulkeley (2010), research suggests that expertise on environmental issues mainly stays within the environmental department. However, it might be the case that within a department, clarity on the *responsibilities* is lacking. Besides, this special department is often not able to implement their policies, as it also crosses issues of other departments, such as: water management, spatial planning, energy supply and economic activities (Termeer et al., 2013). Therefore, clear *coordination* and a division of responsibilities is needed.

Additionally, governance capacity can be influenced by involved actors and their *interests* (Dang et al., 2016). The more actors there are involved, the higher the chance that there are different perspectives on environmental problems (Termeer et al., 2013). This may cause differences in how the problem is tackled in terms of urgency and seriousness. Therefore, the problem can be framed in different ways by different political leaders. Bulkeley (2010) argues that, considering the beliefs of the current leader

of the local government is important. Alford and Head (2017) call this 'interest-differentiation', when conflicts arise between different beliefs and values. This is also related to the concept of power: some actors have more 'power' than others, and are able to convey their interest over someone else's point of view (Alford & Head, 2017). Overall is argued that agreements on a certain climate policy will be more easily reached when having converging perspectives on the issue. If not, the capacity to solve a problem will be limited (Bulkeley, 2010; Dang et al., 2016; Termeer et al., 2013).

Second, resource availability is a quite important factor in local governance capacity (Measham et al., 2011). It depends on four elements: human resources, financial resources, availability of information and knowledge, and time (Ryan, 2015). Not having enough *human resources* available in the first place, already limits the capacity of a government to act upon heat stress problems. Additionally, a lack of *financial resources* limits the provision of environmental infrastructures and measures needed for solving the issue. The availability of *knowledge and information* on how to address the issue is even more important (Bulkeley, 2010). Not only knowledge on the current state of the climate is important, but also the future state. Governing the environment carries uncertainties about future risks and the effectiveness of solutions in the future (Termeer et al., 2013). Governing climate change is knowledge-intensive and having mathematical models and observations are essential (Termeer et al., 2011). However, most of the mathematical models mainly consist of global or national data. Local data is often not available and using the data of higher scales might lead to over- or insufficient reaction (Termeer et al., 2013). Lastly, *time* can be regarded as an important issue. Municipalities might feel that they are lacking time to govern heat stress on top of the other taskings which require attention. According to Measham et al. (2011), resource constraints might eventually lead to short-term solutions, rather than long-term approaches to address climate change.

Third, there is the factor of institutional context, which depends on three elements: rules and tasks; priorities and goals; and support (Measham et al., 2011). Municipalities might feel restricted by regulatory rules of higher governmental levels or must comply to a certain policy, such as the Delta Plan on Spatial Adaptation. On the other hand, such a plan might encourage governments to start working on the issue. Dang et al. (2016) agree on this point: having no *rules* to regulate the actors and to define their roles and interactions, it is not likely that common goals will be reached. In addition, municipalities can be *tasked* to manage state and provincial infrastructure, next to managing their own municipal issues (Measham et al., 2011). Their delegated role is defined by the central or regional government (Bulkeley, 2010). However, these wider range of activities and tasks might limit the municipalities in also solving other issues, such as heat stress. Next to this, shared *priorities and goals* are important elements (Castán Broto, 2017). These might be shared across different levels of governments, but can also be conflicting (Kokx & Van Kempen, 2010). Furthermore, higher governmental levels can offer *support* in the form of funding, data and technical support to facilitate learning to increase governance capacity (Bulkeley, 2010). By this, global and national governments provide an important context for the operating municipalities (Termeer et al., 2011).

Nevertheless, having a high degree of governance capacity as municipality, does not imply that urban climate governance will be effective. Municipalities rely on other governmental levels to realise climate policies, and depend on the resources and capacity of external actors as well (Westerhoff, Keskitalo, & Juhola, 2011). This is agreed upon by Healey, Cars, Madanipour and De Magalhães (2017): there will always remain a form of hierarchy, because one level has significantly more power and access to

resources than other levels. One level also defines the rules for the others. Consequently, one governmental level cannot operate without the other. Or as stated by Corfee-Morlot et al. (2009): the national government cannot implement national policies without cooperating with municipalities as their implementors. On the other hand, municipalities cannot take effective action, when operating in isolation of other governmental levels. Termeer et al. (2011) agree on this point: although environmental adaptation should be executed on the local level, national and even global governments should not be excluded, as they provide an important regulative context for municipalities.

2.4 Summary

To summarise this chapter, the concepts used in this research are wicked problem theory, multi-level governance and governance capacity. First, wicked problems are hard to define, because of lack of knowledge, complexity, involvement of many actors and insolvability. Moreover, climate adaptation has some specific wicked problem challenges, such as: fragmentation, not well-structured policy domain and uncertainty and knowledge intensity (Termeer et al., 2013). Second, climate adaptation governance demands a multi-level governance framework. It can be best defined as: “the negotiated exchange between institutions on multiple levels, including the local, regional and national organisation of the state and other actors” (Keskitalo et al., 2016, p. 2). Cities are important actors here, as impacts of climate change are mainly felt locally, and municipalities are the closest link to citizens and businesses. Nevertheless, collaboration between governmental levels is not completely self-evident, and some problems arise, because of conflicting priorities, different perspectives on climate change and capacity constraints. These multi-level governance problems can be evaluated by the concept of governance capacity. This thesis will consider how internal dynamics and coordination, resource availability and institutional context determine the capacity of municipalities in governing heat stress. In the next chapter, the methods used in this research will be explained, in which will be described how the governance capacity of municipalities in governing heat stress is researched.

3. Methods

For this research, a qualitative research design was used. This is because this research mainly focussed on the experiences Dutch municipalities have, and the processes they went through when governing heat stress. In this way, it could be determined which factors influence the governance capacity of Dutch municipalities regarding heat stress governance. Additionally, it could be determined which factors are experienced as contributing to the development of a heat stress policy and which factors constrain the development of a heat stress policy. The Delta Plan on Spatial Adaptation was an important element during this research, because this national plan determines the responsibilities and goals for municipalities to speed up the adaptation to climate change. The plan was used as a basis for this research, so that it could be analysed in which part of the adaptation process each municipality was, and what processes they went through or still needed to go through.

3.1 Sample selection

During the proposal development phase, an initial exploratory document study was executed. During this study, the sample was selected. This sample consisted of Dutch municipalities, which were selected by their population and the presence of urban heat islands in the city. The sample selection and the exploratory document study proceeded according to the following: first, by using the CBS Statline (CBS, 2019), the 25 municipalities with the largest population numbers in de Netherlands were identified. This is because it is highly likely that the effects urban heat islands are experienced in the cities with the most inhabitants.

Second, it was identified whether these 25 municipalities actually suffer from urban heat islands, using the heatmap of Atlas Natuurlijk Kapitaal (Atlas Natuurlijk Kapitaal, 2019). From this followed that 21 out of 25 municipalities experience heat stress, as these cities clearly popped up red on the heat stress map. Although, some municipalities had a stronger heat island effect than others, this did not imply that these municipalities were in the same stage of developing heat stress policies.

Third, it was determined whether a municipality was having plans or policies regarding heat stress by doing a document study on municipal documents on their websites. From this, a first exploratory research to the current integration of the Delta Plan on Spatial Adaptation was conducted. Mainly ‘green policy plans’ or ‘omgevingsvisies’ were studied. For each municipality, 2 or 3 documents were analysed, because some municipalities have one document on climate adaptation, while others use separated documents. It showed that from the 25 largest municipalities in the Netherlands, some conducted a stress test. Most of the current policies were general climate adaptation policies, directed at greening the city. It also showed that some municipalities are still in the phase of doing research and gaining knowledge. The full overview of the sample selection table can be found in Appendix I.

3.2 Methods of data collection

The following methods for data collection were applied: document study, a survey and semi-structured interviews based on the survey data. These methods were chosen, because the aim of this research was to contribute to the current understanding of the governance capacity of Dutch municipalities in governing heat stress, by providing insights into responsibilities of different levels of government. The chosen methods contribute to the mapping of heat stress governance in the Netherlands. In this way more than one municipality could be studied, so that an overview of the current practices could be created, and governance capacity could be analysed.

Sub question 1 was answered by data from the document study on the Delta Plan on Spatial Adaption. Sub question 2 was partly answered by the document study on municipal policy plans, by data from the survey and from the interviews. Sub question 3, 4 and 5 were answered based on the data collected from the survey and the semi-structured interviews. The survey contained questions regarding internal dynamics and coordination within the municipality and its governance capacity regarding heat stress. Additionally, it contained questions regarding the future role of these municipalities in governing heat stress. After the data of the survey was collected, an elaborative overview of the governance capacity of the 25 largest municipalities in the Netherlands and their experiences regarding heat stress could be formed. Based on the results of the survey, it was decided which municipalities would be contacted for an interview to obtain more in-depth information. By collecting data from different sources and methods, the validity of the research could be assured. The used methods for data collection are explained in detail below.

3.2.1 Document study

The first question was fully answered by a document study. Additionally, sub question 2 was partly answered by a document study. Governmental reports on the Delta Plan on Spatial Adaptation were studied to research which responsibilities are stated in this plan for both the national government and the municipalities. The reports on the Delta Plan on Spatial adaptation from 2015 until 2020 were studied, because in the report of 2015 'Spatial Adaptation' is mentioned for the first time and the subsequent reports mention the progress and changes in the plan.

Additionally, municipal reports and policies were studied again to expand the information found during the sample selection. The municipal documents were researched on the following elements:

1. Whether the Delta Plan on Spatial Adaptation was mentioned.
2. Whether a stress test was conducted/mentioned.
3. What focus the municipal adaptation plan had.
4. Whether the goals of the municipal documents corresponded to the goals of the Delta Plan on Spatial Adaptation.
5. Whether there an action/implementation plan was developed.

By comparing the information found in municipal documents, it could be researched to what extent the Delta Plan is incorporated into municipal policy. First the results were put in an overview in Excel. Afterwards, the results of this study were summarised in table 4 in chapter 5. The municipal documents were found on the website of the researched municipalities.

3.2.2 Survey

The data of sub questions 2 until 5 was mainly collected by the survey. This survey contained mostly multiple choice and statement questions, in which the respondents indicated to what extent they agree on a certain topic, using a Likert scale. When a question required explanation, open questions were used. In total the survey consisted of 40 question and took around 25 minutes to fill in. The survey was written in Dutch, as the research is on heat stress policies of municipalities in the Netherlands. A full version of the survey can be found in Appendix II.

To make sure the survey was sent to the right person, a contact person at Klimaatverbond was contacted. Klimaatverbond has several municipalities as members and aims at helping municipalities in creating an ambitious climate adaptation policy. Their goal is to contribute to a climate neutral and climate-proof Netherlands (Klimaatverbond, 2019). The contact person is project manager climate adaptation and working on issues such as local heat plans. Moreover, the contact person is project manager heat and health at the National Adaptation Strategy (NAS) in the Netherlands. She could provide the contact persons for each of the selected municipality for this research.

The survey was sent to all the 25 contact persons of the municipalities selected before, and could be filled in during November and December. The respondents received an e-mail with the link to the survey. After three weeks, a reminder interview was sent to the persons, who did not yet fill in the survey. After the first reminder, more respondents filled in the survey. The last week before the Christmas Holidays, the last reminder was sent to the respondents.

In the end 16 out of 25 respondents filled in the survey, from which one filled in the survey anonymously. After the survey was closed, an overview of the data was made in Excel. It turned out that most of the respondents filled in the survey quite elaboratively. This was rather helpful for the research, as more background information could support the data found. A few municipalities indicated that they could be contacted for a follow-up interview.

The survey started with general questions regarding the current state of a heat stress policy in the concerned municipality. This was to examine how heat stress is managed within the municipality and whether some policies are already in place. Second, the survey proceeded with several statements regarding their available resources and interaction with higher governmental levels. Municipalities could indicate whether they agreed with the statement or not. Third, the survey asked the municipalities to their future vision regarding heat stress governance. The Delta Plan on Spatial Adaptation served as a basis for the survey, as components of this plan were used in the survey. For example: the subsidy arrangements, the stress tests and the risk dialogues.

At the end of the survey, the respondents were asked whether they are available for a possible follow-up interview. If so, they were requested to fill in their e-mail address or phone number. After the data of the surveys was collected, it was decided whether follow-up interviews are needed, and which municipalities would be interviewed. Moreover, respondents could indicate whether they were interested in the results of the research. After the research is finished, a Dutch summary of the results will be sent to these respondents.

The survey was developed digitally in the Qualtrics survey software. This survey software was chosen, because it provided a professional and clear output of the survey. Additionally, the data could be clearly viewed through reports and data storage within the software. The Qualtrics version used, is a free version. However, the type of survey used for this research did fit within the limitations of this free version.

3.2.3 Semi-Structured interviews

After the survey was filled in, e-mails with requests for follow-up interviews were sent to the respondents who were available. The contact persons of the municipality of 's-Hertogenbosch and Ede reacted on the request for an interview. The interview questions were made on the basis of the responses given in the survey. These questions were directed at gathering more background information regarding certain topics, so that the data in from the survey could be supported. The first interview was face-to-face and held at the City Hall of 's-Hertogenbosch in December. The second interview was by telephone and held with a contact person from the municipality of Ede in January. Both the interviews lasted around 30 minutes.

The interviews were semi-structured. The questions were drawn up beforehand and depending on the answers that were given, other questions were made up during the interview. The flexibility of the semi-structured interviews allowed room for some extra questions, in which more information could be gathered or more explanation could be given. Additionally, during the interviews, there was a possibility to deviate a bit from the topic, but still cover important elements. All the interview questions were open questions and the interviewees had enough time to give and explain their answers. In this way, the interviewees were able to explain their thoughts and experiences regarding heat stress governance.

The interviews were recorded and transcribed afterwards, so that the interviews could be used in this thesis. The question guide of both the interviews can be found in Appendix III and IV. The interviews were not coded, because only 2 interviews were held. With a small number of interviews, it is not necessary to code the interviews, as it is easier to analyse the data. Moreover, the interviews followed the structure of the survey, so that the information given was quite structured already and easy to consult again.

After the interviews were held, the data was compared to the data from the surveys. In this way the data from the surveys could be supported with extra in-depth information, and explanation to the answers could be added. It was decided that only 2 interviews were held, because the main focus of this research was the information provided by the survey. The interviews served only as extra information, but the information provided by the survey remained most important. Moreover, time availability was also an important factor for deciding upon the interviews. Waiting for responses on interview requests and planning the interviews took longer than expected and did not fully fit within the time available for this research.

3.3 Validity

Regarding the validity, both the survey and the interviews were structured in the same way. The questions of the survey were the same for every respondent, so that all the answers would relate to the research questions. The interviews followed the structure of the survey and were made up beforehand. The interviews questions were mainly the same for each interviewee. However, some of the questions were changed, depending on the answers given by the interviewee. The reason for this is that it would be unnecessary to ask the same question if the interviewees answered differently in the survey. Moreover, this also gave room for extra in-depth questions. Since the interview questions were made according to the structure of the survey, the data collected from the interviews could be used to explain and support the results of the survey.

Furthermore, both interviews were conducted under the same circumstances. Although one interview was conducted by phone, the interviewee was at the city hall in a quiet area. The other interview was also held in the city hall in a quiet area. Besides, the formulated questions were open and there was much room for giving explanations. Lastly, both the interviews were conducted shortly after each other.

For the document study, the data found was structured in the same way. Firstly, the municipal goals and ambitions were identified. Secondly, it was researched whether the municipalities had a specific heat stress policy or climate adaptation policy. To collect the information needed, all the municipal documents were checked in the same way, as explained in *3.2.1*.

3.4 Reliability

During the data collection period, the questions of the survey and the interviews were made in such a way that these did not influence the respondents. For each topic, first some introduction questions were made, so that the respondent knew where the question was about. Besides the methods used for this research can also be applied to a different or larger sample, so that the same topic can be researched on a larger sample group. Additionally, all the interviews were recorded and transcribed so that detailed information could be included in this research in the form of quotes. This also makes sure that the data used in this research is the correct data, and that the data can be analysed more than one time.

3.5 Summary

For this research, a qualitative research design was used. During the proposal developing phase, the sample was selected, containing the 25 largest municipalities in the Netherlands. Besides, a document study was executed on the Delta Plan on Spatial Adaptation and municipal documents. After the document study, a survey was sent to the selected municipalities and 2 semi-structured interviews were held. The survey was the main data collection method for this research, while the interviews served as extra in-depth information. In the next chapters, the collected data is described and explained, starting with the Delta Plan on Spatial Adaptation.

4. Responsibilities according to the Delta Plan on Spatial Adaptation

This chapter describes the Delta Programme in general and gives detailed information regarding the Delta Plan on Spatial Adaptation, based on a document study on governmental documents. Besides, this chapter provides an overview of the responsibilities for municipalities and the national government in the Delta Plan, and explains the different tools and supporting instruments available. These results will be used to answer sub question 1.

4.1 The Delta Programme

The Delta Programme is a national programme in which different governmental authorities collaborate to protect the Netherlands from flooding, freshwater shortage and the consequences of extreme weather situations (Delta Commissioner, 2019). Each year, a new Delta Programme is published, in which the progress made in the past year is described and what further steps need to be taken in the coming years. The Delta programme is developed by the national government, but many other governmental bodies have shown their commitment to implement the strategies presented by the programme (Delta Commissioner, 2017).

Initially, the Delta Programme mainly focussed on dyke protection and flood prevention. However, in the version of 2015, consequences of climate change gained attention. This resulted in a Delta Decision on Spatial Adaptation, serving as a starting point for adaptation measures in the Netherlands (Delta Commissioner, 2014). According to this decision, a transition in policy was needed, in which the regional and municipalities had the responsibility to translate this transition into measures (Delta Commissioner, 2014). Therefore, this Delta Decision proposed that the national government, provinces, municipalities and water boards all aim to be climate-proof and water robust in 2050.

In 2017, the progress made on this Delta Decision was evaluated to see whether additional support was needed (Delta Commissioner, 2014). This evaluation showed that the Decision on Spatial Adaptation did start well, but failed to sufficiently encourage governmental authorities to make climate adaptation part of their policies and action. It turned out that that waterlogging, flooding and droughts are important factors on the political agenda. Heat stress however, still needed some progress to appear on the political agenda (Delta Commissaris, 2015). To speed up the implementation of climate adaptation measures, the Delta Programme Commissioner decided to develop a Delta Plan on Spatial Adaptation. In 2016 and 2017 research was executed and proposals for a concrete Delta Plan were developed. This Delta Plan is the implementation programme of the Delta Decisions on Spatial Adaptation (Delta Commissioner, 2017).

In 2018, the full first Delta Plan on Spatial Adaptation was presented. The plan includes climate adaptation strategies for four weather extremes: waterlogging, heat stress, droughts and urban flooding. While the previous Delta Programmes mainly focussed on water and flooding, the Delta Plan on Spatial Adaptation of 2018 treated these four weather extremes as equally important. Therefore, the procedures explained in the plan should all be applied to each of the four weather extremes.

4.2 Delta Plan on Spatial Adaptation

The Delta Plan on Spatial Adaptation proceeds according to the 'analysis', 'ambition', 'action' approach: First, challenges in a specific area must be identified (analysis). These challenges can be different for urban and rural areas, elevated and low-lying parts etc. Second, goals will be formulated and embedded (ambition). Lastly, these goals will be realised through measures (action). Additionally, the Delta Plan on Spatial Adaptation consist of 7 ambitions (Delta Commissioner, 2017). Governmental authorities may differ from this sequence, as some might have already started with adaptation strategies or plans, since the main aim is to speed up the implementation of adaptation measures.

The 7 ambitions are the following (Figure 2):

1. Mapping out vulnerabilities
2. Conducting a risk dialogue and develop a strategy
3. Develop an implementation agenda
4. Linking opportunities in spatial planning
5. Promoting and facilitating
6. Regulating and embedding
7. Responding to disasters

From these 7 ambitions, an action plan has been developed which describes responsibilities of different governmental authorities and corresponding deadlines. The responsibilities of municipalities and the national government are explained below. In table 2 and 3, the responsibilities of the municipalities and the national government are summarised, based on Delta Commissioner (2017).

Figure 2: *Seven ambitions of the Delta Plan on Spatial Adaptation*
Reprinted from: "Delta Programme 2018: Continuing the work on a sustainable and safe delta", by Delta Commissioner (2017). Retrieved from: https://english.deltacommissaris.nl/delta-programme/documents/publications/2017/09/19/dp2018-en-printversie

1. Mapping out vulnerabilities

This ambition aims to give insights into the vulnerability of the four weather extremes. Municipalities should have conducted a stress test before the end of 2019, if such a stress test has not yet been carried out yet (Delta Commissioner, 2017). This stress test must be repeated every 6 years and should:

- Cover both urban and rural environments.
- Target an area's vulnerability to the four weather extremes.
- Pay specific attention to vital and vulnerable functions in the region.
- Consider other issues that raise an area's vulnerability (soil subsidence and changing ground water levels).

Before 2020, the results of the stress test must be published, to inform citizens and businesses on the vulnerability of their area and the urgency of the issue (Delta Commissioner, 2017). In the case of heat stress, the national government has been in charge of developing a 'Standardised Heat Stress Test' in 2017, to support the municipalities in this process. This standardised stress test enables comparability and facilitates the exchange of experiences (Delta Commissioner, 2017). From 2018 on, municipalities are obliged to use the standardised stress test, but already scheduled tests are still allowed to proceed.

2. Conducting risk dialogues and drawing up a strategy

All governmental authorities should start dialogues with stakeholders, after the results of the stress test are published. These risk dialogues should be conducted between 2017-2020. Since 2018, the national government has been responsible for providing a guideline to start the dialogues. For example, in the case of heat stress, these risk dialogues should be aiming at raising awareness on the vulnerability to extreme heat. Additionally, during these dialogues, potential measures to reduce heat stress should be discussed (Delta Commissioner, 2017).

3. Develop an implementation agenda

Before the end of 2020, governmental authorities must develop an implementation and investment agenda, based on the strategy developed during the risk dialogues. These agendas consist of the efforts taken by each party, the bottlenecks that need to be addressed and the issues that can wait or need to be carried out with other tasks (Delta Commissioner, 2017). Urgent bottlenecks require a set of measures, to prevent damage in the near future. Methods for determining the effectiveness of measures should be evaluated by the national government between 2017-2019 (Delta Commissioner, 2017).

4. Capitalising on linkage opportunities

From 2017 on, spatial adaptation should be linked with the energy transition and environmental policies (Delta Commissioner, 2017). Moreover, from 2018 on, municipalities should link spatial adaptation with regular maintenance and management works. However, evaluations of the Delta Plan on Spatial Adaptation show that linkage opportunities may not always be sufficient. Moreover, waiting for linkage opportunities may lead to postponement of measures, which might be urgently needed (Delta Commissioner, 2017).

5. Promoting and facilitating

Several instruments have been set up by the national government to enable knowledge and experience sharing (Delta Commissioner, 2017). These started in 2018, and are continuously expanded and revised:

- Climate-Proof Together Platform: aiming at sharing knowledge, gather information, expertise, and experience. Additionally, this platform will support the exchange of knowledge among municipalities and private actors.
- Spatial Adaptation Incentive Programme: aiming at supporting governments by organising meetings, investing in pilots and doing experiments. This programme will be explained in paragraph 4.4.
- Spatial Adaptation Knowledge Portal: a central point where governments and other actors can find information on spatial adaptation.

From 2018 on, municipalities should draw up collective incentive programmes, to encourage private investments in spatial adaption initiatives (Delta Commissioner, 2017). In this, municipalities are free to determine the combination of communication and financial incentives. Before 2020, the national government should explore the effectiveness of using financial incentives to encourage investments. This should be carried out, in collaboration with other governmental bodies, such as water boards and provinces (Delta Commissioner, 2017).

6. Regulating and embedding

According to the agreements in the Delta Plan, municipalities should embed their contributions to climate adaptations into policy and regulations. This means that the importance of becoming climate-proof should be stressed within guidelines for urban areas (Delta Commissioner, 2017). The coming years, but before the end 2022, municipalities should explore if local regulations need to be changed. The national government should, before 2020, research whether additional regulations are needed to encourage becoming climate-proof (Delta Commissioner, 2017). Next to this, the national government must conduct a stress test on the vital and vulnerable infrastructures in the country, which will lead to a strategy to maintain these.

7. Responding to disasters

Based on the outcomes of the stress test, municipalities will see to it that Security Regions incorporate risks into risk diagrams by no later than 2021 (Delta Commissioner, 2017). Additionally, agreements should be made on the responses to disasters and the renovation of vulnerable functions. Besides, municipalities should explore how they can contribute to damage reduction during disasters, not later than 2020.

Table 2: *Responsibilities of municipalities according to the Delta Plan on Spatial Adaptation*

Responsibilities	**Time frame:**
Conducting stress tests	2018-2019
Repetition of stress tests	Every six years
Publication of results stress tests	Before 2020
Conducting risk dialogues	2017-2020
Develop regional risk agreements	2018-2023
Communicating on raising risk awareness	2017-2020
Develop implementation and investment agendas	No later than 2020
Link climate adaptation with other taskings	Starting from 2017
Exploring necessity to change local regulations	2018-2022
Embed becoming climate-proof in urban area guidelines	2018-2013
Embed becoming climate-proof in Environmental Visions	2019
Develop regional risk agreements in Environmental Plans	2019-2023
Exploring possibilities to employ non-governmental bodies during disasters	Before 2021
Exploring instruments to restrict damage during disasters.	Before 2020
Report on process of spatial adaptation	Starting from 2018

Table 3: *Responsibilities of the national government according to the Delta Plan on Spatial Adaptation*

Responsibilities	**Time frame**
Develop standardised stress tests	2017
Conducting stress tests	2018-2019
Repetition of stress tests	Every six years
Conducting risk dialogues	2017-2020
Develop guidelines for risk dialogues	2018
Develop regional risk agreements	2018-2023
Conducting comprehensive national adaptation dialogues	2017-2018
Communicating on raising risk awareness	2017-2020
Develop methods to determine effectiveness of measures and instruments	2017-2019
Link climate adaptation with other taskings	Starting from 2017
Set up knowledge platforms	2018-2022
Explore financial incentives to promote spatial adaptation	Before 2020
Embed becoming climate-proof in Environmental Visions	2019
Explore strategy regarding national vital and vulnerable functions	2015-2020
Explore necessity to change national regulations	Before 2020
Explore insurability of residual risks	2017-2018

What can be seen from table 2 and 3, is that the municipalities are mainly in charge of implementing the Delta Plan on Spatial Adaption, while the national government is more in charge of guiding and developing guidelines. For example: the municipalities should conduct a stress test and risk dialogues, while the national government should develop standardised stress tests and guidelines for risk dialogues.

Additionally, the national government should set up the knowledge platforms. Nevertheless, the national government should also execute stress tests and risk dialogues, but on a higher scale than the municipalities. Thus, the main difference between the taskings of the national government and the municipalities in the Delta Plan on Spatial adaptation is that the municipalities are mainly the implementers and the national government is mainly the developer of policies.

4.3 Knowledge tools in the Delta Plan on Spatial Adaptation

Since the start of the Delta Plan on Spatial Adaptation, several knowledge tools have been developed and researched by the commissions of the Delta Plan. These tools are freely available for every actor who is interested in the topic (Ruimtelijke Adaptatie, 2019a). The first tool is the *Climate Impact Atlas*, which provides a starting insight into future pressures from heat stress. The second tool is the *Stress Test information leaflet*, which provides instructions for conducting local stress tests and interpreting the results. The third instrument is the *Climate-Proof City Toolbox*, which gives insights into effectiveness of adaptation measures related to heat stress. Within this Toolbox, it is possible to quickly compare and assess several measures. The fourth and last instrument is the *Climate Damage Assessor*, which shows the costs of additional damage caused by heat stress, if there are no adaptation measures in place. However, this tool is still in a beta version, because not all information on potential damage is available yet (Ruimtelijke Adaptatie, 2019a). External parties developed climate adaptation tools as well, which are available through the Ruimtelijke Adaptatie platform. However some of these require some extra support (Ruimtelijke Adaptatie, 2019a).

Furthermore, within the Delta Plan on Spatial Adaptation, related topics are studied to ensure the functioning of the Delta Programme. Research is done on topics such as: urban densification, sea level rise, behavioural changes etc. (Delta Commissioner, 2019). Besides, questions or uncertainties of which the information is not available by the Delta Plan on Spatial Adaptation, will be collected by the Climate-Proof Together Platform. This platform supports municipalities in the process of implementing the Delta Plan (Delta Commissioner, 2019). Additionally, the platform incorporates experienced problems into research plans, if needed (Ruimtelijke Adaptatie, 2019a).

4.4 Supporting instruments in the Delta Plan on Spatial Adaptation

Within the fifth ambition of the Delta Plan on Spatial Adaptation, the Spatial Adaptation Incentive Programme has been developed, to drive efforts and encourage parties to be involved in climate adaptation (Ruimtelijke Adaptatie, 2019c). This support consists of several (financial) instruments (Ruimtelijke Adaptatie, 2019c):

1. *Regional impetus process support*: to support municipalities during the process from heat stress test to forming an implementation agenda. Municipalities must apply for this instrument, to receive the extra budget (Delta Commissioner, 2019).
2. *Implementation project pilots:* a limited number of implementation projects will receive support. These pilots will contribute to the knowledge on the implementation of measures and their effectiveness (Delta Commissioner, 2019). This experience can also serve as an example for other municipalities who are in the same stage of the Delta Plan. To apply, municipalities should already have an overview of their adaptation tasks and urgent issues, to receive the extra support.

3. *Financial incentives pilots:* between 2019-2020, a budget is reserved for eight pilot projects. Municipalities can apply to receive this financial support, and is mainly directed at encouraging businesses and inhabitants to make their living and working environment more climate proof (Delta Commissioner, 2019).

4.5 Progress and amendments to the Delta Plan on Spatial Adaptation 2020

In the Delta Plan on Spatial Adaptation 2020, the progress made by municipalities was evaluated. First, it was found that most of municipalities have conducted a stress test. The Delta Plan on Spatial Adaptation 2019 mentions that, although a lot of municipalities conducted a stress test, the stress tests did not always cover the whole area or was not conducted for all of the four weather extremes (Delta Commissioner, 2018). In the Delta Plan of 2020, such a specification is not mentioned. Also, the risk dialogues were held by a considerable number of municipalities, but not for the entire region of the municipality. Additionally, only a few municipalities have started with an implementation agenda (Delta Commissioner, 2019).

Besides describing the current progress, the Delta Plan on Spatial Adaptation of 2020 also discusses the interim goals for the period 2020-2050 (Delta Commissioner, 2019). For assessing whether the target for being climate-proof in 2050 will be reached, the term 'climate-proof' should have a more specific description. Moreover, the relationship between becoming climate-proof and other tasks, energy transition, cultural heritage will be more researched in the future, as well as the national strategy regarding vital and vulnerable infrastructures (Delta Commissioner, 2019).

4.6 Summary

To summarise this chapter, the Delta Plan on Spatial Adaptation is created to speed up the implementation of climate adaptation measures. It includes climate adaptation strategies for four weather extremes: waterlogging, heat stress, droughts and urban flooding. The Delta Plan on Spatial Adaptation proceeds according to 7 ambitions, from which an action plan is developed. In this action plan, the responsibilities for municipalities and the national government are described (see table 2 and 3). Here can be seen that the municipalities are mainly the implementers of climate adaptation policies, while the national government is mainly the developer. Besides, the Delta Plan on Spatial Adaptation supports municipalities by providing knowledge tools and supporting instruments. Each year the plan is evaluated to investigate which progress is made and whether changes are needed. In the next chapter the information from chapter 4 is used to analyse to what extent the Delta Plan on Spatial Adaptation is integrated into municipal policies.

5. Integration of the Delta Plan on Spatial Adaptation into municipal policies

This chapter will describe the current integration of the Delta Plan on Spatial Adaptation in municipal policies on heat stress in the Netherlands. The results will be used to answer sub question 2. The first part is based on the data collected by studying municipal documents. The second part is based on the data collected by the survey and the interviews.

5.1 The Delta Plan on Spatial Adaptation in municipal documents

From the 25 largest municipalities in the Netherlands, the municipal documents on climate adaptation, 'green policy plans' or 'omgevingsvisies' were studied. For each municipality, 2 or 3 documents were studied. The municipal documents were researched on the following elements: mentioning of the Delta Plan on Spatial Adaptation, mentioning of a stress test, focus of the municipal adaptation plan, corresponding goals and, development of an action/implementation plan.

5.1.1 Results

From researching municipal policy plans of the selected municipalities, it can be stated that almost all the researched municipalities are working on the issue of heat stress and that the Delta Plan on Spatial Adaptation is quite well known across the municipalities. Much of the researched municipalities have the goal of being climate-proof by 2050. Some even have a more ambitious goal by setting this deadline in 2025 or 2040 (Gemeente Rotterdam, 2013; Tauw, 2015). Furthermore, the goal of mainstreaming climate adaptation policies within the municipal processes before 2020, is aspired by half of the researched municipalities. The results of this document study are summarised in table 4.

The specific heat stress policies and measures are often found in 'green policy plans' (groenbeleidsplannen) or climate adaptation plans. These are mainly directed at climate adaptation in a broader sense, as the Delta Plan on Spatial Adaptation is also directed at droughts and flooding. When it comes to climate adaptation or heat stress, there is a general focus on making cities 'greener' by planting more trees and creating more green spaces in the city. However, at this point there is a clear difference between the researched municipalities: on the one hand, there are municipalities that consider heat stress and water retention as equally important issues, in which for both issues different 'green' measures are given. On the other hand, there are municipalities which focus on greening the city, for mainly increasing the water retention and drainage capacity. Heat stress is then shortly mentioned as issue, which can will also be addressed by these measures.

By now, all the municipalities should have conducted a stress test. When researching the municipal documents, it was noticed that municipalities approach the stress tests and the publishing of the results differently. For example, some municipalities outsource the stress test to a research agency (Sweco, 2018; Tauw, 2015). It is also common that municipalities participate in a regional stress test, for example the region 'Vallei & Veluwe', the region 'Rijk van Nijmegen' & 'Land van Maas and Waal' and the Province of Utrecht (Gemeente Utrecht, 2019; Ruimtelijke Adaptatie, 2019b). Besides, some stress tests were executed quite recently while others were executed shortly after the Delta Plan on Spatial Adaptation was created in 2015. The differences in executed stress tests and the reporting can be explained by the fact that the 'Standardised Heat Stress Test' was only developed recently. As municipalities are obliged to repeat the stress tests every 6 years, the stress tests might be more comparable in the future (RIVM, 2019b).

Table 4: *Summary of the document study on the integration of Delta Plan Spatial Adaptation into to municipal documents*

Municipalities	**Delta Plan**	**Stress test**	**Focus**	**Goal: mainstream adaptation in 2020**	**Goal: climate-proof in 2050**	**Action plan or implementation plan**
Amsterdam	✓	✓	More green in city	✓	✓	✓
Rotterdam	*x*	✓	More green in city	✓	✓ (in 2025)	✓
Den Haag	✓	✓	More green in city	✓	*x*	✓
Utrecht	✓	✓	*x*	✓	✓	*x* (in development)
Eindhoven	✓	✓	More green in city	✓	✓	✓
Tilburg	✓	✓	*x*	✓	✓ (in 2040)	✓
Almere	✓	✓	Water management	*x*	*x*	*x* (Waterplan)
Groningen	✓	✓	*x*	✓	*x*	*x* (in development)
Breda	✓	✓	*x*	✓	✓	✓
Nijmegen	✓	✓ *	More green in city	*x*	✓	*x*
Apeldoorn	✓	✓ *	*x*	*x*	✓	*x*
Haarlem	✓	✓	*x*	✓	✓	✓
Enschede	✓	✓	More green in city	✓	*x*	*x*
Arnhem	*x*	✓	More green in city	*x*	*x*	✓
Amersfoort	✓	✓ *	*x*	*x*	✓	✓
Zaanstad	✓	✓	More green in city	*x*	✓	*x* (in development)
's-Hertogenbosch	✓	✓	More green in city	*x*	✓	*x*
Haarlemmermeer	*x*	✓ **	*x*	*x*	*x*	*x*
Zwolle	✓	✓	More green in city	✓	✓	✓
Zoetermeer	✓	*x*	*x*	*x*	*x*	*x*
Leiden	*x*	*x*	More green in city	*x*	✓	*x*
Maastricht	*x*	*x*	More green in city	*x*	*x*	*x*
Leeuwarden	✓	✓	More green in city	✓	✓ (in 2035)	*x* (in development)
Dordrecht	✓	✓ **	Water management	✓	✓ (in 2035)	*x*
Ede	✓	✓ *	More green in city	*x*	*x*	*x* (in development)

Legend ✓*Mentioned in policy* *x Not mentioned/not found* ** Regional stress test* *** Stress test conducted but heat stress not explicitly mentioned*

Lastly, most of the researched municipalities are now developing an action plan or implementation plan. For some researched municipalities, creating an action or implementation plan is a goal for 2020 (Gemeente Ede, 2019; Gemeente Leeuwarden, 2019a). Therefore, these plans are currently in development. However, less than half of the researched municipalities does not have an explicit action or implementation plan yet.

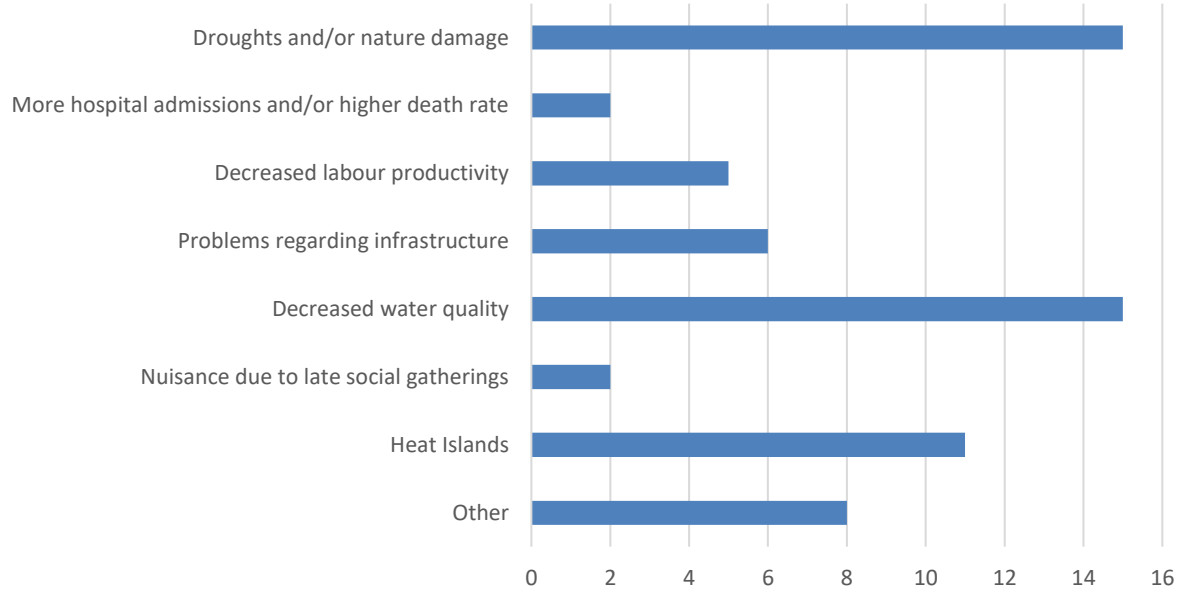
5.2 The Delta Plan on Spatial Adaptation in the municipal organisation

This part of chapter 5 is based on the data collected by the survey and the interviews. The survey was sent to the 25 largest municipalities in the Netherlands. Besides, two interviews were held, one with a policy advisor and one with programme manager, both in the field of climate adaptation. The first part of the survey focussed amongst others on experienced consequences of heat stress, familiarity with the Delta Plan on Spatial Adaptation, already developed heat stress policies and the urgency of heat stress on the political agenda. These concepts are valuable in determining the integration of the Delta Plan on Spatial adaptation into municipal policy. Data of other parts of the survey is covered in chapter 6 and 7.

5.2.1 Results

From the data of the survey follows that, almost all respondents experienced consequences of extreme heat in their municipal region. Table 5 shows that droughts, nature damage, heat islands and decreased water quality are experienced by most of the municipalities. Around half of the respondents experienced problems regarding infrastructure, such as bridges that cannot open or close or roads that expand due to the warm asphalt. However, the respondents indicate that municipalities often do not have exact data on excess deaths or decreased work productivity during summer. They indicate however, that this does not mean that these consequences did not occur during the summer.

Table 5: *Results of the survey regarding experienced consequences of extreme heat*

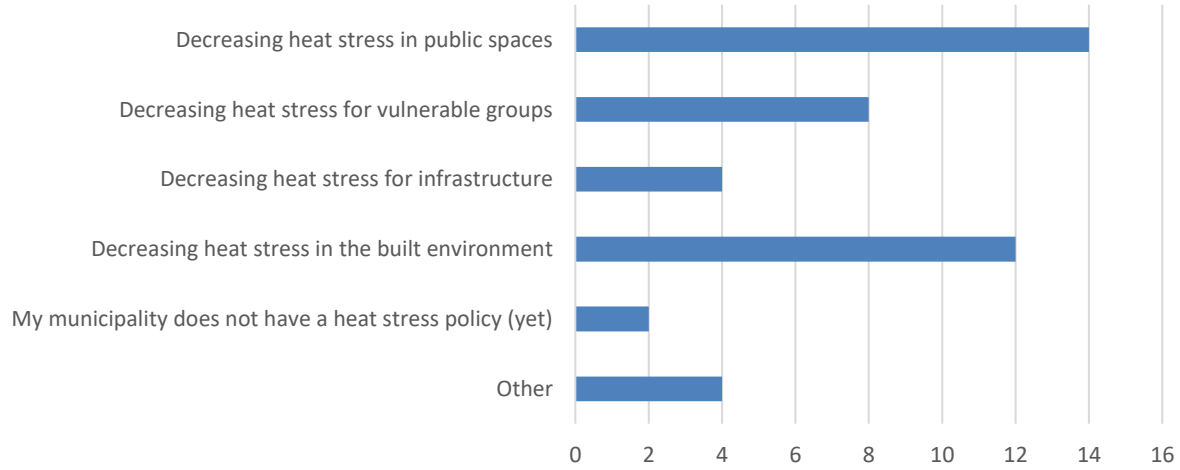


Almost all the respondents indicate that they are familiar with the Delta Plan on Spatial Adaptation and that they proceed according to this plan. Only one municipality is not familiar with the plan and one respondent indicates that the plan is known by the municipal organisation, but that policy is not developed according to this plan. From interview A and B, it comes forward that the Delta Plan on Spatial Adaptation is more regarded as a method or tool, instead of a compelling plan. It gives a clear signal of the importance of governing heat stress and a direction on how to start working on the issue of heat stress. Additionally, it can be used as a benchmarking tool towards other municipalities. However, according to the interviewees, a municipality should have room to find their own direction in governing heat stress, as every municipality is different and has different problems. "I think the national government could help by employing one generally used method [Delta Plan on Spatial Adaptation]. However, I think that there should also be room for municipalities to give their own interpretation to this" (Interview A).

From the respondents, only a few indicate that their municipality already developed a heat stress policy, specifically directed at heat stress or as part of a general climate adaptation policy. However, most of the respondents mention that policy is being developed at the moment and that they are expecting this policy to be finished in the first months of 2020. These municipalities are now working on converting a regional strategy into a local strategy, developing an implementation agenda, defining specific tasks and measures, or integrating heat stress into maintenance work.

The municipalities that are in the process of formulating a policy, mainly focus on directing this policy towards reducing heat stress in public spaces and the built environment. The results are shown in table 6. For example: one municipality is working on creating shadow on sidewalks and 'cool' public spaces and exploring opportunities regarding the 'albedo effect'[1] during summer. Another example is that a municipality identified 'vulnerable spots' and tries to combine heat stress measures with flooding measures. Half of the respondents indicated that their policy is also directed reducing heat stress for vulnerable groups, such as elderly people.

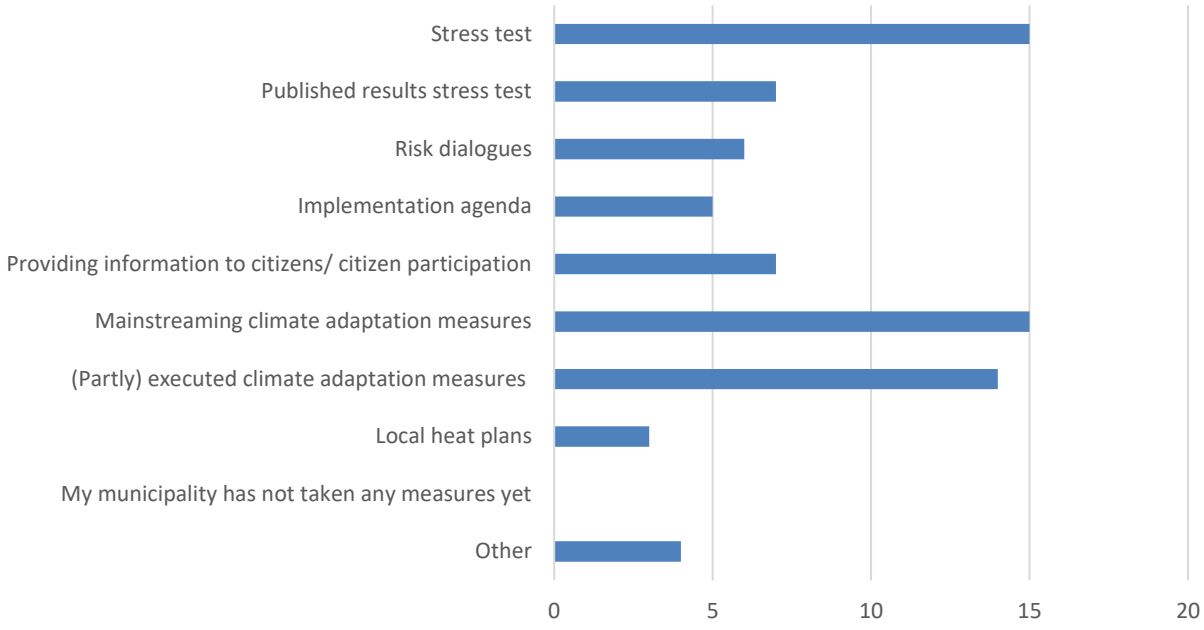
Table 6: *Results of the survey regarding the focus of municipal heat stress policies*



[1] "Solar reflectance, or albedo, is the percentage of solar energy reflected by a surface" (Environmental Protection Agency (EPA), 2008, p. 8)

15 out of 16 respondents conducted a stress test and integrated climate adaptation measures into other spatial measures or policies. Only half of the respondents is conducting risk dialogues, but municipalities still have one year to fulfil this task. Table 7 shows that only a few respondents indicate an implementation agenda or a local heat plan is developed.

Table 7: *Results of the survey regarding measures taken by municipalities regarding heat stress*

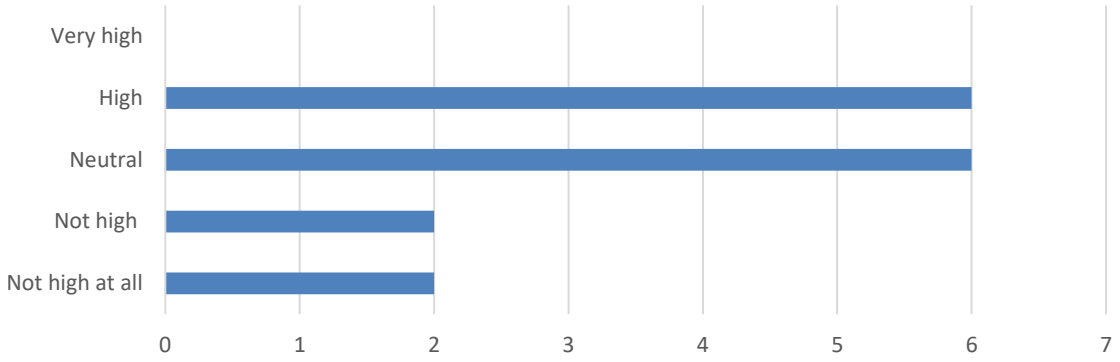


What stands out is that none of the respondents indicate that heat stress is extremely high on the political agenda in their municipality. See Table 8 for the results. Less than half of the respondents indicate 'neutral' or 'high'. Moreover, four respondents indicate that heat stress is not high or not high at all on the political agenda. In the comment section, one municipality explains that heat stress is part of the climate adaptation policy in general. This could be an explanation for the fact that heat stress is not regarded as an important issue on the political agenda.

However, the point of urgency was also mentioned by both the interviewees. Currently, people do not experience heat stress as a problem. Warm weather is regarded as 'enjoyable', instead of problematic. Moreover, heat stress might be a problem for vulnerable citizen groups and not for all citizens. Nevertheless, the problem is gathering attention. Interviewee A explains:

> I notice that since 2018, there is a different political perspective [within the municipality]. This means that there is also a different perspective on the problem. Consequently, heat stress as a problem is more recognised. The climate also contributed to this: the past two summers were extremely warm, so people experience this warmer weather as well. (Interview A)

Table 8: *Results of the survey regarding the urgency of heat stress on the political agenda*



5.3 Summary

To summarise this chapter, from the document study on municipal documents comes forward that most of the researched municipalities are working on the issue of heat stress. This can also be seen from the data of the survey. Most of the municipalities conducted a stress test and developed an implementation plan. However, some municipalities are in a further stage of developing a heat stress policy than others. The survey shows that heat stress is not very high on the political agenda and that the urgency of the problem is often not experienced yet. This was also stressed during the interviews. Besides, the respondents argue that the Delta Plan on Spatial Adaptation can be more regarded as a method or benchmark, but within this plan they should also have room for making their own plans. The next chapter will proceed on explaining the results of the survey and the interviews, but will focus on the governance capacity part of the survey.

6. Governance capacity of Dutch municipalities regarding heat stress

This chapter will describe the results regarding the governance capacity of Dutch municipalities. These results will be used to answer sub question 3 and 4. The chapter is divided into three parts: internal dynamics and coordination; resource availability; institutional context.

6.1 Internal dynamics and coordination

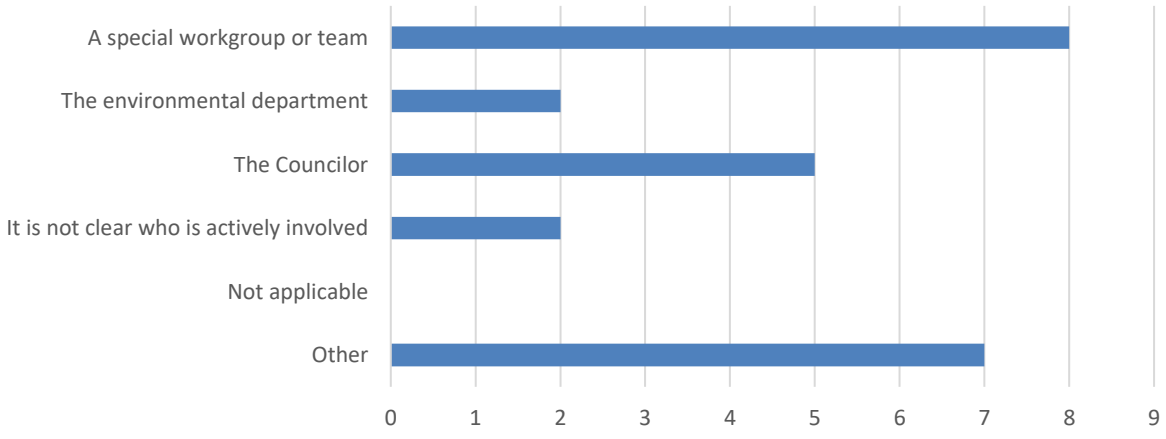
The first part of this chapter describes the internal dynamics and coordination within the municipal organisation, according to the respondents. The survey asked the respondents amongst others how heat stress is governed within their municipality, what problems arise and whether there is a designated 'heat stress coordinator' working at the municipality. The interviews served as supporting explanation to the answers given in the survey.

6.1.1 Results

Table 9 shows that half of the respondents indicate that a special 'team' is actively involved in formulating a heat stress policy. However, a few respondents indicate that this team consists of only a small group of people, some respondents even work alone on the topic or with one other person. One municipality indicates that since a few months, a person is now responsible for coordinating and formulating a heat stress policy. However, the other respondents do not mention the presence of a coordinator in formulating a heat stress policy. Interviewee B explained:

> We do not have a specific advisor heat stress at the municipality. It is my task now, to take on this role. With that, it is automatically more difficult to work on the issue, and it asks for the integration of more disciplines. ... It is good to see the combination and to see how we can make progress in the area of spatial design or in the health care. That is where we try to focus on now, to pack things together. That is also the part which is most challenging. (Interview B)

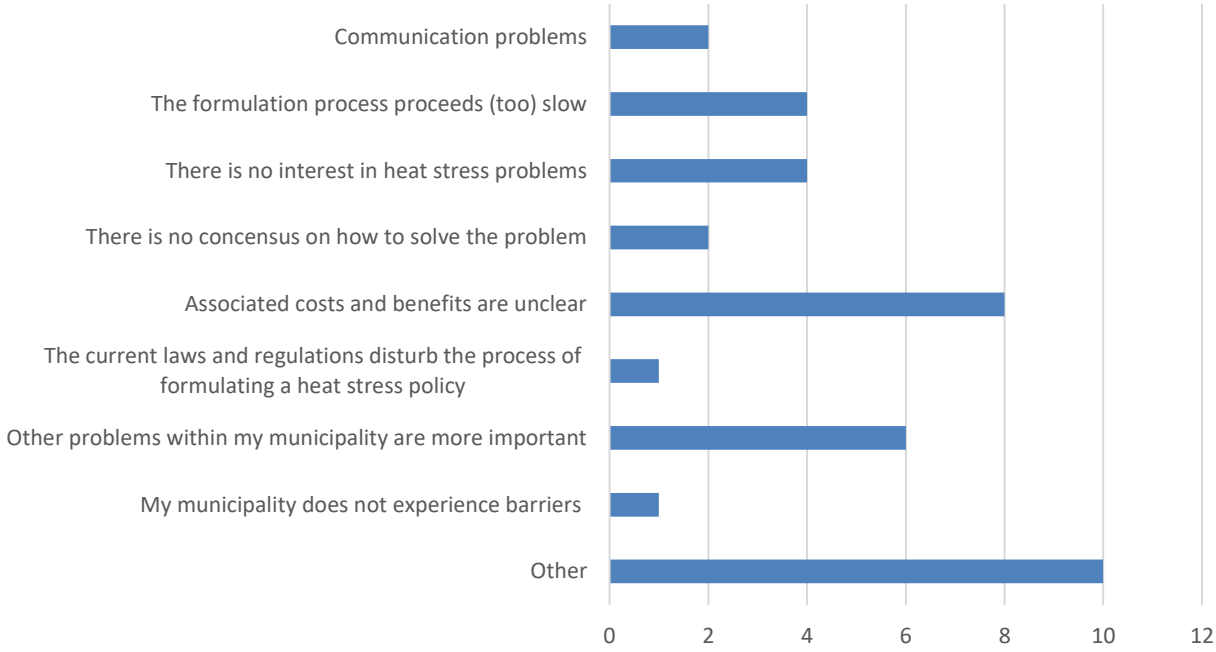
Table 9: *Results of the survey regarding who is actively involved in formulating a heat stress policy*



Nevertheless, all municipalities indicate that there is collaboration between different departments of the municipality. Most of the collaboration takes place with the spatial planning department and liveability. Besides departments such as public space, green management, health and sustainability are also often mentioned.

Within this collaboration, some problems arise. This is shown in table 10. Half of the respondents indicate that the costs and benefits of measures are often not clear. Additionally, some indicate that other problems within the municipality are of greater importance or that there is less interest in heat stress policy. Respondents explain that climate adaptation and heat stress are relatively new topics for the municipality and therefore the urgency is not felt by all departments. Instead of seeing the problems of heat stress, people enjoy the warm weather. It is also mentioned that there is no person 'responsible' or that no one is the owner of heat stress problems, which makes it difficult to govern. Lastly, it is mentioned that heat stress policy disturbs urgent plans for building more houses and is therefore often neglected. It would in that case be better to integrate heat stress measures in new housing plans.

Table 10: *Results of the survey regarding experienced barriers within the municipal organisation in formulating a heat stress policy*



6.2 Resource availability

The second part of this chapter describes the resource availability when it comes to governing heat stress, according to the respondents. Examples of resources are financial resources, human resources, knowledge and information, and time. In the survey, respondents could indicate to what extent they agreed upon a statement related to resource availability, and could give extra explanation afterwards. In here the interviews served as supporting explanation as well.

6.2.1 Results

In table 11, an overview of the results regarding the resource availability according to the respondents is given. Firstly, regarding sufficient human and financial resources, the majority of the respondents answers 'agree' to 'neutral'. Secondly, regarding sufficient knowledge and information, the majority answers 'neutral' to 'disagree'. All the respondents are familiar with the knowledge tools provided by the Delta Plan on Spatial Adaptation, and the majority of the respondents is using these tools as well.

The respondents indicate that they mainly use the tools as a basis for their own research. The knowledge tools mainly provide national data, but the respondents indicate that they transferred the tools into local information to formulate a local heat policy. Additionally, some indicate that the tools contribute to more awareness on the issue heat stress.

Another issue regarding knowledge and information, which is often mentioned, is that heat stress is an 'unclear' and 'intangible' problem. The exact consequences and problems are not clearly visible. Therefore, it is often not considered as a problem. Interviewee B explained:

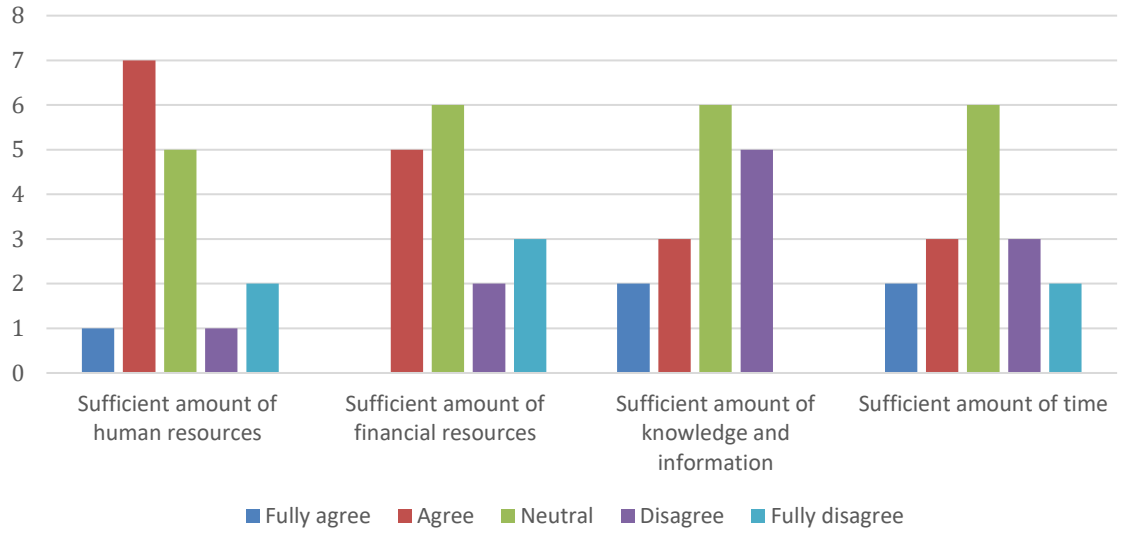
> During extreme precipitation: a lot of water is coming down and the nuisance is immediately experienced. In 2018, we have had a rain shower of 80 millimetres ... That same day, there was also a heat record. ... Such a heat record ... does then not really matter ... However, only after a week of extreme hot days, heat stress will be experienced. (Interview B)

Besides, respondents indicate that heat stress is difficult to 'quantify'. When is heat stress considered as a problem? Is it when there is one extreme hot day or when there is a longer period of extreme heat? And at which temperature is it considered problematic? Hence, respondents explain that currently heat stress problems only become priority when the consequences are clearly visible. According to the respondents, it is important that information on consequences of heat stress, vulnerable locations and effective measures is available. This was also stated during interview B:

> In the case of extreme precipitation, this can all be quantified. The size of the sewage pipe ... where stays water in the streets ... In the case of heat stress ... In Ede, the main street is the city centre has been renovated, large rows of trees are planted for a liveable city centre. These also contribute to reduce heat stress. But how much do they contribute? A half degree, one degree or two degrees? Not even a degree, you tell me? So, in that case, it is a relatively new and unknown subject, which also makes it more difficult to get it explicitly on the agenda. (Interview B)

Thirdly, regarding the sufficient amount of time, the majority answers 'neutral'. Interviewee A explained that time is needed, because creating awareness within the municipal organisation takes time. Without awareness it is difficult to formulate a policy and time is needed to achieve this. This also came forward from the surveys. Respondents indicate that urgency is most important in the first place and when heat stress becomes a priority, time, money and finances will follow automatically.

Table 11: *Results of the survey regarding the availability of resources in governing heat stress*



6.3 Institutional context

The last part of this chapter describes the institutional context around heat stress governance, according to the respondents. In here the interaction between the national government is described, as well as the difficulties experienced within this interaction. Additionally, it describes the given support and the contribution of the Delta Plan on Spatial adaptation to municipal heat stress policy. The questions in this part of the survey were mainly statement questions or multiple-choice questions. The interviews serve as supporting explanation, but are more important here. During the interviews came forward how municipalities experience the existence of national plan, such as the Delta Plan on Spatial Adaptation.

6.3.1 Results

Regarding the division of responsibilities between the municipalities and the national government, most respondents indicate that the current division is the 'right' one (Table 12). The majority of the respondents answers 'agree' to 'neutral'. They explain that the municipality can work on the issue of heat stress, but there should be room for own interpretation. From interview B comes forward that the national government is *the* designated actor to emphasise the urgency and the importance of working on the issue of heat stress, while the municipalities formulate a policy adjusted to the local situation. The interviewee explains:

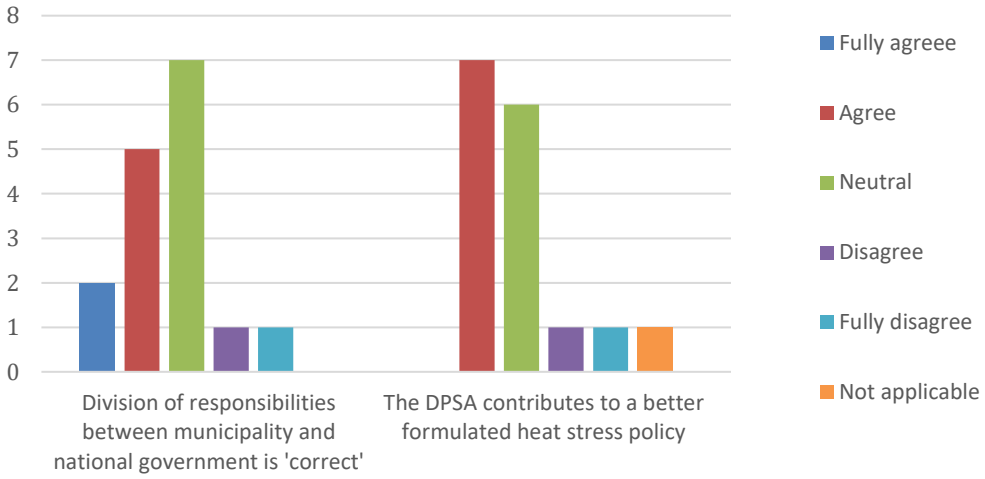
> I think both [governmental levels] are needed. As municipality we can look more detailed to the local level, than higher levels. However, with these higher levels we are able to get in contact with larger parties, such as Staatsbosbeheer, Natuurmonumenten and the health regions. These parties can become more involved at these higher levels ... So, I think it is an interaction. (Interview B)

However, a few respondents indicate that the national government provides too abstract information. Especially smaller municipalities have difficulty in formulating policy, as they have less expertise on the topic than larger municipalities. Besides, clear laws and regulations should come from the national government to guide the policy formulation.

Nevertheless, half of the respondents indicate that they do not experience difficulties in the division of responsibilities between the municipalities and the national government. Lastly, the majority of the respondents indicate that the Delta Plan on Spatial Adaptation contributes to a better formulated heat stress policy. This is shown in table 12. With such a plan, the government can increase awareness and stress the urgency of heat stress adaptation measures. It urges municipalities to start working on the issue. This is also emphasised during interview A and B. Furthermore, the Delta Plan on Spatial Adaption gives direction to policy and can serve as a benchmark:

> I think it [Delta Plan on Spatial Adaptation] is important, that it progresses this way and that it gives some kind of benchmarking towards others. Where do you stand in the risk dialogues? It gives a clear signal that municipalities should start working the issue. Although it is not very compelling, it gives direction and helps all municipalities to take on the issue. (Interview A)

Table 12: *Results of the survey regarding the division of responsibilities in the Delta Plan on Spatial Adaptation (DPSA) and the contribution to a better formulated heat stress policy*



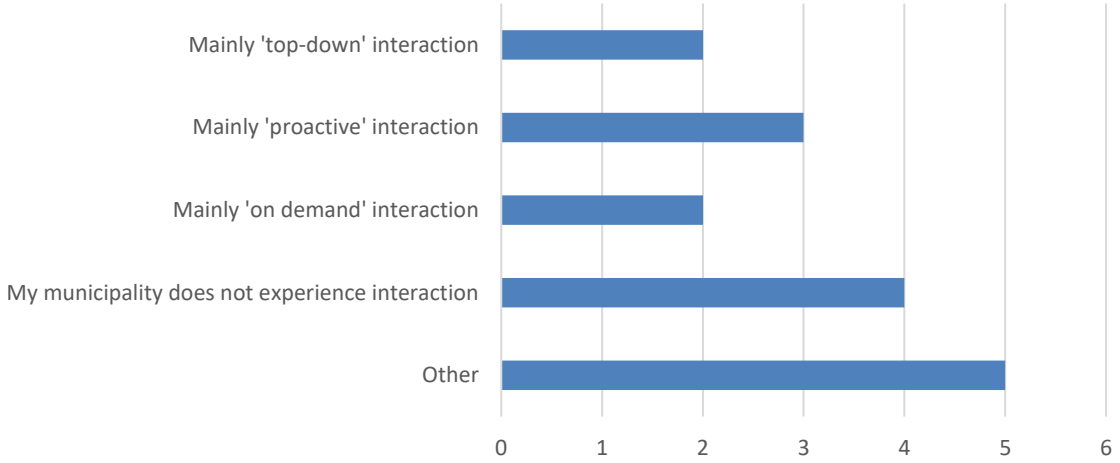
Additionally, the respondents mainly answer ‘neutral’ to the question whether the national government provides sufficient support to formulate and execute a heat stress policy. Besides, financial support, access to data and research, and the use of knowledge tools and platforms for knowledge sharing are most important in formulating a heat stress policy. In here, the respondents stress again that more insights and clarity are also important supporting elements in formulating a heat stress policy. Some respondents argue for an adjustment in regulations as well. For example, rules for climate adaptive building of houses or a ‘compulsory climate test’.

What stands out, is that respondents have difficulty in describing the interaction with the national government, or that they do not experience interaction with the national government. This is shown in table 13. However, respondents explain that the municipalities and the national government both work on heat stress, but that each level has its own responsibilities and distance towards society. Nevertheless, interviewee B stated that interaction with the national government is necessary:

> Yes, I think it [interaction with the national government] is important, because it is a broad issue and to prevent that 25 different regions start working in 25 different directions. ... Yes, there should be room for local customisation ... but I think in the end there should be a framework according to which heat stress policy will be formulated. (Interview B)

Furthermore, respondents indicate that on regional level, there is a better relationship with the national government. Nevertheless, a few respondents indicate that, in the case of heat stress, there is no interaction (yet) with the national government. The question whether this interaction with the national government in the 'right' one, most of the respondents answered 'agree' to 'neutral'.

Table 13: *Results of the survey regarding the experienced interaction with the national government*



6.4 Summary

To summarise this chapter, from the survey follows that most of the respondents have a special team working on the issue of heat stress and that there is collaboration within different departments of the municipality. Additionally, respondents indicate that human and financial resources are important and that most of the municipalities are using the knowledge tools from the Delta Plan on Spatial Adaptation. However, respondents also indicate that heat stress is a quite unclear problem and that urgency to solve the problem is often lacking. Consequently, without urgency, other resources are lacking as well. Furthermore, most of the respondents agree that the current division of responsibilities between the national government and the municipalities is the 'right' one. Also, the Delta Plan on Spatial Adaptation contributes to a better formulated heat stress policy. According to the respondents, financial support, access to data and research, and the use of knowledge tools and platforms for knowledge sharing are most important in formulating a heat stress policy. Lastly, what stands out, is that respondents have difficulty in describing the interaction with the national government or that some do not experience interaction with the national government. In the next chapter, the results of the last part of the survey will be elaborated upon.

7. Future roles and expectations in governing heat stress

This chapter describes the results regarding the future role of the municipalities and the national government regarding heat stress governance. These results are used to answer sub question 5. The chapter is divided into three parts: role of the municipalities; role of the national government; and future plans and visions.

7.1 Role of the municipalities

In this part of the survey, the respondents were asked how they see the municipal role in the future and what kind of roles will become more important. This was mainly done by using statement and multiple-choice questions. Moreover, the extra explanations given are quite important, because the multiple-choice questions provided quite abstract information. The extra explanation provided more in-depth support of the answers given. Therefore, the interviews also play an important role in this chapter.

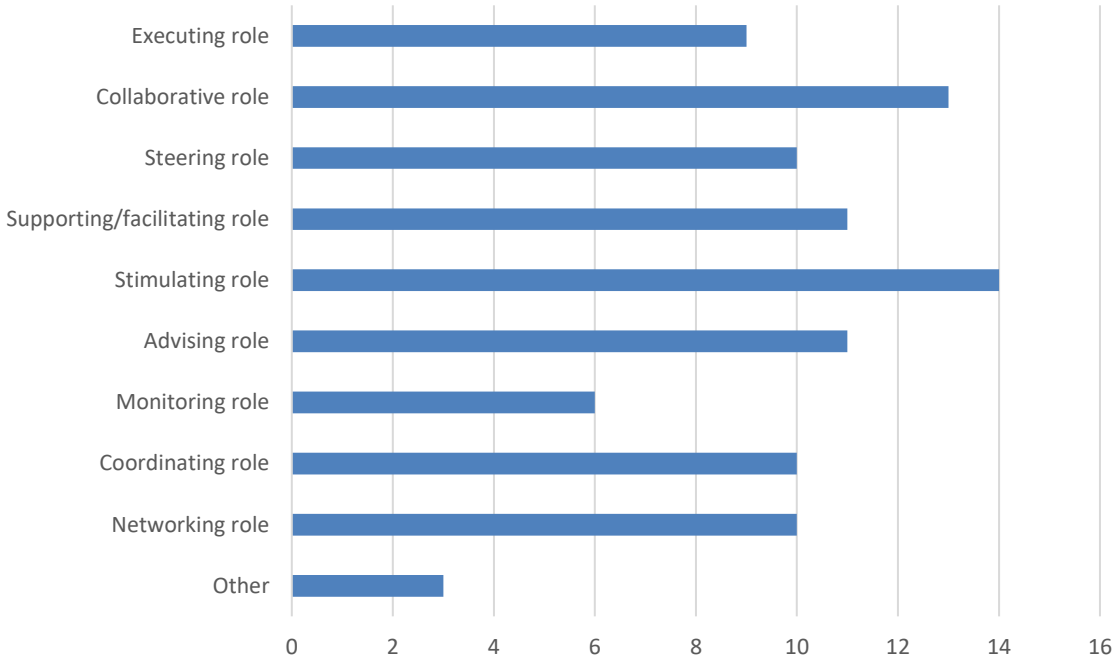
7.1.1 Results

Half of the respondents indicate that their goals regarding climate adaptation and heat stress are formulated according to the Delta Plan on Spatial Adaptation. A few indicate that their municipality did not yet formulate goals regarding heat stress or that they do not know whether their municipality formulated goals according to the Delta Plan on Spatial Adaptation. Only 4 respondents indicate that their goals are not formulated according to the Delta Plan on Spatial Adaptation. Nevertheless, more than half of the respondents indicate their municipality is able to act climate- and water-proof from 2020 on.

Furthermore, almost all respondents indicate that the role of the municipality will become more important in the future governing of heat stress. 15 out of the 16 respondents indicate ‘very much agree’ or ‘agree’. Interviewee A explains: “the municipality is the closest to the citizens and the companies, and that is where it should take place. That is why I think that the role [of the municipality] becomes more important” (Interview A). Besides, municipalities can learn from each other and advise each other, what makes municipalities more suitable for governing heat stress.

In Table 14 is shown what role the municipalities should take on, according to the respondents. The stimulating and collaborative role are mostly mentioned. However, as can be seen from the table, almost every role is considered important. The respondents explain that different roles are needed for different measures. For example, when collaborating with citizens or companies, a different role is needed then when measures in public space need to be executed. The role of the municipality is thus dependable on the executed project. Moreover, the respondents stress that the municipality is not able to govern heat stress on its own. Collaboration is ‘very much’ needed.

Table 14: *Results of the survey regarding the role municipalities should take on in governing heat stress*



7.2 Role of the national government

The second part of this chapter focusses on what role the national government should take on, according to the respondents. Additionally, it focusses on what support the national government should provide more in the future. Here the interviewees are quite important, because they provided clear information on what is needed and what their experiences are regarding the interaction with the national government.

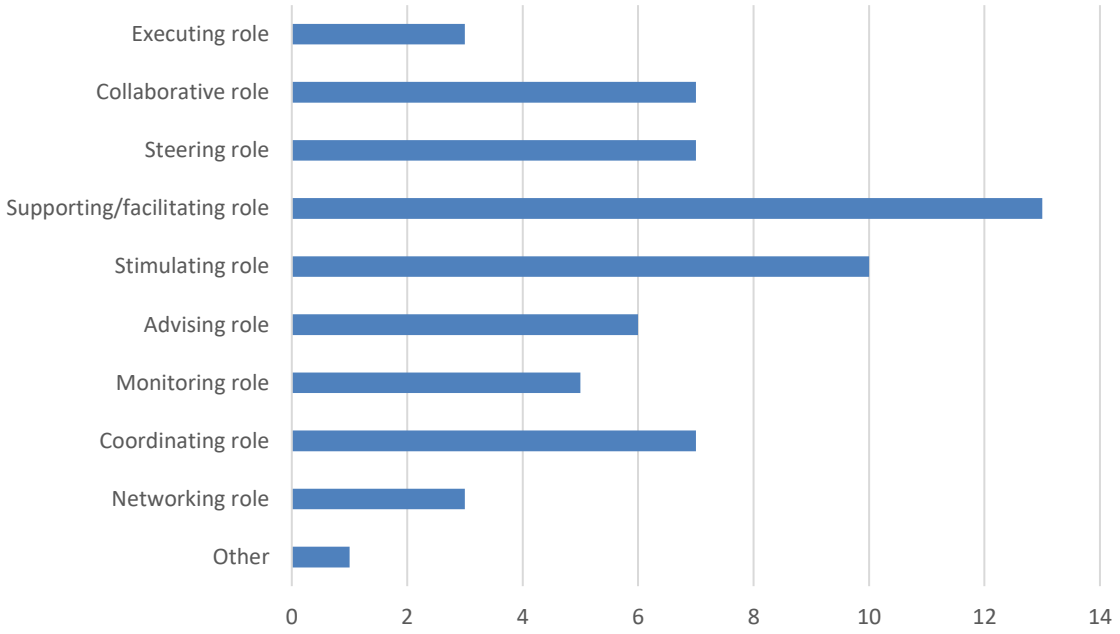
7.2.1 Results

Regarding the role, which the national government should take on, it can be seen that the supporting/facilitating and stimulating role are important. The results are shown in table 15. Besides, almost all respondents indicate that they 'agree' or are 'neutral' regarding the importance of the national government regarding heat stress governance in the future. 2 respondents indicate that they did not agree on this.

Furthermore, from interview A comes forward that the most important role of the national government is giving direction to heat stress policy and giving signals to municipalities that they should take on heat stress problems. It is stressed again that capacity from the national government is needed, but municipalities should have room to make their own plans and policies. Moreover, interviewee B argues that the national government can serve as a networking actor:

> As a network linking between different governmental levels, where the local level is more detailed that the regional level, and the national level even more abstract. ... I think you should really look at those different levels, so that we are all 'partners' who follow the right path together. ... I think there should be interest in what happens at the local and regional level, so that this in turn can contribute to the development of national policy. (Interview B)

Table 15: *Results of the survey regarding the role the national government should take on in governing heat stress*



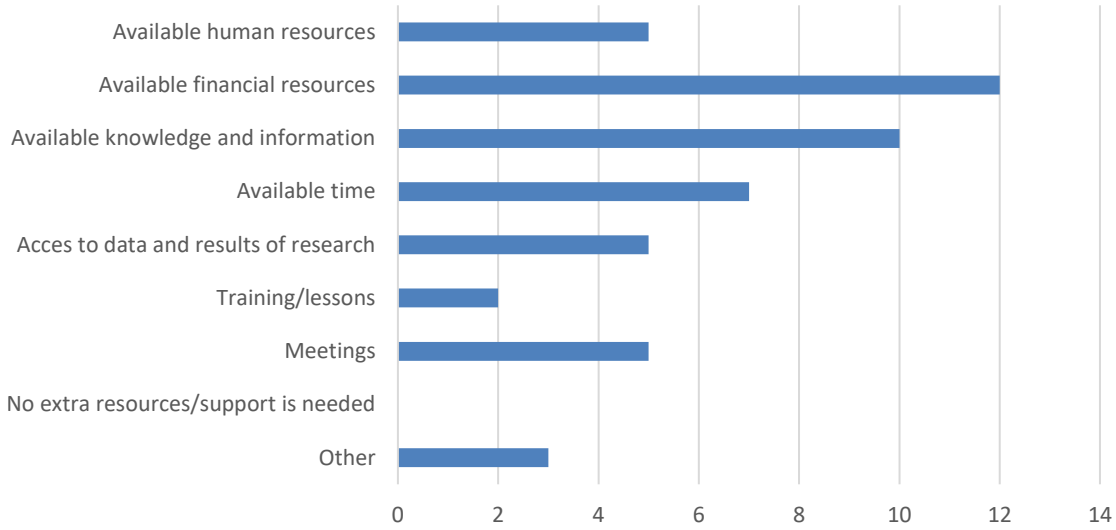
However, most the respondents agree that the national government should provide more support in the future, so that municipalities are able to better formulate and execute a heat stress policy. They indicate that a pro-active interaction between the national government and the municipalities is desirable. In here, they explain that a complete plan is not explicitly needed, but support and facilitating measures are more helpful. Additionally, some argue that before formulating a national plan, the governments should ask for input of lower governmental levels. Lastly, the communication to citizens is also an important factor in formulating a plan such as the Delta Plan on Spatial Adaptation.

Regarding the question what kind of supporting measures are needed in the future, the respondents indicate that especially financial subsidy and stimulating measures are needed from the national government. At the moment, the measures are not enough to help all the involved parties. This is also shown in table 16. During interview B comes forward that the national government could also play an important role in facilitating the translation from pilot projects towards explicit measures:

> I can imagine that moving from pilot projects towards actual implementation, promoting, subsidising and stimulating are measures, which need to be taken. ... Especially in the beginning I can imagine that ... a subsidy or something can contribute to speed up the transition to the actual practice. (Interview B)

Besides, respondents explain that monitoring mechanisms are lacking. They do not know whether they are on the right track or right direction. Moreover, urgency and awareness are again mentioned here, as which something the national government should facilitate.

Table 16: *Results of the survey regarding the support needed to govern heat stress in the future*



7.3 Future plans and ambitions

The last part of this chapter focusses on the future plans and ambitions of the municipalities. Here the data collected during the document study served as background information. At the end of the survey the respondents were asked what their future plans and ambitions are. This was an open question. Besides, the interviewees were asked the same, and could provide extra in-depth explanation.

7.3.1 Results

Regarding the future plans and ambitions of the respondents, it can be seen that most of the respondents have developed their ambitions regarding heat stress, but specific policy will be formulated in the coming years. However, most of the respondents are already taking 'no-regret' measures to reduce heat stress. This mainly done by creating more green spaces within the municipality. Additionally, the respondents are working on involving citizens and companies in the heat stress policy, to create awareness. This is also emphasised during the interviews. Lastly, the respondents are exploring opportunities to incorporate heat stress directives into new spatial plans and projects, and also incorporate these into all maintenance works.

7.4 Summary

To summarise this chapter, from the survey follows that both the role of the municipalities and the national government becomes more important in governing heat stress in the future. For municipalities the stimulating and collaborative role are most important. However, more roles are important, as different tasks and measures require different roles. For the national government, the supporting/facilitating role and stimulating role are important. Nevertheless, respondents agree that the national government should provide more support in the future, so that municipalities are better able to formulate and execute a heat stress policy. Especially financial support and subsidies are needed. Moreover, respondents explain that monitoring mechanisms are lacking, and more awareness and urgency is needed. Lastly, the respondents argue that a pro-active interaction between the municipalities and the national government is most desirable. In the next chapter, the results of chapter 4, 5, 6 and 7 will be discussed.

8. Discussion

This research is executed to provide insights in the factors that influence the governance capacity of Dutch municipalities with regard to heat stress. In this chapter, the results described in chapter 4, 5, 6 and 7, will be discussed and evaluated against the theory used in the theoretical framework. Besides, the limitations of this research will be discussed.

8.1 Discussion of the findings

From the data follows that two factors are frequently returning when analysing governance capacity in governing heat stress. The first one is that heat stress is regarded as a 'complex' and 'intangible' problem, which can be regarded as a negative influencing factor. The second factor is the existence of a governmental framework or plan, in this case the Delta Plan on Spatial Adaptation, which gives direction to policy and pushes municipalities to start working on heat stress. This is a positive influencing factor. The other results found, can mainly be grouped under these two factors. An overview of this is given in figure 3.

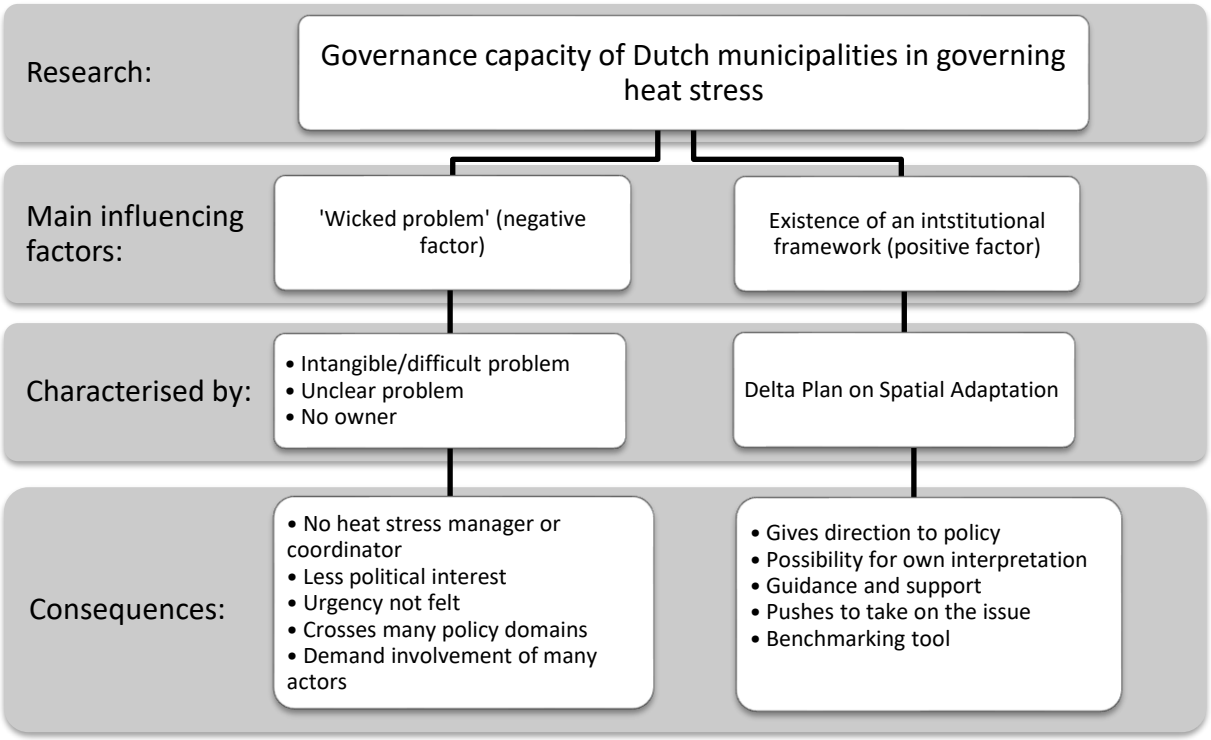


Figure 3: *Overview of the findings of this research, grouped under a negative and a positive influencing factor*

8.1.1 Wicked problem theory

The first factor on the complexity of governing heat stress, is in line with the theory of 'wicked problems' (Termeer et al., 2013). Heat stress is recognised as an 'unclear' and 'intangible' problem, of which the consequences are not clearly experienced by every person. Additionally, there is 'no owner' of the problem. This is in line with the characteristics described by Termeer et al. (2013), as well as with the 'governance of adaptation' challenges of wicked problems, also described by Termeer et al. (2013). These are argued to be specific challenges for climate adaptation problems.

Although this theory by Termeer et al. (2013) is mainly directed at climate adaptation policies in general, the results of this research show that heat stress matches the characteristics of wicked climate adaptation problems, as argued below.

First, within heat stress governance there is *fragmentation,* as it influences many policy domains and involves multiple actors. Heat stress can not specifically solved by one policy domain (Termeer et al., 2013). It requires collaboration with domains such as public health, spatial planning, green management and environment. Moreover, it demands collaboration with businesses at industry areas, as these are mostly the 'hotspots' in a city, and organisations such as the GGD (public health service) to inform citizens. Therefore, without a heat stress coordinator or manager, it is difficult for a municipality to take on the issue, as it demands the involvement of many actors and governmental levels. The latter can ensure that the problems is specified and structure is provided.

Second, a *not well-structured policy domain* clearly occurs when governing heat stress. As mentioned above, it requires more than one policy domain, but with more domains, it is unclear who is responsible for solving the issue (Termeer et al., 2013). Besides, the urgency of the problem is not felt by each actor, as for some actors the warm weather is rather enjoyable, than a problem. Moreover, heat stress is mainly a problem for vulnerable groups, who might not be fully represented within the municipal organisation. Finally, heat stress is a relatively new issue, for which much knowledge is needed. The severity of the consequences of heat stress are often unknown, as well as the contribution to heat stress reduction of certain solutions.

Third, heat stress governance is filled with *uncertainties and is knowledge intense*. As mentioned above, much knowledge is needed to judge the uncertainties and the effectiveness of the proposed solutions. Besides, due to the fact that many actors are involved in governing heat stress, this also includes many different perspectives on heat stress governance (Termeer et al., 2013). As a matter of fact, this is not beneficial for creating clarity and a mainstream vision on heat stress. Developments such as the 'Standardised Heat Stress Test', are valuable instruments in providing clarity on heat stress and how to adapt to it. Lastly, there is less research on local scale, which makes it difficult for municipal policy-makers to apply the data on their region. Much of the data is national, while local action is needed.

8.1.2 Governance capacity

The second factor suggests that 'institutional context' is an important factor that influences the governance capacity in governing heat stress, which is also described by Measham et al. (2011) and Bulkeley (2010). The Delta Plan on Spatial Adaptation is the institutional context in here, and offers support, rules and tasks and defines priorities and goals. The results of this research indicate that having such a plan or framework contributes to a better heat stress policy, as it guides municipalities through the process, serves as benchmark, pushes municipalities to take on the issue, and gives direction to heat stress policies. However, according to the respondents, there should be room for incorporating their own interpretation into the plan.

Regarding the theory on governance capacity by Bulkeley (2010), Dang et al. (2016), Measham et al. (2011) and Ryan (2015), 'institutional context' is not the only factor that determines the governance capacity. Other factors such as 'resource availability' and 'internal dynamics and coordination' are

equally important. Yet, the results of this research imply that 'institutional context' is more important than the other two factors. The data shows that most of the municipalities only started working on heat stress after the Delta Plan on Spatial Adaptation was introduced. Nevertheless, it could be argued that this depends on the situation: heat stress is a new issue to govern for municipalities and that for now the institutional context is most important. How will this be in around five years, if heat stress governance is more integrated in the municipality? Will institutional context still be the most important factor or does it more support in the background? It cannot be completely ruled out that changes within this context will occur.

In the case of heat stress in the Netherlands, it can therefore be stated that 'institutional context' is currently the main influencing factor when determining the governance capacity, and that 'internal dynamics and coordination', and 'resource availability' will follow automatically, once an 'institutional context' has been adopted. The institutional context provides a framework in which municipalities can make arrangements and allocate resources. It therefore serves as a starting point to govern heat stress, and as an initiator for support, money, responsibility and creating urgency.

8.1.3 Multi-level governance

The link between these two factors is the multi-level governance framework. The wicked problem of heat stress demands the involvement of many actors in different governmental levels. On the one hand, the institutional context provided by the Delta Plan on Spatial adaptation tries to give each actor a place in this 'wicked problem'. On the other hand, the impact of heat stress is mainly experienced on the local level (Betsill & Bulkeley, 2006). Moreover, municipalities are the closest link to the citizens (den Exter et al., 2015). Therefore, the municipalities are *the* designated actors to implement policies.

What is important here is that, the respondents indicate that the Delta Plan on Spatial Adaptation is not regarded as a compelling plan, and that there should be room for municipalities to give their own interpretation to governing heat stress. This is because each region has different characteristics. Some municipalities are already much greener than others or have more water flowing through the city. Besides, the approach for governing heat stress should fit within the plans for spatial planning and green management made before. A set of standard measures given by the national government is therefore inconvenient and it is vital that role of cities in this is recognised by the national government. Having the Delta Plan for Spatial Adaptation gives support and is important, but it is essential that the difference between regions and cities is recognised, so that heat stress will be solved on a local scale at the spots where it is most needed.

To summarise, on the one hand there is the Delta Plan on Spatial Adaptation, which gives direction to heat stress policy and is a framework that guides municipalities through the difficulties and responsibilities faced. On the other hand, there is the complexity and the unclarity of heat stress, which is still hinders the implementation of a fully developed heat stress policy. These two factors are constantly facing each other when governing heat stress in the Netherlands. The question is whether this interplay will remain the same in the future. When new knowledge becomes available, will this change the governance capacity of municipalities in governing heat stress? And how much time will this still take? And will this knowledge be provided by the national government? Or will municipalities take on this task by their selves? These are questions which will be saved for the future.

8.1.4 The role of cities

Lastly, regarding the future roles and expectations, municipalities will mainly take on the stimulating and collaborative role. However, more roles are important, as the respondents explain that different tasks and measures require different roles. For the national government, the supporting/facilitating role and stimulating are important future roles. The results show that both the role of the municipalities and the national government becomes more important in governing heat stress in the future. This can be explained by the fact that local governmental approach for governing heat stress is needed, as the impacts of heat stress are mainly felt locally (Termeer et al., 2013, 2011; Wälti, 2010). However, as argued by Leck and Simon (2013), no single governmental body or level is capable of tackling climate change on its own. In the case of heat stress, municipalities alone cannot implement policies without the regulative context provided by the national government. This is in line with the view of Corfee-Morlot et al. (2009), Healey et al. (2017) and Termeer et al. (2013): although adaptation measures should be executed on the local level, the national government provides an important regulatory context. The other way around, the national government needs the collaboration with municipalities, as those are the implementors of a heat stress policy. In here the necessity of multi-level governance framework in governing heat stress is emphasised again (Termeer et al., 2013).

Nonetheless, within this interplay between the municipalities and the national government, some complications are defined. The results show that the national government should provide more support in the future, in the form of financial support and subsidies. Moreover, the results show that monitoring mechanisms are lacking, and more awareness and urgency should be created. Therefore a perfect collaboration between the national governments and its municipalities is not completely self-evident, as argued by Kokx and Van Kempen (2010). In the case of heat stress, the municipalities might feel restricted by the support offered by the national government, as they feel they are not able to govern heat stress in the way they want to. This can be supported by van der Heijden et al. (2019): the national state determines the margins in which the municipalities can act, as the national government sets the scope and the directives for policy development. However, it could be argued that the municipalities should be the ones, who determine the margins needed to act properly and that the national government should act according to these. As climate issues should be governed on the local level according to literature, why does the national government determine these margins? Is this because heat stress governance is still in the beginning phase? Is this because heat stress is a wicked problem?

What is most important here is that both governmental levels are needed for developing a heat stress policy. One level for support and one level for implementation. The complexity of heat stress is not contributing to defining clear roles and tasks within the multi-level framework, but the issue cannot be solved by only one level of government. Therefore, the interplay between governmental levels will remain in the future, with significant roles for both of the levels.

8.2 Limitations

Regarding the data collection, during the document study it turned out that finding the needed documents was quite difficult in some cases. It is then hard to determine whether the document is not published or whether they do not have a document (yet). Besides some municipalities have quite recent documents available while other municipalities have documents older documents available.

However, during the study was always checked whether follow up documents or projects were in place. In this way the most recent information of each municipality could be found.

Furthermore, not all selected municipalities filled in the survey. However, during interviews, more detailed information on the answers could be collected. Moreover, the respondents in the survey provided quite extensive answers, as the survey was set up in such a way that own answers and explanations could be written down. By combining several methods, such as a document study, a survey and interviews, the data could be checked on whether the information given in the surveys and the municipal documents matches the information given during the interviews. It turned out that the interview data could be used as supporting information for the other data, which indicates consistency of the data.

Regarding the focus of this research, it is beyond the scope to investigate the horizontal relations between governmental levels and other private and public actors. It only focusses on the vertical relationship between municipalities and the national government. However, during the data collection phase, the relation with other public and private actors was often mentioned by the respondents. For example: the involvement of citizens was often mentioned, as well as collaboration with the GGD and businesses. Mapping of the actors involved in governing heat stress can be important, as these may also have an influence on the governance capacity of Dutch municipalities in governing heat stress.

Additionally, this research focusses on the 25 largest municipalities in the Netherlands. A smaller group of respondents has been chosen, because then this research can focus on in-depth experiences and provide insights into heat stress governance of municipalities, while still creating an overview of cities throughout the whole of the Netherlands. In here, difference in characteristics between densely built (larger) and rural (smaller) municipalities are not considered. It might be the case that rural municipalities have different experiences regarding heat stress governance, as these might already have more green spaces than densely built municipalities. Besides, there might be differences in inhabitants. Smaller municipalities may have more farmers or elderly people living in the region. Therefore, a heat stress policy might be more focussed on liveability and droughts, rather than creating green spaces.

Yet, regarding the external validity, it can be stated that the results mainly apply to larger cities, and that it cannot be stated for sure that the same results apply for smaller municipalities. However, it does say something about the governance capacity of smaller municipalities. As the largest municipalities already come across several issues, it might be that smaller municipalities are struggling with the same issues. Moreover, if the policy recommendations made in this research would be followed, not only the larger municipalities will benefit, but also the smaller. Lastly, the results from larger municipalities could serve as an example or as information for other municipalities, which are working on adapting to heat stress.

9. Conclusions and recommendations

This research investigated what factors influence the governance capacity of Dutch municipalities with regard to heat stress. A qualitative research was executed, to research which factors are experienced as contributing to the development of a heat stress policy and which factors constrain the development of a heat stress policy. In this way, this research can contribute to the current understanding of the governance capacity of Dutch municipalities in governing heat stress, by providing insights into responsibilities of different levels of government. Additionally, this research provides insights into the factors that influence the governance capacity regarding heat stress governance, such as: internal dynamics and coordination, resource availability and institutional context. Furthermore, it contributes to scientific literature on governance capacity, wicked problem theory and multi-level governance in the Netherlands. By conducting a document study, a survey and semi-structured interviews, the data of this research was collected. In this chapter the sub questions and main research question will be answered and recommendations for policy and further research will be given.

9.1 Conclusions of the sub questions

The first sub question focusses on the responsibilities of municipalities and the national government in governing heat stress in the Netherlands, according to the Delta Plan on Spatial Adaptation. The document study shows that this Delta Plan is created to speed up the implementation of climate adaptation measures. The plan proceeds according to 7 ambitions, from which an action plan is developed. In this action plan, the responsibilities for municipalities and the national government are described (table 2 and 3)**.** The main difference in responsibilities between the municipalities and the national government is that the municipalities are mainly the implementers and the national government is mainly the developer of policies. For example: the municipalities should conduct the stress tests and risk dialogues, while the national government is in charge of providing the support and guidelines. Furthermore, some tasks are the same for both governmental levels, but the scale on which the tasks are executed differs: the municipalities operate on the local scale, while the national government operates on the national scale.

The second sub question focusses on the extent to which the Delta Plan on Spatial Adaptation is currently integrated in municipal policy plans on heat stress in the Netherlands. It can be stated that most of the researched municipalities are working on the issue of heat stress, and have conducted a stress test and/or developed an implementation plan. According to the municipalities, the main issue when integrating the Delta Plan is that heat stress is not very high on the political agenda and that the urgency of the problem is often not experienced. Nevertheless, the municipalities argue that the Delta Plan on Spatial Adaptation does serve as a method or benchmark, but within this, there should also be room for giving an own interpretation to the plan. This is because, every municipality has other circumstances and experiences heat stress differently. For example, some already have more green spaces, while others have more pavement and high-rise buildings. Every municipality thus needs a different heat stress policy.

The third and the fourth sub question focus on the governance capacity of Dutch municipalities with regard to heat stress. These questions research to what extent the governance capacity is influenced by internal dynamics and coordination; resource availability; and institutional context. It is shown that

most of the municipalities have a special team working on the issue of heat stress, and that there is collaboration between different departments of the municipality. Additionally, the researched municipalities mention that human and financial resources are important, and that most of the municipalities are using the knowledge tools from the Delta Plan on Spatial Adaptation. Nevertheless, they also mention that heat stress is a quite unclear problem and that urgency to solve the problem is often lacking. Furthermore, the current division of responsibilities between the national government and the municipalities is the 'right' one, according to the municipalities. What stands out is that municipalities find it difficult to describe the interaction with the national government or some do not experience interaction with the national government.

The fifth sub question focusses on the expectations of Dutch municipalities regarding their and the national government's role in governing heat stress in the future. Municipalities expect that both the role of the municipalities and the national government will become more important in governing heat stress in the future. According to the respondents, the role of municipalities should be stimulating and collaborative, but other roles are important too, depending on the tasks and measures required. For the national government, the supporting/facilitating role and stimulating role will be important, but the municipalities argue that more support in the future is needed. Moreover, monitoring mechanisms are lacking and more awareness and urgency is needed. The municipalities argue that the national government can play an important role in here. Lastly, it was mentioned that the interaction between the governmental levels should be more pro-active.

9.2 Answering the main question

From the conclusions above can be stated that two factors frequently return when investigating the governance capacity in governing heat stress. The other factors researched, can mainly be grouped under these two factors (see figure 3, chapter 8). The first one is that heat stress is regarded as a 'complex and intangible' problem, which is a negative influencing factor. This is because, the development of a heat stress policy is constrained by the complexity of the problem, as the consequences of heat stress are unclear, and effectiveness of the measures is often unknown. Besides, the problem is 'intangible', which makes that urgency and seriousness of the problem are often not felt or that consequences are not clearly visible.

The second factor is the existence of a governmental framework or plan, in this case the Delta Plan on Spatial Adaptation, which gives direction to policy and pushes municipalities to start working on heat stress adaptation. Besides, this plan serves as a benchmarking tool, so that it is clear in which part of the process of adapting to heat stress each municipality is in, and provides tasks or responsibilities for each level of government. The municipalities are here mainly the implementers, while the national government provides support and guidelines for the municipalities. Having such an institutional context is a positive influencing factor.

By combining these two factors, the main question can be answered: the governance capacity of Dutch municipalities in governing heat stress is negatively influenced by the complexity and intangibility of the problem, and positively influenced by the existence of an institutional context such as the Delta Plan on Spatial Adaptation.

Comparing this with the theory, it can be concluded that the problem of heat stress can be regarded as a 'wicked problem', as stated by Termeer et al. (2013). Besides, the theory on governance capacity implies that there is no distinction in importance of influencing factors and elements. However, this research suggests that in the case of heat stress having an 'institutional context' is more important than the other elements. Lastly, the theory on multi-level governance is the link between the 'wicked heat stress problem' and the institutional context. Heat stress governance requires that multiple levels of government are involved, as the problem is complex and not one level can solve the problem on its own (Leck & Simon, 2013). However, a perfect collaboration between the different levels of government might not be completely self-evident (Kokx & Van Kempen, 2010). The national government determines the margins in which municipalities can govern heat stress. For example: the municipalities argued that monitoring mechanisms are lacking and that more urgency and support is needed. The Delta Plan on Spatial Adaptation can contribute to this in the form of guidance and support.

9.3 Research and policy recommendations

For future research, it would be interesting to investigate what factors influence the governance capacity of smaller municipalities. Therefore, the same research can be applied, but on a larger sample. Besides, this research does not consider the interaction with public and private actors, other than the national government. Therefore, future research could focus on what influence these actors have on the governance capacity of municipalities, as some respondents mentioned the involvement of other actors as well. Actors such as the GGD, businesses, industries, and citizens were considered important by the respondents. The GGD can serve as an information provider to citizens, to show the urgency of heat stress. In turn, citizens might be encouraged to adapt to heat stress by greening their gardens. The industry sector can make sure that there is more support for heat stress adaptation measures of the municipality. Conducting the same research on a larger sample and taking more actors into account, may provide a more elaborative overview of the governance capacity of municipalities. In that case, this research could be the basis for further research.

Furthermore, this research could be repeated in the future, to see whether the factors that influence the governance capacity have been changed, or whether obstacles or limitations from the past are still occurring. This is important to learn what decisions will lead to more progress and success in the future, and which factors will have a negative effect. Lastly, this research can also be executed on a different climate adaptation case than 'heat stress', to investigate whether the governance capacity differs per selected case. For example: droughts and extreme precipitation. By comparing different cases, lessons can be learned: the approach when formulating a policy for extreme precipitation can be compared to the approach when formulating a heat stress policy. The way in which the extreme precipitation policy is developed, might serve as a guidance for heat stress policy. Elements which are important for one policy, may also be important for other policies. In this way a better heat stress policy might be developed.

For future policy development, it is shown that clarity and tangibility are important factors that can contribute to a better understanding of heat stress governance. Although it was concluded that heat stress is a 'wicked problem', its influence on the governance capacity of municipalities can be changed, if governing heat stress will be accompanied by clear and tangible values. For example: at what

temperature is heat stress a problem and how much do certain measures actually contribute to decreasing heat stress? Heat stress is a relatively new issue in the Netherlands, and research is still being executed. An example of this is the 'Standardised Heat Stress test'. Doing research takes time, but the issue is urgent. Since last two years, the summers in the Netherlands have become warmer and warmer. Research on the local context is important, so that the problem of heat stress will become more tangible for municipalities. This will lead to more people being aware of the issue and more municipalities targeting the issue.

The national government could play a leading role in this in several ways: on the one hand, the national government could conduct the research and translate the results to the local context. On the other hand, the national government could provide support for municipalities, so that they can conduct research themselves, directly focused on the local context. Besides, the national government could play a role as a networking actor, that links the municipalities with important research agencies or business. By this, the municipalities are able to execute research on their local context and clarify what measures are needed.

For municipalities it will be difficult to execute research on their own on the efficiency of measures and tangible values, this is more a task for the national government. A recommendation for municipalities would be to assign a heat stress coordinator or manager, who is in charge of identifying which actors are needed in the process of adapting to heat and linking the different policy domains. Currently, heat stress is often treated as part of the climate adaptation in general, but this research shows that the complexity and intangibility of the problem requires more effort, and that it is not 'part of the climate change problem'. Within the municipality, one person is needed, who is able to see the linkages between different domains and actors, and which collaboration is needed for which heat stress adaptation measure. In this way, the heat stress problem can become more specified and understandable for policy-makers. Besides, this will make sure that the urgency of adapting to heat stress is pointed out, as it will become clear what is needed and who is involved. Assigning a heat stress coordinator or manager will be an important step for municipalities in the process of adapting to heat stress.

Lastly, as the respondents indicate that the Delta Plan on Spatial Adaptation serves as an important framework, which gives direction to policy and encourages municipalities to start working on heat stress. It is important that this plan remains up to date and that the information provided is accessible and understandable for all municipalities. Besides, in the Delta Plan on Spatial Adaptation, options for monitoring systems could be explored. In this way, municipalities can get a confirmation on whether they are on the right track in adapting to heat stress and it can also serve as an encouraging factor. This is more a supporting and guiding task, and is therefore a recommendation for the national government.

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Appendix I – Summary of sample selection

Municipalities	UHI?	Municipal plans/ambitions:	Specific heat stress policy:	Small summary
Amsterdam	Yes	Structuurvisie Amsterdam 2040: the surface of Amsterdam is becoming more paved. More green will contribute to cleaner air, water drainage and less heat (Gemeente Amsterdam, 2011). Moreover, the municipality aims at giving subsidies for green roofs (Gemeente Amsterdam, 2019).	The ambitions of Amsterdam remain in a general field of becoming a climate proof-city by creating more green areas (Gemeente Amsterdam, 2013). The municipality mainly asks inhabitants to take the initiative to plant more green in the city.	• General adaptation policy • Greening and subsidies • Heat map TU Delft
Rotterdam	Yes	In the coming years, the municipality of Rotterdam wants to plant more green in the city to reduce among others heat stress (Gemeente Rotterdam, 2019).	Policy is mainly directed to making the city more green. This is a more general policy, which is also directed to making Rotterdam more livable (Gemeente Rotterdam, 2019).	• General adaptation policy • More green • Heat map TU Delft
Den Haag	Yes	Stimulating initiatives of inhabitants by giving subsidies and providing knowledge (Gemeente Den Haag, 2016).	In collaboration with TU Delft, the municipality of Den Haag did research on heat islands in the city. The results of this research will be used for creating policy regarding the heat stress problems (Gemeente Den Haag, 2016).	• Heat map TU Delft • Providing knowledge and subsidies
Utrecht	Yes	Possibility of subsidies for inhabitants. The municipality is planning to incorporate more green in the city (Gemeente Utrecht, 2019).	The municipality of Utrecht conducted a heat stress test in 2018, in collaboration with the province of Utrecht. The municipality of Utrecht itself still has an ongoing research on heat stress and its consequences (Gemeente Utrecht, 2019).	• Heat stress test • Greening and subsidies • No specific policy yet
Eindhoven	Yes	Research on heat stress in the city of Eindhoven shows that without taking measures, the city will have an increase in heat stress of 40% (Gemeente Eindhoven, 2016). Their ambition is to be climate-proof in 2050.	The municipality of Eindhoven developed the Klimaatplan 2016-2020 in which the climate adaptation ambition of the municipality is stated. Greening measures are an important part of this Klimaatplan (Gemeente Eindhoven, 2016). Additionally, the municipality has a 'Groen beleidsplan'.	• Climate proof by 2050 • Greening and subsidies • Extensive climate plan • Stress test
Tilburg	Yes	The city aims at implementing more green spaces in the city centre. Moreover, inhabitants can receive support when they want to contribute to sustainability (Gemeente Tilburg, 2015).	The municipality of Tilburg has an 'action plan climate adaptation' to make Tilburg climate proof in 2040. In this plan is researched where the needs, challenges and opportunities are for the city of Tilburg (Gemeente Tilburg, 2015).	• General adaptation plan • Greening and subsidies • Climate proof by 2040
Almere	No	The website of the municipality of Almere only gives a little information on green roofs, which redirects to another website. No information on subsidies are given or specific plans/initiatives are developed.	No ambitions or plans directed at heat stress or climate adaptation	• Not much information on climate adaptation • No specific policy

Groningen	Yes	The website of 'Groningen klimaatbestendig' contains a lot of examples for inhabitants to show what they can do for climate adaptation (Gemeente Groningen, 2019). The results of the stress test are available for inhabitants on the municipal website.	The municipality conducted a stress test climate adaptation, which identified risks and vulnerabilities in Groningen (Sweco, 2018). There are no policy initiatives regarding heat stress made by the municipality. The reason for this might be that de stress test is conducted quite recently.	• Heat stress test • Greening and information • No specific policy yet
Breda	Yes	The municipality of Breda focusses on collaboration between public and private actors. Inhabitants are quite important in their current plans. Subsidies can be given to citizens who want to implement green infrastructures (Gemeente Breda, 2016). Moreover, the municipality invests in research to make Breda liveable during warm days (Gemeente Breda, 2016).	In 'the Impuls', the municipality explains its sustainability vision for the coming years. Their focus is on awareness and taking a broader scope: nature in public space, health and economy (Gemeente Breda, 2016).	• Broader scope of climate adaptation • Research and subsidies • No specific policy yet
Nijmegen	Yes	There is no clear climate adaptation report or action plan available. However, the municipality of Nijmegen was the 'European Green Capital' in 2018, for which they amongst others changed concrete pavement for green in the city.	Nijmegen is aware of heat stress in the city, but no clear policies are made. In a factsheet, the municipality shows the percentage of concrete in certain areas compared to green in these areas (Gemeente Nijmegen, 2018).	• European Green Capital • Information available • No specific policy yet
Apeldoorn	Yes	The municipality aims at planting more trees to cool the city during warm days (Gemeente Apeldoorn, 2019). In 2018, a heat stress test was conducted. From this the extreme warm areas could be identified and translated into policy (Ruimtelijke Adaptatie, 2018).	There are no clear adaptation plans in the city of Apeldoorn yet. However, as the stress test was conducted quite recently, policies might be still under development. The municipality does try to make the city greener in order to make the city more liveable.	• Heat stress test • More green in the city • No specific policy yet
Haarlem	Yes	The ambition of Haarlem is to be climate proof in 2050 and citizens can receive support to finance their own sustainable projects (Gemeente Haarlem, 2019).	In 2016, the municipality of Haarlem conducted a stress test to see whether the city is climate proof. It turned out that Haarlem is a compact city with much concrete. With this the city is able to develop a policy regarding heat stress (Ruimtelijke Adaptatie, 2016).	• Heat stress test • Subsidies • Climate proof in 2050 • No specific policy yet
Enschede	Yes	With more green areas in the city, Enschede tries to decrease the temperature during warm days, such as parks and green roofs. The municipality also collaborates with several actors to make the city more climate proof (Gemeente Enschede, 2019b).	The municipality of Enschede collaborates with Twente University to measure the temperature in the city. The municipality also uses the heat stress maps (Gemeente Enschede, 2019a).	• Heat stress maps of Twente University • Greening of city • No specific policy yet

Arnhem	Yes	The municipality gives subsidies to support inhabitants to green the city. Within such an application, the municipality looks at the heat map to see whether the initiative contributes to the city climate.	The municipality has a 'klimaat plan' in which municipality buildings serve as an example in climate change adaptation (Gemeente Arnhem, 2019b). Additionally, it has a lot of information with regard to heat stress. There are heat maps, attention maps, facts sheets on greening and water in the city (Gemeente Arnhem, 2019a).	• Heat stress test • Greening and subsidies • Lots of information on heat stress available
Amersfoort	Yes	The ambitions of the municipality of Amersfoort is to have a healthy and clean city. This can be achieved by adding more green to the city and to collaborate with several partners (Gemeente Amersfoort, 2019b).	The municipality created a program for a climate proof city, in which the environmental issues of heavy rain and heat stress are considered. However, this is a quite new plan and still in its starting phase. The municipality aims at identifying vulnerabilities in 2020 (Gemeente Amersfoort, 2019a).	• General adaptation policy • Greening the city • No specific policy yet: starting phase
Zaanstad	Yes	The municipality website links to several maps and information on what the municipality does and when (Gemeente Zaanstad, 2018). The municipality of Zaanstad has a general policy regarding protecting green areas and water. In 2019, the municipality agreed upon the plan (Gemeente Zaanstad, 2018).	The climate adaptation plan is a general plan for the municipality to adapt to climate change conform the Delta plan. The municipality aims at finishing the plan in 2020 (Gemeente Zaanstad, 2019).	• General adaptation policy • More green • Finishing plan conform Delta plan in 2020 • No specific policy yet
Den Bosch	Yes	The ambition of the municipality of Den Bosch is to be climate-proof in 2050 (Gemeente 's-Hertogenbosch, 2018). At the moment, the municipality focusses on research and collaboration with other actors (Provincie Noord-Brabant, 2019).	The municipality wants to make the city more green and to develop knowledge and technical measures to reduce heat stress and create green, water and shadow areas (Gemeente 's-Hertogenbosch, 2018). This is a general climate adaptation plan of which heat stress is a small part.	• Climate proof in 2050 • Research • More green in the city • No specific policy yet
Haarlemmer-meer	No. Only at Schiphol	The municipality is aware of climate change and the consequences (Gemeente Haarlemmermeer, 2015). The information is gathered quite recently, which might be the reason that there are no clear strategies yet. Moreover, Schiphol can be a difficult factor for the municipality.	The municipality of Haarlemmermeer has also developed its own heat map. However, on the municipal website, no clear policies regarding climate adaptation can be found (Gemeente Haarlemmermeer, 2019).	• Aware of climate adaptation • Heat map • No specific policies yet • Information is quite recent
Zwolle	No	Although the heat island effect is not that severe in Zwolle, there is a lot of information on the municipal website available. The municipality gives information and tips to citizens and also want to collaborate with citizens (Gemeente Zwolle, 2019a).	The municipality of Zwolle has an adaptation strategy in which they make more room for water and more green spaces for within the city. Moreover, the city conducted stress tests. Within the city, the municipality aims at developing a green-blue infrastructure (Gemeente Zwolle, 2019b).	• Heat stress test • Greening and subsidies • Lot of information on heat stress available

Zoetermeer	Yes	The municipality of Zoetermeer has a general ambition to become 'sustainable', of which a better green policy is a small part. This is to make the city more livable (Gemeente Zoetermeer, 2019).	There is no clear heat stress policy developed.	• General adaptation plan • More livable city • No specific policies yet
Leiden	Yes	The municipality of Leiden provides subsidies for Green roofs and encourages citizens to make their living area more green (Gemeente Leiden, 2019). The municipality is mainly focused on collaboration with other actors (GaGoed Leiden, 2019).	There are no specific heat stress policies made, but the municipality aims at research and pilot projects. Additionally, the municipality created together with regional partners a climate map (Gemeente Leiden, 2019).	• Research and pilot projects • More green in city • No specific policies yet
Maastricht	Yes	The city aims at connecting surrounding green areas with the city (Gemeente Maastricht, 2012).	The municipality of Maastricht also has heat stress maps, in collaboration with Klimaatatlas. However, no specific heat policies have been made by the municipality (Gemeente Maastricht, 2019).	• Connecting green areas • Heat map • No specific policies yet
Leeuwarden	No	The municipality of Leeuwarden aims at making the city more green. Moreover, they invite inhabitants to make their own living area more green as well, through tips and subsidies (Gemeente Leeuwarden, 2019b).	The municipality of Leeuwarden has a 'Beleidsplan groen', in which measures are given to adapt the city to climate change (Gemeente Leeuwarden, 2016). However, this is a more general climate adaptation plan and not specifically aimed at heat stress.	• More green in city • Subsidies • No specific policies yet • General adaptation plan
Dordrecht	Yes	The municipality of Dordrecht mainly aims at collaborating with citizens and other actors when governing environmental issues (Gemeente Dordrecht, 2019a).	The climate policies of the municipality of Dordrecht are mainly focused on water and climate change, as Dordrecht is a city next to the water. There are some general greening policies, but no specific heat stress policies (Gemeente Dordrecht, 2019b).	• Collaboration with other actors • Mainly focus on water • No specific policy
Ede	Yes	The municipality of Ede focuses on research and gaining knowledge in the field of climate change adaptation. According to the municipality, there is more knowledge available on national impacts, but local information is lacking (Gemeente Ede, 2017).	When more knowledge is available, the municipality is aiming at incorporating this into their policy (Gemeente Ede, 2017). Additionally, the municipality of Ede joined the regional heat stress map of the organisation of 'Klimaat Vallei and Veluwe' (Klimaat Valei en Veluwe, 2019). At the moment, there are no specific heat stress policies available.	• More research and knowledge • Regional heat stress map • No specific policies yet

Appendix II – Survey

Voor mijn afstudeeronderzoek van de Master Urban Environmental Management aan de Wageningen Universiteit, doe ik onderzoek naar de 'governance capacity' (bestuurscapaciteit) van gemeenten rondom het hittestress beleid. Met dit onderzoek wil ik in kaart brengen in hoeverre het Delta Plan Ruimtelijke Adaptatie geïntegreerd is in het hittestress beleid van gemeenten en welke factoren van invloed zijn op de 'governance capacity' van Nederlandse gemeenten om hittestress beleid te formuleren en uit te voeren. Dit onderzoek richt zich alléén op het Delta Plan Ruimtelijke Adaptatie en niet op andere programma's (zoals bijvoorbeeld de Nationale Adaptatie Strategie). Als u niet bekend bent met het Delta Plan, kunt u bij de desbetreffende vragen n.v.t. aanvinken.

Deze vragenlijst bestaat uit 40 vragen, waarvan de meeste vragen meerkeuze zijn. Daarnaast zijn er enkele open vragen. Aan het einde van iedere pagina is er ook mogelijkheid om eventuele opmerkingen of extra informatie toe te voegen. De totale vragenlijst zal ongeveer 20 minuten in beslag nemen.

Het Delta Plan Ruimtelijke Adaptatie is een plan van verschillende overheden, gericht op het klimaatbestendig en water robuust inrichten van Nederland. Dit Delta Plan moet ervoor zorgen dat deze inrichting intensiever en versneld plaatsvindt. Hittestress is hiervan een onderdeel en is een relatief nieuw en lastig probleem in Nederland. De impact van hittestress wordt namelijk vooral op lokale schaal ervaren, en kan verschillen per regio of gemeente. Het is daarom dus van belang dat dit hittebeleid door verschillende overheidsniveaus bestuurd wordt.

Introductievragen:
Het eerste deel van deze vragenlijst bestaat uit 7 vragen. Deze vragen zijn algemene introductie vragen over de huidige stand van zaken met betrekking tot hittestress en het beleid in uw gemeente.

1. Welke gemeente vertegenwoordigt u en wat is uw functie? De naam van uw gemeente en uw functie worden niet gebruikt in het onderzoek. Deze zijn alleen van belang voor het interpreteren van de resultaten. Wanneer u anoniem wilt blijven, kunt u deze optie aanvinken en hoeft u uw gemeente naam en functie niet in te vullen.
   - Naam gemeente: ....
   - Functie: ...
   - Optie: ik wil graag anoniem blijven

2. Welke gevolgen van extreme hitte heeft uw gemeente ervaren in de regio afgelopen zomer? *[Meerdere antwoorden mogelijk]*
   - Droogte en/of natuurschade
   - Meer ziekenhuisopnames en/of verhoogd sterftecijfer
   - Verminderde arbeidsproductiviteit binnen de regio (denk aan: tropenrooster, mensen die in de buitenlucht werken)
   - Problemen met infrastructuur (denk aan: bruggen die niet meer werken, uitzetten van infrastructuur, smeltend asfalt, verhoogde energievraag)
   - Verminderde waterkwaliteit
   - Overlast door sociale ontmoetingen in de buitenlucht tot laat op de avond
   - Hitte eilanden
   - Anders, namelijk: ... [optie voor zelf invullen]

3. Is uw gemeente bekend met het Delta Plan Ruimtelijke Adaptatie?
   - Ja, mijn gemeente is bekend met het plan en handelt ook conform het plan
   - Ja, mijn gemeente is bekend met het plan maar handelt niet conform het plan
   - Nee, mijn gemeente is niet bekend met het plan.
   - Weet ik niet.

4. Heeft uw gemeente al beleid geformuleerd rondom hitte?
   - Ja, mijn gemeente heeft al beleid geformuleerd: specifiek gericht op hitte *of* als onderdeel van een breder klimaatadaptatiebeleid.
   - Mijn gemeente heeft nog geen beleid rondom hitte
   - Anders, namelijk: ... [optie voor zelf invullen]

5. Waar richt het hittebeleid van uw gemeente zich vooral op?
- Het verminderen van hittestress in de openbare ruimte
- Het verminderen van hittestress voor kwetsbare mensen (zorg en welzijn)
- Het verminderen van hittestress voor de infrastructuur
- Het verminderen van hittestress in de gebouwde omgeving
- Mijn gemeente heeft (nog) geen hittebeleid
- Anders, namelijk: [optie voor zelf invullen]

6. Welke maatregelen/initiatieven heeft uw gemeente al genomen met betrekking tot hitte? *[Meerdere antwoorden mogelijk]*
- Uitvoeren van een stresstest
- Publiceren resultaten stresstest
- Voeren van risicodialogen
- Opstellen van een uitvoeringsagenda
- Verstrekken van informatie aan inwoners/burgerparticipatie
- Mee koppelen van klimaat adaptatie maatregelen met andere ruimtelijke opgaven
- (Deels) begonnen met het uitvoeren van ruimtelijke adaptatie maatregelen in de regio (denk aan meer groen, groene daken, meer schaduw creëren etc.)
- Het opstellen van lokale hitteplannen
- Mijn gemeente heeft nog geen maatregelen/initiatieven genomen
- Anders, namelijk: ... [optie voor zelf invullen]

7. Hoe hoog staat hittestress op de politieke agenda in uw gemeente?
- Zeer hoog
- Hoog
- Neutraal
- Niet hoog
- Helemaal niet hoog

[Ruimte voor eventuele opmerkingen]

Internal dynamics and coordination
Het tweede deel van de vragenlijst gaat over de interne dynamiek en coördinatie binnen uw gemeente. Dit gedeelte bevat 4 vragen over betrokkenheid en samenwerking tijdens het formuleren van hittebeleid en de eventuele belemmeringen die worden ervaren.

8. Wie is er binnen uw gemeentelijke organisatie actief betrokken bij het opstellen van een hittebeleid? *[Meerdere antwoorden mogelijk]*
- Een speciale werkgroep of speciaal team
- De afdeling milieu
- De wethouder
- Het is niet duidelijk wie er binnen mijn gemeente actief betrokken is bij het opstellen van een hittebeleid
- N.v.t
- Anders, namelijk: ... [optie voor zelf invullen]

9. Wordt er binnen uw gemeentelijke organisatie samengewerkt met verschillende afdelingen/teams om tot een hittebeleid te komen?
- Ja, er is samenwerking tussen verschillende afdelingen
- Nee, er is geen samenwerking tussen verschillende afdelingen
- N.v.t.

10. Met welke afdelingen/teams wordt voornamelijk samengewerkt? *[Meerdere antwoorden mogelijk]*
- Veiligheid
- Ruimtelijke ontwikkeling
- Leefbaarheid
- Financiën
- Economie
- Zorg
- N.v.t.
- Anders, namelijk ... [optie voor zelf invullen]

11. Welke belemmeringen binnen uw gemeentelijke organisatie worden ervaren tijdens het opstellen van beleid rondom hitte? *[Meerdere antwoorden mogelijk]*
- Communicatieproblemen
- Het proces vordert (te) langzaam
- Weinig interesse voor het probleem
- Geen consensus binnen mijn gemeente over het oplossen van het probleem
- Onduidelijkheid over kosten en baten van maatregelen
- De huidige wet- en regelgeving belemmert het maken van beleid
- Andere problemen die binnen mijn gemeente spelen zijn belangrijker
- Mijn gemeente ervaart geen belemmeringen
- Anders, namelijk ... [optie voor zelf invullen]

[Ruimte voor eventuele opmerkingen]

Resource availability
Het derde deel van deze vragenlijst bestaat uit 8 vragen en gaat over beschikbare middelen binnen uw gemeente, zoals: aantal werknemers, financiën, kennis en informatie, en tijd.

12. Stelling: mijn gemeente heeft voldoende beleidsmedewerkers beschikbaar om een hittebeleid op te stellen en uit te voeren.
- helemaal mee eens
- mee eens
- neutraal
- mee oneens
- helemaal mee oneens

13. Stelling: mijn gemeente heeft voldoende financiële middelen beschikbaar om een hittebeleid op te stellen en uit te voeren.
- helemaal mee eens
- mee eens
- neutraal
- mee oneens
- helemaal mee oneens

14. Met welke van de volgende kennishulpmiddelen uit het Delta Plan Ruimtelijke Adaptatie is uw gemeente bekend? *[Meerdere antwoorden mogelijk]*
- de Klimaateffect atlas
- de Bijsluiter stresstest
- de Toolbox Klimaatbestendige Stad
- de Klimaatschadeschatter
- Geen van deze hulpmiddelen
- N.v.t.
- Anders, namelijk ... [optie voor zelf invullen]

15. Maakt uw gemeente ook gebruik van deze kennishulpmiddelen?
- Ja, mijn gemeente maakt gebruik van (enkele van) deze kennishulpmiddelen
- Nee, mijn gemeente maakt geen gebruik van deze kennishulpmiddelen.
- N.v.t

16. Waarom wel/niet?
- Uw antwoord: [tekstvak]
- N.v.t.

17. Stelling: mijn gemeente heeft voldoende kennis en informatie beschikbaar om een hittebeleid op te stellen en uit te voeren.
- helemaal mee eens
- mee eens
- neutraal
- mee oneens
- helemaal mee oneens

18. Stelling: mijn gemeente heeft voldoende tijd beschikbaar om naast de andere gemeentelijke taken ook een hittebeleid op te stellen en uit te voeren.
- helemaal mee eens
- mee eens
- neutraal
- mee oneens
- helemaal mee oneens

19. Welk middel is volgens uw gemeente het meest nodig om een hittebeleid op te stellen en uit te voeren.
- voldoende beschikbare beleidsmedewerkers
- voldoende beschikbare financiële middelen
- voldoende beschikbare kennis en informatie
- voldoende beschikbare tijd
- Anders, namelijk ... [optie voor zelf invullen]

[Ruimte voor eventuele opmerkingen]

Institutional context
Het vierde gedeelte van de vragenlijst bestaat uit 10 vragen en gaat over de institutionele context waarin hittebeleid geformuleerd en uitgevoerd wordt. De vragen gaan over taakverdeling en interactie tussen de nationale overheid en uw gemeente en over de ondersteuning vanuit de nationale overheid.

20. Stelling: de huidige verdeling van taken en verantwoordelijkheden tussen mijn gemeente en de nationale overheid is geschikt om het hitteprobleem op te lossen.
- helemaal mee eens
- mee eens
- neutraal
- mee oneens
- helemaal mee oneens

21. Waarom eens/oneens?
Open vraag ...

22. Welke van de volgende belemmeringen ervaart uw gemeente binnen de verdeling van taken/verantwoordelijkheden tussen de gemeente en de nationale overheid? *[Meerdere antwoorden mogelijk]*

- Communicatie problemen
- Onduidelijk wie verantwoordelijk is voor wat
- Taakomschrijving is niet duidelijk
- Taken worden niet of niet op tijd uitgevoerd
- Verwachtingen komen niet overeen
- Onduidelijk wat op lokale en wat nationale schaal moet worden opgelost
- Mijn gemeente ervaart geen belemmeringen binnen deze taakverdeling
- Anders, namelijk ... [optie voor zelf invullen]

23. Stelling: het Delta Plan Ruimtelijke Adaptatie draagt bij aan een beter geformuleerd hittebeleid binnen mijn gemeente.

- helemaal mee eens
- mee eens
- neutraal
- mee oneens
- helemaal mee oneens
- n.v.t.

24. Welke ondersteuning van de nationale overheid krijgt uw gemeente om een hittebeleid op te stellen en uit te voeren. *[Meerdere antwoorden mogelijk]*

- Financiële steun
- Toegang tot data en resultaten van onderzoeken
- Gebruik van kennistools en platforms voor informatiedeling
- Trainingen/lessen
- Bijeenkomsten
- De gemeente krijgt geen steun van de nationale overheid
- Anders, namelijk: ... [optie voor zelf invullen]

25. Voor welke van de volgende (financiële) hulpmiddelen uit het Delta Plan Ruimtelijke Adaptatie heeft uw gemeente een verzoek ingediend *of* komt uw gemeente voor in aanmerking? *[Meerdere antwoorden mogelijk]*

- Procesondersteuning regionale versnelling
- Pilots uitvoeringsprojecten
- Pilots financiële prikkels
- Mijn gemeente heeft zich niet aangemeld voor deze hulpmiddelen
- Mijn gemeente is niet bekend met deze hulpmiddelen
- N.v.t.

26. Stelling: de ondersteuning die mijn gemeente krijgt van de nationale overheid is voldoende om een hittebeleid op te stellen en uit te voeren.

- helemaal mee eens
- mee eens
- neutraal
- mee oneens
- helemaal mee oneens
- N.v.t.

27. Welke vorm van ondersteuning van de nationale overheid is volgens uw gemeente het meest nodig om een hittebeleid op te stellen en uit te voeren? *[Meerdere antwoorden mogelijk]*

- Financiële steun
- Toegang tot data en resultaten van onderzoeken
- Gebruik van kennistools en platforms voor informatiedeling
- Trainingen/lessen
- Bijeenkomsten
- Anders, namelijk: ... [optie voor zelf invullen]

28. Hoe kan de interactie tussen uw gemeente en de nationale overheid het best omschreven worden?
- De interactie is vooral top-down: de overheid ontwikkelt een plan en controleert, en de gemeente voert uit. Interactie wordt voornamelijk gezocht door de overheid.
- De interactie is vooral proactief: de overheid ontwikkelt een plan, vraagt om feedback, geeft uitleg en controleert. De gemeente voert uit, geeft feedback, vraagt om verduidelijking en werkt samen etc. Interactie vindt vaak plaats en wordt gezocht door zowel de overheid als door de gemeente.
- De interactie is vooral 'on demand': de overheid ontwikkelt een plan en de gemeente voert uit. Interactie wordt gezocht door de gemeente óf door de overheid, maar alleen wanneer dit noodzakelijk is.
- Mijn gemeente ervaart geen interactie met de nationale overheid
- Anders namelijk: ... [optie voor zelf invullen]

29. De huidige vorm van interactie is de juiste om een gemeentelijk hittebeleid op te stellen en uit te voeren.
- helemaal mee eens
- mee eens
- neutraal
- mee oneens
- helemaal mee oneens
- n.v.t.

[Ruimte voor eventuele opmerkingen]

Future role
Het laatste gedeelte van deze vragenlijst bestaat uit 11 vragen en gaat over de toekomstige rol van de overheid en gemeentes in het formuleren en uitvoeren van hittebeleid. Het doel van het Delta Plan Ruimtelijke Adaptatie is een klimaatbestendige en water robuuste ruimtelijke inrichting van Nederland in 2050. Gemeenten moeten daarom vanaf 2020 klimaatbestendig en water robuust handelen. Het Delta Plan Ruimtelijke Adaptatie is gemaakt om dit proces te versnellen. De vragen gaan over de ondersteuning en interactie die nodig zijn om de doelen van dit Delta Plan te halen. Daarnaast wordt er gevraagd naar de rollen van de verschillende overheden binnen toekomstig hittebeleid.

30. Zijn de klimaatdoelen van uw gemeente vastgesteld aan de hand van dit nationale doel van het Delta Plan Ruimtelijke Adaptatie?
- Ja, de gemeentelijke doelen zijn vastgesteld aan de hand van dit nationale doel.
- Nee, de gemeentelijke doelen zijn niet vastgesteld aan de hand van dit nationale doel.
- Mijn gemeente heeft (nog) geen klimaatdoelen.
- Weet ik niet.

31. Stelling: mijn gemeente is in staat om vanaf 2020 klimaatbestendig en water robuust te handelen.
- helemaal mee eens
- mee eens
- neutraal
- mee oneens
- helemaal mee oneens

32. Welke problemen in de interactie tussen uw gemeente en de nationale overheid zullen moeten worden opgelost om de doelen uit het Delta Plan Ruimtelijke Adaptatie te behalen? *[Meerdere antwoorden mogelijk]*
- Communicatieproblemen
- Onduidelijke verantwoordelijkheden
- Taakomschrijving is niet duidelijk
- Taken worden niet of niet op tijd uitgevoerd
- Verwachtingen komen niet overeen
- Mijn gemeente ervaart geen problemen binnen deze interactie
- Anders, namelijk ... [optie voor zelf invullen]

33. Welk middel en/of welke ondersteuning zal uw gemeente in de toekomst meer nodig hebben om de doelen uit het Delta Plan Ruimtelijke Adaptatie te behalen? *[Meerdere antwoorden mogelijk]*

- Het aantal beschikbare beleidsmedewerkers
- Beschikbare financiële middelen
- Beschikbare kennis en informatie
- Beschikbare tijd
- Toegang tot data en resultaten van onderzoeken
- Trainingen/lessen
- Bijeenkomsten
- Er zijn geen extra middelen en/of ondersteuning nodig.
- Anders, namelijk ... [optie voor zelf invullen]

34. Welke rol(len) zal uw gemeente in de toekomst moeten aannemen om een goed hittebeleid op te stellen en uit te voeren? *[Meerdere antwoorden mogelijk]*

- Uitvoerende rol
- Samenwerkingsrol
- Sturende rol
- Ondersteunende/faciliterende rol
- Stimulerende rol
- Adviserende rol
- Monitoringsrol
- Coördinerende rol
- Netwerkende rol
- Anders, namelijk: ... [optie voor zelf invullen]

35. Stelling: De rol van gemeentes in het algemeen met betrekking tot het hittebeleid wordt belangrijker in de toekomst.

- helemaal mee eens
- mee eens
- neutraal
- mee oneens
- helemaal mee oneens

36. Welke rol(len) zal de nationale overheid in de toekomst moeten aannemen om een goed gemeentelijk hittebeleid op te stellen en uit te voeren? *[Meerdere antwoorden mogelijk]*

- Uitvoerende rol
- Samenwerkingsrol
- Sturende rol
- Ondersteunende/faciliterende rol
- Stimulerende rol
- Adviserende rol
- Monitoringsrol
- Coördinerende rol
- Netwerkende rol
- Anders, namelijk: ... [optie voor zelf invullen]

37. Stelling: De rol van de nationale overheid met betrekking tot het hittebeleid wordt belangrijker in de toekomst.

- helemaal mee eens
- mee eens
- neutraal
- mee oneens
- helemaal mee oneens

38. Stelling: De nationale overheid zal meer ondersteuning moeten bieden in de toekomst om een goed gemeentelijk hittebeleid op te stellen en uit te voeren.

- helemaal mee eens
- mee eens
- neutraal
- mee oneens
- helemaal mee oneens

39. Welke manier van interactie is nodig om in de toekomst een goed gemeentelijk hittebeleid op te stellen en uit te voeren?

- Top-down interactie: de overheid ontwikkelt een plan en controleert, en de gemeente voert uit. Interactie wordt voornamelijk gezocht door de overheid.
- Proactieve interactie: de overheid ontwikkelt een plan, vraagt om feedback, geeft uitleg en controleert. De gemeente voert uit, geeft feedback, vraagt om verduidelijking en werkt samen etc. Interactie vindt vaak plaats en wordt gezocht door zowel de overheid als door de gemeente.
- 'On demand' interactie: de overheid ontwikkelt een plan en de gemeente voert uit. Interactie wordt gezocht door de gemeente óf door de overheid, maar alleen wanneer dit noodzakelijk is.
- Anders, namelijk ... [optie voor zelf invullen]

40. Wat zijn de doelen/plannen van uw gemeente met betrekking tot hittebeleid in de toekomst?
Open vraag ...

[Ruimte voor eventuele opmerkingen]

Afsluiting:
Op basis van de resultaten van de vragenlijst, wordt er besloten of extra informatie nodig is om het onderzoek te voltooien. Hiervoor zou ik graag persoonlijke interviews houden.

Bent u bereid om mee te werken aan een persoonlijk interview over het hittebeleid in uw gemeente?

- Nee, ik ben niet beschikbaar voor interviews
- Ja, ik ben bereid om mee te werken. Vul hieronder uw email adres en/of telefoonnummer in
- [optie voor gegevens invullen]

Bent u geïnteresseerd in de resultaten van het onderzoek?

- Nee, ik heb geen interesse
- Ja, ik zou graag de resultaten van het onderzoek ontvangen [email adres invullen]

Hartelijk dank voor het invullen van deze vragenlijst!

Appendix III – Interview guide municipality of 's-Hertogenbosch

Introvragen:

- Zou ik dit interview op mogen nemen?
- Hoelang bent u al bezig met het opstellen van klimaatadaptie beleid?
- Sinds wanneer is hittestress onderdeel geworden van klimaatadaptatie beleid?

Beleid is in ontwikkeling:

- Hoe ervaart u het proces van het ontwikkelen van beleid?
- U heeft een stress test uitgevoerd (of laten uitvoeren) voor de gemeente Den Bosch, wat zijn de volgende stappen die u gaat nemen?

Methodiek DPRA:

- Draagt deze methodiek bij aan het ontwikkelen van een beter klimaatbeleid?
- Is het voor uw werkgroep duidelijk welke doelen het DPRA nastreeft?
- Is het voor uw werkgroep duidelijk welke maatregelen er moeten worden genomen/eisen er zijn om te voldoen aan het DPRA?
- Zijn de doelen en eisen die gesteld worden in het DPRA haalbaar voor uw gemeente? *[Bijv. Klimaatbestendig en water robuust handelen in 2020 – antwoord neutraal]*

Geen urgentie hitteprobleem:

- Ervaart u dit ook binnen werkgroep waarin klimaatadaptatie behandeld wordt? En ook in met andere werkgroepen waarmee u samenwerkt?
- Hoe zou de urgentie van het hitteprobleem volgens u beter benadrukt kunnen worden? (O.b.v. antwoord: zou dit vanuit de overheid moeten komen, of meer vanuit de gemeente?)
  [Denk aan: integratie verschillende beleidsdoelen verschillende afdelingen]

Beschikbare middelen:

- U gaf aan dat beschikbare tijd het meest nodig is om een beleid op te stellen. Ervaart u dit als een belemmerende factor binnen het opstellen van een hittebeleid?
- Zijn middelen zoals geld, tijd, aantal werknemers en kennis belangrijk om een hittestress beleid op te stellen? Waarom wel/niet?
- Zo ja, zou de nationale overheid hier (deels) aan bij kunnen dragen?
- Zo nee, wat is volgens u dan noodzakelijk bij het opstellen van een hittestress beleid?

Kennisdeling:

- U geeft aan dat kennisdeling erg waardevol is. Kunt u dit verder toelichten? *[Kennisdeling nu vanuit VNG]* Zou dit ook vanuit de nationale overheid moeten komen?/ Hoe zou de nationale overheid kunnen bijdragen aan meer kennisdeling?

Interactie overheid:

- U geeft aan dat de interactie die u ervaart met de nationale overheid vooral 'on demand' is. Is er interactie met de nationale overheid nodig om tot een hitte beleid te komen?
- Zo ja, hoe zou deze interactie dan vorm kunnen/moeten krijgen in de toekomst? (Rol overheid/belemmeringen nu)
- Zo nee, waarom niet?

Toekomstperspectief:

- Wat is uw toekomstperspectief met betrekking tot het hittestress beleid in uw gemeente?
- Wat is hierbinnen de rol van uw gemeente/project groep?
- Wat is hierbinnen de rol van de nationale overheid?

Appendix IV – Interview guide municipality of Ede

Introvragen:

- Zou ik dit interview op mogen nemen?
- Hoelang bent u (of de gemeente) al bezig met het opstellen van klimaatadaptie beleid?
- Sinds wanneer is hittestress onderdeel geworden van klimaatadaptatie beleid?

Beleid is in ontwikkeling:

- Hoe ervaart u het proces van het ontwikkelen van beleid?
- U gaf aan dat het beleid in ambitie is geformuleerd voor de gemeente Ede, wat zijn de volgende stappen die u gaat nemen?

Methodiek DPRA:

- Draagt deze methodiek bij aan het ontwikkelen van een beter klimaatbeleid?
- U gaf aan dat het onderwerp niet duidelijk belegd/nieuw is. Kunt u dat verder toelichten?

[Dit was uw antwoord in de vragenlijst: Onderwerp niet duidelijk belegd /nieuw. Geldt voor klimaatadaptatie, is onderwerp voor gehele organisatie, maar wordt nog niet per se overal zo ervaren (ik ben namelijk van de sector ...); Inmiddels is er wel duidelijke trekker met werkgroep die het onderwerp verder brengt. Tevens is er bestuurlijk draagvlak.]

Beschikbare middelen:

- U gaf aan dat hittestress een onderdeel is van de gemeentelijke taken, maar dat dit nog niet zo wordt ervaren. Kunt u dat verder toelichten?
- Wat zou er nodig zijn om dit wel te bereiken?
- U gaf ook aan dat het niet altijd duidelijk is hoe groot het probleem van hittestress is. Zou de overheid bij kunnen dragen aan verduidelijking of is dit meer iets wat vanuit de gemeente zelf moet komen?

[Dit was uw antwoord in de vragenlijst: Middelen gaat niet per se de oplossing zijn, maar aangezien klimaatadaptatie nog geen onderdeel is van de reguliere werkzaamheden wordt bestaand budget niet altijd) ingezet om hitte stress tegen te gaan (bv, immers ik had een beheer opgave, het vervangen van het trottoir en daar hoort het plaatsen van 'n boom niet bij). Vervolgens is niet altijd voldoende duidelijk hoe groot het probleem van hitte stress is, is dit een gevoel? of is dit hard te maken? gaat dit over één dag of spelen problemen pas bij langdurige periode en voor wie dan?]

- Zijn er nog meer elementen nodig om hittebeleid te formuleren, naast geld, tijd, medewerkers en kennis?

Interactie nationale overheid:

- U gaf aan dat de koppeling naar DPRA-werkregio's een goede stap is. Speelt de nationale overheid een belangrijke of actieve rol in deze werkregio's?
- Is er interactie met de nationale overheid nodig om een hittebeleid te kunnen formuleren? En zo ja, hoe zou deze interactie dan vorm moeten krijgen? En zo nee, waarom niet?
- Zou de nationale overheid in de toekomst nog een andere vorm van ondersteuning kunnen bieden dan dat het nu doet?

Toekomstperspectief:

- Wat is uw toekomstperspectief met betrekking tot het hittestress beleid in uw gemeente?
- Wat is hierbinnen de rol van uw gemeente/project groep?
- Ziet u hierbinnen een rol voor de nationale overheid?