

The diffusion and “translation” of heat stress knowledge into policy in Dutch municipalities

Master’s thesis presented for the master specialization Economic Geography



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Preface

Here it is, my master's thesis, the final research project of the specialization Economic Geography, part of the master Human Geography at the Radboud University in Nijmegen. The writing of the thesis was a period of hard work, accompanied by the inescapable periods of distraction and inspirational struggles. My family and friends helped me to keep motivated and to take time to relax when it was needed. My parents helped me to correct language errors and I am thankful for their efforts. It was sometimes quite hard for me to write this thesis in English and not in Dutch. In my opinion the quality of the content should be of highest importance. When writing a thesis in your second language it is sometimes hard to formulate your statements as accurate as they would be in your first language. I want to thank my supervisor Arnoud Lagendijk for his pleasant cooperation. His theoretical additions helped narrowing the research approach and creating a theoretical framework. The meetings with Arnoud Lagendijk and the more practical help from my trainee supervisors Mathijs van Vliet and Mattijs Hehenkamp at Movares formed a useful and pleasant variation. My trainee supervisors stimulated me to present the outcomes of the survey at the National Heat Congress in July 2018 and I want to thank them for that opportunity. I also want to thank my dog for the nice walks that helped me make up my mind and come up with new ideas. Last but not least, I am very grateful for all the 194 civil servants that filled out the survey and also for the interviewees that were so kind to take their time and help me with their knowledge and stories.

Summary

This thesis investigates the diffusion and translation of heat stress knowledge in Dutch municipalities. It discusses the different actors in the Dutch heat stress network and it provides insight in how municipalities translate knowledge into policy. A survey, interviews and documents analysis help to provide this insight. The hot summers of 2003 and 2006 led to a higher mortality number across whole Western-Europe and to more attention to the dangers of heat. Nevertheless, broad scale policy development is not taking place in the Netherlands. Since all municipalities have to execute a climate stress test in 2019, it is assumable that the Dutch approach to heat stress is changing and policy development might take place in the future. This makes it relevant to do research on this policy issue that is starting to develop. It is interesting to investigate what considerations are made by the municipalities and how these considerations are being influenced. An answer to the following research question can create these insights:

“To what extent is heat stress-knowledge diffused among Dutch municipalities and how is the translation of this knowledge into policy influenced by processes, frames, beliefs and rationales?”

The survey helped in providing an overview of the current state of the Dutch heat stress knowledge and policy developments. 194 municipalities filled out this list of questions. The survey made clear that the general heat stress knowledge among Dutch municipalities is not sufficient and direct heat stress policy is only implemented in a small amount of front runner municipalities. The climate stress tests help in improving the local knowledge. They can be considered as the first contact with the local heat stress issue. Before the stress tests, the policy development was depending on local specific circumstances: the interest of an individual policy maker, or the coincidental contact with research projects. The stress tests take this dependency on local specific circumstances in the first contact with heat stress away. The actual development of policy is at this moment still depending on local specific circumstances. These circumstances are influenced by different kind of *processes, frames, beliefs* and *rationales*.

The national government (Nationale Adaptatie Strategie (NAS) and DeltaProgramma Ruimtelijke Adaptatie(DPRA)) tries to create receptivity for heat stress knowledge in municipalities by creating a sense of urgency. Different (regional) knowledge exchange platforms are organized where local policy workers meet each other. Several examples of these newly developed platforms and research projects are given. The health care and construction sector are considered as sectors that should be more actively present in the heat stress discussion and during knowledge exchange platforms. Potential heat stress measures almost all of the time have influence on the health care- and construction sector. Adapting to heat is starting to gain more attention and receptivity is created among (local) policy makers, but an integral approach is still lacking. Not all relevant policy departments and influential actors are actively part of the heat stress debate, mainly because of an insufficient sense of urgency.

The *processes* help in drawing attention to the issue of heat stress and some of these processes increase the impact of heat: *climate stress tests, urbanization* and *demographic ageing*. The *frames* and *beliefs* affect how these processes influence the rationales for policy development. The framing of heat as an urban issue creates a higher sense of urgency in urban areas, but it forms a rationale for a lack of policy development in non-urban municipalities. This frame, combined with limited resources, affects the priority that is given to heat in the local policy development. While heat has effect on a variety of policy sectors and measures have to be taken in almost all of these sectors, heat is not considered as a problem by the integral organization of a municipality. The belief that heat is not a serious issue and is not part of the daily business of Dutch people influences the effect

of the *processes* on the substance of the rationales. The *frames* and *beliefs* have influence on the sense of urgency and willingness to adapt. As a consequence of *frames* and *beliefs*, the same *processes* lead different rationales among municipalities and subsequently to differences in policy development.

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1. Introduction

The summer of 2003 was one of the hottest summers ever measured in the Western-European history. From May until August the temperatures were significantly higher than the normal daily average. May and July were two degrees Celsius warmer than the normal temperatures during these months, August was 3.8 degrees Celsius warmer and June even 4.2 degrees higher across Western-Europe. Especially in June and early August some hot periods occurred, in which the temperatures at night were higher than the average temperature across the whole day normally is (Black, Blackburn, Harrison, Hoskins, & Methven, 2004). As a consequence there was no time for cooling down during these heat waves, even not at night. This led to serious problems and an increase in the mortality numbers. In these summer months, approximately more than 70.000 people died in Europe as a consequence of the heat (Robine, Cheung, Le Roy, Van Oyen, Griffiths, Michel, 2007). Especially in France, where more than 14.000 people died, the summer of 2003 led to a public discussion about heat policies. Because the heat waves appeared during the holiday period, lots of doctors were not in function. Therefore not enough medical workers were at place to deal with the heat problems. This led to criticism on the national health system in France (Ogg, 2005).

Before 2003 the problem of urban warming was not a main factor on the Western-European policy agendas. Even after the summer of 2003 this did not change rapidly. Urban warming can be seen as a "silent killer". The summer of 2003 was one of the largest natural disasters in Western-Europe in the last decades, but it is not commonly known. In the Netherlands, where 1500 to 2000 people died during this summer as a consequence of the heat, it took a few more years to see urban warming as a serious danger. Boezeman and Kooij notice four different transformation moments in (de)-stabilizing the concept of urban warming in the Netherlands (Boezeman & Kooij, 2015).

The first moment was in 1960. This is the moment when urban warming was noticed for the first time within scientific literature, by Conrads (Boezeman & Kooij, 2015, p. 6). An interesting remark that can be made is that a Google scholar search on the key words "*heat stress Netherlands*", "*urban heat stress Netherlands*", "*heat island effect*" or "*heat cities Netherlands*" and their Dutch equivalents, before the year 2002 shows mainly articles on the influence of heat stress on farm animals, such as cows, chickens and pigs. After the year 2002, the majority of the articles are about the influence of overheating on the human body and society. This shows that before the 21st century science was aware of the existence of the phenomenon, but not of the risks for human beings. It was considered as a risk for the food production. Boezeman and Kooij give another example of how the concept of urban warming was approached in the 20th century Netherlands: the Dutch meteorological institute (KNMI) was aware of the fact of urban warming, but saw it as a distortion in the temperature measures. During hot nights, the temperature in the cities can be up to 7 degrees Celsius higher than in the local countryside. It was noticed that cities are warmer than the surrounding areas, but no policy measures were made to prevent the probably unknown risks of urban heat stress. Urban warming was considered "*an interfering noise factor for constructing reliable temperature series by the Dutch meteorological office.*" (Boezeman & Kooij, 2015, p.16).

The second transformation moment occurred in 2007. After the heat waves of 2003 and 2006 (KNMI, 2006), the problem of urban warming eventually appeared in the policy documents. In 2007 the National Heat Plan¹ was adopted and therefore adapting to urban warming was seen as an element

¹ The National Heat Plan is developed by the National Institute for Public Health and the Environment (RIVM). This plan is put into operation during hot periods. When the plan becomes active the RIVM makes organizations, professionals and volunteers that are involved with the care taking of vulnerable groups extra aware of the potential dangers of heat (RIVM, 2011).

of climate change adaptation. Discussions were no longer on the question if urban warming was a matter of *fact*, but whether it was a matter of *concern*.

The third moment of transformation led to what Boezeman and Kooij call “*making stable couplings to other domains that enable adaptation*” (Boezeman & Kooij, 2016, p.16), to what extent is it worthwhile to adapt to urban warming and what policy sectors should be part of this adaptation process? In Arnhem for example the urban warming problem was connected to urban planning. It was integrated in concrete spatial visions. Nevertheless, these visions did not have much impact. The heat stress problem was not considered as urgent, so the different actors did not feel the need to adapt.

The last transformation moment as observed by Boezeman and Kooij, is the attempts that were made to transform the normative elements of the object of urban warming into an object of risk. More attention was paid to the issue of heat stress in (national) media and in city councils. This transformation can be seen as the attempt to solve the issues that were responsible for the lack of success of the second and third transformation.

At the current moment, in 2018, it might be time to add a fifth moment of transformation to the list of Boezeman and Kooij. In September 2017 the Dutch Ministry of Infrastructure and Water management developed the “*Deltaplan ruimtelijke adaptatie 2018*” (Deltaprogramma 2018, 2017), this forces all Dutch municipalities to execute a climate stress test in their region. Heat stress is one of the issues in this test. The test let all municipalities map the climate risks and dangers within their area. The test is not mandatory, but all governmental entities agreed to perform the stress test. The test can be seen as a next step in the transformation from science to policy in the Dutch policy sphere. Therefore, it is quite assumable that we will later on need to add a sixth transformation moment to the list. The stress test lets local governments map the risks, but does not make them take necessary measures to prevent the risks. The implementation of measures can be seen as the sixth transformation. To what extent this fifth or even sixth moment of transformation is currently happening and if these moments can be added to the list of Boezeman and Kooij needs to be further investigated. The framework by Boezeman and Kooij forms an interesting ground to build further on within this thesis.

New policy subject

Heat stress is a relatively new subject on the Dutch policy agenda. The moments of transformation, as described by Boezeman & Kooij (2016), show how the topic is slowly developing towards a mature policy issue. However, until now heat stress is mainly a subject of which local governments are aware, but do not feel the urgency for to implement it in the local policy. In 2015, research was done on climate adaptation in Dutch municipalities. Only 7 of the total of 389 municipalities said they took actions against heat stress to a “high extent”. 21 municipalities stated their actions can be considered to an extent that is “nor high, nor low”. 81 municipalities declared they took actions to a “low” or even “very low” extent. The other 279 municipalities did not answer the question. So in 2015 only 7 municipalities are known for their serious heat stress actions. This is less than 2% of all Dutch municipalities. The research is an initiative by the “*Vereniging Nederlandse Gemeenten (VNG)*” (VNG, 2016).

2015 is the most recent year of which figures are available about to what extent Dutch municipalities try to tackle heat stress. In September 2017, as part of the Deltaplan Ruimtelijke Adaptatie, all municipalities agreed to perform a climate stress test within the next two years. Therefore, it is likely that in 2018 more municipalities would consider their measures taken against heat stress as “to a

high extent". Unfortunately, until now no accurate numbers and figures are available that could confirm this assumption.

The research done by the VNG and the upcoming stress tests imply that the concept of measures against heat stress is a new policy issue that is still developing. One could say that we can speak of an innovation, not so much a technological innovation, but more an innovative policy concept for the Dutch policy field. This makes it interesting to investigate how such a new policy issue is spread, diffused and adopted among the Dutch municipalities. Research on such a current theme could be socially relevant.

1.1 Societal relevance

According to the KNMI (see figure 1) periods of hot weather lead to heat stress in Dutch municipalities. These warm periods might cause concentration problems and less productivity of working people. It can also lead to health problems, especially among the more vulnerable groups: *"elderly, very young, obese individuals, people using certain medications, socially isolated individuals, poor, the mentally ill, those without air conditioning and outdoor workers."* (Wilhelmi & Hayden, 2010, p. 4). The heat waves of 2003 and 2006 show that these health problems can even cause a higher mortality number (CBS, 2003) (CBS, 2006). The KNMI models in figure 1 show that the amount of hot periods will increase significantly in the calculated year 2050. This model shows that the urban areas will have more, and more intense, hot periods. While also the non-urban municipalities will face heat stress problems. The fact that heat stress even occurs in less dense areas is the reason why in this thesis *heat stress* is the preferred term and other terms that are used in science and society, such as *urban-heat island* and *urban heat stress* are not used. The term *urban* implies that heat stress is a "city-problem", this does not enough justice to the problems heat stress can cause in non-urban municipalities.

Figure 1 represents the amount of nights in which heat stress will occur. On the left is the current situation shown, on the right the predicted situation for 2050. The maps show that the number of overheated nights will grow in the coming years. The maps also show that urban areas are the most vulnerable for heat, but even the smaller municipalities face nights in which people can get overheated. The amount of overheated nights in non-urban municipalities will in 2050 will be higher than the amount of overheated nights in urban municipalities in 2018. Every municipality has to deal with nights that lead to heat stress. Facing these meteorological facts and predictions and combining them with the fact that only seven of the 389 municipalities consider their taken heat stress measures as "high" (VNG, 2016), makes it socially relevant to investigate why most of the municipalities have not taken heat stress measures. If we know why most of the municipalities lack heat stress measures and what motivated the others to develop heat stress policy, we might come to know how to stimulate those municipalities where heat stress may cause problems, to develop heat stress policy.

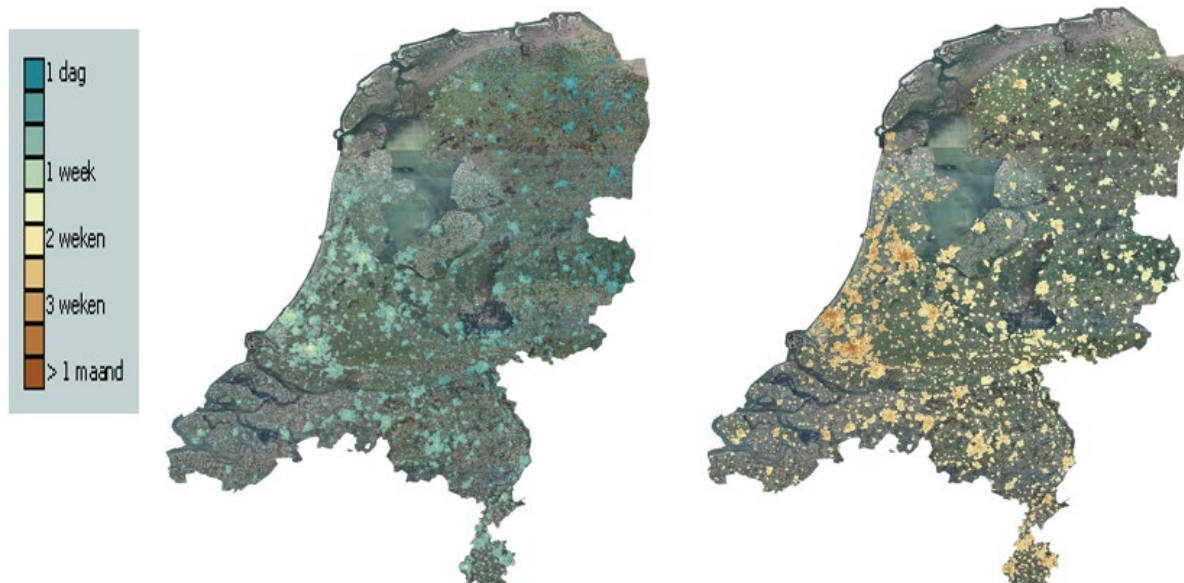


Figure 1 Left: current days of heat stress, right: predicted days of heat stress in 2050 (Klimaat-effectatlas, 2018)

Therefore it is necessary to get to know the persons and institutions that spread the knowledge about heat stress and how this knowledge is translated into actual policy. So it is the process of diffusion and translation that is the interesting part. Who stimulates and motivates municipalities to take action? How is the network of this new knowledge and policy subject shaped and subsequently, what are the underlying rationales that influence the development of policy? If we can answer these questions, we can get insight in how to stimulate those municipalities where heat stress action seems needed.

It is interesting to see how a new policy issue spreads between different governmental scales. What are the rationales for the development or the lack of development of heat stress policy? The answers of the Dutch case might add new insights to the international knowledge and are also interesting for other countries where heat stress is an upcoming policy issue. Think about comparable countries as Denmark and Belgium. Adapting to heat is not part of the identity of these countries. So the incentives and rationales might differ from locations where dealing with heat is a core daily issue: Spain, Portugal, Southern part of the USA etc. (Keatinge, W; Donaldson, G; Cordioli, Elvira; Martinelli, M; Kunst, A; Mackenbach, J; Nayha, S, 2000)

Heat stress is getting more and more attention in the Netherlands. An example is the Heat Stress Congress in June 2018. This is the first national heat stress congress in the Netherlands. The minister of Infrastructure and Water was one of the key speakers at this congress (Kennisportaal Ruimtelijke Adaptatie, 2018). This shows that heat stress is on the agenda of the Dutch government. Nevertheless, the project leader of the heat stress congress states that there are four major climate risks; it is getting hotter, dryer and wetter and the sea level rises. The consequences of heat are getting the least attention of these four. She is convinced that we have to pay more attention to heat, because it contains lots of challenges (Kennisportaal Ruimtelijke Adaptatie, 2018). Therefore, heat stress can be seen as a topic that is getting more attention, but still not enough. Right now, when the topic is rapidly developing, research on the spreading and translation of the subject is socially relevant.

1.2 Scientific relevance

Heat stress is a new phenomenon in the Netherlands, also in the knowledge sphere. Research is mainly done on climate adaptation in general. In the Netherlands more specific on water and

flooding. International science has paid attention to adapting to heat, but the Dutch case can bring other problems and issues to the surface. Especially on the policy developing issues. The international knowledge about the technological solutions for heat stress can partly be copied to the Dutch cities, but the Dutch adaptation-policy- world differs from other countries (Swart & Biesbroek, 2009). The spreading of heat stress knowledge and the translation of this knowledge into policy is an unexplored area in the Netherlands.

According to Massey, Biesbroek, Huitema and Jordan (2014, p. 441) the field of adaptation policy research, which adapting to heat is part of, “*has expanded rapidly in recent years but is dominated by interesting but non-cumulative cases.*”. The non-cumulative approach is focusing on case studies, case studies can be very relevant, but according to Massey et al., there is not enough knowledge of the general adaptation approach in municipalities. There is no overview of the variety of underlying reasons and considerations of the different approaches in Dutch municipalities. The survey that is held as a data-collection method within this thesis, fills this gap noticed by Massey et al. A survey held among all Dutch municipalities goes beyond the non-cumulative case study approach. It provides the possibility to get more insight in the broader status of the Dutch adaptation policy sphere. Further on, Massey et al. pay attention to the explanatory variables that can declare certain adaptation decisions:

“For scholars of adaptation policy, it provides a means to go beyond single cases to understand why countries choose (not) to adapt – a field of analysis that is still in a nascent stage (Javeline, 2014). In particular, more attention should be paid to the explanatory variables”. (Massey et al., 2014, p. 442)

The goal of this research is to find the underlying rationales that influence the adaptation to heat stress by Dutch municipalities. The focus is on the human players within the network and on influences such as processes, beliefs, frames and rationales that altogether give insight in the considerations municipalities make in adapting or not-adapting to heat. The survey gives answer to these questions on a broader scale and provides insight in the general considerations and influences. The addition of in-depth interviews provides an interesting deepening and explanation of the answers given in the survey. Therefore this thesis fills both of the knowledge gaps that are mentioned by Massey et al.: the lack of cumulative knowledge and the lack of knowledge about underlying considerations.

In the introducing part of this research Boezeman and Kooij (2016) are cited. They noticed four moments of transformation in the Dutch heat stress policy sphere. In the introducing section of this thesis the assumption is made that in the meantime a fifth moment of transformation has occurred and a sixth transformation is developing. This fifth transformation is the *Deltaprogramma Ruimtelijke Adaptatie* and the announced climate stress tests. The sixth moment of transformation might be the actual implementation of measures and policy against heat stress.

While the heat stress sphere in the Netherlands is currently on the move (*Deltaprogramma Ruimtelijke Adaptatie, climate stress tests, knowledge consortiums, KNMI climate scenarios, national policy on being climate proof*) it is almost a necessity to keep the knowledge of this changing phenomenon up to date. It seems inevitable that within the coming years more transformation moments can be added to the four moments as formulated by Boezeman and Kooij (2016). These transformation moments form useful stepping stones in the Dutch heat stress history. It might be a missed opportunity if we stopped doing research on developments that might become a next transformation moment, especially now, when heat stress is gaining more and more general attention.

This thesis can make clear what the influence of the *Deltaprogramma* and the climate stress tests is. It might also bring other influences to the surface that are part of a possible new transformation moment and it can give more insight in the state of the implementation and development of adaptation policy in Dutch municipalities.

Therefore this research can form an addition to the work of Boezeman and Kooij (2016), who noticed four transformation moments and it fills the knowledge gaps as mentioned by Massey et al.(2014): the lack of cumulative knowledge and the lack of knowledge about underlying considerations.

1.3 Research questions

The following research question flows from the societal situation and the current status of the heat stress knowledge:

To what extent is heat stress-knowledge diffused among Dutch municipalities and how is the translation of this knowledge into policy influenced by processes, frames, beliefs and rationales?

Three sub questions are formulated to answer the main research question:

- **What are the main actors in the Dutch heat stress network and what is their role?**
- **How are process, frames and beliefs influencing the processes of diffusion and translation?**
- **How are underlying rationales influencing the processes of diffusion and translation?**

The theoretical basis for answering the main question will be elaborated in the next chapter.

2. Theoretical framework

The relevant theories for answering the research questions are discussed in the theoretical framework. Altogether these theories form a structure that provides an essential basis for the further parts of the research. Firstly, the role of networks is discussed, than the concepts of diffusion and translation are elaborated. It becomes clear that the diffusion of knowledge goes via the heat stress network. A network in which different human intermediaries play a role. How knowledge is spread and translated within a network, under the influence of processes, frames, beliefs and rationales, is discussed and explained within the theoretical framework.

2.1 Network approach

The focus in the innovation literature was for a long time on linear innovation and the linear model. This model saw the innovation process as a chain of events that occur after each other (Di Stefano, Gambardella, & Verona, 2012). The innovation process starts with (scientific) research, than the technological development follows and at the last stage the diffusion and market introduction takes place. This “technology push” approach implies that more scientific knowledge eventually leads to more products that consumers will buy and use. This is now seen as a quite naïve approach, society does not just simply adjust to what the industry offers. Later on, the “demand pull” approach was added to this theory. This suggests that consumers address to the knowledge centers what they need and desire (Di Stefano et al., 2012). Further in time, the demand pull approach was considered as too superficial. Society sometimes only wants something, when its available or invented (Hekkert & Ossebaard, 2010). E.g. before the invention of the car; if one would ask people what kind of improvements on transport they liked, people would probably say they want bigger carriages or carriages with more and faster horses. It is not likely that a significant part of society would say they want a car, without ever seen one or without ever hearing of it.

The successor or follow up of the linear model is the innovation system model. This model emphasizes the environment and the space in which an innovation process takes place. The environment influences the process in different ways (Hekkert & Ossebaard, 2010). Innovation is the work of humans. Not only the technological and scientific parts, but also the rules of the game are developed and adhered by humans. All these people in the innovation system have different motives and beliefs that drive them, but all actors have some sort of interest in the succeeding or failing of an innovation. These aspects of beliefs, motives and commitment will be further elaborated in the following paragraphs.

An approach that is closely linked to the system innovation model is the policy network approach. Bressers (1993) uses the definition by Hufen and Ringeling (1990) to explain policy networks: *“Social systems in which actors develop interaction- and communication patterns, that show some sort of sustainability and are aimed at policy problems or policy programs.”* (Bressers, 1993, p. 311). Bressers elaborates further on this definition with saying that this implies that before identifying a certain policy network, the policy problem needs to be demarcated. So if we want to identify the policy network of the concept of heat stress, we need to demarcate the relevant policy problem. The relevant issue is that only 7 of the 389 Dutch municipalities have taken serious heat stress measures, while the KNMI shows there are more municipalities in which heat stress is a problem and that this amount will only rise according to the predictions of 2050. The specific policy problem is therefore a lack of heat stress policy in the Dutch municipalities.

According to Bressers, different characteristics play a role in the typology of policy networks. He pays special attention to two of these characteristics: *“intertwinedness”* and *“connectedness”*. Intertwinedness is a more institutional typology and connectedness a merely ideological characteristic.

Intertwinedness is about the intensity of the interactions between different actors within the network. This beholds interactions within the policy-making process as well as interactions outside this process. To improve these interactions and encounters intermediaries can play an important role within the network (Bressers, 1993, pp. 311-312). An indicator for intertwinedness, as stated by Bressers, is to what extent (semi)private organizations are involved in the policy making process, particularly by formal discussions and working structures.

Connectedness describes to what extent the policy goals of one actor are conforming to the policy goals of another actor. More specific, to what extent do the different actors within the network sympathize with each other’s policy goals. Do the actors have shared values and ideas (Bressers, 1993, p.312)? This concept shows resemblances with the concepts of *beliefs* and *frames*, that will be further explained later on in this chapter.

Bressers uses intertwinedness and connectedness to distinguish four types of policy networks and provides examples of these different network types:

	High intertwinedness	Low intertwinedness
High connectedness	Agriculture ‘70	Economic affairs
Low connectedness	Environmental control ‘90	Environmental hygiene ‘70

Table 1 Four types of policy networks (Bressers, 1993, p. 315)

It might be interesting to do research on how the heat-stress-network fits within these four network types. Important note is that a network can be a combination between two or more of the mentioned network types. These types are just a guideline, not a clear distinction.

With the network approach the goal is to focus on the spreading and adoption of a new policy subject, that can be described as a mobile and moving entity. When taking the network approach, with all its factors that play an essential role in the spreading and adoption of the concept of heat stress policy, as main approach to do research on the mobility of this policy subject, one can argue if the terms "spreading" and "adoption" are not too superficial. Other terms do more justice to the moving and travelling character of new policy ideas and concepts. Although spreading and adoption are not "wrong" terms and they will still be used within this research when appropriate, more accurate concepts are "diffusion" and "translation".

2.2 Diffusion

Jans, Denters, van Gerven, & Need (2013) make an interesting distinction between spreading and diffusion. They prefer to use the term "spreading" when answering the descriptive questions if, when and how an innovation has spread within a certain population. They start using the term "diffusion" when answering the explanatory question. When answering this question about to what extent municipalities are influenced by other municipalities in innovation-decision making, they come to know if one can speak of "diffusion". Jans et al.(2013) describe diffusion as a specific type of spreading, in which municipalities are influenced by other organizations in their decision making process. Therefore they only want to use the term diffusion in the explanatory question, because there it becomes clear if diffusion is the right term in the specific case.

Massey, Biesbroek, Huitema and Jordan (2014, p. 435) use the following description to define diffusion: *"the process through which a previously adopted policy or set of policies spreads across jurisdictions over time and through certain channels."*

Looking at the definition of Massey et al. (2014) and the explanation of Jans et al., we notice that diffusion is an essential part within the network approach. The definition of *diffusion* makes you aware of the fact that the spreading of a new policy idea takes place within a world that we can describe as a network that consists of different (geographical) scales and that is influenced by many different actors and factors. These actors, that are part of the network, make the policy concept move from actor to actor. During this travelling process, the concept is influenced by different intermediaries. It is sometimes adopted by governmental bodies, but is most of the time being translated and modified to fit the ideas and frames of actors and is always moving, moving from scale to scale and actor to actor. These processes are constantly influencing the content of the concept, they have influence on the substance of the knowledge. The shape of the policy concept is constantly changing, since all actors within the network influence the concept and sent it forward in a modified way to new actors (Braun & Gilardi, 2006).

To answer the explanatory question by Jans et al.(2013), it is necessary to have understanding of the spreading of the heat stress knowledge. To investigate the diffusion process, it has to be clear to what extent the heat stress knowledge is spread among the Dutch municipalities and which actors play(ed) an influential role in this spreading process. As mentioned before, in 2015 only 7 of the 389 municipalities said they took heat stress measures to a "high extent". Elaborating further on the in 2017 announced climate stress tests, it is assumable that in the current situation more municipalities developed policy against heat stress. Therefore, one can expect that the spreading process has developed over the last years. A first step would be to map the current situation of the spreading of

heat stress policy within the Netherlands. After this more superficial approach, the diffusion can be researched by a more in-depth approach.

The definition of networks by Hufen and Ringeling (1993), as given in paragraph 2.1, shows how diffusion takes place within and via the network: *“Social systems in which actors develop interaction- and communication patterns”*. The actors within the network have an essential role in the diffusion of knowledge and policy as defined by Massey et al. (2014). Diffusion takes place in connection with the formation of a network. The actors within the network affect the content of the diffused knowledge. Developments within the shape of the network influence the content of the knowledge (Braun & Gilardi, 2006). How this knowledge is translated into policy by governmental organizations will be elaborated in the next paragraph and later on the different intermediaries, processes, frames, beliefs and rationales that influence the shape of the network and the processes of diffusion and translation will be further discussed.

When researching the qualitative outcomes and impacts of diffusion processes, the way the diffused information is translated into policy is an essential addition. This next step in the policy network process is discussed in the following part.

2.3 Translation

Diffusion is a process that takes place within the network. To draw conclusions on the shape of the diffusion process, it is necessary to do research on how the diffused knowledge is translated into policy (Marsh & Sharman, 2009). Especially within the sphere of a new policy subject, such as the heat stress issue, the way the knowledge is translated into policy is interesting. It is not clear how the municipalities, that differ from each other in their demography, the political structure and the geographical location will translate the knowledge into policy. Similar with the differences in structure in these municipalities, they will differ in the way they translate the knowledge and in the rationales and beliefs that support their policy decisions. Firstly, the subject of *“translation”* will be further discussed. After that, the underlying processes, beliefs, frames and rationales that influence the processes of diffusion and translation are further elaborated.

The processes, beliefs, frames and rationales differ from municipality to municipality and from network to network. The heat stress network is not the same as other climate adaptation networks in the Netherlands. Mainly because it is a new policy subject and because some other intermediaries and motives play a role within this network (VNG, 2017). This influences the way the knowledge is translated. The next quote by Duijn (2009) makes clear how the translation of knowledge differs from case to case:

“The way the intermediaries are put in circulation, by what actor or force they are issued, at what place in the network they emerge, what they do there, as well as how they are translated and put into further circulation are questions that can clarify the emergence and development of specific networks, for each network will have its own idiosyncratic translation process.”(Duijn, 2009, p. 82)

This quote shows that all networks differ from each other in the way the different actors *“communicate”* together and information is translated. This makes it interesting to do research on the communication and translation within a network, such as the heat stress network.

The heat stress knowledge is not only just spreading, the information that is travelling is translated by different actors. All the rationales and processes that altogether influence and form the knowledge about heat stress that is circulating, are constantly on the move. They move from one actor to another actor, for example between governmental entities. This is done through intermediaries. When moving from entity A to B, the information is influenced and modified by

several actors. For example by consultants and civil servants. These intermediaries make it possible for the knowledge to move from A to B. While making the knowledge move, the actors influence the content of the knowledge with the way they translate it (Howells, 2002, p. 877). They translate the knowledge by adding their own rationales and by the influence of the different processes that play a role. After that, the knowledge is sent to a next actor, who makes his own translation of the knowledge and sends it forward. Note, this is not always as simple as it sounds. The translation is a process that is most of the time not a deliberate action by the actors. The intermediaries have influenced the actors (Gandara, Rippner, & Ness, 2017). It is possible that these actors are not always aware of the social structure by which they are influenced. This makes it a process in which it is hard to find a starting point, some origin in which the process started. Since it is a moving process, there is no real beginning. The knowledge of a concept is constantly on the move and is a result of other knowledge and sciences over the world. It is a result of the frames in which people live, the processes of which they are influenced by and the rationales and beliefs they enhance.

It is therefore necessary to demarcate a starting point within the research if you want to find the intermediaries and factors that influence the policy the most. Without this demarcation of a starting point one will undoubtedly eventually drown in the world of (social) frames and knowledge that somewhere influenced knowledge about climate adaptation. It is more interesting to find out what factors play an influential role in the current spreading of heat stress knowledge and the translation of this knowledge into policy. What institutions and which persons and instruments are the motivating factors for municipalities to start thinking about heat stress policy? And which frames, beliefs, processes and rationales are influential factors in the translation of the knowledge? Why are some municipalities making policy against heat stress and others not? What frames, beliefs, processes and rationales are decisive factors for determining why a municipality does or does not develop heat stress policy?

The heat stress knowledge is influenced by frames, beliefs, processes and rationales of different actors. How this travelling knowledge is translated by actors depends on their rationales. The adopting actors modify the package of knowledge and send it forward to a next actor, who translates the knowledge depending on their rationales. While modifying the package of knowledge, actors are constantly being influenced by other actors in the network. The different actors within the network who play a knowledge developing and knowledge sending role can be considered as intermediaries. The processes, beliefs and frames that influence the rationales for policy decisions can be considered as other factors that have influence on the diffusion and knowledge translation process.

2.4 Intermediaries

As mentioned before, the process of diffusion and translation within the network, takes place as a consequence of the influences of different intermediaries within the network. These persons or organizations tie the different actors in a network together and make sure new actors are connected to the existing network (Duijn, 2009, p. 81). Duijn defines intermediaries as *“anything that passes between actors in the course of relatively stable transactions”* (Duijn, 2009, p. 81). This definition considers intermediaries not only as humans or organizations but also as material or processes and scripts, such as *“behavior”* or *“the rules of the game”*. This demarcation of intermediaries is known from the actor-network theory approach. In this research actor-network is not one of the main theories that will be used, but the essence of the theory plays a role in the background.

When investigating which intermediaries play an influential role in the heat-stress-network, the focus will first be on the intermediaries, e.g.: influential politicians, policy makers, consultants, cooperation networks, scientists or concerned citizens. The intermediaries are essential to map how municipalities are being involved in the heat-stress-network. This shows what intermediaries inspire

the municipalities to be part of the network. Other factors can have an impact on the network as well. Think about the peer pressure that arises when other municipalities are getting involved in the network, a lack of (financial) resources to take measures, or the differences in to what extent people are convinced of the tempo in which the climate is going to change. These factors can become clear at a later stage of the research process. Since the heat stress network is a new phenomenon in the Netherlands (Deltaprogramma 2018, 2017), that is not extensively researched, it is useful to first map the human players within the network. After that, these human intermediaries can be interviewed to make clear what the underlying forces are that drive the network and that “inspire” the municipalities to adopt this policy innovation.

The human intermediaries are used to map the network. This can be done through surveys among all Dutch municipalities. These questions will be more superficial and relatively easy to answer. To bring the other factors that have influence to the surface, more in depth questions need to be asked. For example by face to face interviews with influential intermediaries and with chairmen of the municipalities.

The other influences on the diffusion process and on the way knowledge is translated present themselves as *processes, frames and beliefs*, that have impact on the *rationales*. The rationales are more underlying considerations that play an important role in the way the package of knowledge is evolving. They give shape to the moving package by influencing the processes of diffusion and translation.

Interesting about these factors is that we can describe them as travelling entities in a fixed form. Not all rationales or processes are relevant. Only if they have influence on the local policy, and therefore have local agency, they can be determined as an agency-making-factor in the network of heat stress knowledge. It is interesting to find the factors that make agency, since these are the relevant aspects that influence the policy making process (Dwiartama & Rosin, 2014). Finding these influences will declare the differences in the development of heat stress policy between Dutch municipalities.

2.5 Rationales

Rationales are influenced by the processes, frames and beliefs. The processes, frames and beliefs lead to rationales that can be considered as motives. Motives for action or motives for a lack of action. Rationales don't come from nothing, they arise out of the conjunction of human intermediaries and processes, frames and beliefs within a specific network. The rationales affect the processes of diffusion and translation and are therefore an agency making factor within the heat stress network. Finding rationales provides more insight in the considerations on which actors within the network make their decisions. The rationales might sometimes exist even before the specific network was developed, but they have an influence on the decisions that are made by actors within the network. The next quotation provides more insight into why it is essential to find the rationales that make local agency:

“Rationales contain assumptions about the nature of the system within which an intervention is to be made. Implicitly or explicitly they articulate, problematize and justify the need for intervention and outline the logic through which that policy intervention is expected to lead to the intended outcomes. Uncovering the theory and the rationale behind policy action or inaction is essential if any meaningful evaluation is to occur.” (Laranja, Uyarra, & Flanagan, 2008, p. 823)

This quote makes clear that finding the underlying rationales is essential in declaring why some municipalities are, and others are not, adapting to climate change and more specific, developing heat stress policy. These rationales can differ from municipality to municipality and from individual to

individual. Berkhout (2005, pp. 386-388) gives several key problems that can occur in climate adaptation and that can provide rationales for policy intervention:

- **Awareness of climate vulnerability:** to which extent are actors, individuals as well as organizations, aware of the vulnerability of their (local) system for climate change? If these actors are not aware of the vulnerability, it is questionable if they are willing to take action against climate change. The predictions of climate change models and the impact this change will have are therefore essential. The awareness or dis-awareness can become an influential rationale for measures against heat stress.
- **Awareness of adaptation options:** *“organizations are not yet aware of the measures (technological, institutional and so on) that could be taken by them to moderate these climate vulnerabilities and risks. Adaptation needs to be integrated more widely, and may involve, over the short run, only small adjustments to the procedures of many organizations.”*(Berkhout, 2005, p. 387). Without the awareness of the options, municipalities have a rationale for not integrating climate adaptation (adaptation to heat stress, more specific) in their daily spatial policies and in innovative projects.
- **Uncertainty and motivation:** *“For many organizations there will continue to be considerable uncertainty about the precise nature and risks of changing climate and variability, about their climate vulnerability and about the benefits of adaptation.”* (Berkhout, 2005, p. 387). The role of climate prediction models is important to reduce uncertainty. More tailored information on a smaller scale will take away uncertainties about the risks municipalities will face. Private actors need to have incentives to take adaptation measures. Without the participation of these smaller actors, the broad scale adaptation benefits will be lower. Within the heat stress context, the participation of housing corporations is an example of private actors that need to have an incentive and the motivation to take adaptation measures. Green roofs placed on corporation buildings will have benefits for all residents of the buildings. The residents are depending on the corporation. Therefore the corporation needs to have an incentive (motivation) to take measures.
- **Adaptation spillovers:** When climate adaptation measures are taken, the benefits are not always totally for the actor who took the measures. Spillover effects might occur. An actor that did not pay for or did not put energy and time in the measure might benefit from efforts taken by others. On the other hand negative spillover effects can occur. An adaptation measure can have negative effects on individual actors. These spillovers can lead to under-investment in climate adaptation. This generates a rationale for a lack of adaptation measures, but on the other hand it generates a rationale for policy and legal interventions, as an instrument to take measures that are for communal benefits (Berkhout, 2005).
- **Constraints on adaptation:** Berkhout states that scarcities and constraints may exist in adaptation issues. Adaptation draws on resources (capital, knowledge, technology and consent) that are not always held by the agent that wants to adapt. These scarcities and constraints can sometimes be tackled by adding the market to the process, but not all of these barriers can always be overcome. Berkhout considers the above mentioned problems of awareness as a cause for these constraints. Policy can sometimes remove some of the adaptation constraints, for example by improving the awareness by necessary third parties. The constraints therefore form a rationale for a lack of action, but they also can be a reason for actors to motivate third parties to be part of the adaptation process.

Elaborating further on these adaptation problems makes Berkhout come up with five primary objectives for climate change adaptation. These objectives can be considered as broad rationales for climate change adaptation that are answers to the problems mentioned above:

- ***“Information knowledge and learning (to inform the potentially vulnerable):*** Governments have played a major role in the sponsorship of climate science and in the provision of tools such as global, regional and national climate scenarios. This informational role is being continually expanded. Experience shows that awareness of climate impacts and vulnerability assessment remains patchy, being well-developed in some sectors, such as water services and insurance, and generally poor in many other sectors.
- ***Early-warning and disaster relief (to assist in the provision of disaster relief):*** Most governments have in place plans, organizations and resources to alert people to weather-related disasters and cope with the consequences, at home and abroad. These will need to be continually reviewed as the frequency, scope and intensity of weather-related disaster changes as a result of climate change. An important aspect of adaptive capacity is the capacity to cope with weather-related events.
- ***Facilitating adaptation options, guiding adaptation and enabling adaptive capacity (to incentivize and enable adaptation):*** There are strong ‘public good’ arguments for investing in scientific and technological resources that may be widely adopted in response to climate change. A standard response to greater uncertainty is to broaden the portfolio of adaptations that are available to vulnerable sectors. Beyond investing in innovations that may be applied by adaptors, there is also a clear role for regulators to signal the need to adapt to the private sector. The rationale for this is the potential for under-investment in adaptation by economic actors confronted by high uncertainty about the likelihood and consequences of climate change impacts.
- ***Regulating distributional consequences of adaptation (to regulate adaptation ‘spillovers’ and risk-shifting):*** Unregulated, it is likely that the most vulnerable social groups will end up bearing many of the new social and economic risks that arise as a result of climate change. A simple example of this is the proposed reduction in the term (from 3 years to 2 years) of liability insurance covering new houses in the UK, partly as a response to heightened risks of storm damage (Hertin et al., 2003). In this way the house-owner, rather than the house-builder’s insurer, comes to take on an increased risk.
- ***Infrastructure planning and development (to plan and regulate long-term and infrastructural assets so as to reduce future vulnerabilities):*** Water, transport and energy infrastructures are likely to be influenced by changing climate, as is the distribution of settlements, especially in coastal and fluvial flood plains. Modification of infrastructures and of spatial plans in response to experienced and predicted climate impacts is another area in which Governments will play a major role. Difficult trade-offs are likely to be necessary between conflicting social, economic and environmental objectives as a result.” (Berkhout, 2005, pp.388-389)

These rationales consider climate adaptation in general. Adapting to heat stress is one issue within climate adaptation. It is interesting to investigate how the Dutch heat stress rationales fit in the general climate adaptation framework of Berkhout. Since heat stress is, especially in the Netherlands, a relatively new policy issue (Boezeman & Kooij, 2015; Deltaprogramma 2018, 2017) , some new rationales may come to the surface. Rationales that maybe only play a role in the Dutch policy sphere. Other rationales for climate adaptation might be less influential to the heat stress problem in the Netherlands. The specific rationales for dealing with heat stress problems are a new and unexplored territory and are therefore a valuable research topic, scientific as well as societal.

Rationales are influenced by frames, beliefs and processes. Frames in which actors live and which they enhance, beliefs of which they are convinced and that effect the way they act and processes that influence certain policy decisions. The frames, beliefs and processes provide a rationale for the

way actors act. These rationales are travelling from actor to actor. When forwarding the knowledge of the concept of heat stress, an actor intentionally or unintentionally adds his own convictions to the concept. Although the rationales are travelling, the content of the rationales is considered as quite fixed. An actor does not easily change the beliefs he enhances or the frames in which he acts (Goldstein & Keohane, 1993, p.10). It is important to investigate what rationales make agency on a local level if we want to declare adaptation differences. What are the rationales that have impact on the local policy? To bring this agency-making rationales to the surface, it is necessary to find the frames, beliefs and processes that make the actors act the way they act. Therefore, the next sections elaborate further on the concepts of processes, frames and beliefs.

2.6 Processes

Processes are considered as factors that might influence the processes of diffusion and translation. In an empirical study on processes it is relevant to find those processes that have influence on the case, that make local agency. The processes are more tangible and visual than the frames and beliefs. Examples of processes are different types of scripts, guidelines, protocols, roadmaps and societal changes such as immigration or urbanization. Together with intermediaries, frames and beliefs the processes have influence on the identity and shape of networks and on how knowledge is diffused and translated (Mützel, 2009).

Organizations and governmental institutions act via all sorts of “rules”. These rules influence the policy making process (Sabatier, 1991). Sometimes in a negative way, but sometimes these processes speed up the policy making process.

The Deltaplan Ruimtelijke Adaptatie and the linked climate stress tests are examples of such processes that might bring the policy making of heat stress to a next level. All municipalities agreed to conduct a climate stress test within their region (Deltaprogramma 2018, 2017). It is assumable that the Deltaplan has influence on the policy making process. What the exact influence of this plan and the stress test is will be part of this thesis. During the research it will become clear if and how the stress tests have influenced the heat stress world of the Netherlands. Besides the stress tests there are undoubtedly other processes that have influence. Some might occur on a regional scale and others on a higher geographical level. What these agency-making processes are needs to be examined within this research. When the influential human intermediaries, processes, frames, beliefs and rationales that influence the network have come to the surface, it will be clear what the shape of the network looks like. To map the network, the agency-making intermediaries need to be examined. This consists of the human-intermediaries and the processes, frames, beliefs and rationales. All these agency-making factors influence the content of the heat stress knowledge and make it travel among several scales. This eventually has effect on the local translation of the knowledge and the transformation from knowledge into policy.

2.7 Frames

Frames are one of the factors that can have influence on rationales for policy development. Art Dewulf (2013) describes frames and the concept of framing as follows:

“The process by which issues, decisions, or events acquire different meanings from different perspectives has been studied as framing in a variety of social science disciplines, including communication science, social psychology, sociology, public administration, and political sciences. By highlighting certain aspects of the situation at the expense of others, by drawing different boundaries around the issue and by putting forward different elements as the core of the issue, people from different backgrounds construct frames about policy issues that may differ considerably from how others frame the issues.” (Dewulf, 2013, p. 322)

This shows that the frames people have and use in translating knowledge differs and that different frames from others can influence the adopting agent. These frames therefore influence the content of the travelling knowledge.

The role of the social context in which the knowledge translation takes place is receiving more attention in nowadays research. Peter Hall (1993) wrote about the importance of the social and political context in research on political phenomena and public policy:

“Politicians, officials, the spokesmen for social interests, and policy experts all operate within the terms of political discourse that are current in the nation at a given time, and the terms of political discourse generally have a specific configuration that lends representative legitimacy to some social interests more than others, delineates the accepted boundaries of state action, associates contemporary political developments with particular interpretations of national history, and defines the context in which many issues will be understood.” (Hall, 1993, p. 289)

This social context, as described by Hall, is a macro-level approach. Yves Surel (2000) reviews in his article three main approaches that describe the role of values, ideas and representations in the study of public policy. These approaches that are reviewed by Surel: “paradigm” (Hall, 1993), “advocacy coalition” (Sabatier and Jenkins-Smith, 1993) and “the référentiel” (Jobert&Muller, 1987; Faure et al., 1995), all share a questioning that is based on the macro-level. The macro-level frames and paradigms affect the opinions and decisions on micro-level, sometimes even on the beliefs of individuals. It is necessary to be aware of the influence that the macro social context has on the decisions made on micro-level. Nevertheless, there can be differences between entities on micro-level that live and act within the same macro-level scale. For example because someone can enhance a different frame within the same macro-level (Surel, 2000). It is therefore important to get to know these different frames that influence the policy-making process. These frames might declare differences in policy decisions and in the translation of knowledge.

2.8 Beliefs

Besides processes and frames, *beliefs* can also form the basis for a rationale for the behavior of actors. Beliefs can be defined as ideas, or as opinions. According to Goldstein and Keohane (1993, p. 3) these ideas can influence governmental policy. Inspired by the works of the German sociologist Max Weber, Goldstein and Keohane came up with three types of beliefs: *world views*, *principled beliefs* and *causal beliefs*.

- *World views* are ideas that can have serious impact on human action and behavior. Think about religions or political ideals like communism. These world views are not always clearly present, they can be embedded within culture (Goldstein & Keohane, 1993). It is a likely assumption that within Dutch politics world views that are more or less modern Western are the leading view. Nevertheless, there are some municipalities where the Christian reformed political parties have influence on the daily politics. The world views within these municipalities might differ from other Dutch municipalities.
- *Principled beliefs* are described by Goldstein and Keohane as: “they mediate between world views and particular policy conclusions: they translate fundamental doctrines into guidance for contemporary human action”(Goldstein & Keohane, 1993, p. 9) Examples given by Goldstein and Keohane of principled beliefs are: “slavery is wrong”, “abortion is murder” and that “human beings have the right of free speech”.

- *Causal beliefs* are beliefs about cause-effect relationships, these relations gain their authority from consensus of recognized elites. Scientific knowledge is one of these recognized elites. Scientists can reveal how certain behavior or actions can lead to a positive or negative outcome. Another example of causal beliefs is that of learning from others, or from the past. Goldstein and Keohane give as example: *“the Hungarian and Polish revolutions in the fall of 1989 showed people in East Germany and Czechoslovakia that unarmed mass protests could bring down long-standing repressive governments.”* (Goldstein & Keohane, 1993, p. 10). This shows that when different individuals have shared beliefs, they can achieve something, something that could not be achieved by one individual on his own. Goldstein and Keohane(1993, p. 10) end this part with saying that *“Causal beliefs imply strategies for the attainment of goals, themselves valued because of shared principled beliefs, and understandable only within the context of broader world views.”*

Changes in world views or principled beliefs occur less often than a change in causal beliefs. Changes in world views and principled beliefs have mostly more influence on policy outcomes than a change in causal beliefs (Goldstein & Keohane, 1993, p.11). Nevertheless, since changes in causal beliefs occur more often than changes in principled beliefs or world views, a policy shift is most of the time the consequence of a change in causal beliefs. Ideas and beliefs can only have impact when they are combined with power and interests, this does not only include power of elites, but also power of groups of citizens with a shared belief or idea (Börzel & Risse, 2009, p. 13). People that in itself not have much power or influence, but the attractiveness of their idea or belief eventually gives them power and interest that are needed to have influence. This can be the beliefs of an influential individual, a politician for example, or the shared beliefs of a group of individuals, as mentioned above in the example given of causal beliefs (Goldstein & Keohane, 1993). Goldstein & Keohane make clear that it is difficult to determine what the causal relation is between beliefs and policy outcomes. What is the impact of beliefs on a policy outcome? Therefore it is necessary to describe the beliefs and ideas and explain the policy outcomes and changes. After that one must search for evidence of the conditions in which the causal connection took place.

2.9 Commitment

The above mentioned rationales, processes, frames and beliefs influence the willingness of agents to adapt to climate change. Even when adaptation policy is developed, these aspects can still influence the commitment of an individual actor to the project.

Commitment enhances the dedication to a project and to what extent an individual feels responsible for, and connected with, a certain case or policy. Lindberg and Wincent (2011) distinguish positive and negative consequences of commitment. Positive sides of commitment are more present in the earlier stages of the commitment process, the negative sides get more to the front at the later stages of the process. One of the positive sides of commitment is that it influences cognitions and behavior. Individuals that are committed to the process put more energy in achieving the goals than individuals that are less committed. These committed individuals are more persevering when it comes to conflicts and are more willing to force others and the environment to achieve the goals (Veldhuis, 2015). This contributes to the efficiency and effectiveness of the policy process.

Besides the positive effects of commitment on the policy goals, commitment can have negative effects on a project. It is possible that an individual is too personally and emotionally involved with the process, therefore he is not able to oversee and judge decisions on a rational basis and tries to justify wrong decisions. As a consequence, the policy process is heading in the wrong direction.

Because of his emotional concerns, the individual professional is not able to change the course into the right direction. He believes, sometimes against all knowledge, that all his previous efforts and energy will have a positive outcome. He does not want to change the process, even if it is clearly the wrong course. This personal involvement can lead to negative effects on the relation commitment. Others can get irritated as a consequence of over the top emotional involvement (Veldhuis, 2015).

There is also the possibility of a lack of commitment. Veldhuis describes three alternative attitudes that can be present when a person is not committed to a process or policy goal. The first attitude is *incomprehension*; a person is not aware of what the process chain is about and what it tries to achieve. The individual will not contribute to the success of the process. Another attitude is *resistance*; it is clear what the process stands for, but the individual person does not agree with the process or the outcome of the process. In this case, the person even tries to hinder the policy process. The last possible attitude is *willingness to accomplish*; the professional feels no emotional bonding with the process, but he is willing to fulfill the agreements. Because of the minimal determination, this will not lead to the best possible outcome (Veldhuis, 2015).

Veldhuis (2015) distinguishes two types of commitment: *goal commitment* and *relation commitment*. Goal commitment contributes to active participation, perseverance and behavior that leads to achieving the policy goal. Relation commitment leads to better relations. Good goal commitment can lead to better relation commitment and vice versa.

It is interesting to see how the different agency making rationales influence the commitment of individuals to the making of heat stress policy. Rationales can lead to positive or negative commitment and might therefore influence the development and implementation of heat stress policy in a certain municipality.

2.10 Conceptual model

Underneath is the conceptual model shown that flows out of the theoretical framework. The heat stress knowledge is the central concept in the network. It travels via human-intermediaries to the municipalities, where it is translated. The translation is influenced by the processes, frames and beliefs, that has effect on the substance of the rationales. The municipalities change the heat stress knowledge by adding their own translation to the subject. Through human intermediaries the new concept is travelling to other municipalities. Therefore it is a constantly changing and moving process.

The goal of the research is to find the human intermediaries, processes, frames, beliefs and rationales that make agency, that influence the process of diffusion and translation. By uncovering these influences and by examining the relevant municipalities and actors, the network can be filled out.

The next chapter discusses in more detail how these goals will be reached and how the research will be executed.

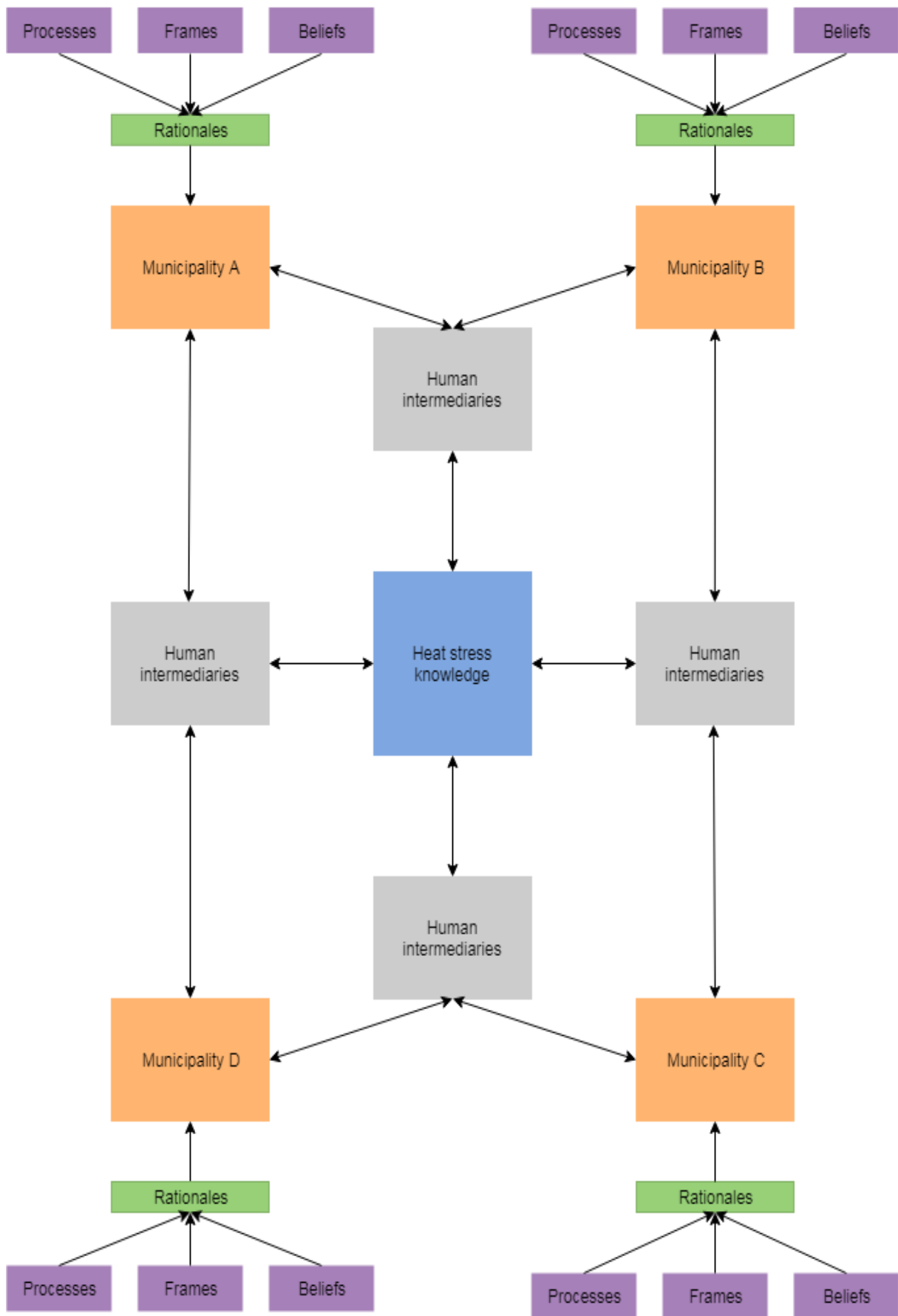


Figure 2 Conceptual model

3. Methodology

The methodology that is used to collect and analyze the data that gives answer to the research questions is discussed within this methodology chapter. First the research approach that is used is elaborated, then the data collection methods are discussed and finally it is explained how the collected data is analyzed.

3.1 Research approach

Different methods were used during this research. A combination between survey, interviews and document analysis has provided insight in the Dutch heat stress world. The shape of the network and its influential actors are approached in a more descriptive manner, while the research on the translation of knowledge into policy can be considered as a combination between descriptive and explanatory research. It is described what the influential processes, frames, beliefs and rationales are. This description leads to an explanation of the differences in how municipalities translate knowledge into policy.

Triangular approach

The methodological approach is triangular. This approach implies that qualitative and quantitative methods can form a useful addition to each other (Jick, 1979). The interviews and documents are analyzed qualitatively. The results of the survey are analyzed in both qualitative and quantitative manners. Some of the results of the questions are visualized in graphs and figures. These are all just the simple outcomes of the survey shown in graphs. For example: the answers of the question on whether a municipality has executed a stress test or not, are shown in percentages of the groups "executed" "not executed" and "in progress". Although these percentages might assume a quantitative analysis, these results are just used to analyze them in a qualitative way. The data that are collected in the survey are analyzed with usage of a qualitative approach.

The main reason for the combination between survey, interviews and documents is the fact that climate adaptation research in the Netherlands lacks cumulative knowledge, it is mainly focusing on case studies. The survey fills in this gap of cumulative knowledge, while the interviews and documents ensure the in-depth addition to the questions asked within this survey.

Since heat stress is a new policy subject, not much knowledge is available on the current state of the Dutch heat stress network and policy development. Although the goal within this thesis is to do in-depth research on the processes of diffusion and translation of knowledge into policy, the lack of knowledge about the current state of knowledge diffusion and policy development makes a survey necessary. A survey that provides insight in the current state of the heat stress knowledge within the Dutch municipal organizations makes clear to what extent heat stress policy is developed and provides a first overview of the different human intermediaries, processes, frames, beliefs and rationales that can declare the differences in knowledge translation.

The interviews with knowledge senders within the network and with policy makers from a selection of municipalities, combined with document analysis, add the qualitative in-depth knowledge to the outcomes of the survey.

Inductive approach

As mentioned in the theoretical framework, knowledge on the influence of processes, beliefs, frames and rationales on knowledge diffusion and translation exists, although not on all these aspects very extensive. Knowledge of these influences on adapting to heat within the Netherlands does simply not exist. Therefore an inductive approach is a useful starting point. When a sufficient theory lacks, induction helps building a bottom-up theory (Thomas, 2006). Later on, when a theory is built, it can

be discussed in a deductive manner how the newly developed theory fits within the existing theory on diffusion and translation of knowledge into policy. The main research approach is therefore considered as inductive, but the inductively built theory will be evaluated in a deductive manner (Fereday & Muir-Cochrane, 2006). It becomes clear how the Dutch heat stress case fits within the general theories of adaptation policy development and knowledge spreading.

3.2 Data collection

The data collection consists of three different methods: survey, interviews and documents analysis. Some of the interviews are held before the survey, to get an insight in the heat stress network. Other interviews are held after the survey was executed. The survey gives insight in the current state of the Dutch heat stress network, knowledge development and policy development by the municipalities. It provides a statistical ground to draw further on. The interviews give an in-depth explanation of the statistics that came out of the survey.

3.2.1 Survey

The first step in the data collection process is an online survey. A survey that gives insight in the current state of the processes of diffusion and translation of heat stress knowledge within the Dutch municipalities. Therefore, the survey was sent to all 380 Dutch municipalities.

The questions within the survey are a combination between open and closed questions. In table 2 the questions that were actually used within the analysis of the results are given. Some other questions eventually were not used within this research, since these answers provided not enough relevant information. These unused questions are available in appendix III and the results of these questions can be viewed in appendix IV.

Question	Answer options	Follow-up question
Has the municipality executed a climate stress test?	Yes, No, In progress	Why has the municipality not yet executed a stress test?
How would you consider the heat stress knowledge within the municipality?	Very high, high, not high/not low, low, very low	
How did the municipality get their heat stress knowledge?	A list of 9 organizations are given as options. Municipalities could add their own answer if relevant.	
How would you describe the amount of heat stress within your municipality?	Very major, major, not major/not limited, limited, very limited	
In what way are measures against heat within the municipality part of the policy?	Directed policy, indirect policy, not part of the policy	Answer "not part" : Why is heat stress not part of the policy? Answer "directed" or "indirect" : How was the municipality stimulated to develop heat stress policy?
How is the heat stress policy shaped?	A list of 7 forms of heat stress measures are given as options. Municipalities could add their own answer if relevant.	
When developing and locating	Yes or no	Answer "Yes" : At what kind of

facilities for vulnerable groups, is heat stress taking into account?		facilities is heat stress taking into account?
What amount of days of less productivity among the citizens, as a consequence of the heat, is considered acceptable or not acceptable? (1-7 days, 8-14 days, 15-21 days, 22-28 days, more than 28 days)	Acceptable or not acceptable	
What higher amount of mortality during a hot period, as a consequence of the heat, is considered acceptable or not acceptable? (1-5%, 6-10%, 11-15%, 16-20%, more than 20%)	Acceptable or not acceptable	

Table 2 overview of used survey questions and answer possibilities

Response

The survey was sent to all 380 Dutch municipalities. 194 municipalities filled out the survey, in a period between April 2018 and July 2018. This is a good number of response. Earlier surveys on heat stress or climate adaptation in the Netherlands did not get such a high response. Questions about heat within a survey done by the VNG in 2015 and 2016 were answered by 110 municipalities (VNG, 2016). A research by the "Klimaatverbond" called "Voetje voor voetje" got a response of 85 municipalities and that research is considered by the Klimaatverbond as the first of its kind in the Netherlands because of its scale and its depth (Klimaatverbond Nederland, 2015). A response of 194 municipalities on the same topic can therefore be considered as a satisfying result.

The 194 responding municipalities have a total population of 8.660.840 people. This means that half of the total Dutch population is represented in the survey. So although three big cities (Amsterdam, Rotterdam and Utrecht) have not participated in the survey,, the average population per municipality is still representative. The 194 responding municipalities have an average population of +-44.600 people and the total 389 Dutch municipalities have an average population of +- 44.200 people. The missing of the above mentioned three big cities is compensated by the participation of The Hague and fifteen other urban municipalities with a population over 100.000 people. The fact that the average population of the participating municipalities is comparable to the national average municipal population is the reason that Amsterdam, Rotterdam and Utrecht have not been more actively requested to participate than other municipalities. If these municipalities would have been actively requested, the urban municipalities would have been over represented. There are smaller municipalities that stated no one in the municipality has enough heat stress knowledge to give answer to the survey questions. Therefore, some of the extremes might have been taken away in the results of the survey: three large urban municipalities that possibly are front runners have not participated, while some smaller municipalities that are considered as laggards also have not taken

part. If one of these groups would have been more actively approached to participate, this could have affected the results.

Respondents

Since not all municipalities have a particular official that is responsible for heat stress or climate adaptation, all surveys were sent to the general email addresses of the municipalities. Within the accompanied email it was asked to forward the survey to the policy worker that has the most knowledge about heat stress. It becomes clear that climate adaptation is a topic that until now has no clear problem owner, since the surveys were filled out by persons working at a variety of departments. It differs from the departments of public space, environment, Municipal Health Services (GGD), healthcare, climate adaptation and livability to water management and sewerage. This shows how the subject of heat stress has effect on many sectors and departments. Heat stress has an effect on all of the above mentioned sectors. Nevertheless, there are only few municipalities that actually have a department that has climate adaptation as a top priority, let alone adapting to heat.

Last two questions

The last two questions, about the consequences of heat stress that are acceptable or not acceptable had a lot of non-response. The question about what amount of nights of heat stress are not acceptable was answered by 52% of the municipalities that filled out the survey. The question about what higher mortality number as a consequence of heat is not acceptable was answered by only 44% of the municipalities. Several municipalities sent emails to explain why they did not fill in these two questions. The main reason is that there is no local policy on what consequences are acceptable or not acceptable. If they would answer these questions it would be the personal opinion of the respondent, not the municipal policy. The answers given to these questions are therefore not usable in a quantitative manner. Nevertheless, the fact that more than half of the municipalities did not give an answer, combined with the accompanied emails, shows that municipalities do not know what consequences they consider as acceptable. This makes these two questions still interesting to investigate in an interpretative way.

3.2.2 Interviews

The survey forms the basis to get an overview of the current situation of the heat stress network and of the current status of heat stress knowledge and policy within Dutch municipalities. The interviews form a qualitative deepening to the results of the survey. Some interviews were held before the survey was developed, these interviews helped gaining better insight in what questions were relevant to ask in the survey. Other interviewees were selected as a consequence of the outcomes of the survey.

The goal of the interviews was to get to know why and how policy was developed, or not developed. During these interviews the focus was mainly on the processes, frames, beliefs and rationales that influenced the policy decisions in the specific case: which rationales are the agency making factors and what processes stimulated the municipality to take action? How did factors have an effect on the content of the policy?

The interviews were also used to get more information on the role of human intermediaries. What persons or organizations motivated the municipality to take action? Who connected them to the network? How are they making agency? What is the role of the municipality in the network?

Interviews were held with two different groups of interviewees: three interviews with knowledge senders from within the heat stress network and four interviews with municipal policy workers responsible for the local heat stress policy in different municipalities.

Knowledge senders

Three interviews were held with so called *knowledge senders*. Persons that are part of the Dutch heat stress network and send knowledge to the municipalities. In their turn, they also collect and receive knowledge that is send by others. These interviews provide insight in the heat stress network. They give an overview of how the network is shaped and what sectors are missing within the network. It becomes also clear how the actors within the network try to send knowledge to the municipalities and how the municipalities react on this process of knowledge sending and collecting. These persons elaborate how they try to create receptivity and how the shape of the network has changed during the last years. The three knowledge sending persons that were interviewed had the following functions:

- Researcher from the knowledge consortium “Klimaatbestendige stad²” from the Amsterdam University of Applied Sciences.
- Senior policy advisor Ministry of Infrastructure and Water management and part of the National Adaptation Strategy (NAS)
- Senior project leader Klimaatverbond focusing on climate adaptation and policy advisor National Adaptation Strategy (NAS)

These interviews were all semi-structured. General questions were written down on forehand and formed the red line during the interviews. Since the goal of these interviews was to collect information on the shape and identity of the network and on how knowledge was diffused and translated by municipalities in an explorative manner, semi-structured interviews were the best fitted instrument. This provides room to ask questions coming up during the interviews, as a consequence of the answers are given.

Municipalities

Four municipalities are selected for further research. This enhances interviewing the policy worker that is responsible for the local heat stress policy and by analyzing relevant policy documents.

The number of four municipalities is chosen because this number is low enough to conduct in-depth interviews and combine this with document analysis and because it is high enough to get information from municipalities that differ in their geographical location, demographical structure and heat stress policy. Therefore, the following municipalities are selected:

- **Arnhem:** An urban area in the semi-periphery (Beer de, Ekamper, & Gaag van der, 2018). The interview is conducted with the strategic management consultant at the municipality of Arnhem, focusing on the city climate. Arnhem is one of the forerunners in the Dutch heat stress policy sphere. Within the survey they said they had very high knowledge of the concept of heat stress and they try to translate this knowledge into different kinds of policy measures.
- **Almere:** An urban area in the core (Randstad) (Beer de et al., 2018). The interview is conducted with the policy advisor Water of Almere. Almere answered in the survey that they considered heat stress as a limited problem in their municipality and that they do not take specific heat stress measures. This makes Almere one of the most populated municipalities within the Netherlands that considers heat stress as a limited problem.

² In English: “climate proof city”

Nevertheless, they mentioned that they have specific reasons why heat stress is not such a serious issue in their area. That makes Almere an interesting case for further research. It was useful getting to know what considerations and processes affected their position. This gave a different view on the processes, frames and beliefs that influence the policy process.

- **The Hague:** An urban area in the core (Randstad) (Beer de et al., 2018).
The interview is conducted with the policy worker sustainability and omgevingswet³. The Hague is one of the largest Dutch municipalities and claims to take specific heat stress measures and considers the knowledge of the topic as very high. For this research The Hague formed a relevant case to investigate how they got the knowledge and how they translated the high knowledge into policy actions.
- **Meierijstad:** A non-urban area in the semi-periphery (Beer de et al., 2018).
The interview is conducted with the policy worker public space Meierijstad. As a reaction on the survey, Meierijstad requested to talk about the concept of heat stress and how they face this policy subject. This interview ended up to be a useful addition to the other interviews. Meierijstad can be considered as a non-urban municipality that made rational decisions in their heat stress policy, but is struggling to collect the right knowledge and instruments to develop the desired policy.

All together the four cases provide insight in the considerations and policy decisions within a variety of Dutch municipalities:

	Municipality in the core	Municipality outside the core
Heat stress policy developed to a high extent	The Hague	Arnhem
Heat stress policy developed to a lesser extent	Almere	Meierijstad

Table 3 Case study municipalities, selection criteria

Every municipality that is interviewed considers its own heat stress knowledge as “not high, not low”, “high” or “very high”. Although it might be interesting to broaden the interview population further by adding municipalities to the selection that consider their own knowledge as “low” or “very low”, the consideration is made to do not add these municipalities to the interview selection. Since these municipalities have very less, to even none, knowledge about heat stress there is not enough information to collect during these interviews. These municipalities have no policy worker that is responsible for dealing with heat stress, so the only relevant and interesting question to ask would be why their knowledge is low. This is considered as too little information to gather for the conduction of a full interview. The survey showed that this question can be answered with the results of the survey. The more open and qualitative questions within the survey give answer to why municipalities have no heat stress policy, sufficient heat stress knowledge, or have not conducted a climate stress test:

- *Why has the municipality not executed a climate stress test?*
- *Why has the municipality developed no heat stress policy?*
- *How did the municipality gain knowledge about heat stress?*

³ “Omgevingswet” is a new Dutch law on spatial development. This law bundles all existing laws that enhance the living environment.

The interviews focus on those municipalities that have collected knowledge and made considerations about the development of heat stress policy. During these interviews it has also become clear what triggered them to collect knowledge and develop policy and why this process has not started earlier. Thereby it is considered that these questions and the qualitative and more explanatory questions within the survey provided enough information to give insight in the influential rationales.

Since heat stress is a relatively new policy subject, more interviews per municipality probably would not provide new relevant information. Most municipalities do not have more than one person that is actively dealing with heat stress. The persons that are responsible for dealing with heat stress were interviewed. Extensive and in-depth interviews with these relevant persons provide profound information about the considerations and processes in the specific case. This will be a useful addition to the information that flows out of the survey.

3.2.3 Documents

During the whole data collection process documents are analyzed, as an addition to the survey and interviews. This enhances policy documents from the Ministry, the Deltaplan Ruimtelijke Adaptatie and the case study municipalities.

These documents give more insight in the processes, frames, beliefs and rationales that influence the processes of diffusion and translation and form a useful objective addition to the interviews and survey. Altogether these three methods ensure a triangular data collection approach.

3.3 Data analysis

The next paragraph explains how the collected the data are analyzed. Within this paragraph the data analysis is divided in *survey*, *interviews* and *documents*.

3.3.1 Survey

The results of the survey are analyzed in different ways. Some results are qualitatively approached, others are made visual on a map and some are analyzed in a more quantitative way. In the next part is discussed how the specific results are analyzed:

- **Has the municipality conducted a climate stress test?** The answers are made visual in percentages of the total. The answers on the question why some of the municipalities have not conducted a stress test are qualitatively analyzed and provide insight in the different rationales that influence the process of developing heat stress policy.
- **The extent of heat stress knowledge within the municipality.** The answers are made visual in percentages and the results are shown on a map made with QGIS⁴. A geographical order becomes visual. The results of this question are compared with the results of the same question that was asked by the VNG in 2016. This gives some insight in the development of the Dutch heat stress knowledge.
- **The organizations that spread heat stress knowledge.** The most mentioned institutions that send heat stress knowledge are ranked. This provides insight in what institutions are part of the heat stress network and what sectors or institutions are missing.
- **How the municipalities consider the extent of heat stress within their area.** This is made visual in percentages. It provides better insight in to what extent policy makers are aware of the problem in their municipality. The differences between the actual situation and the experienced amount of heat stress becomes visual.

⁴ (QGIS 3.2.3-Bonn, Copyright 1989). QGIS is an open source GIS program.

- **If and how heat stress is part of the local policy.** The three possible answers are made visual in percentages. The question why heat stress is not part of the local policy in some municipalities is analyzed in a qualitative way and forms a basis for finding the agency making non-human intermediaries.
- **What measures are taken to prevent heat stress.** These answers are qualitatively analyzed. The most given answers (minimum of 10%) will be mentioned. The case studies have to provide in depth information on why these specific measures were taken.
- **How are the municipalities stimulated to take heat stress measures?** These results are qualitatively approached. The most frequently given answers (minimum of 10%) are mentioned in the research and form, again, a tool to start the case studies. This more superficial broad scale information added with in-depth knowledge from the case studies forms the right base to find the agency making rationales.

Open questions coded

At some questions municipalities had the opportunity to add their own answer to the list of answer options, via the option: *"other namely"*. This is the case in the following questions:

- Why has the municipality not yet executed a climate stress test?
- How did the municipality get their heat stress knowledge?
- Why is heat stress not part of the policy?
- How was the municipality stimulated to develop heat stress policy?
- What is the shape of the heat stress policy?
- At what kind of facilities is heat stress taken into account?

Within these more open questions a variety of answers was given by the municipalities. The analysis of these questions was made possible by a process of coding. All the different answers were categorized. For example with analyzing the question *"How did the municipality get their heat stress knowledge?"*. Different examples of regional knowledge exchange platforms were given. All these platforms are categorized as *(regional) knowledge exchange platforms*. Using this method all of the answers given on the open questions are coded and categorized. This makes an analysis of the results possible. It makes clear from what kind of organizations municipalities receive their knowledge and where they receive it. It makes also clear what sectors are missing in the heat stress network.

3.3.2 Interviews

All interviews were recorded and fully transcribed. This process of transcription is useful to prevent the risk of a lacking memory, the risk that notes taken during the interview might not be totally accurate and that taking integral notes could distract the interviewer from his task of listening and asking the right questions.

Coding

After all the interviews were transcribed they were all coded, using the program ATLAS.ti⁵. Via a process of open coding the first analyzation was made. These codes were modified and adjusted later on in the coding process. The parts of text that are coded differ in length between a few words to a group of sentences. First of all the interviews were analyzed with the usage of *open coding*. This is a first approach in the coding process to examine, explore and categorize the text parts broadly (Strauss & Corbin, 1990). A total list of more than 40 different codes was used. This approach is

⁵ (ATLAS.ti 8, 2002-2019) ATLAS.ti is a program that is used for the analysis of qualitative data.

useful to bring some order in the chaos that this amount of information is accompanied by. Examples of codes used are: *construction sector, stress tests, NAS, urban problem, local specific circumstances*.

Eventually all these open codes are grouped in a limited number of codes (*axial coding*), that represent the different variables of this research:

- *Network*
- *Knowledge spreading*
- *Processes*
- *Beliefs*
- *Frames*
- *Rationales*
- *Commitment*
- *Norms*⁶

The goal of axial coding is to find the relationships between the open codes. This makes clear what patterns are visible in the interviews (Strauss & Corbin, 1990).

All relevant parts of text (differentiating between a couple of words to several sentences) were divided between these codes. Within these broad group of codes the text parts still had their own smaller, more specific, codes. For example: a part of text about the influence of the stress tests is given the code "*processes*", but is also given the sub code "*stress tests*". Since the stress tests are considered as a process that influences the diffusion and translation of knowledge into policy. It is also possible that more than one of the above mentioned codes are appointed to the same part of text. A part of text about the framing of heat as an urban problem is given the code "*frames*", but is also given the code "*knowledge spreading*" since the part of text is about how the knowledge that is spread is framed.

After the process of axial coding, selective coding was applied. This can be considered as some sort of conclusion drawing or the visualization of a common thread (Strauss & Corbin, 1990). In the example of stress tests: a part of text is first labelled as *stress test*, than it is categorized in the axial code *processes*, with selective coding it is concluded that the stress tests have influence on the diffusion of knowledge. Therefore, all transcripts are examined again, focusing on the influence of the stress tests on knowledge diffusion. Analyzing these interviews is a process of learning. During the coding process it becomes clear what information is relevant and what is less relevant.

3.3.3 Documents

The analysis of documents was a continuously repeating process. From the start of the research till the end of the data analysis documents were consulted. In the first instance the documents were used to create an overview of relevant agents to interview and of what questions are useful to ask during the survey and interviews. Later on in the research the documents were used to check the results of the survey and the statements made in the interviews.

The documents are only broadly coded when necessary. In the first part of the research some sort of coding was useful to create an overview of the current network and current state of the heat stress policy. Later on, coding was less useful. When checking statements made in interviews the consulting of policy documents was quite straightforward. At that phase of the research the document analysis had more the shape of fact checking than the creation of order in collected data.

⁶ "*Norms*" represents the different views that were given on the question if some sort of norm for a maximum amount of heat stress could help the municipalities develop directed policy.

4. Results and analysis

The results of the data collection process are shown and discussed within this chapter and the analysis that eventually leads to the answering of the research question is made. First the current state of the Dutch heat stress knowledge and policy is presented. This representation is the result of the survey and forms the basis for further analysis. After that, the heat stress network is discussed, by naming the most important human intermediaries, elaborating what human intermediaries are missing, discussing how municipalities receive and collect their knowledge and eventually visualizing the network. Hereafter the focus is on finding the influential processes, frames, beliefs and rationales. Starting with the results of the survey and interviews that can be considered as influential processes, frames and will eventually lead to an analysis of the agency making rationales.

4.1. Current state

To explain the differences between municipalities in processes of diffusion and translation of knowledge, it is useful to first make clear what the differences are. What is the current state of heat stress knowledge at Dutch municipalities and to what extent is heat stress policy developed? The results of these two survey questions are shown in figure 3 and figure 4.

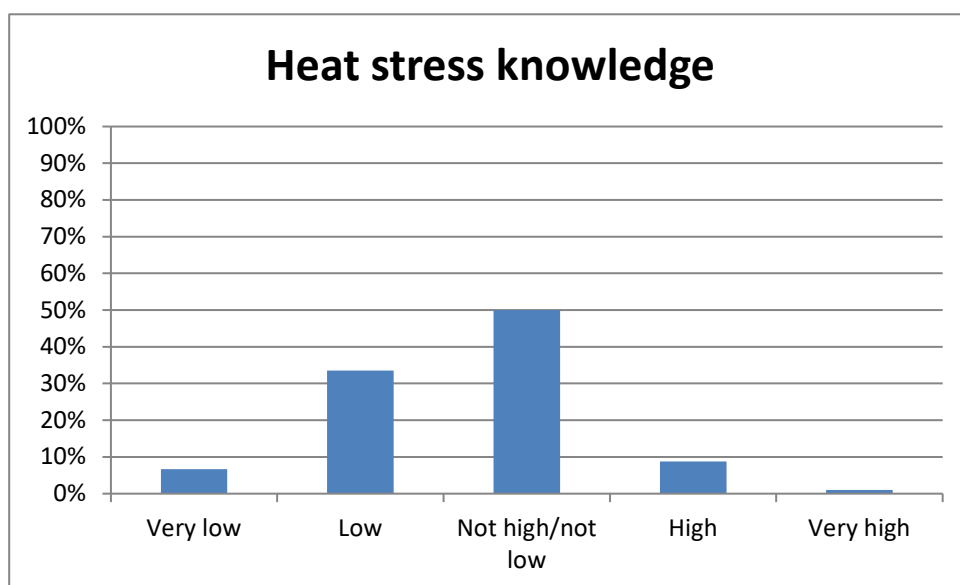


Figure 3 Heat stress knowledge within Dutch municipalities

Only 10% of the municipalities consider their own knowledge as “high” or “very high”, 40% considers its knowledge as “low” or “very low”. This implies that sufficient knowledge is lacking, since 90% of the municipalities do not consider their own knowledge at the topic as high.

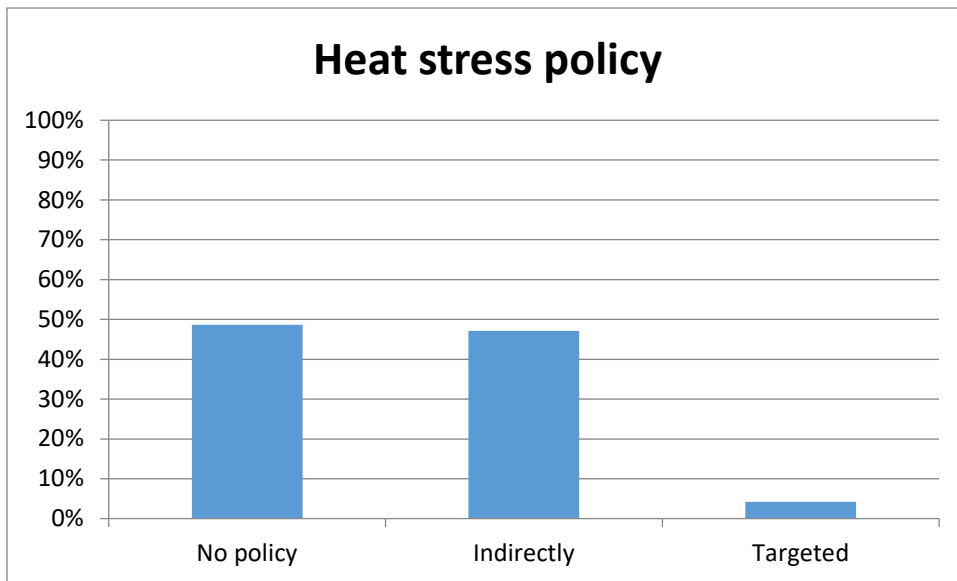


Figure 4 heat stress policy within Dutch municipalities

Only 4% of the municipalities have policy directed at preventing heat stress. 47% take indirect measures, for example by planting more or the right trees and creating more green areas. These green areas are not directed at preventing heat stress, they are directed at creating better livability or preventing water problems. The prevention of heat stress is just a positive effect of these measures, that was not part of the motivation to implement the measures. The interviews with the policy workers from Almere, Arnhem, Meierijstad and The Hague show how the cooling effect of green areas is mostly just a positive externality and not the main reason for the development of these areas (Appendix I). Different examples of (future) spatial projects that help prevent heat stress are shown on the website of "GroenBlauweNetwerken", an institute that tries to stimulate sustainable and resilient cities. In none of these projects is the prevention of heat stress the only goal (Urbangreenbluegrids, 2019).

According to answers given in the survey, the group with *indirect policy* to some extent did not take the measures to prevent heat stress. This group is quite hard to define, since some of the municipalities implemented policy, while not realizing at that time that it prevents heat stress, but still consider this policy as *indirectly*. Other municipalities took measures not directly aimed at preventing heat stress, but were aware of the positive effect this measure has on the prevention of heat stress. Therefore this group with *indirect policy* is quite broad.

The group with municipalities where heat stress is not part of any sort of policy is quite straightforward and clear. 49% of all municipalities have no sort of heat stress policy. These 95 municipalities was asked why heat stress is not part of any form of policy. Responding municipalities had the opportunity to give multiple answers. The most mentioned answers are shown in the next table.

Why no heat stress policy?	Times mentioned
No relevant issue	34
First execute a stress test/collect knowledge on local issue	21
Lack of knowledge	17
Policy has yet to be developed	16
Did not know it was an existing problem	13
No financial priority	11
No or insufficient governmental support	10

Table 4 Why is heat stress not part of policy? Survey results

The results in table 4 show that only the first answer “no relevant issue” can be considered as a decision that is based on personal or organizational opinions. It seems that these 34 municipalities made considerations and decided that heat stress is not a serious problem in their area. Still, it can be argued whether these municipalities conducted sufficient research on their local situation to draw this conclusion. Several of the other answers given show that the lack of sufficient knowledge is considered as an influential factor for the missing of local heat stress measures. The *execution of a stress test*, *lack of knowledge* and the fact that municipalities *did not know it was an existing problem* are all signs of a lack of sufficient heat stress knowledge. The answers *no financial priority* and *no or insufficient governmental support* are signs of a lack of broadly based awareness of the consequences of the problem and the missing of sufficient resources.

4.2 Network

To understand how the process of diffusion of heat stress knowledge is taking place, it is necessary to map the heat stress network. Therefore the first step is to explore which organizations and individual persons are the main senders of heat stress knowledge. In the survey the municipalities gave answer to the question how they received heat stress knowledge. Where did they get the knowledge from? This is a first step in examining what organizations, institutions and persons play a role in the heat stress network. Senders of knowledge within the network can also be receivers of heat stress knowledge and vice versa. The exact role of the players within the network will be discussed further on in this thesis.

In the survey municipalities were asked from which institutions they received heat stress knowledge. The most mentioned institutions are scheduled in table 5:

Sending institution	Times mentioned
DPRRA	113
Water boards	91
Municipalities	83
Consultancy	65
Provinces	54
NAS	46
Science	41
Regional knowledge exchange platforms	30
Not	15
Internal knowledge	14
Ministry I&W	10
Heat maps	7
Media/internet	4

Table 5 Amount of times a knowledge sending institution is mentioned by the Dutch municipalities as an institution of which they received heat stress knowledge.

Most answer options in the survey were “given options”. The answers “*regional knowledge exchange platforms*”, “*internal knowledge*”, “*heat maps*”, “*media/internet*” were formulated via the option “other, namely”. It is assumable that these answers would have been mentioned more often if they were “given options”. Therefore, it is remarkable that still 30 municipalities say they receive heat stress knowledge via regional knowledge exchange platforms. Several examples of these regional platforms were given by the municipalities (Appendix IV):

- Platform water Vallei & Eem
- Cooperation waste water chain Zeeland
- Cooperation waterpanel Noord
- Knowledge consortium Amsterdam University of Applied Sciences (Hogeschool van Amsterdam), where 10 municipalities, located around Amsterdam, are part of the knowledge project.
- Metropolitan area Eindhoven
- Platform water Vallei & Veluwe
- Cooperation water West-Brabant
- Region West-Brabant
- Nature and environment Utrecht
- Regional Adaptation Plan Overijssel
- Regional climate adaptation strategy of The Hague and Rotterdam made it visual for surrounding municipalities
- General regional adaptation platforms

This regional exchange of knowledge seems to be an influential factor, since 83 municipalities receive knowledge from other municipalities. The exchange of knowledge happens to a certain extent between municipalities within the same region, for example on knowledge platforms and meetings and more informal, during collaborations on regional projects, that are not per se heat related projects. The map in figure 5 shows how municipalities consider their own heat stress knowledge. The visualization of these statistics within a map show small regional clusters. Adjoining municipalities estimate the heat stress knowledge often the same, or just with a small difference. It shows the influence and importance of regional knowledge exchange.

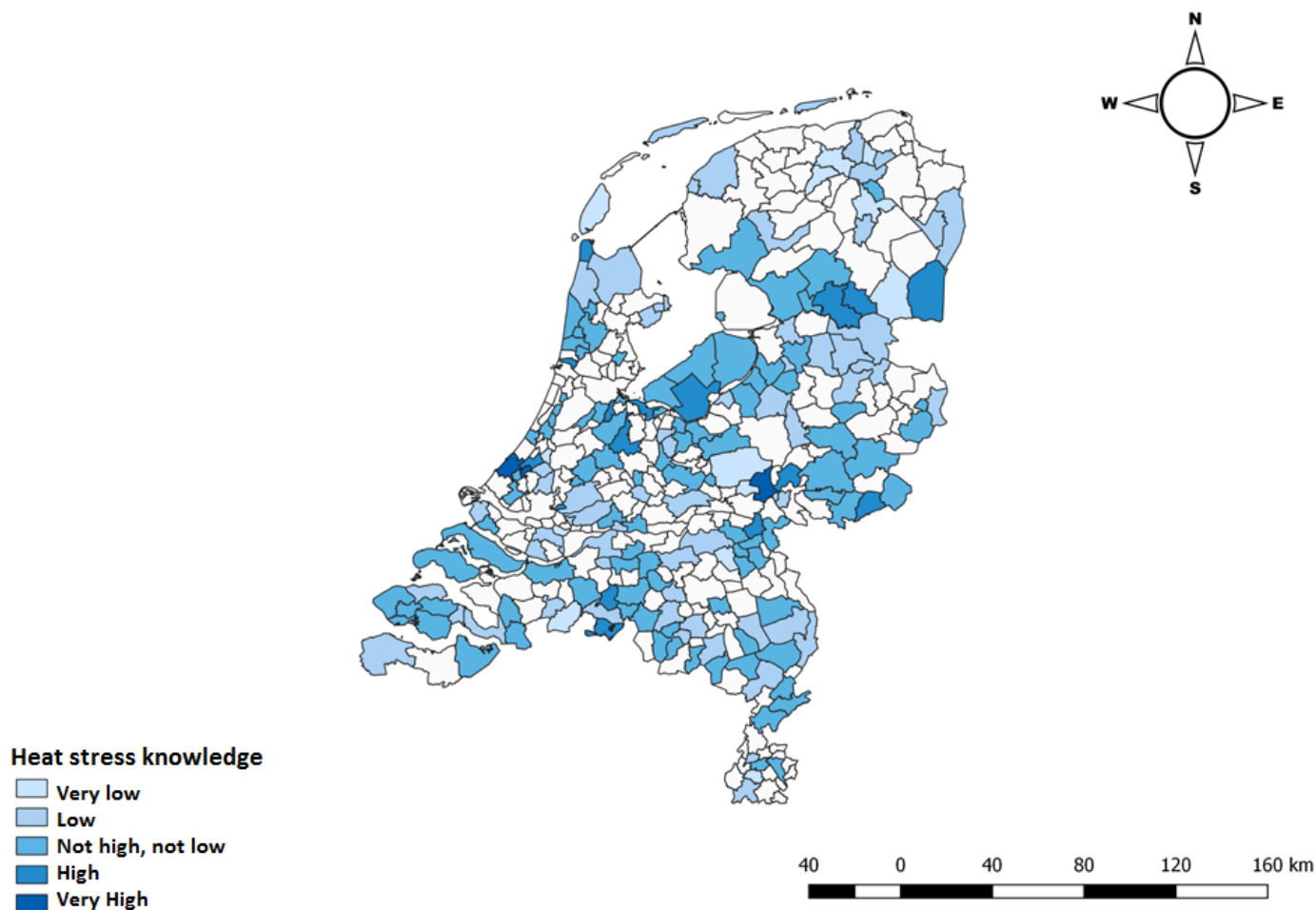


Figure 5 Extent of heat stress knowledge within the Dutch municipalities, according to the municipalities.

Information on heat stress and heat related problems is sent on a higher scale by the national government and its sister organizations Deltaprogramma Ruimtelijke Adaptatie (DPRA) and Nationale Adaptatie Strategie (NAS). These organizations create a sense of urgency at the municipalities. They draw attention to the issue of heat stress. The actual exchange of knowledge takes place on a lower scale level, at climate adaptation discussions and knowledge sessions. This is where municipalities, DPRA, water boards, NAS and consultancy bureaus meet each other. The heat stress network is visualized in figure 6. The most influential organizations and institutions are mentioned, according to the results of the survey and interviews. The municipalities are given a central position within the network, since the questions in the survey are aimed at getting to know how the municipalities are collecting and receiving their knowledge. The building industry and health care sector are mentioned in the interviews and the survey as sectors that are missing in the heat stress knowledge exchange network. According to the municipalities and the interviewees these two sectors could play an important role within the development of heat stress policy (Appendix I; Appendix IV; Ruimtelijke adaptatie, 2018). In the “processes” paragraph is further elaborated why these sectors are not part of the network and what their potential role could be. Their absence can be considered as influential in the diffusion and translation of heat stress knowledge by the municipalities.

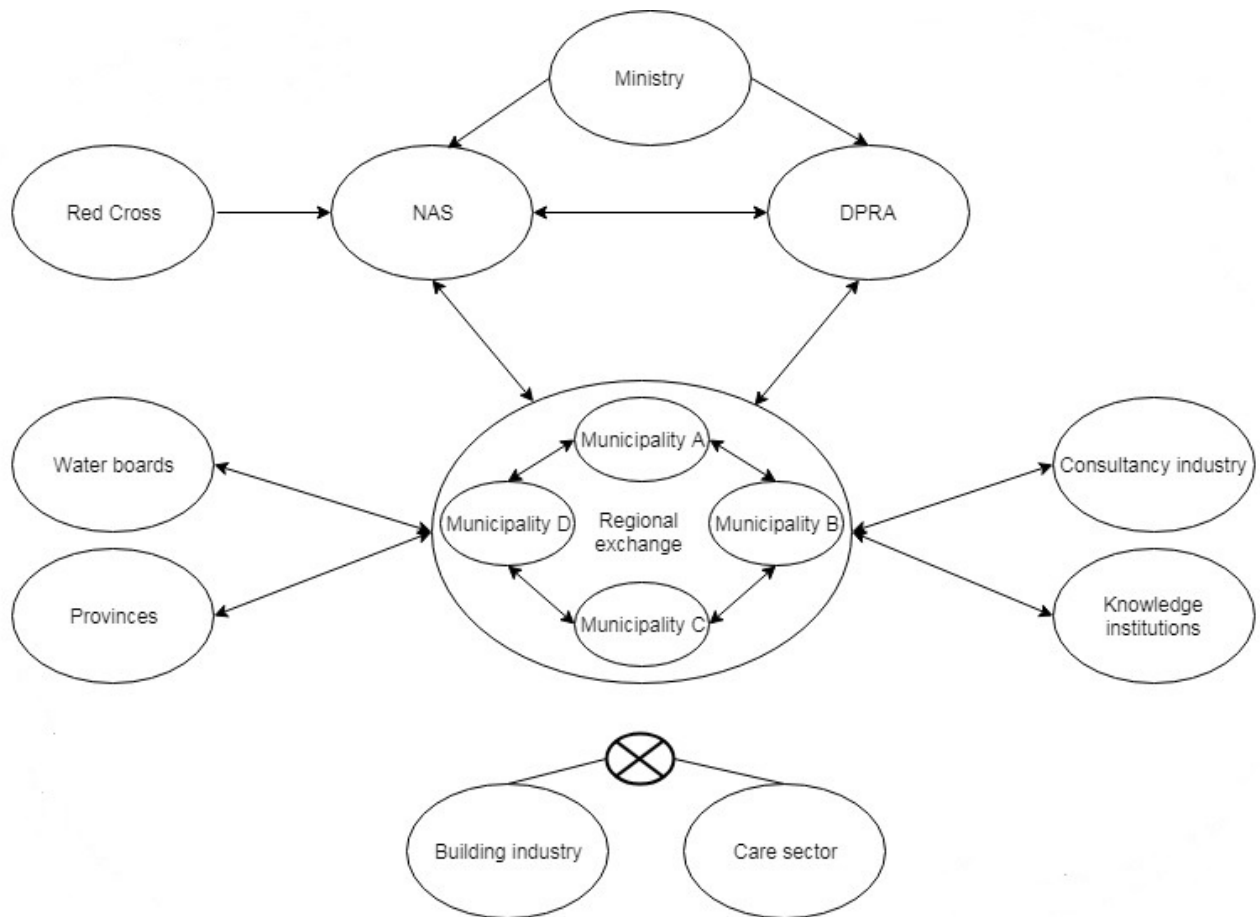


Figure 6 Visualization of the Dutch heat stress network. The municipalities are given a central position as knowledge receivers.

4.2.1 To create receptivity

The DPRA and the NAS are two of the main parties that try to let the Dutch municipalities adapt to heat. These organizations have to depend on the extent to which the knowledge diffusion and translation takes place. Inevitably, they try to influence the speed of this process. One of the aspects in a diffusion process is the creation of receptivity (Deroïan, 2002). If the receivers of the knowledge are not open to accept the knowledge and reproduce it, the diffusion process is bound to fail. DPRA and NAS try to create this receptivity on various ways. It becomes clear that the diffusion process of heat stress knowledge had quite a slow start, but it is accelerating in recent years. The national heat stress congress is an example of how these organizations have created receptivity (Appendix I; Kennisportaal Ruimtelijkeadaptatie, 2018).

One of the interviewees is working for the “Klimaatverbond”, she is one of the organizers of the national heat congress and is involved with the NAS. She tells how the NAS and Klimaatverbond try to slowly make heat stress part of the minds of policy makers. She explains how the heat waves of 2003 and 2006 are considered as key moments in which the problems of urban warming gained attention (Appendix I). During these summers thousands of people died as a consequence of the heat in Western Europe. This led to a first broad attention to the negative effects of heat on people in the Netherlands. She elaborates that the 2003 heat wave led to a Euro Heat Program (World Health Organization, 2009) and to research done by the Wageningen University and the University of Amsterdam. This Dutch research was noticed in Amsterdam and this was one of the first moments

heat gained attention in the Dutch policy sphere (Appendix I). Three years later the heat wave of 2006 was the motive to start the National Heat Plan in the Netherlands (Ministerie van Volksgezondheid, Welzijn en Sport, 2007). This shows that these natural events in 2003 and 2006 helped to gain attention and urgency on the topic of heat stress. One can consider them as essential processes or events in the process of knowledge diffusion and attention creation of heat stress in the Netherlands. The influence of these heat waves is invigorated by a research from the Climate Proof Cities Consortium, commissioned by the Dutch ministry of Infrastructure and Environment. In this research it is explained how the heat waves of 2003 and 2006 made the “city climate” a relevant knowledge and policy issue in the Netherlands (Climate Proof Cities Consortium, 2011, pp.16-17).

The policy worker from the NAS and klimaatverbond tells that organizations such as the NAS try to create more consciousness about heat stress during the years. For example by doing research, publishing articles and news messages and by organizing events such as the national heat congress. In a process that is taking years, they slowly make more and more people, sometimes even unknowingly, aware of the dangers of heat. They try to be ready to scale up when a hot period occurs. Over the years they slowly create receptivity and when the urgency is felt, as the consequence of a heat wave, they try to use this sense of urgency to strike and scale up. These are moments when city aldermen are more aware of the risks of heat and the urgency to take heat stress measures is felt among a broader part of the local government and society. She states that one could say that the NAS and DPRA use a hot period to take more actions and gain more attention (Appendix I).

The paragraphs above show how different municipal policy makers, intermediaries and policy workers from the national government (NAS and DPRA) meet each other at knowledge exchange platforms⁷ and on regional meetings. One of the goals of the NAS and DPRA is to create a sense of urgency among the local policy makers. Therefore, they first have to create receptivity. The meetings help in creating a sense of urgency. Knowledge institutions such as the Wageningen University, the University of Amsterdam and the Amsterdam University of Applied Sciences help in trying to create this sense of urgency in the form of knowledge development and knowledge spreading. Municipalities help in the development of knowledge by joining research projects (Hogeschool van Amsterdam - Urban Technology, 2018), front runner municipalities provide feedback on implemented measures and DPRA and NAS learn from municipal policy makers about why municipalities are not yet receptive for heat stress knowledge. It is a process of trial and error. Altogether this makes clear that a new policy issue is accompanied by different barriers before policy development and implementation takes place.

4.3 Processes

Processes, such as scripts, guidelines, rules, events, or societal happenings, have an impact on the way knowledge is translated. These processes can form a ground for a decisive rationale. As a more general example: the process that our climate is getting warmer forms the basis for the rationale that we should protect the elderly people against heat. This rationale can have influence on the translation of heat stress knowledge by a certain municipality.

There are several processes that came out of the survey and interviews. The most important processes will be described and it will be discussed how and to what extent these processes have influence on the translation of knowledge into policy by the Dutch municipalities.

⁷ Example given: the national heat congress 2018 and the list of regional exchange platforms mentioned in paragraph 4.2

4.3.1 Local specific circumstances

The differences between municipalities in to what extent knowledge is translated into policy (previously shown in figure 4) can partly be declared by the local specific circumstances. The senior policy worker from the Ministry and the NAS tells that he thinks that the front runner municipalities did not become front runners because heat stress caused them problems, they looked at heat stress (as a consequence of local specific circumstances), then saw they had a problem and then took measures and became front runners. He knows no examples of municipalities that started looking at heat stress because they had a problem (Appendix I). None of the municipalities that participated in the survey for this thesis state they did research on the local heat stress issue because heat caused problems. External institutions (such as the NAS, DPRA, knowledge institutes, media, other municipalities and exchange platforms) provided local attention for the consequences of heat in the survey-municipalities, not the actual visual and observed consequences of overheating (Appendix IV). Therefore it is more a coincidence, or the consequence of local specific circumstances, that a municipality started paying attention to heat stress. The Hague and Arnhem are front runner municipalities whose stories support this hypothesis.

The Hague

The policy officer sustainability and omgevingswet at the municipality of The Hague was interviewed. He explains how The Hague became involved with heat stress and how it became a front runner municipality (Appendix I):

In the years before 2004 The Hague was part of a knowledge program on climate adaptation. The focus was mainly on water problems (Regionale klimaatadaptatiestrategie Haaglanden, 2014, p. 73) . In 2004 it was considered that most of the water related problems were under control in The Hague, but there were still some (financial) resources left (Appendix I). Therefore the municipality started looking at other climate issues. The consequences of heat were not clear and heat was not seen as a serious problem. Together with the universities of Wageningen and Amsterdam The Hague started doing research on heat related problems. Parallel on the heat waves of 2003 and 2006 the consequences of heat became more visual. Nevertheless, it was not an issue that had the integral support of the whole local government. A research of knowledge center TNO⁸ changed this. In this research The Hague was considered to be the hottest city in the Netherlands (Klok, Schaminée, Duyzer, & Steenveld, 2012, p. 12). This grabbed the attention of the whole local government. There had to be some sort of urgency. It made it easier to implement measures against heat stress. The report by TNO led to more support among the governmental organization to develop heat related policies (Appendix I). The research “Haagse Hitte” (in English: The Hague heat), that was funded and supported by the local government of The Hague, was aimed at deepening the local knowledge on heat and providing a more detailed insight in the local heat issue (Hoeven van der & Wandl, 2017). The fact that this research was commissioned by the local government shows how the sense of urgency of the issue of heat stress has increased since 2012. So, although The Hague was one of the first Dutch municipalities to look at heat related problems in their area, they did not look at heat because there was a problem. They first looked at heat, joined research programs and saw other publications before realizing they had heat stress problems. This eventually led to further research and directed heat stress policy. The decisions to pay more attention to heat stress in 2004 and the 2012 TNO research can be considered as local specific circumstances that stimulated the governmental focus on heat stress.

⁸ Netherlands Organisation for Applied Scientific Research

Arnhem

Arnhem is an example of how coincidences, personal interests and local specific circumstances are decisive factors for why a municipality gets in touch with heat stress knowledge and starts to implement a heat stress policy. The responsible policy advisor for the local city climate told the story of Arnhem (Appendix I):

In 2008 Arnhem became a partner in the European subsidy project “Future Cities”. This project stimulates cities to be climate proof. Adapting to heat was one of the six topics within Future Cities (Future Cities, 2010). The main reason Arnhem got involved with this project is because there were some interested and committed civil servants. Before Future Cities Arnhem joined an Interreg⁹ subsidy project on water problems. A few civil servants thought it would be interesting to join other European programs on different adaptation topics, which eventually was the Future Cities project (Appendix I). As a consequence of Future Cities Arnhem became in 2008/2009 one of the first Dutch municipalities that tried to develop a heat policy and became one of front runner municipalities in the adaptation to heat (Boezeman, Ganzevoort, van Lier, & Louwers, 2014). Rotterdam was another city where heat stress research was done. Together with the Wageningen University, Rotterdam used a bike to measure the temperature on hot days and make the urban heat islands visual on a map. Arnhem, as one of the front runners, had the opportunity to borrow this research bike and make their own heat map (Roskamp, et al., 2010, p. 14). At the same time a new city council was installed in Arnhem. The responsible alderman was interested in the research projects and saw that the bike measurements showed that some parts of the city were warmer than others. With the results he was convinced of the impact of heat stress in Arnhem. The local city alderman therefore supported the prevention of overheating from Arnhem. So the first main “coincidence” in Arnhem was that interested civil servants made Arnhem part of the Future Cities project and consequently gave Arnhem the opportunity to use the research bike. The second coincidence was that at the same time a new council was installed and the new alderman was intrigued by the results of the research projects. Nevertheless, all these steps are still more on the research side than on the action or policy side (Appendix I).

A third coincidence, or local specific circumstance, meant a next step in the development of heat stress policy in Arnhem. In 2011 and 2012, when Arnhem took actively part in the Future Cities project, Arnhem developed a new spatial development vision. The project leader of the new vision was actively involved with the Future Cities project and therefore it was quite simple to make heat stress part of the spatial development vision (Gemeente Arnhem, 2012, pp. 52-54). This meant that heat stress became part of the city policy, as we can see in the current coalition agreement (Gemeente Arnhem, 2018, p. 14) and a memorandum in the summer of 2015 (Gemeente Arnhem, 2015, p. 8). The city of Nijmegen was together with Arnhem part of the Future Cities project, but the local government of Nijmegen did not decide to implement a new spatial development vision at that time (Appendix I). As a consequence, heat stress measures did not become part of the local policy of Nijmegen. Again we see that personal interests, commitment and coincidental timing are essential in declaring why municipalities became front runners in heat stress knowledge and policy development.

There appears to be no structural line in why a municipality becomes a front runner. The main factors are the local specific circumstances that, as the word says, differ from place to place. The only main general factor one can distinguish is that all front runner municipalities had one or more civil servants that in one way or another got interested in the issue of heat stress. How these people got involved with heat stress differs from place to place, but without this individual interest it is

⁹ Interreg is a European Regional Development Fund from the European Union, aimed at regional policy development and cooperation between regions in different European countries (Interreg Europe, 2018).

assumable that these municipalities would not be such early adopters as they can be considered now.

Timing

The researcher from the Amsterdam University of Applied Sciences (HvA) and the project leader of the Klimaatverbond and NAS support in the interviews the supposition that coincidence and timing are decisive factors in the differences between municipalities (Appendix I). Nijmegen is given as an example: during the hot period in 2015, when an official heat wave occurred between the 30th of June and the 5th of July (KNMI, 2016), the project leader had a conversation with Nijmegen and Arnhem about a regional heat plan. The civil servants of these municipalities were willing to start some sort of plan and saw the urgency. A year later, during a hot period in the holiday period (third week of July), the same sort of conversation was held, but led to less initiatives. The main reason was the absence of several civil servants during the vacation period. This shows that a hot period alone is not enough to start initiatives. The issue with hot periods is that they mostly occur during the holiday periods. Coincidence and timing, combined with interested civil servants are essential factors to start with some sort of feeling for the urgency of heat stress. To actually start implementing heat stress policy, an organization broad urgency has to be felt (Appendix I; Mees, Driessen, & Runhaar, 2015). The survey results that are visualized in the previously shown table 4 support this supposition. All of the answers that are given on the question why no heat stress policy is developed yet, are the consequence of a low sense of urgency (Appendix IV).

4.3.2 Stress tests

The cases of The Hague and Arnhem support the supposition made that the municipalities that payed attention to heat stress did not pay attention to it because they had a problem, they looked at the local heat issue and then saw it causes problems. The reason why they started looking at heat was mainly the consequence local specific circumstances. There seems to be no structure.

All municipalities agreed to execute a climate stress test. This test can form the lacking structure and can take the dependency on coincidences away. The fact that all municipalities have to execute a stress test on four climate issues, of which heat is one, means all municipalities have to look at what the consequences of heat are for their area (Deltaprogramma 2018, 2017). This can be the same trigger as the Future Cities project was for Arnhem and the research projects were for The Hague. The stress tests are just an agreement on mapping how climate proof the individual municipalities are, there is no agreement on measures or action that form the next step after the stress test is executed. So, there still is the dependency on timing, sense of urgency and personal interest that influence the translation of knowledge into policy. Nevertheless, the stress tests take the coincidence in the important first step away. Every municipal council will look at heat in their area. In the interviews is said that *“municipalities do not look at heat because they have a problem. As a consequence of some sort of coincidence they look at heat and then see there is a problem”* (Appendix I). The stress test replaces this *“some sort of coincidence”* and therefore the last sentence has to be reformulated: *As a consequence of the stress tests all municipalities look at heat and then consider if heat causes problems or not.* The role of the stress tests are visualized in the next figures, that are the results of the survey (Appendix IV).

All municipalities gave answer to the survey question whether they had already executed a stress test or not. Figure 7 shows the results.

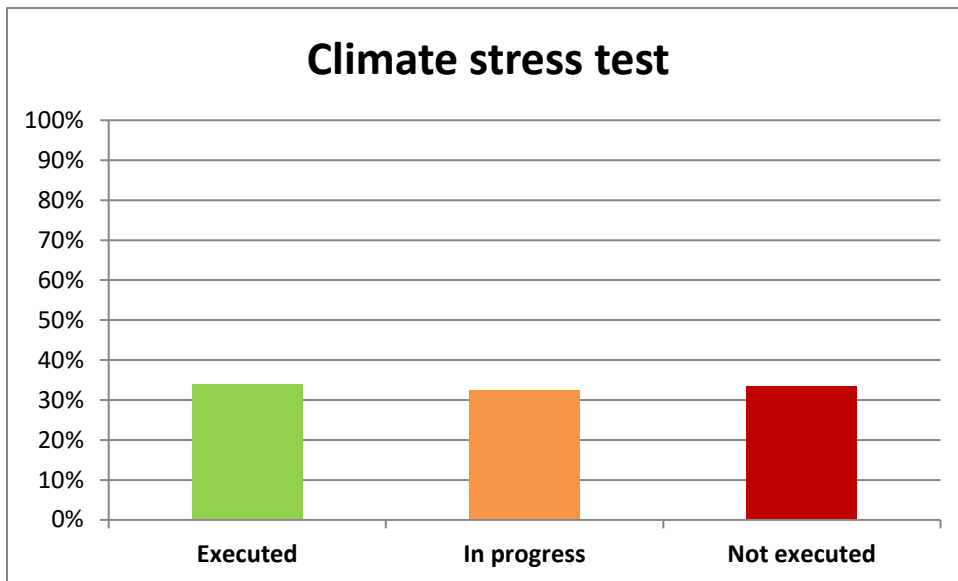


Figure 7 Percentage of Dutch municipalities that executed, are in progress executing or have not executed a climate stress test.

66 of the 194 participating municipalities have executed a stress test, 63 are at this moment executing the stress test and 65 municipalities have not started the stress test. This ratio of amount of municipalities that executed a stress test is confirmed by the policy maker from Meierijstad (Appendix I) and by the Ministry of Infrastructure and Water Management in their Deltaprogramma 2019. Although exact numbers are not mentioned within this program, they state that most of the municipalities have started a stress test, but most of the time not for all four climate issues or not for the entire municipal territory (Deltacommissaris, 2018). Since all municipalities agreed to execute a stress test at latest at the end of 2019, it is assumable that in the period between the first half of 2018 (when the survey was held) and the end of 2019 the percentage of municipalities that have executed a stress test will grow and the group that has not executed a test becomes smaller. This figure forms an interesting base to explore what the effect of a climate stress test is on the heat stress knowledge and heat stress policy of a municipality. The differences in heat stress knowledge between municipalities based on whether they have executed, are executing or have not started a climate stress test are shown in figure 8.

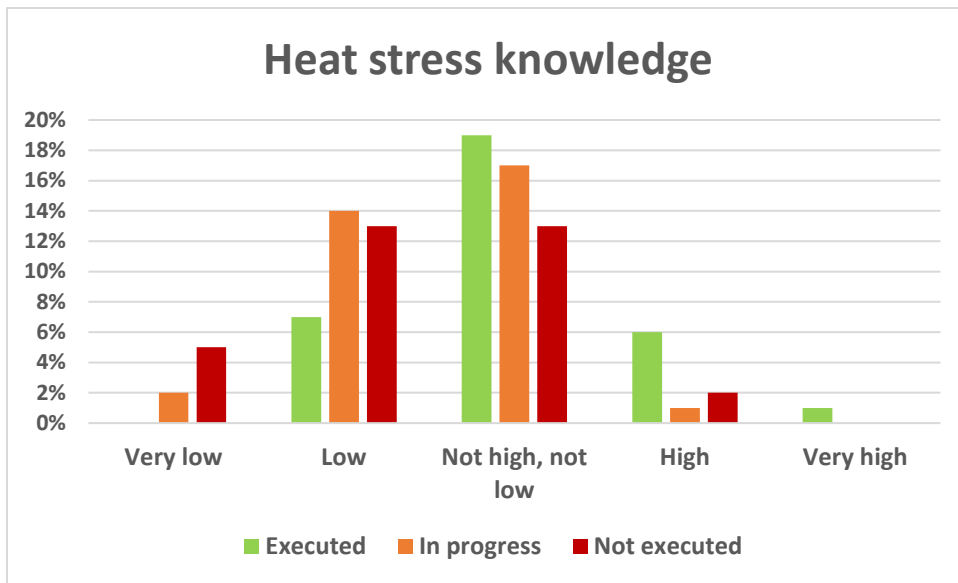


Figure 8 Differences in heat stress knowledge between municipalities that have executed, are executing, or have not yet executed a climate stress test.

Municipalities that have not executed a stress test (not started it) clearly consider their own heat stress knowledge more often as “very low or low”. While municipalities that have finished the stress test mostly consider their own knowledge as “not high, not low”. These municipalities more often have high or very high heat stress knowledge than municipalities that have not yet finished the climate stress test. Although it is clear that in general the municipalities consider their knowledge as low or average, municipalities that executed a stress test score definitely higher than municipalities that have not started the test. For most municipalities the stress test forms the first contact with the local consequences of heat. The test provides municipal knowledge about the concept of heat stress in general and the local case in particular. Although the tests are sometimes done in a superficial manner, with a focus on water related problems, it still provides a first insight in the concept of heat stress and an upgrade of the local heat stress knowledge. This could eventually, in the long term, mean a first step in the development of local heat stress policy. As is shown in figure 9.

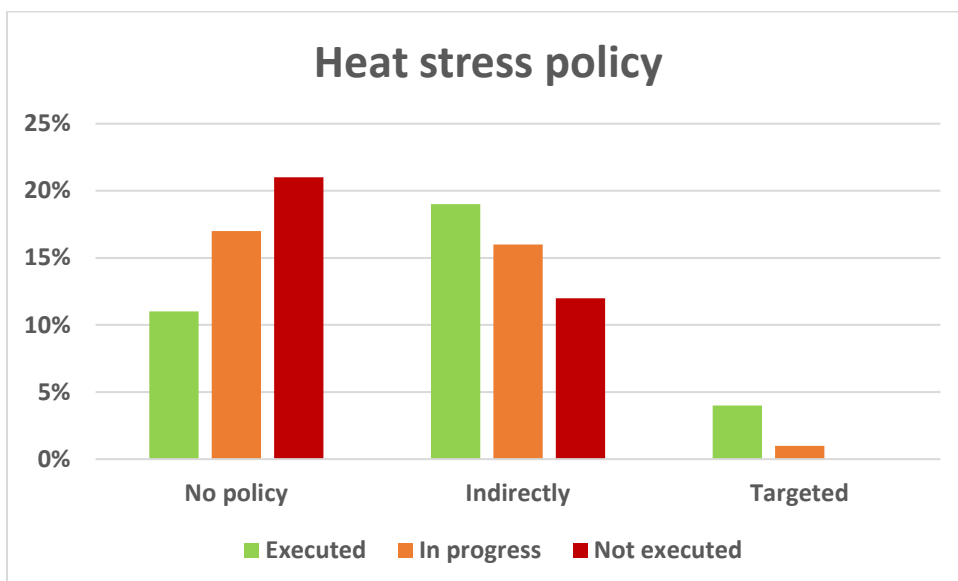


Figure 9 Differences in heat stress policy between municipalities that have executed, are executing, or have not yet executed a climate stress test.

Figure 9 shows that municipalities that have executed a stress test more often have some sort of heat stress policy than municipalities that have not executed a stress test. This is most visible in the categories “no policy” and “indirectly”. The figure shows that stress tests can form a first step to implement indirect measures in the existing local policies. The development of directed heat stress policy is not happening on a broad-scale, as is made visual by the survey results (Appendix IV) and by a statement from the Association of Dutch Municipalities (VNG, 2017). All interviewees confirm that policy development and implementation is only happening on limited scale. The senior policy worker from the ministry and the NAS explains that there are large differences between the municipalities: a few municipalities have actually implemented heat stress measures (the front runners), some municipalities have sufficient knowledge but have not developed policy and the majority of the municipalities have not paid attention to the local impact of heat (Appendix I). The stress test alone is not a sufficient stimulation to implement directed measures against heat stress. Local specific circumstances, personal interests, commitment and timing are decisive factors whether directed heat stress policies are (being) developed. It might be possible that in the long term the stress tests could actually lead to more (in)direct heat stress measures. The first step is to improve the knowledge. The stress test forms this first step and contributes to the local knowledge development and the awareness of the problem. For the actual implementation of a heat stress policy just the growth of knowledge is not enough, more influential variables are necessary. Local specific circumstances are the main factor in progressing from stress test to local heat stress policies, but the stress tests form the first necessary encounter with the local heat issue.

Reasons to develop heat stress policy

As a supplementary question to the question within the survey about the development of heat stress policy, it was asked what stimulated the municipalities to develop heat stress policy. This question was asked to the 98 municipalities that answered to have implemented direct or indirect heat stress policy. These municipalities could give multiple answers to the question and had the opportunity to formulate their own answer when the most accurate answer was not given in the list of answer options. The results of this question are clear:

- 61 municipalities answered that **personal convictions** of the responsible policy maker(s) stimulated the development of heat stress policy
- 47 municipalities made clear that the **stress tests** stimulated the heat stress policy development
- 21 municipalities said an influential stimulation to develop heat stress policy was the **concern for the inhabitants**

The other 17 answers that were given by the municipalities are only mentioned 1 to a maximum of 9 times. (Appendix IV)

This confirms the above mentioned influence of the stress tests and the individual interests and commitment. It shows that the development of heat stress policy until now depends on the personal convictions and commitment of a local policy maker, which is being supported by statements from the project leader of the NAS and Klimaatverbond and from the senior policy advisor of the ministry and the DPRA (Appendix I). The stress tests bring some structure in the first contact with heat stress and can therefore be a stimulation to develop a policy. Still, even after the execution of a stress test, the personal interests are decisive. Since there are no guidelines, rules or mandatory steps that have to be followed when a stress test shows certain results.

4.3.3 General processes

Besides the steered processes, such as the stress tests, that are aimed at creating a better translation of knowledge and more implementation of heat stress policies, more general processes also influence the processes of diffusion and translation.

Believe in climate change

In the interviews with a researcher from the knowledge consortium *climate proof city* from the Amsterdam University of Applied Sciences (HvA) and with the policy worker from the Klimaatverbond and the NAS it became clear that nowadays more people are convinced that the climate is changing.¹⁰ Less people are skeptical towards climate models and predictions (Appendix I). Therefore more people are aware that it will be warmer in the future and less people first have to be convinced. This “battle” is fought in the past decennia and was essential for the heat stress discussion we have nowadays. This change of perspective on climate change is a more global process that also can be considered as a “*belief*”. Without this development and change of world view the heat stress problem would not be considered as much as a problem as it is considered now. If policy makers would not believe in climate change, there would be no reason for them to adapt to the future, there would only be reason to adapt to the present.

An example of the predictions of climate change in the Netherlands is the before mentioned Klimaat-effectatlas. The different scenarios are mapped in this atlas. These are climate scenarios predicted by the Dutch meteorological institute (KNMI). The hottest scenario shows that in 2050 the smaller villages will have as much nights of heat stress as the largest cities nowadays have (Klimaat-effectatlas, 2018). These predictions make heat stress not only a problem for the cities, but also a future problem for the non-urban areas. The process of climate change itself, or perhaps even more nuanced: the predictions of climate change, form a rationale for adaptation to climate change and in this case more specific: adaptation to heat.

Other climate events

Besides the believe in climate change, other climate events can also be considered as influential processes. Natural events that occur during the years move the attention to different adaptation topics. Heat waves feed the urgency to protect vulnerable people against global warming, but a period of drought replaces this attention to the supply of sufficient water (Appendix I). In 2016 severe weather and hail storms caused approximately 500 million euro damage in the Dutch province of Noord-Brabant (RTL Nieuws, 2017). The senior policy worker from the Ministry and the NAS explains in the interview that this event moved the attention in the Dutch policy sphere more to water related problems (Appendix I). These kind of processes that cannot be influenced or directed are influential factors in how much attention is paid to a certain climate topic, in the case of this research: heat. This influence makes it logically that the NAS and DPRA try to use a heat wave to create more attention and stimulate municipalities to take adaptation measures.

Urbanization

Another process that affects heat stress and the awareness of the issue is urbanization. In 2016 the “Centraal Bureau voor Statistiek” (CBS) and “Planbureau voor de Leefomgeving” (PBL), published their predictions on the urbanization of the Netherlands. It is expected that the four largest cities will grow further and also most of the large and medium scale municipalities will face a population growth, while most of the smaller periphery municipalities will have a population decline (PBL/CBS, 2016). Nevertheless, in almost all Dutch municipalities the amount of households will continue to

¹⁰ Although two of the interviewees make this statement, there is no recent research that supports (or does not support) this statement.

grow, even in the areas where a decline of population is expected. This means that in all of these municipalities more houses need to be built (PBL/CBS, 2016).

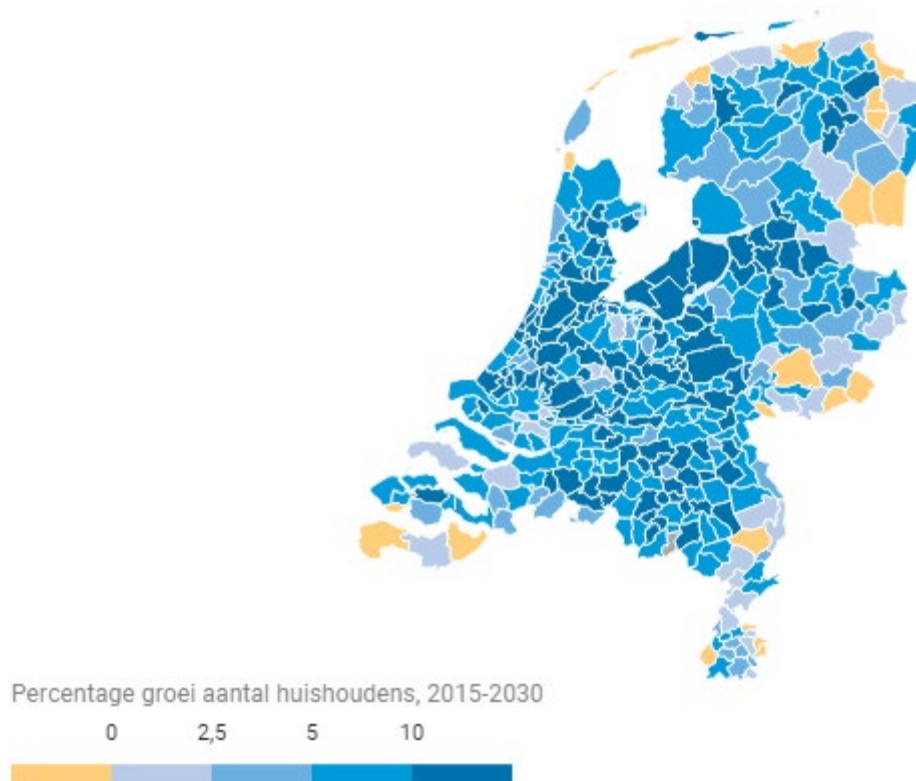


Figure 10 Percentage of growth of amount of households 2015-2030 (PBL/CBS, 2016)

This building process can have an effect on the impact of heat. In the interview with the senior policy advisor from the Ministry and the NAS is explained that urbanization will cause a strengthened urban heat effect. The area that faces heat stress will grow, since more area will be built. The green spaces between cities that can have a cooling effect threaten to disappear (Appendix I). This process of urbanization intensifies the problem of heat stress. Urbanization also means that more people will live in cities and consequently more people will encounter heat stress. The map shown above makes visual that also the smaller municipalities enhance more households, which means more houses. Together with the climate predictions of the KNMI (Klimaat-effectatlas, 2018), this makes heat stress not only a “city-problem”, but an issue for almost all Dutch municipalities.

Construction sector

The map in figure 10 and the prediction of the CBS and PBL that the Netherlands will continue to urbanize in the next 10-15 years, means a serious task for the construction and building industry. The Dutch Minister of the Interior and Kingdom Relations said in 2018 that the Netherlands have to build 700.000 houses between 2018 and 2025 and maybe even one million houses in 2030 (Ministry of the Interior and Kingdom Relations, 2018). This building task is one of the leading issues in the construction sector of the Netherlands. The number of one million houses shows that the impact of heat will grow, but since this building task is one of the main tasks of the construction industry nowadays, it means heat is not one of the core issues. The consequence of the building task is that more green is not the top priority. The top priority is to build more houses. They try to build the houses in a sustainable way, but when money is running out, more green is one of the elements that is dropped out. In four of the interviews (senior policy advisor Ministry and NAS, project leader

Klimaatverbond and NAS, researcher HvA and the policy advisor city climate of Arnhem) it is stated that the housing sector has other priorities than taking heat stress measures (Appendix I). They also mention that in the last year they see a small change. The housing sector realizes building in a sustainable way also means building in a way that is climate proof. This building task provides opportunities. If one million houses need to be build, there is an opportunity to develop these new houses heat proof and to plan the newly developed spaces in a green and climate proof manner. This can only happen if the urgency to be climate proof is felt integrally. Until now, the construction sector is considered as one of the core sectors that is missing within the heat stress network (Appendix I). Maxime Verhagen, chairman of “Bouwend Nederland”, stated during a heat stress symposium that *“the construction sector has several opportunities to deal with heat stress and water related problems. But when during tender processes the only target is the lowest price, green innovations have no chance.”* (De Limburger, 2018) Verhagen implies that the construction sector should focus more on a climate proof building approach.

Health care sector

Together with the housing sector, the health care sector is one of the influential industries that is missing in the heat stress network. Both sectors have big tasks, which means there is not enough time, money and maybe even a lack of urgency to take serious heat stress measures (Appendix I). The care sector is present in the heat stress debate, but according to policy workers from municipalities and the NAS, not sufficient, considering the health care sector is one of the main problem owners of heat stress (Appendix I; Ruimtelijke adaptatie, 2018). One of the responsible processes for the small contribution of the health care sector to heat stress adaptation is the fact that since the financial crisis in 2008 the care sector had to deal with budgetary cuts. More specific: the yearly increase of the national health care budget stopped. Since 2008, in most of the years the relative increase of the health care budget was lower than the relative increase in GDP (CBS, 2017). This led, and is still leading, to structural reforms in the health care sector. It means that the budgetary cuts and reforms are having the top priority. Dealing with heat stress and starting with long term adaptation plans is not one of the main priorities. Therefore, the health care sector is considered as one of the sectors missing in most of the heat stress discussions and regional meetings. While the health care sector can be considered as one of the most affected sectors by heat stress (Appendix I).

Demographic ageing

Besides the budgetary cuts, other processes have influence on the health care sector. One of them is the demographic ageing of the Netherlands. PBL/CBS predict that the population of the Netherlands will continue ageing. The percentage of people above 65 years old will grow between 2015 and 2030 in every province, but there are regional differences. Rural areas face more demographic ageing than urban areas (PBL/CBS, 2016). An ageing population means more people that are vulnerable for heat (Appendix I). Although part of the reason why the population is ageing is because people simply live longer. Consequently it might be possible that people stay healthy for longer and therefore become vulnerable to heat at a higher age. Nevertheless, the population structure of the Netherlands inevitable leads to an ageing population in the coming years. Thus, more people in the Netherlands will be vulnerable to heat. This means that the health care sector, which is one of the main problem owners right now, will see that the impact of heat only increases further.

Elderly people stay longer at their own home

Parallel to the process of ageing a trend is visual in the Netherlands that elderly people live at home for longer (Garssen & Harmsen, 2011). They end up at retirement houses at a later age. Which means less elderly people are staying in residents with so called “24 hour care”. As a consequence of this

process it is harder for caretakers and municipalities to reach these elderly people during hot periods. The national government of the Netherlands stimulates elderly people to live longer in their own houses. “*Who is no longer able to take care of his own, can indicate this at the local government,*” is stated by the national government (Rijksoverheid, 2018). One can argue if, during hot periods, vulnerable people are realizing they are vulnerable and know how to take care of themselves. The RIVM (the national health institute) activated the national heat plan in the summer of 2018, as the temperature was several days above the temperature norm¹¹. This heat plan tells, among other things, elderly people to stay cool and drink enough. It also tells professional caretakers, family, friends and neighbors to pay more attention to vulnerable people. The spokesperson of the national senior citizen organization reacted in the media that this plan is exaggerating and she thinks it is not necessary that the Red Cross visits elderly- and nursery houses during this heat wave, to mention the risks of heat and to explain how people can protect themselves (Algemeen Dagblad, 2018). Although the elderly organization later withdrew this statement as a consequence of critique, this reaction, of the spokesperson of the organization that speaks up for the elderly people, gives a view of how the risks of heat are interpreted in the Netherlands. Heat is not integrally seen as a serious danger. This might be because of the climatological history of the Netherlands. Dutch people are not used to deal with heat and the “silent deaths” heat causes are not becoming visual for most of the inhabitants. On the other hand, one of the criticisms on the national heat plan is that it is patronizing (Appendix I). People do not want to depend on others and think they know how to take care of themselves, it is not up to the government to tell when someone has to drink water. So, it might be useful to use other communication terms in the national heat plan and even in the general communication about heat solutions. One of the difficulties with heat stress is that the problems are not getting much attention and are not always visual. On top of that the solutions for individuals to tackle heat stress are not sexy, they are considered as quite patronizing: drink more water, put a wet towel in your neck, close the doors during the day, stay cool (Appendix I). Heat stress is not a very appealing problem and has ditto solutions for individuals. This discourse is a consequence of the climate in the Netherlands. It is not a surprise that adapting to heat is not one of the core daily activities of Dutch citizens. However, with a changing climate, this way of living might change to. Probably not simultaneously, but eventually society will adjust itself.

4.3.3 The influence of processes

It shows that on the one hand the more general processes such as *urbanization, ageing and (the believe in) climate change*, processes we can consider as societal and natural developments, have influence on the impact of climate change. This might lead to a rationale for governmental interference. The climate stress tests can be considered as examples of this governmental interference. This assumes that processes that have an influence on the *impact* of climate change form rationales for adaptation policy. These rationales are present at the national government, but the influence of these processes on local policies (municipalities) is smaller. The development of local policies is depending on local specific circumstances. The processes that are mentioned, do not lead to the same extent of rationales for policy development on the local scale as to rationales for policy development on a national level. The development of stress tests does have an influence on municipal level, but this does not immediately lead to broad scale policy development among the municipalities. These processes are apparently not influential enough yet to develop policy. They provide not directly rationales for policy development on municipal level. The next two paragraphs of

¹¹ The national heat plan is activated if the maximum temperature is higher than 27 degrees Celsius on four successive days. Other factors that are taken in consideration are the night temperature and the humidity (RIVM, 2018).

frames and *beliefs* make clear why processes do not immediately lead to rationales for knowledge gathering and policy development.

4.4 Frames

The *frames* and *beliefs* have an influence on how the processes lead to rationales. Knowledge of this total set of *processes*, *frames* and *beliefs* is necessary to declare how certain rationales have developed. The elaboration of the frames and beliefs gives insight in why the same processes lead to rationales that lead to policy development in one municipality and lead to rationales that lead to a lack of policy development in other municipalities. In the processes paragraph is shown that the local specific circumstances are decisive in the differences in policy development, but the next two paragraphs will make clear how frames and beliefs have influence on the local specific circumstances and on the substance of the local present rationales.

4.4.1 Framing as an urban problem

Heat stress is mostly framed as an urban problem. Think about the terms of “urban heat stress” or “urban heat island effect”, that are commonly used concepts to describe the issue of heat stress. The project leader of the Klimaatverbond and the NAS who is interviewed and who is also one of the organizers of the National Heat congress, considers heat stress mainly as an urban problem. She is not very concerned about smaller municipalities that see heat not as a relevant issue for their region (Appendix I).

One of the other interviewees is working for the Amsterdam University of Applied Sciences within a knowledge consortium that does research on climate adaptation. This research program is called: “Klimaatbestendige stad” (in English: “climate proof city”) (Hogeschool van Amsterdam – Urban Technology, 2018). It focuses on making cities climate proof and heat stress is one of the topics within this project. The issue of heat stress is within this project framed as an urban adaptation task. Another example of the framing of heat stress as an urban problem is the Future Cities Project where Arnhem was part of. Together with Nijmegen Arnhem was part of an EU subsidy project on future cities, that was focusing on climate adaptation within cities. There are several examples of how these kinds of projects are framing heat stress and sometimes the broader issue of climate adaptation as an urban topic. The “National Knowledge- and Innovation Program Water and Climate” (NKWK) for example has a research project called: “Climate proof city”. The NKWK is a cooperation between governmental institutions, businesses and knowledge institutions. Although this implies a broad and differentiated approach, the focus in their climate adaptation project is totally on the city. In the opening text on the website they mention how important it is for cities to be climate proof. No words are spend on climate adaptation in smaller municipalities (NKWK, 2018).

The subjects that were represented on the national heat congress of 2018 confirm this urban focus. None of the more than thirty knowledge sessions was explicitly focusing on the impact of heat in non-urban municipalities and on specific measures that are relevant for these municipalities. While there were several sessions that had a specific urban focus and others more implicitly had an urban approach (Kennisportaal ruimtelijke adaptatie, 2018).

Answers given in the survey state that smaller municipalities do not know how and to what extent they need to develop heat stress policy. This implies an influence of the framing of heat as an urban issue on the awareness of the impact of heat, the knowledge gathering and the policy development in non-urban municipalities. To what extent differences between urban- and non-urban

municipalities in the diffusion of knowledge and the translation of knowledge into policy have become visual in the survey is discussed in the next paragraph.

4.4.2 Differences between larger and smaller municipalities

The fact that heat stress is framed as an urban problem, might affect difference between urban and non-urban municipalities in development of heat stress knowledge and policy. The survey provides an interesting insight in this issue. In the next three figures a distinction is made between municipalities with a population under 40.000 and municipalities with a population above 40.000.¹² 64% of the responding municipalities are considered as “small”(non-urban) municipalities and 36% as “large”(urban) municipalities.

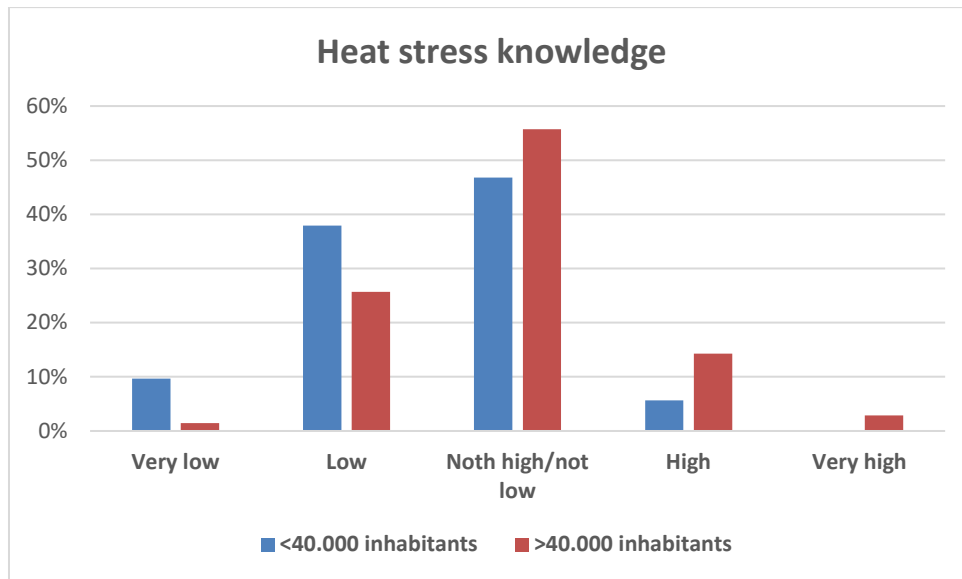


Figure 11 Difference in heat stress knowledge between small and large Dutch municipalities

Although both groups consider their knowledge mainly as “not high/not low”, non-urban municipalities have less knowledge about heat stress than urban municipalities. Only 6 % of the non-urban municipalities considers its own knowledge as “high” (or “very high”), while 17 % of the urban municipalities considers this knowledge as “high” or “very high”. 48% of the non-urban municipalities considers its knowledge as “low” or “very low” and only 27% of the urban municipalities considers its own knowledge as “low” or “very low”. It shows the differences between urban- and non-urban municipalities when it comes to heat stress knowledge (Appendix IV). The statements within the interviews that the differences in knowledge between the front runner municipalities and the large group of municipalities that have not sufficient knowledge about heat stress are getting larger, support the outcomes of the survey results presented in figure 11 (Appendix I).

¹² There is no strict definition when it comes to population if a municipality is considered as “urban”. The demarcation of 40.000 inhabitants as an urban municipality is chosen as a consequence of looking at the identity of the municipalities. If the boundary would be set at 50.000, municipalities like Venray, Waalwijk, Vlissingen and Veldhoven would not be considered as urban. Another reason is that the demarcation of 40.000 divides the municipalities in two groups with a comparable amount of municipalities. This demarcation is arguable, as if the case with every definition of a city or urban municipality. The results of the survey are available in the appendix and can be used to repeat the comparison with a different definition of “urban municipality”.

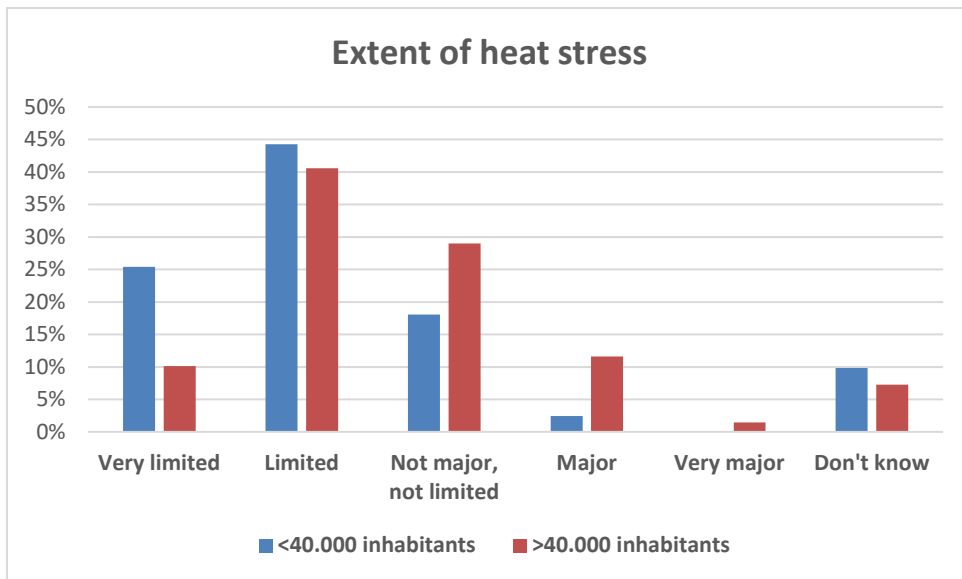


Figure 12 Differences between small and large Dutch municipalities in how municipalities describe the extent of heat stress in their area.

When looking at how the extent of heat stress within the municipality is experienced, the differences between urban and non-urban become visual: 69% of the small municipalities considers the extent of heat stress in their own municipality as limited or very limited, against 51% of the larger municipalities. 2% of the small municipalities considers the extent of heat stress as major (or very major), against 13% of the large municipalities.

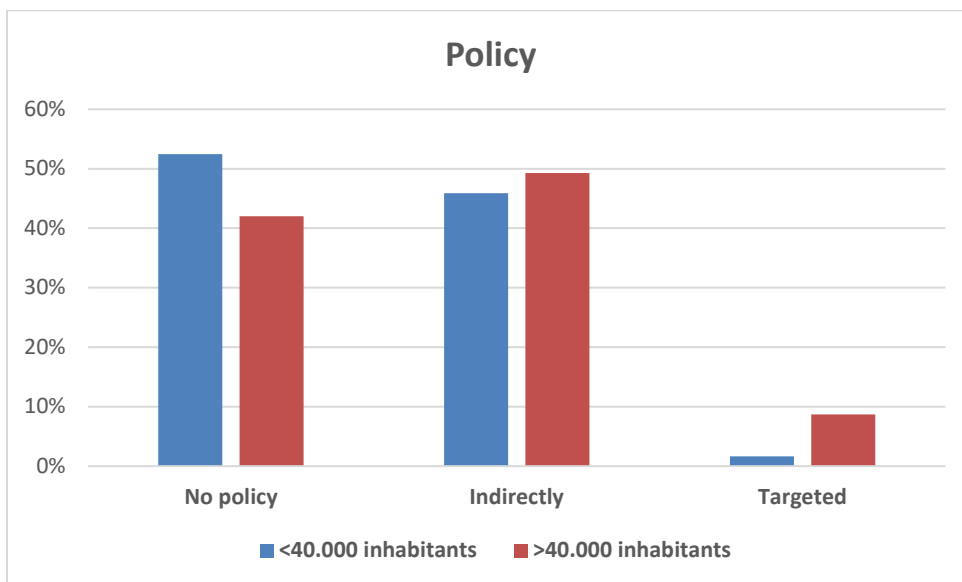


Figure 13 Differences in heat stress policy between small and large Dutch municipalities

When it comes to policy development we see smaller differences. There are more smaller municipalities that have no heat stress policy and more larger municipalities have directed heat stress policy, but the differences are not that big. The reason that these differences are small is because only a few large municipalities have implemented directed policy, not because much small municipalities have implemented policy, since only 2% of the small municipalities have implemented policy directed at preventing heat stress. The category “indirectly policy” is harder to define. Within

this category there can be a broad range of differences. Some municipalities consider trees that were planted while preventing heat stress was not considered as one of the positive effects of the trees, as indirect heat stress policy. While other municipalities actually take measures deliberately to prevent heat stress, but only when it is part of a broader project, and consider this type of policy also as “indirectly”.

Altogether the survey has made clear that urban municipalities consider their own heat stress knowledge higher than non-urban municipalities. Within urban municipalities heat stress is also more often considered as a problem. In the development of heat stress policy the differences are less clear, but this is mainly because all municipalities have not developed directed heat stress policy. It might be possible that the framing of heat as an urban problem has influence on this lack of knowledge and policy development in non-urban municipalities.

4.4.3 Arguments for a broader approach

It is clear that heat stress is framed as an urban-issue and that this has influence on the knowledge- and policy development in non-urban areas.

KNMI predictions

The expected amount of nights of heat stress in the smaller villages in 2050 will be higher than the amount of nights of heat stress in the largest cities right now, see figure 14.

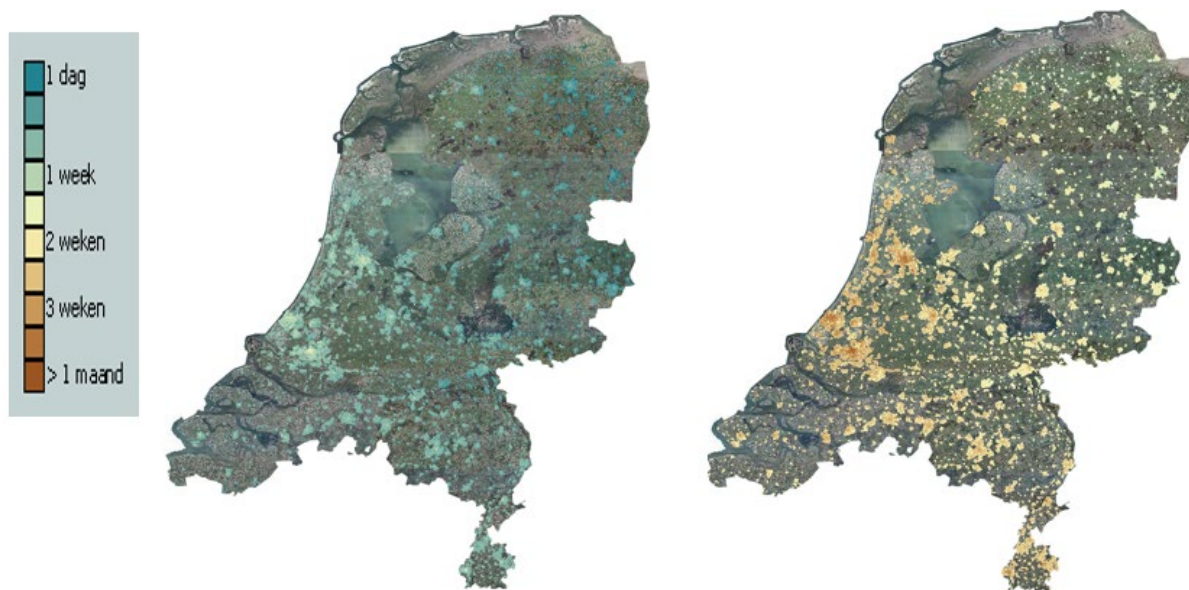


Figure 14 Left: current days of heat stress, right: predicted days of heat stress in 2050 (Klimaat-effectatlas, 2018)

So if the extent of heat stress in the cities in 2018 is considered as a problem, then we must consider the expected extent of heat stress in the smaller villages in 2050 also as a problem. In other words, framing the issue of heat stress as an urban problem does not enough justice to what the future consequences will be for smaller villages.

Demographic ageing in the non-urban areas

Heat has the most influence on people that are considered as vulnerable. Elderly people are considered as a large group of vulnerable people (Wilhelmi & Hayden, 2010, p. 4). The impact of heat is higher on elderly people than on young and healthy people. Not only the temperature is relevant, the demographic structure of a municipality is also responsible for the differences in the problems heat can cause. Therefore, it is more relevant to look at the impact of heat, than only at the

temperature. Municipality A might be one degree Celsius warmer than municipality B, but if municipality B consists of significantly more elderly people than municipality A, the impact of the heat might be higher in municipality B, despite the lower temperatures. A high Urban Heat Island effect therefore not always means a high amount of experienced heat stress. The focus on urban areas in the heat stress debate ignores the process of an ageing population in non-urban areas, it ignores the importance of the demographic structure in the impact of heat. A prognosis of the PBL and CBS showed that the non-urban areas will age faster than the urban areas. In 2030 26% of the population in non-urban-areas will be 65 years or older, in contrary to the four biggest cities of which 17% of the population will be 65 years or older (Kooiman, Jong de, Huisman, Duin van, & Stoeldraijer, 2016, pp. 26-27). This shows that relatively more vulnerable people live in non-urban municipalities than in urban municipalities and this difference will only continue to grow in the future. If the vulnerability and the ageing population in non-urban areas are taken into account, it is remarkable that the focus in science and policy is so empathically on urban areas.

Climatological differences

Even in a small country like the Netherlands there are significant climatological differences. The next two figures show how the temperature differs from region to region and between day and night. The temperatures in figure 15 are the average maximum temperatures measured in July 2018 at the official meteorological stations of the KNMI. These maximum temperatures occur (almost every day) in the afternoon, the minimum temperatures occur during the night and early morning. Looking at figure 15 makes clear how the inland of the Netherlands is hotter than the more coastal areas. The eastern and southern part of the Netherlands were 2-5 degrees warmer than the Randstad (the urbanized Western part of the Netherlands).

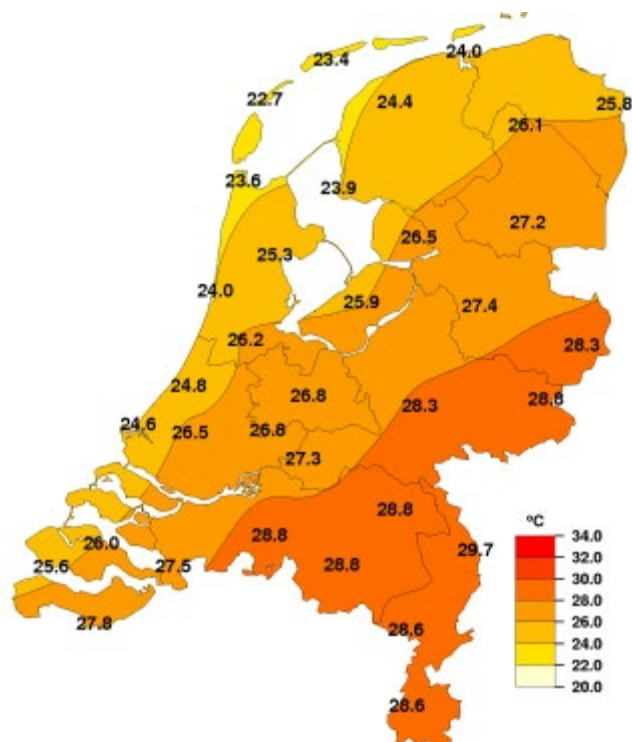


Figure 15 Average Maximum Temperature July 2018 (KNMI, 2018)

The minimum temperature shows a different outcome. During the night the coastal areas have the same temperature as the inland regions and some areas at the coast are even warmer than the inland.

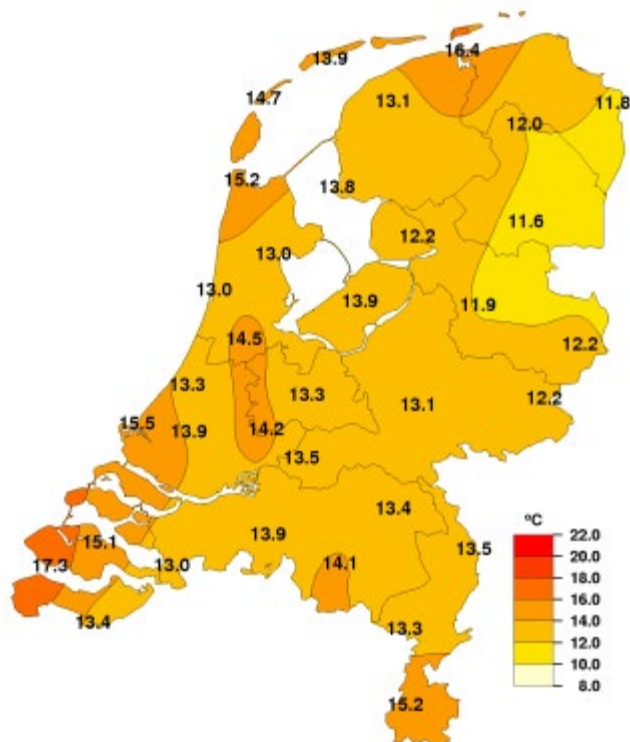


Figure 16 Average Minimum Temperature July 2018 (KNMI, 2018)

All these temperatures are measured at official weather stations and are therefore not influenced by the warming effects of cities and villages. The urban heat island effect has to be added to these temperatures to get the temperatures in the cities. Research from TNO showed that the 73 largest cities in the Netherlands have an average urban heat island effect of 2,9 degrees Celsius during daytime and 2,4 degrees during the night (Klok et al., 2012, p. 11) . Which means that during the night cities in the Randstad are seriously warmer than smaller villages in the inland. During daytime non-urban areas in the south on an average day in July 2018 are as hot as an average city in the Western part of the Netherlands. It is clear that the largest cities have the highest urban heat island effect and this effect can be up to 8 degrees in extreme conditions but this is not the case in most of the Dutch cities, since the average Urban Heat Island (UHI) is 2,9 degrees in the 73 largest cities. Climatological differences can be higher than this 2,9 degrees. A non-urban area in the inland might have an UHI-effect of 0 degrees Celsius, but can still be warmer than an average city in the Randstad with an UHI-effect of 2,9 degrees Celsius.

The focus on urban areas is too limited. Heat stress does not only occur in urban areas and does not only occur when an urban heat island effect is measured, as a research commissioned by the Deltaprogramma Ruimtelijke adaptatie showed that even small villages in the province of Zeeland have an “urban” heat island effect (Caljouw, 2018). The demographic structure of a municipality and the climatological differences are other factors that have an influence on the actual impact of heat. The UHI effect is one of these influences, but a focus that is limited only to the amount of UHI effect, ignores other factors that influence the impact of heat. It pays no attention to the predictions of the KNMI that show that in 2050 the non-urban areas will have more nights of heat stress than the largest cities face in 2018. It is clear that cities have a higher urban island effect than villages, but this does not mean that there is no heat stress in non-urban areas. One may wonder what the purpose is of the focus on urban areas. To what extent is it relevant that one municipality faces more heat stress than another municipality? If a municipality faces heat stress, than this might be a rationale for

action. It is of no importance if that municipality is considered as “urban” or “non-urban”. The urbanization degree is not the only relevant variable to determine whether a municipality faces heat stress or not. This is not a new scientific insight, but it is an observation of the general course in the Dutch climate adaptation policy sphere. A course that leads to an urban focus of which one can argue what the positive contribution on the general policy development in Dutch municipalities will be.

Most of the knowledge about heat stress and measures to develop is aimed at urban areas and on the urban spatial structure. The focus on the heat island effect declares this urban focus. The heat island effect is the highest in urban areas but this does not automatically mean that the amount of heat stress is the highest in an urban municipality. For smaller villages different measures and policy might form a better solution. The policy measures in urban areas focus more on limiting the urban heat island effect, by taking spatial measures. In non-urban municipalities, with a low UHI, the policy will not be focusing on limiting the heat island effect, but on dealing with the impact of heat. For example by policy that is targeting on taking care of the vulnerable groups and on making the municipality a pleasant and livable place to be, even during the hottest summer days.

Smaller villages are sometimes not convinced that heat stress is a problem in their area, according to the results of the survey (Appendix IV). The urban heat island effect might be pretty low compared to the larger cities, but a village in the southern part of the Netherlands should perhaps better focus on making the (public) space a pleasant and livable area to spend your time, even during hot summer days and on dealing with an ageing population in a warming climate. The focus in science and policy on limiting down the (night) temperature in urban areas forms a rationale for smaller villages to do less about heat stress. This goes against the governmental policy that all municipalities have to act climate proof in 2020 and actually be climate proof in 2050 (Deltaprogramma 2018, 2017). A more general approach that is focusing on all municipalities, instead of only the urban areas, would better fit these adaptation goals. The framing of heat as an urban issue is now providing a rationale for a lack of heat stress policy in non-urban municipalities.

4.4.4 Comparison

One of the reasons why the local government of The Hague started developing heat stress policy was because research bureau TNO concluded that The Hague was the hottest city in the Netherlands (Klok, et al., 2012). This grabbed the attention of the city aldermen and subsequently preventing heat stress became a higher priority (Appendix I). Although later research done by The Hague showed that The Hague is not the hottest city in the Netherlands (Hoeven van der & Wandl, 2017), this case makes clear that the comparison plays an important role. The local government does not want to be the hottest city. Nevertheless, “hottest city” is a relative concept that has to be placed in perspective. The hottest city in the Netherlands is not as overheated as most cities in Spain, but is probably hotter than every city in Scandinavia.

An interesting example of the comparison is the difference between Arnhem and Almere. Almere mentioned in the survey that heat stress is a limited problem in their municipality (Appendix IV). The policy worker that was interviewed later clarified this by saying that compared to other cities in the Randstad Almere is not that much overheated, mainly because of a young population and much green and water in the city (Appendix I). This is true, in comparison to other cities in the Randstad Almere has not as much nights of heat stress (see figure 1). Arnhem, on the other hand, considers the impact of heat on its region as not major/not limited (Appendix IV). Arnhem is one of the front runners and tries to actively prevent heat stress, with directed policy. Arnhem is the hottest municipality in its region, contrary to Almere that is located near hotter cities. Nevertheless, if you compare Arnhem and Almere, they have approximately the same amount of overheated nights.



Figure 17 Current nights of heat stress: left Arnhem, right Almere (Klimaat-effectatlas, 2018).

The priority that is given to heat stress in the local policy developments actually differs significantly (Appendix I). There are several reasons that lead to this difference, but the comparison with the surrounding municipalities plays a role. A city does not want to be the most overheated municipality of the region, or in the case of The Hague: of the country. This comparison to other municipalities can form a rationale for the development and implementation of heat stress measures, but it can also form a rationale for a lack of heat stress measures. A comparison is always relative to the case you compare it with. Looking at their own local situation can form a rationale to act, comparing this situation to a hotter regional municipality might form a rationale for a lack of action.

The influential factor of the comparison can form a risk. Every municipality that is not the most overheated area in their region can use this comparison as a rationale for a lack of heat stress measures. The focus on urban areas indirectly emphasizes the influence of the comparison. Non-urban areas compare themselves to urban areas and consider heat is more an urban issue, while even in the smallest villages heat can have negative impact. In order to develop heat stress policy it should be of no relevance if other Dutch areas face more heat stress.

4.4.5 Priorities smaller municipalities

Besides the framing of heat stress as an urban problem other aspects have influence on the differences in translation of heat stress knowledge between small and large municipalities. Small municipalities have other priorities. They have other things to worry about. Several tasks have been moved from higher governments to the municipalities over the last years (Appendix I; VNG, 2013). Interviewees and answers within the survey simply state that there is not enough time and capacity to collect heat stress knowledge. As mentioned before, within the most municipalities there are only one or two civil servants (sometimes even no one) responsible for dealing with heat stress, but this is not their main task. Heat stress is just one of their policy subjects. Therefore, these policy workers have not enough time to go to sufficient regional heat stress or climate adaptation knowledge exchange platforms (Appendix I; Appendix IV), while this regional knowledge exchange is considered very important. Research from the Klimaatverbond and a statement from the project leader from the NAS and the Klimaatverbond showed that the front runner municipalities have not enough capacity to share their knowledge and the peloton municipalities have not enough capacity to collect the

knowledge (Klimaatverbond Nederland, 2015; Appendix I). This has changed slightly in the period 2015-2018. The DPRA, the NAS and the arranged stress tests have created more knowledge exchange platforms and thereby created a growing attention and capacity within the municipalities. Nevertheless, Arnhem for example tells that it stopped with actively sharing knowledge and trying to activate other municipalities, mainly because most of the time it had no results. The municipalities that collected the knowledge do not have the capacity and give not enough priority to heat stress measures to actually do something with the collected knowledge (Appendix I). So this interview with the policy advisor from Arnhem supports the statement from the Klimaatverbond and NAS. One of the reasons that is given by the municipalities for the lack of capacity is the fact that the Deltaprogramma Ruimtelijk Adaptatie does not support the municipalities enough (Appendix I). Together with the NAS was decided that all municipalities have to execute a climate stress test at latest in 2019 and that all municipalities have to be climate proof in 2050. Municipalities complain that there is not enough support and funding to achieve these goals (Appendix I). There is not enough money available for municipalities to create capacity for heat stress measures. First capacity is needed to collect knowledge and conduct stress tests. This process seems to be developing in a positive way. On the other hand, the next step: actually developing and implementing heat stress policy, is not developing rapidly. Not only money and capacity for creating measures and policy is needed, municipalities simply do not know where to start with their policy and how this policy must look like. It is not clear when their policy is sufficient or not (Appendix I; Appendix IV). In a research from the University of Applied Sciences of Amsterdam is stated that in order to start with the implementation of climate adaptation measures, municipalities first have to know what a climate proof city is and what it looks like. The shape of the measures differ from municipality to municipality, depending on the local specific circumstances (Kluck, Klok, Kleerekoper, Loeve, Bakker, & Boogaard, 2016, p. 60). Therefore municipalities have to map the local heat stress issue and develop local specific policy.

The problem of not knowing where to start with the policy development becomes clear when looking at the amount of municipalities that have developed policy directed at limiting heat stress. Only 4% of all municipalities have implemented directed heat stress policy (see figure 4).

Although the lack of sufficient resources and the fact that the municipalities have other tasks they worry about more can be considered as *processes*, the given priority is the consequence of *framing*. This considers not only the framing of heat as an urban problem by agents outside the municipalities, as mentioned before, but also the frames that live within the municipal organization itself. It is a general consideration among the municipal governments that heat stress is not a major problem (see figure 12). When decisions have to be made about the spending of scarce resources, it is logical that those issues that are not considered as serious problems are given less priority. This consideration of heat as a limited problem is the consequence of frames people live in. It is the consequence of the general framing of heat as an urban issue and the consequence of the general frame that heat is not that dangerous, mainly because most of the negative aspects of heat are not as visual as other climate issues.

4.4.6 Communication

Another aspect of frames that influence the translation of knowledge into policy is that of communication by the municipalities. The interviewees from Almere and The Hague both explain that they try to be smart in how to communicate climate adaptation to the citizens. Almere tells that words such as *heat stress*, *climate adaptation* and *environment* are considered as so called allergy words. Groups of citizens show resistance if these words are used by the government. These terms represent types of policy that are not corresponding to their opinions and needs. The resistance to

these words and their accompanied policies is not only visual within the municipal population, but also within the municipal council. In Almere the Partij Voor de Vrijheid (PVV) was part of the council and also considered the words as “allergy words” (Appendix I). The policy makers framed the policy measures therefore not as climate adaptation actions, but as actions that are better for the livability of the inhabitants and makes the municipality more attractive for visitors and businesses. Almere has a large green and blue (water) structure and is willing to expand this if possible. The local policy developers stopped framing these actions as climate adaptation actions. This took out a lot of the negative reactions from the citizens and the PVV (Appendix I). The heat stress policy of Almere is part of a broader vision on livability and spatial development. A cool city during hot periods is part of a livable environment. In the “Meerjarenprogramma” of Almere is extensively written about the green blue networks and the positive effects of these networks on the manifestation of Almere as an attractive and healthy place to live and to start businesses. The term “heat” is not mentioned once within this policy document, but the measures that are described actually do have positive effects on the adaptation to heat (Bestuurlijk overleg Almere 2.0, 2018, p. 16). According to Almere it has more success to prevent the usage of these “allergy words” and just start implementing the measures and sell them as positive effects for the livability, health and attractiveness of the city (Appendix I).

These examples show how different forms of frames that are used by the government can influence to what extent measures against heat are accepted. It makes also clear how citizens as well as local politicians are not convinced of the problems of heat stress. This might be because the local problems are actually not that serious, but it can also be because sufficient knowledge is lacking and the issue is framed as an urban problem that is considered as quite patronizing, as is shown in the previous paragraphs.

4.4.7 The influence of frames

This paragraph about *frames* shows how frames have influence on the felt sense of urgency. A sense of urgency that is a necessary ingredient for the presence of rationales for adaptation policy. In paragraph 4.3 different processes were formulated that have influence on the impact of heat. The frames make clear that without the right framing urgency to develop adaptation policy is not felt. Frames have influence on rationales for policy development. In the heat stress case, the most influential frames form a rationale for a lack of policy development in those municipalities that consider themselves not as urban and in municipalities that consider heat stress not as a policy issue that has high priority. In a more general sense one can conclude that frames have influence on the sense of urgency and therefore on the substance of the rationales. How an issue is framed has influence on to what extent actors are motivated to take measures. It shows how the general processes of a warming climate, an urbanizing country and an ageing population not lead to the same rationales for policy development in all municipalities. The framing of heat stress as an urban issue and the general frame that heat is not a top priority influence to what extent policy is developed.

4.5 Beliefs

Besides processes and frames *beliefs* can have influence on local policy. Beliefs are defined as ideas, opinions or convictions. Together with frames beliefs have effect on how processes have influence on the substance of rationales. This paragraph shows what the influential beliefs are and how they have effect on the diffusion and translation of knowledge.

Governmental task?

According to Meyer, Josselin, de Jong and Hoekstra (2006) half of the area within a municipality is public space, the other half is private property. This differs between rural and urban municipalities and depends on the definition. Nevertheless, in the built part of a municipality, the percentage of area that is private property is even higher than in the countryside. This means that the local government can only directly influence half of the space: the public space. The efforts of companies and citizens are necessary in making a municipality climate proof. Interviewees tell that the belief among citizens about the seriousness of the problem of heat stress is mostly not high enough. Subsidies for green roofs are not a great success, they are mostly requested by people in the more wealthier neighborhoods of a city (Appendix I). People have other priorities in spending their money. Besides the more financial reasons, people are just convinced that climate adaptation is a task for the (local) government. A survey, held by the Dutch news and broadcast foundation NOS, among 1700 people that had problems that are related with flooding as the consequence of heavy rainfall, shows that these people believe that adapting to heavy rainfall is a governmental task. 85% thinks the government should invest more in sewerage, while only a quarter of them is willing to pay more sewerage taxes. When it comes to removing stones and placing more green is 70% convinced that the government should do this. Approximately 50% is willing to replace stone for plants in their own garden (NOS, 2018). The participants of the survey had serious flooding problems. When it comes to a less tangible issue such as heat stress, it is assumable that this percentage is even lower and that even more people consider adaptation measures not their task. The belief among the inhabitants that climate adaptation is a task for the local government and not for the citizens is a problem that is confirmed by the interviewees that are working for the local municipality (Appendix I). One of the reasons for this belief might be that hot weather is not generally considered as a potential risk.

Hot weather is considered as positive, not as a problem

Adapting to climate change is part of the Dutch culture. Dikes, polders, the Dutch are used to live with water and prevent the land from flooding. Adapting to heat is not part of the Dutch culture. In the Mediterranean countries siesta is for example part of the daily routine. Even during heat waves, siesta is not a common activity in the Netherlands. Dutch people are not used to deal with a long period of high temperatures (Appendix I). The civil servant that is responsible for the city climate in Arnhem tells that during hot periods their inhabitants open the windows of the houses during the day and close them during the night (Appendix I). Obviously, this will warm the house further, it will not cool it down. People in the Netherlands want to enjoy the hot weather, it is not considered as a problem or potential danger (Runhaar, Mees, Wardekker, van der Sluijs & Driessen, 2011). This makes it harder for local governments to tackle heat stress. Most of the citizens think climate adaptation is a governmental task, but only about half of the area is public space (Meyer et al., 2006). The other half is private property, property where people live that are not used to deal with heat stress and of which a significant part considers heat as a period to enjoy. This combination between the beliefs that climate adaptation is a governmental task, heat is not a real danger and the frame in which Dutch people live where they are not used to deal with the problems of heat, makes it difficult for governmental entities to limit heat stress. It may take some time before dealing with heat is part of the daily (summer) routine of Dutch citizens.

Integral problem

Not only among citizens, also among the municipal government and policy makers heat is generally not considered as a problem. The integrality of the problem is not seen within most local governments (Appendix IV). Interviewees from the municipalities as well as the interviews that are standing on the knowledge spreading side of the network endorse this statement (Appendix I). Within most municipalities only a few committed individuals try to restrain the consequences of

(urban) warming (Runhaar et al., 2011), while these consequences have effect on a variety of municipal departments. As mentioned before, the surveys were filled out by people that were working on a diversity of domains. Differing from sewerage, health care, city development, public space, environment, climate adaptation and many more (Appendix IV). This shows that heat stress has influence across the integral organization, but within most municipalities the responsibility of tackling heat stress is accommodated at just one department. The other departments are not always aware that heat stress affects their work field. The civil servant from Meierijstad that was interviewed for example tells that he considers that the health care department is the problem owner of heat stress (Appendix I). For most municipalities the fact that heat stress has influence on the health of their inhabitants is the main reason to limit heat stress. The other reason is livability in a more general sense, just to make citizens and visitors feel comfortable during summer days. The health care sector is one of the main problem owners, but this sector is also mentioned as an important player that is missing in most heat stress debates (Appendix I). So the health care sector is an important problem owner, the task of limiting heat stress is mostly accommodated at one (sometimes even none) department, while the solutions have to be found across the integral municipal organization:

- Health care takers have to pay more attention to the vulnerable people during hot days
- The spatial development sector can create more green spaces
- The housing and construction sector can pay more attention to how heat proof their buildings are
- The local businesses want the city center to be attractive, even during a hot period
- The sewerage sector has to pay attention to heat stress solutions (such as planting trees) that can be implemented when work on the sewerage is planned
- Running projects to prevent loneliness among elderly people could be coupled to the problem of heat stress among vulnerable groups. These projects can help in reaching the lonely elderly people during hot periods and make them less vulnerable for heat.

The belief that heat stress is an integral task is absent in almost every municipality that is not one of the front runners and even in these front running municipalities heat stress has not a top priority. Runhaar et al. tell in a research on three Dutch front runner municipalities (Arnhem, Rotterdam and Tilburg) that *“Barriers that the three municipalities face regarding the implementation of measures are the lack of a sense of urgency on the part of politicians and citizens and budget constraints.”* (Runhaar, Mees, Wardekker, van der Sluijs & Driessen, 2012, p. 784). When this belief of urgency is only present in one municipal department, it is hard to convince other departments that are needed for an integral heat stress policy to invest in the necessary resources (money, knowledge and time).

4.5.1 The influence of beliefs

The beliefs have influence on the motivation of actors to take action. The beliefs that heat is not a problem, or not their problem provide a rationale for a lack of action. A rationale that can be described as that the persons that might take adaptation measures are not convinced that their adaptation measures are needed. Since they are not convinced that action on their side is needed, they are not motivated to take action. So, although certain *processes* might plea for adaptation measures, *beliefs* can have impact on the motivation of actors to take action. Without a general belief in the necessity to take action and without a belief in the benefits of certain measures, policy makers as well as citizens are less motivated to implement measures and are less committed to the case.

4.6 Rationales

The processes, frames and beliefs form the basis for rationales. Rationales for the development of adaptation policy, and rationales for a lack of adaptation policy. Finding these rationales means uncovering the underlying considerations that are made by the municipalities. Considerations about the nature of the system in which the adaptation interventions have to be made.

4.6.1 Framework of climate adaptation problems and rationales

Berkhout (2005) elaborates five problems with climate adaptation and five rationales that are the consequences of these problems in his framework of climate adaptation rationales. A broader general explanation of these problems and rationales is given in the theoretical framework paragraph of this research. In the current section will be discussed what the rationales are within adaptation to heat in the Netherlands and how they fit within the framework of Berkhout. Using this framework provides a manner to place the Dutch heat stress case in more general climate adaptation theory. Since heat stress is a new policy subject in the Netherlands it is interesting to investigate to what extent the underlying policy considerations differ from general climate adaptation rationales. The framework of problems and rationales helps in finding the relations between the previously described processes, frames and beliefs and the rationales. Thereby it is explained what the rationales are and how the processes, frames and beliefs lead to these rationales. Some of the rationales by Berkhout might be less relevant for the Dutch heat stress case, while on the other side some new rationales might come to the surface.

Inform the potentially vulnerable

The first problem Berkhout describes is that of the awareness of climate vulnerability. Not all vulnerable sectors and individuals are aware of their climate vulnerability. This forms a rationale for governments to inform the potentially vulnerable.

The previous sections about processes, framing and beliefs have shown that not all vulnerable groups and municipalities are aware of their vulnerability. Only 7% of all municipalities consider the impact of heat stress in their region as “major” or “very major” (Appendix IV). Heat preventing measures are sometimes considered as patronizing (Appendix I; Wuijts, Vros, Schets & Braks, 2014). Within most municipalities only one sector is to some extent responsible for heat stress policy, while affects a large variety of sectors. Most of these sectors are not aware of their vulnerability (Appendix I; Runhaar et al., 2011). The approach on the national scale is a bit contrary. The fact that there is a DPRA and a NAS that try to inform municipalities about the consequences of heat, accompanied by the KNMI scenarios and the Klimaateffectatlas, shows that one of the influential rationales is the need to inform the potential vulnerable. On the other side, the fact that heat stress is framed (also by the national government) as an urban problem, forms a logical rationale for a lack of heat stress policy in non-urban municipalities. The Klimaateffectatlas, based on the KNMI 2050 scenarios, shows that the non-urban municipalities will face more nights of heat stress than the urban municipalities face in the current climate. It would be logical that this forms a rationale to inform also the non-urban municipalities about their vulnerability. The opposite is happening, heat stress is framed as an urban problem. Although the last year there seems a slight change into a more broad approach, the focus on urban areas forms a rationale for action in urban municipalities, but forms a rationale for a lack of action in non-urban areas. A more broad approach could still form a rationale for measures in urban areas, but also means more awareness of the vulnerability of non-urban municipalities.

Awareness of possible measures

The next general problem in climate adaptation is the awareness of possible measures. Organizations are not aware of the solutions that could reduce their vulnerability. This composes a rationale for early warning and frequent updates of existing measures and policy. Berkhout assumes that most governments have *“in place plans, organizations and resources to weather-related disasters and to cope with the consequences at home and abroad”* (Berkhout, 2005, p.388).

It is arguable whether the Dutch (local) governments already have sufficient plans, organizations and resources. The national heat plan is the only broad scale instruments to inform the local governments, health care institutions and citizens. The survey showed that 4% of the Dutch municipalities have policy directed at preventing heat stress (Appendix IV). One of the main reasons for this lack of adaptation measures is the fact that heat stress is a new subject in the Dutch policy sphere. As a consequence, a significant part of the municipalities is not aware of their vulnerability and the risks of heat (first adaptation problem). The climate stress tests are the first step for municipalities to map their vulnerability. Two third of the municipalities have not yet finished a stress test and therefore first have to be aware of the risks before they can be aware of the possible measures. The municipalities that have finished a stress test indicate that they do not know where to start when it comes to the development and implementation of heat stress policy. Only a small group of front runner municipalities is actually aware of what measures suit their case (Appendix IV). This problem of awareness of possible measures therefore forms mainly a rationale for the national government and its organizations (DPRA, NAS) to inform the municipalities about the possible measures. The municipalities itself, where the problem of a lack of awareness and knowledge is located, give heat stress not enough priority to actually intensively try to collect knowledge about solutions. Some municipalities have not yet conducted a stress test and municipalities that have conducted a test only have one or just a few persons that to some extent are responsible for heat stress policy. The awareness of the impact heat can have on a broad scale of sectors is not present. Only the larger front runner municipalities have the awareness of the problem and the solutions and have enough resources to collect the knowledge. Smaller municipalities that sometimes are aware of the problem, lack the resources to intensively collect knowledge about solutions (Appendix I). It is mostly depending on individual efforts and interests. It seems that this approach is changing in the last year. The national heat congress is an example of how the national government more actively tries to inform the municipalities about the risks and the solutions. Nevertheless, it still depends on the interests of individuals. This interest might change further in the coming years, if the issue of heat stress gains more and more (policy) attention.

This makes heat in the Netherlands an interesting part of climate adaptation and of the rationales and problems Berkhout mentions. Berkhout assumes some sort of long term history and existence of a climate problem, while heat stress is a new issue in the Netherlands, that has slightly been gaining attention since 2003. The problems of awareness of vulnerability and solutions are therefore decisive for the formation of rationales for action and a lack of action.

Uncertainty about the impact of climate change and the impact of adaptation

The next problem Berkhout describes is the uncertainty about the impact of climate change and the benefits of adaptation. This provides a rationale for a lack of action. There has to be an incentive to adapt, especially for private actors. Investing in climate adaptation has public-good arguments, it is considered a governmental task. Nevertheless, the private sector has to be part of the process to make adaptation a success. The government has a task to regulate the missing sectors in the

adaptation process, to prevent under-investment by private actors as a consequence of uncertainty about the impact of climate change and the impact of adaptation (Berkhout, 2005).

The uncertainty about climate change and climate change predictions has decreased in the last ten to twenty years, but the uncertainty about the impact of heat is still present in the Netherlands. Municipalities address that they do not know what the effects of heat will be and when their policy is sufficient (Appendix IV). This could form a rationale for the national government to come up with a set of guidelines on how to deal with heat stress, but until now there is no such a general set of measures. Different organizations and institutions are trying to develop guidelines for a “climate proof city”¹³ (Klemm, Lenzholzer, & van den Brink, 2017), but these projects are still in a developing and examining phase. It is mostly up to the individual municipalities to develop their own approach, sometimes in cooperation with adjacent municipalities. Since there is no general approach, the development of policy depends on individual decisions and beliefs (Appendix I). If the responsible policy worker within a municipality is not convinced of the problems of heat stress, it logically lacks a heat stress policy in that area. The main approach by the national government is now to make municipalities, individuals and the private sector aware of the impact of heat, but it lacks regulation. As a consequence, several influential private sectors, such as the construction sector, are missing in the heat stress debate and the actual adaptation process (Appendix I). Berkhout (2005) emphasizes that these private players should have an incentive to adapt. Until now, this incentive is not present. Therefore, there is no rationale for private players and for non-convinced municipalities to adapt.

Adaptation spillovers

The fourth problem in the framework of Berkhout is that of adaptation spillovers. These spillovers can lead to under-investment in adaptation. This generates a rationale for policy and legal interventions.

Within the case of heat stress the vulnerable persons (elderly, young children, (mentally) ill persons) are depending on adaptation measures by others. Elderly people are depending on the amount of care takers that are available in the summer period, on measures that cool down their village or city and on measures that cool down the building they live in. The groups which health is at risk the most depend on the urgency among persons that are less vulnerable to heat to take adaptation measures. When asked in the survey what motivated the municipalities and its civil servants to take heat stress measures, three reasons are clearly mentioned the most: personal beliefs, the climate stress test and a concern for the citizens (Appendix IV). The first and third reason show how civil servants feel the responsibility to protect the vulnerable inhabitants. It is a governmental task to protect its citizens, but it is also an instrument to deal with under-investment. The fact that dealing with heat stress is not part of the daily business of the building industry, that the care sector is one of the missing sectors in the heat adaptation discussion and housing corporations are not intensively on a broad scale trying to make buildings heat proof, forms a rationale for governmental regulation. There are several reasons for this under-investment in heat stress measures by private actors, of which the most important reasons are two problems mentioned by Berkhout: *awareness of vulnerability and*

¹³ One can argue what the purpose is of framing these guidelines as guidelines for a “climate proof city”. Since the survey of this research and the interview with the policy worker from Meierijstad make clear that the smaller municipalities are more dealing with the problems of “not knowing where to start with policy development” and “not knowing when policy is sufficient” than the larger municipalities. A more general approach might be more appealing for those municipalities that can be considered as *laggards*, since mainly the non-urban municipalities are not that far when it comes to knowledge and policy development.

possible measures. Heat stress is a young policy subject in the Netherlands, it probably takes some time before the impact of heat is taken more seriously and will be part of the core business of private actors. Nevertheless, even when heat stress is getting more and more attention, there will always be the risk of adaptation spillovers and under-investment. Since the benefits of a measure are not always for the agent that makes the costs.

Another more practical example of a heat stress adaptation spillover is a consequence of the fact that heat mostly occurs during summer times. If citizens take adaptation measures when it is hot, they can for example take extra days off, hold a siesta, have special summer working times¹⁴ or go on holiday. This can have consequences for the vulnerable people that are depending on care takers, family and friends. The 2003 heat wave in France showed how the adaptation to heat by one group (health care takers), can lead to extra vulnerability and risks for another group (e.g. elderly people). Going on holiday during summer time can be seen as some sort of adaptation to heat. When it is hot people feel it is too warm to work and they want to enjoy what is called “nice weather”. While right during these hot periods in some sectors extra manpower is needed to protect the vulnerable people (Appendix I; Ogg, 2005).

Constraints on adaptation

The last adaptation problem mentioned by Berkhout is that of scarcity and constraints. Resources are not always held by the adapting agents, with constraints and scarcity as a consequence. The corresponding rationale is that governments have to take infrastructural measures when it comes to climate adaptation, this can lead to win-wins, but also to trade-offs.

Since resources are always limited decisions are made based on priority. The awareness of the problem of heat is in the most municipalities not high enough to give heat a top-priority (Appendix I; Appendix IV). The governmental department that is responsible for adapting to heat needs resources from other departments. These departments mostly do not feel the urgency to spend their resources on heat. Only in the front runner municipalities a broad approach is visible, where the consequences of heat are part in several departments. The “coincidental” case of Arnhem shows the importance of a high placed individual (city alderman) that is interested in the subject (Appendix I). Even with this interest it is still hard to gain enough resources. The lack of resources can be considered as an important argument for a lack of information and knowledge gathering in smaller municipalities.

The senior policy worker from the ministry and the NAS explains that some of the solutions have to be found in *system measures*. Measures that cannot be taken by a single municipality, but that are part of the general adaptation process. For example to what extent heat prevention is part of the education of young architects and city developers (Appendix I). The municipalities that want to adapt are to some extent depending on the knowledge and the leading discourse of how buildings are designed and cities are developed. The willingness to adapt can therefore be hindered by the leading approaches in the underlying systems of relevant actors.

4.6.2 Specific heat adaptation problems and rationales

The Dutch heat stress case enhances two adaptation problems and corresponding rationales that can be considered as an addition to the list of rationales by Berkhout:

¹⁴ In Dutch: “tropenrooster”

Heat is considered as something positive

In the Netherlands heat is generally considered as something positive. Contrary to other climate issues such as flooding or water problems is heat mainly not seen as a problem (Wolf, Adger, Lorenzoni, Abrahamson, & Raine, 2010). Adapting to heat is not part of the Dutch culture. When it is warm or hot Dutch people mostly want to enjoy the weather by going outside, sit on terraces and open the doors during daytime (Appendix I). The process of considering heat as a potential danger is too young to make it a general conception. This is not only the case among the Dutch citizens, but also among municipalities. The survey shows how the impact of heat is generally considered as limited (Appendix IV). This inescapably forms a rationale for a lack of adaptation. This problem and rationale can be placed before the first problem and rationale mentioned by Berkhout: inform the potentially vulnerable. In the Dutch heat stress case, the persons and institutions that have to inform the potentially vulnerable are not aware and convinced of the danger themselves. This makes it almost impossible to overcome the five problems mentioned by Berkhout. The national government (DPRA and NAS) is trying to accelerate this awareness-increasing-process by developing the climate stress tests, inform municipalities, sending information and by organizing knowledge exchange platforms. Therefore, one could say that the general Dutch approach of considering hot weather as something positive, forms a rationale for the national government to change this approach. They try to top-down inform the municipalities about the risks and it is up to the municipalities to take the actual local adaptation measures. The framing of heat stress as an urban problem has a positive effect on the larger municipalities, which now can be considered as the front runners in the Dutch heat adaptation sphere. This approach of framing is helpful when it comes to change the minds of those municipalities that are the most susceptible to heat and possess the most resources. To some extent these municipalities are the easiest to convince and therefore a logical starting point. Nevertheless, the framing of heat as an urban problem has had a negative effect on to what extent civil servants from smaller municipalities feel their municipality is vulnerable for heat. The general conviction that heat causes problems might have grown, but the urban-framing-approach caused a new adaptation problem: the non-urban municipalities are not convinced heat is a relevant issue for their area. It is considered as an urban problem. Since these municipalities have smaller resources than the larger municipalities (Korsten, 2015, p. 3) and heat is not a high priority (since they are not convinced it is a problem) (Runhaar et al., 2011), it is hard for those municipalities to collect knowledge about the impacts of heat and the possible measures. The development of heat stress policy in these municipalities is totally depending on the stress tests and to what extent individual policy makers are committed to the subject. Even when a committed policy maker is present, the adaptation problems by Berkhout still have to be overcome.

Regulations

Berkhout mentions the importance of regulation, but the influence of regulation within the heat stress case is of more influence than Berkhout elaborates. There are three important regulatory agreements: the climate stress tests that have to be executed at the end of 2019, the agreement that all governments have to act climate adaptive in 2020 and the treaty that in the year 2050 all built area is climate proof (Deltaprogramma 2018, 2017). The survey shows the importance of the climate stress tests. The agreement to fulfill a stress test forms a rationale for the municipalities to get in contact with heat and to map their vulnerability. The climate stress tests are the first important contact with the issue of heat stress. The impact of the other two agreements is not measured in the survey and it might be too early to do research on that influence. Nevertheless, the most influential agreement is the 2050 treaty to be totally climate proof. In order to fulfill this goal it is needed to act climate proof in 2020. To know what measures are needed to act climate proof, it is necessary to first map the local climate issues in the form of a climate stress test. The most important rationale in the

Dutch heat stress adaptation case therefore is the need, or maybe even the pressure, to adhere to the agreement. This agreement was needed since not only the vulnerable groups do not know they are vulnerable, also the civil servants that have to take the adaptation measures and inform the vulnerable groups, are not fully convinced of the problems heat can cause (Appendix I; Appendix IV; Runhaar et al., 2011). This is an inevitable consequence of the Dutch culture, in which citizens and policy makers are not used to deal with the risks of heat stress.

4.6.3 The influence of rationales

Rationales can be considered as the underlying reasons for certain actions. The rationales lead to the extent of cooperation of actors towards a certain issue. The conviction that the government needs to protect its citizens forms a rationale among the national government for the development of policy against heat stress.¹⁵ The conviction that it is a governmental task to protect vulnerable inhabitants is also present in municipal governments, but it is not a general conviction among integral municipal organizations that heat is one of the potential dangers for the citizens and it is not clear how policy should look like. This leads to differences in rationales between the national and the local government. Although the need to protect (vulnerable) citizens could form a rationale for policy development in both the national and local government, differences in knowledge development, resources and sense of urgency lead to different rationales for policy intervention. Subsequently, the extent of heat-stress-policy-development differs between national and local government and differs even between the variety of municipal governments. The differences in knowledge development, resources and sense of urgency can be declared by the *processes, frames and beliefs*. The difference in effect of these processes, frames and beliefs on local rationales for policy development are the consequence of local specific circumstances.

5. Conclusion

Within this concluding chapter the different sub questions are first answered, before answering the main research question:

To what extent is heat stress-knowledge diffused among Dutch municipalities and how is the translation of this knowledge into policy influenced by processes, frames, beliefs and rationales?

5.1 Sub question 1: what is the shape of the Dutch heat stress network?

When trying to define the shape of the network it is useful to place the Dutch heat stress network within the four types of policy networks by Bressers (1993) that were mentioned within the theoretical framework of this research. The different factors that influence the network and to what extent different actors are part of the network are discussed in the empirical part of this thesis. The framework of Bressers helps to draw conclusions on the findings in the empirical part, to tie the different findings together and make statements on the general shape of the network. By making a verdict on the *intertwinedness* and *connectedness* of the network, it is possible to determine how the Dutch heat stress network is shaped in comparison to other Dutch policy networks.

- The main indicator for *intertwinedness* is to what extent (semi)private organizations are involved with the policy making process, particularly by formal discussions and working structures. The visualized heat stress network shows the attendance of consultancy firms as

¹⁵ Examples of national policy against heat stress are the climate stress tests, the goal to make all Dutch municipalities climate proof and the existence of the DPRA and NAS.

a main (semi)private organization within in the network. Other sectors like the construction and health care sector are considered as important sectors that are missing within the network and within the policy making process. Another private group, citizens, consider climate adaptation generally as a governmental task. The only main private organizations that are generally involved within the policy development and knowledge spreading process are the consultancy firms. Therefore the network can be identified as a network with a low level of intertwinedness.

- *Connectedness* describes to what extent the policy goals of one actor are conforming to the policy goals of another actor. On a national scale within policy documents, adaptation projects, knowledge projects and general communication heat is framed as an urban problem. The framing of heat stress as an urban problem is not helpful when it comes to the stimulation of collecting knowledge and developing policy by all municipalities. On the one hand the climate stress tests and the agreement that all municipalities have to be climate proof implies that climate adaptation and heat stress are problems that are relevant for all municipalities, on the other hand the framing of heat stress as an urban problem forms a rationale for a lack of action by all municipalities that consider themselves not as urban. This approach is a sign of a low *connectedness*. Especially when taking the climate predictions of the KNMI into account, where even the rural municipalities will face more nights of heat stress than the largest cities face in the current situation. On a local scale, within the municipal organizations, heat is not integrally considered as a (potential) danger. While the measures against heat have to be taken in a variety of sectors, within most municipalities the issue of heat stress is only the responsibility of one sector. This implicates a low level of connectedness within the network.

Altogether the shape of the heat stress network can be considered as a network with a low level of *intertwinedness* and a low level of *connectedness*. It has to be mentioned that the high tempo in which heat stress is gaining attention could lead to higher levels of intertwinedness and connectedness in the (near) future.

Knowledge and policy development grouped

The low levels of intertwinedness and connectedness of the Dutch heat stress network are reflected in the level of knowledge and policy development. 90% of the municipalities does not consider their own heat stress knowledge as high or very high and only 4% of the municipalities developed policy directed at preventing heat stress. When it comes to the development of heat stress knowledge and policy the Dutch municipalities can be divided in four groups:

- **Group 1:** Municipalities that do not know heat stress is an issue. Nearly no heat stress knowledge and no policy is developed. (small group)
- **Group 2:** Municipalities that realize heat stress is an existing issue, but have not enough knowledge on the local problems of heat stress to actually develop policy. Mainly since a stress test is not yet conducted or no heat map is developed. (large group)
- **Group 3:** Local heat problem is clear and visual, but knowledge on further measures is not sufficient and only indirect policy is developed. (large group)
- **Group 4:** The frontrunners. The local issue is mapped and further steps are clear. Local administrative problems, communication and integral belief of the consequences of heat stress and the shared responsibilities sometimes prevent actual implementation of heat stress measures. (small group)

- **Group 5:** At this moment no Dutch municipality is part of the fifth group. Municipalities within this group have actually developed and implemented broad scale directed heat stress policy. Awareness of the risks and shared responsibilities are an integral part of the municipal policy. (no municipalities)

Only within the last group knowledge and available resources can be considered as sufficient. The execution of a stress test brings municipalities from group 2 to group 3. Before the stress test this progression was depending on local specific circumstances. The step from group 3 to group 4 is still depending on these local specific circumstances. Most municipalities have not enough knowledge on what further steps they need to take to deal with the outcomes of the stress test. Sometimes there are one or a few individual civil servants that possess this knowledge, but the awareness of the problem and the awareness of possible solutions have to be apparent among the integrality of the organization to implement measures, mainly because heat stress measures will generally be part of other measures. It is not reasonable to assume that in the Netherlands, where heat stress is a new phenomenon and awareness of the risks is not integrally present, heat stress will be leading in spatial development projects. Therefore the so called indirect measures are important: planting more or the right trees when doing infrastructural maintenance, make sure a new developed neighborhood is heat proof, couple heat prevention for vulnerable people (prevent dehydration) to projects against loneliness among elderly people, etcetera. For this policy approach of coupling and indirect policy a broad and integral sense of urgency has to be felt. A lack of sufficient knowledge and a sense of urgency are therefore the main obstacles in the development of policy.

5.2 Sub question 2: how are process, frames and beliefs influencing the processes of diffusion and translation?

The processes, frames and beliefs influence the diffusion and translation of knowledge. Several of these processes, frames and beliefs have been found and it has been discussed how they influence the diffusion and translation processes. In this conclusion section a general conclusion is drawn on how processes, frames and beliefs make agency and how they have influence.

Processes

Natural events like the heat waves of 2003 and 2006 can be considered as processes that draw attention on the (potential) danger of heat. The progressing believe in climate change and the predictions by the KNMI about the changing climate put the concept of adapting to heat on the policy agenda. The goal of the national government to make the Dutch municipalities climate proof led to the agreement that all municipalities have to execute a climate stress test. This test is an essential first factor in getting in touch with the local issue of heat stress and the first step in the development of knowledge. The executed stress tests do not lead to the development of directed heat stress policy on a large scale. The main reasons for this lack of policy development are the lack of sufficient knowledge and the lack of integral belief that heat is a serious danger. Since there are no guidelines or mandatory further steps that have to be followed when a stress test is executed, the actual development of policy depends on the local specific circumstances: individual interest, commitment, timing and available resources.

The other more general processes: urbanization and an ageing population, on the one hand make the potential impact of heat higher, but on the other hand lead to the fact that the construction sector (urbanization) and the health care sector (ageing population) have serious tasks that lead to a lower priority at these sectors of the implantation of heat stress measures.

Processes alone are not of enough influence to make agency in the diffusion and translation process. Without the company of the right frames and beliefs these processes have insufficient effect. Nevertheless, processes can lead to frames and beliefs that eventually strengthen the influence of the processes. Think about the processes of climate change, demographic ageing and stress test development. These processes influence the substance of the beliefs and frames that have influence on adapting actors. Processes are needed to create a sense of urgency, but without the right frames and beliefs, this sense of urgency will not be broadly felt and will not lead to rationales for policy development.

Frames

Frames enhance the processes by which issues, decisions, or events acquire different meanings from different perspectives (Dewulf, 2013, p. 322). Peter Hall (1993) described the influence of the social context in which political decisions and policy development take place. The frames that are discussed within this thesis are all based on one decisive factor: *the role of communication*. Communication on national and local scale, on macro and on micro level.

The communication on macro level, by the national government, is two sided and can be described as contradictory. On the one hand climate adaptation is framed as a subject that is a task for all municipalities, as is showed by the goal to make all municipalities climate proof and the climate stress test all municipalities have to execute. On the other hand the issue of heat stress is mainly framed as an urban problem, as is shown by the variety of projects and policy documents and the general communication in which constantly terms like *urban climate*, *stedelijk hitte eiland effect*, *de gezonde stad*, etc. are used. This communication leads to a logical frame within non-urban municipalities that heat stress is not their main priority. These macro level communication forms have influence on the micro level frames and therefore on the micro level translation of knowledge. It is shortsighted to conclude that a different communication on macro level would immediately lead to more heat stress policy on a micro level, since the municipalities in general believe they have not enough resources to collect all the necessary knowledge and develop sufficient policy. Nevertheless, the framing of heat as an urban problem does not contribute to a higher priority of heat stress within all municipalities that consider themselves not as urban. The gathering of knowledge and the translation of knowledge into policy is depending on the local specific circumstances, on the individual interests and commitment by local policy makers. The framing of heat as an urban issue is not conforming to the goal of policy makers on the macro level to create a general position of receptivity among all the municipalities. It shows how framing on macro level (sometimes maybe even unintentional framing) has influence on the translation of knowledge into policy on a micro level.

On a smaller scale the case of Almere shows how frames on micro level can even have influence on the frames of individuals that act within the same micro level. Although one can argue if the groups of individuals that are represented by the different political parties act within the same micro level.

Frames steer the direction of how and by whom knowledge is translated. The example of framing heat as an urban issue shows how this frame supports urban municipalities to develop policy, but actually demotivates non-urban municipalities in their heat stress policy development. Frames have influence on the sense of urgency and therefore on the motivation of different actors. So, although the process of an ageing population in rural areas might stimulate non-urban municipalities to take measures, the urban framing draws less attention to this issue and more to the urban heat island effect. It shows how frames can modify and nuance the direction of the influence of processes. This specifically has an effect on the rationales of actors. Frames influences the motivation of actors to

adapt and declare thereby (together with processes and beliefs) the substance of the rationales for adaptation action.

Beliefs

Three influential beliefs are found: the fact that citizens are of the opinion that climate adaptation is a governmental task, hot weather in the Netherlands is in general not considered as a potential danger and heat stress is not considered as a relevant issue among the integral municipal organizations.

The three described beliefs can be summarized in two words: *awareness* and *responsibility*. All the beliefs are the consequence of a low sense of urgency for the danger of heat (awareness) and differentiating opinions about who is responsible for adaptation policy (responsibility).

Goldstein and Keohane (1993) formulated three types of beliefs: *World views*, *principled beliefs* and *causal beliefs*. This framework helps identifying the beliefs. By demarcating them in the categories of Goldstein and Keohane it becomes more clear why the influence of the beliefs differs. The framework helps in emphasizing the importance of a shift in beliefs and declaring why a decisive policy shift has not yet occurred.

The belief among citizens that climate adaptation is a governmental task is a *principled belief*. The fact that heat is generally concerned as something positive, not as a potential danger can be considered as a *causal belief*: the belief that heat does not cause serious problems. Another influential *causal belief* is the fact that heat stress is not considered as a relevant issue among the integral municipal organization. This belief is about the awareness of what the potential risks of heat are and how certain measures have influence on this danger. A policy shift is most of the time the consequence of a shift in causal beliefs (Keohane and Goldstein, 1993). In the Dutch heat stress case a first small shift in causal beliefs (the 2003 and 2006 heat waves, accompanied with the KNMI 2050 predictions led to a small scale change of causal beliefs) led to the policy shift that is now occurring: rising attention to the negative effects of heat, thinking about the execution of climate stress tests, the national heat congress and projects on making cities heat proof. Nevertheless, broad scale change in causal beliefs has not yet occurred. As mentioned, within the most municipalities only one sector (sometimes even none) is trying to develop heat stress policy. The general belief is still that the consequences of heat are not that serious, or not the responsibility of the specific policy sector. Without a shift in this causal belief, the next policy shift will not occur. This policy shift would enhance the broad scale development and implementation of heat stress policy. Referring to the five groups of municipalities mentioned in paragraph 5.2, this would mean a progression from group 2 or 3 to group 4, or maybe even to a newly developed group 5.

The above described processes, frames and beliefs all have influence on the commitment of different actors within the network: knowledge senders and the adapting actors. The policy makers on national scale, as well as local committed individuals, try to create commitment among the policy makers on a micro level scale: the municipalities. The processes, frames and beliefs influence the commitment and thereby the way in which knowledge is translated. They form the ground for the rationales for the translation of knowledge into policy.

As shown, a shift in beliefs is necessary to create the right sense of urgency for the development of adaptation policy. Without the belief and the willingness to adapt, *processes* have not enough influence to create a policy shift. Beliefs are a necessary ground to provide rationales for policy development. The heat stress case has shown how the beliefs and the convictions of individual policy makers can have an effect on the local policy, but this research has also shown that without a general belief among citizens and policy makers, broad scale policy development will not take place.

5.3 Sub question 3: how are underlying rationales influencing the processes of diffusion and translation?

Different rationales are influencing the process of diffusion and translation. The rationales mentioned by Berkhout (2005) are all relevant for the Dutch heat stress case.

The main process that makes the Dutch heat stress case exclusive, at least exclusive within the Dutch adaptation policy sphere, is the fact that adapting to heat is not part of the Dutch nature and culture. It is not the general assumption that adapting to the potential dangers of heat is a necessity. This forms a rationale for a lack of policy development. Policy makers, as well as the citizens, are not convinced that adapting to heat needs to have a higher priority. This rationale forms the basis for all the rationales that are formulated by Berkhout (2005).

The rationales mainly provide an incentive for a lack of policy development in most municipalities. Only for the front runner municipalities and the knowledge spreaders at a higher governmental scale the rationales have a positive effect on the development of heat stress policy. In the municipalities that are not considered as front runners, these problems form only a rationale for knowledge diffusion and translation into policy for the policy worker that is personally committed to the subject. This individual, or small group of individuals, feels responsible for the local heat stress policy, but at the same time is realizing that without the support of the integral governmental organization sufficient heat stress policy is not possible. As long as the general concern is not that heat stress is a potential danger and integral knowledge on how to tackle heat stress is not sufficient, a variety of sectors will not be aware of the fact that adapting to heat is an issue that needs to be dealt with on an integral scale. As long as this awareness is not present, sectors that are needed to adapt will have a rationale for a lack of heat stress policy development.

The substance of the rationales is influenced by the different influences of *processes*, *frames* and *beliefs*. Where rationales have led to policy development, this was the consequence of the rationale of an individual policy maker. Until now most rationales lead to a lack of policy development, since a general sense of urgency among policy makers is not present. The change in *processes* (stress tests), *frames* and *beliefs* that is slowly starting to develop, might mean a change of rationales in the (near) future. Further research in the coming years can provide more insight in the changing motivations and considerations of a broader group of policy makers.

5.4 Research question: to what extent is heat stress-knowledge diffused among Dutch municipalities and how is the translation of this knowledge into policy influenced by processes, frames, beliefs and rationales?

The spreading of heat stress knowledge takes place within a young and developing network. A network that is constantly on the move and changing in its identity. More and more municipalities are becoming part of the network. Although they become part with the intention to collect knowledge, they unintentionally become knowledge developers and knowledge senders within the network. Especially within the heat stress case, that is a new policy subject, all actors that come to collect knowledge help in developing new knowledge and creating better insights.

Processes, *frames* and *beliefs* have influence on the shape of the *rationales* that lead to policy development or to a lack of policy development. The general common thread among all these processes, frames, beliefs and rationales is that adapting to heat is a new policy subject in the Netherlands. Therefore the knowledge within municipalities about the concept is low and policy makers are not integrally convinced that heat is a potential danger, let alone what the right measures

would be to tackle the eventual dangers. This first contact with the local heat stress issue was depending on local specific circumstances: individual interests and commitment, resources and timing. The stress test is taking this dependency on local specific circumstances within the first contact with the issue of heat stress away. All municipalities will get in touch with the local heat stress issue. Hereby we can conclude that a fifth transformation moment has occurred in the Dutch heat stress adaptation process. Boezeman and Kooij (2015) noticed four transformation moments. The last transformation moment as observed by Boezeman and Kooij, is what they call the attempts that were made to transform the normative elements of the object of urban warming into an object of risk. This transformation can be seen as the attempt to solve the issues that were responsible for the lack of success of the second and third transformation. The climate stress tests can be considered as a form of these attempts, but it is more than an attempt, it appears to be the first instrument that makes all municipalities get in touch with the local risks of heat stress. It is the first method that takes away the dependency of local specific circumstances in the first contact with heat stress and can therefore be considered as a fifth moment of transformation in the Dutch heat stress policy development.

Nevertheless, the dependency on local specific circumstances is still present when it comes to the actual development of heat stress policy, since there are no further steps that need to be followed when a stress test is executed. There is no action perspective. Within the smaller municipalities there is mostly just one policy sector (sometimes even none) that tries to stimulate heat stress policy development, while the measures that have to be taken have influence on a variety of policy sectors. The framing of heat stress as an urban problem is not contributing to the development of awareness of the risks of heat stress. It provides an incentive for a lack of willingness to develop heat stress policy among the municipalities that consider themselves not as urban. While climate change predictions show that the amount of overheated nights in 2050 in non-urban municipalities will be higher than the amount of overheated nights in the largest Dutch cities in the current situation. The process of urbanization will only intensify the effects of heat, since almost all Dutch municipalities will have to build more houses. As long as the general consideration is not that heat is a potential danger, broad scale heat stress measures will not be developed. With general consideration not only the climate adaptation policy makers are meant, but the integral municipal policy development, since heat stress measures have influence on a variety of sectors. As long as a shift in causal beliefs does not occur, it is hard to expect an intensive policy shift.

The *frames* and *beliefs* have influence on the sense of urgency and willingness to adapt. As a consequence of *frames* and *beliefs*, the same *processes* lead different *rationales* and subsequently to differences in policy development between municipalities.

6. Recommendations

The research has led to a couple of recommendations. Recommendations for further research as well as societal recommendations that can be used in the development of policy.

6.1 Recommendations for further research

First of all it is useful to repeat the survey among the Dutch municipalities within two to five years. If the outcomes of that survey are compared with the outcomes of this research, interesting things will come to the surface. At that time all stress tests have to be finished. This will give more insight in the influence the stress tests will have at the development of heat stress policy.

Within this research a fifth moment of transformation is added to the four transformation moments in the Dutch heat stress case as formulated by Boezeman and Kooij (2015). It would be interesting to do research on how the next step in the policy development takes place and what the sixth moment of transformation will be. It is inevitable that if heat stress measures will be part of the Dutch (municipal) policy on a large scale, a sixth transformation moment occurs. This transformation would include more general steps following upon the outcomes of the survey and actual broad scale policy implementation. Until now the policy development is depending on local specific circumstances. An instrument or approach that takes this dependency away would be an influential event that has to be considered as next moment of transformation in the development of Dutch heat stress policy. Further research on what the exact nature of the next transformation moment will be, would be an interesting addition to this research and the research done by Boezeman and Kooij (2015).

In general it would be interesting to do more research on climate adaptation issues that are not integrally considered as potential danger. In this time of climate change it is interesting to see how new climate issues pop up in societies. Issues that were not considered as a problem not long ago. This could bring other influential rationales to the surface. The Dutch heat stress case showed how the fact that hot weather is more considered as something positive than as something negative has influence on the motivation to develop policy. It is useful to do further research on how a weather related phenomenon develops in a short period from an event that is within society considered as pleasant, to a live threatening policy subject. The knowledge and awareness gaps that occur in this rapidly developing policy issue lead to interesting processes that are asking for further on the development of these processes in different countries and over a longer period of time.

6.2 Policy recommendations

The stress tests take the dependency on local specific circumstances away when it comes to the first contact with the local heat stress issue. The next step, the actual development of heat stress policy, is still depending on these local specific circumstances. Since heat stress solutions enhance a variety of policy sectors, the development of some sort of general structure would be a useful instrument for municipalities to work with. For example a set of guidelines on how to develop a healthy and climate proof environment.

Two of the important policy sectors that are missing in the heat stress network are the construction sector and the health care sector. Although the NAS and DPRA are aware of this, it is still recommended to try to stimulate these sectors to be more part of the heat stress network. Heat stress can be tackled within three locations: the public area, buildings and the health care sector (Appendix I). For a broad scale heat stress approach the building and health care sector need to be part of the policy development process, until now most measures are aimed at the public area. A focus that pays more attention to the health care sector could help the non-urban in municipalities in how their policy should look like.

It is necessary to be aware of the influence of framing, specifically the framing of heat as an urban problem. Although the name of *the national heat congress* deliberately did not include the word *urban*, the general approach is to communicate heat as an urban issue. To prevent that all municipalities that do not consider themselves as urban do not feel the need to develop policy, it would be useful to stop framing heat as an urban problem. For instance it could be framed as a general concern for public health, comfort, livability and productivity. With a focus more on *heat stress* in general and less on the *urban heat island effect*. This could also lead to a different approach in heat stress measures between urban- and non-urban municipalities. Urban municipalities might

better focus on limiting the warming effect of the city (UHI). While this warming effect is less relevant for non-urban municipalities. There the focus could be more on the health care sector, especially in municipalities with an ageing population, and on creating an environment that is pleasant and livable, even during the hottest days of the summer.

On a municipal level, it could be useful to communicate heat stress in a different way. Especially when policy development is getting resistance from within the municipal organization or from the citizens, it would be useful to learn from the Almere case. Stop with framing measures only aimed at limiting heat and start with framing it as the development of a healthy, pleasant and livable environment. Since the consequences of heat are not always visible, this approach could turn out to make it easier to implement heat stress measures in running projects.

7. Limitations of the study

Every research has its limitations, as is the case with this research. One of the limitations is located in the survey. Since heat stress is a new policy subject and not all municipalities have a policy worker that is familiar with heat stress, the reliability of the answers given differs. Therefore the answers of the survey that are given are not meant to draw conclusions on individual municipalities. Although the surveys are filled out by the policy workers that are the most familiar with heat stress in the municipality, it is not useful to compare the outcomes of municipality A with municipality B. Mainly when it comes to the more in-depth survey questions, on how knowledge is received and why policy is not developed, the given answers have to be considered as answers given by an individual policy maker. Nevertheless, all the answers together form an interesting and useful overview of the Dutch heat stress case. The survey is well suited for general conclusions and comparison between groups of municipalities, but is not the best instrument to draw conclusions on individual municipalities.

The survey question about the way in which heat stress measures are part of the local policy would be better when other answer options were given. Within this thesis the options were *directly*, *indirectly* or *not*. Especially the group *indirectly* is too large. Since there are many sorts of indirectly policy, the types of policy within this group are too much divergent. It would have been better to reformulate the question and give other answer options. For example: *to what extent are heat stress measures part of the local policy? Answer options: very low, low, not high/not low, high, very high*. This would have given more nuance to the types of policy that are developed.

A triangular method is used in this research. It was sometimes hard to find the right policy documents to complement the survey and interview results. Since heat stress is a new policy issue that in some municipalities is no policy issue at all, relevant documents are hard to find. If no policy documents on heat stress in a certain municipality can be found, this might imply that no policy is developed or even no policy recommendations have been made. Nevertheless, the fact that they cannot be found does not always mean that they do not exist. Even if they actually do not exist, informal encounters between civil servants in which heat stress has been discussed can still have taken place. Therefore it is hard to define to what extent a municipality that has not developed any sort of heat stress policy, indirectly is paying more attention to heat stress than can be proven with policy documents. A more in-depth case study on these municipalities that have no heat stress policy at all could provide better insight in their considerations.

The fact that heat stress is framed as an urban problem is clear and that there are differences in knowledge gathering and policy development between urban- and non-urban municipalities is also clear. To what extent this urban framing can be justified is more arguable. In this thesis several arguments are given for a more broad approach of framing, aimed at all municipalities that face heat

stress. Other researchers or policy makers might be of opinion that an urban focus is the right focus and might be able to provide strong arguments for this focus. Nevertheless, it is sometimes very valuable and useful to go against the general stream when you think it is needed. The criticism on the urban framing might be a bit misplaced in a “results” section, but since the survey results showed clear differences between urban- and non-urban municipalities and the fact of urban framing became clear during the interviews and the analysis of documents, it was considered as most powerful to place the arguments for a broader focus directly after the survey results that proved the differences in knowledge- and policy development.

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Appendix I. Interview transcripts

The interview transcripts can be consulted in the attached file.

Appendix II. Interview codes

The codebook that includes the used interview codes can be consulted in the attached file

Appendix III. Survey questions

Hittestress Nederlandse gemeenten

Start of Block: Default Question Block

Q20 Fijn dat u 10 minuten van uw tijd vrij wilt maken om deze korte vragenlijst in te vullen. De enquête is onderdeel van mijn masterscriptie voor de studie Sociale Geografie aan de Radboud Universiteit.

Het onderzoek richt zich op de vraag hoe de kennis over hittestress wordt omgezet in beleid (hittestress staat ook wel bekend als het hitte-eiland effect, of urban heat island).

Hittestress is een relatief nieuw klimaatvraagstuk dat langzaam aan steeds meer aandacht krijgt in de Nederlandse beleids wereld. Er zijn nu nog aanzienlijke verschillen tussen gemeenten in de mate waarin hittestress onderdeel is van het beleid. Mijn interesse gaat vooral uit naar het verklaren van deze verschillen. Welke oorzaken liggen er ten grondslag aan deze verschillen? Het antwoord op deze vraag kan een bijdrage leveren aan het aanpakken van het probleem op de langere termijn.

Met het beantwoorden van de vragen uit deze enquête geeft u mij zeer nuttig inzicht in hoeverre gemeenten hittestress al dan niet als een probleem zien en hier beleid voor hebben ontwikkeld, of gaan ontwikkelen. Dit vormt een belangrijke basis voor het onderzoek. Gemeenten die de enquête invullen worden, indien gewenst, op de hoogte gehouden van de uitkomsten. Dus wellicht doet u ook weer nieuwe ideeën op.

Alvast bedankt!

Page Break

Q1 Voor welke gemeente bent u werkzaam?

Q2 Wat is van toepassing op uw gemeente?

- Er is nog geen klimaatstresstest uitgevoerd (1)
- We zijn momenteel bezig met het uitvoeren van een klimaatstresstest (2)
- Er is al een klimaatstresstest uitgevoerd (3)

Display This Question:

If Wat is van toepassing op uw gemeente? = Er is nog geen klimaatstresstest uitgevoerd

Q27 Waarom heeft u nog geen klimaatstresstest uitgevoerd? (meerdere antwoorden mogelijk)

- Er is geen budget voor beschikbaar (1)
- De kennis ontbreekt (2)
- Het heeft (nog) geen prioriteit (3)
- We zijn nog niet benaderd door partijen om de test uit te voeren (4)
- Anders, namelijk: (5) _____

Q3 Hoe zou u de mate van kennis binnen uw gemeente over hittestress omschrijven?

- Zeer hoog (1)
 - Hoog (2)
 - Niet hoog, niet laag (3)
 - Laag (4)
 - Zeer laag (5)
-

Q7 Hoe is de gemeente aan kennis over hittestress gekomen? (meerdere antwoorden mogelijk)

- Andere gemeente(n) (1)
 - De provincie (2)
 - Ministerie van Infrastructuur & Waterstaat (3)
 - Deltaprogramma Ruimtelijke Adaptatie (4)
 - Nationale Adaptatie Strategie (11)
 - Waterschap (5)
 - Rijkswaterstaat (6)
 - Adviesbureau/consultant (7)
 - Wetenschappers/universiteiten (8)
 - Niet (9)
 - Anders, namelijk (10) _____
-

Display This Question:

If Hoe zou u de mate van kennis binnen uw gemeente over hittestress omschrijven? != Zeer laag

And Hoe zou u de mate van kennis binnen uw gemeente over hittestress omschrijven? != Laag

Q19 In welke mate verspreidt de gemeente zelf actief kennis over hittestress onder andere gemeenten?

- Zeer hoge mate (1)
 - Hoge mate (2)
 - Niet in hoge, niet in lage mate (3)
 - Lage mate (4)
 - Zeer lage mate (5)
-

Q4 Hoe zou u de mate van hittestress binnen uw gemeente omschrijven?

- Zeer ingrijpend (1)
 - Ingrijpend (2)
 - Niet ingrijpend, niet beperkt (3)
 - Beperkt (4)
 - Zeer beperkt (5)
 - Weet ik niet (6)
-

Q5 Op wat voor manier zijn maatregelen tegen hittestress binnen de gemeente onderdeel van het beleid?

- Als gericht beleid (1)
- Als meekoppelkans bij overige projecten (2)
- Niet (3)

Display This Question:

If Op wat voor manier zijn maatregelen tegen hittestress binnen de gemeente onderdeel van het beleid? = Niet

Q9 Waarom zijn maatregelen tegen hittestress geen onderdeel van het beleid? (meerdere antwoorden mogelijk)

- In onze gemeente is het geen relevant probleem (1)
- We weten/wisten niet van het bestaan van het fenomeen hittestress (2)
- De kennis over mogelijke maatregelen ontbreekt (3)
- Het heeft geen financiële prioriteit (4)
- Het vertrouwen in de klimaatvoorspellingen ontbreekt (5)
- Er is geen draagvlak onder de bevolking (6)
- Anders, namelijk (7) _____

Page Break

Display This Question:

If Op wat voor manier zijn maatregelen tegen hittestress binnen de gemeente onderdeel van het beleid? != Niet

Q18 Op wat voor manier uit het beleid tegen hittestress zich? (meerdere antwoorden mogelijk)

- In de hoeveelheid groen in de gemeente (1)
- In de aanleg van waterpartijen (2)
- In de bouwsector (materiaalgebruik) (3)
- In de aanleg van groene daken (4)
- In de morfologie van de gemeente (de stedenbouwkundige wijze waarop de gemeente is ingericht) (5)
- In de hoogte van de bebouwing (7)
- In de breedte van de straten (8)
- Anders, namelijk (6) _____

Display This Question:

If Op wat voor manier zijn maatregelen tegen hittestress binnen de gemeente onderdeel van het beleid? != Niet

Q22 Hoe is de gemeente gestimuleerd om beleid te ontwikkelen? (meerdere antwoorden mogelijk)

Door persoonlijke overtuiging van de beleidsmakers (3)

Door het uitvoeren van een klimaatstresstest (4)

Uit zorg voor de inwoners (5)

Door maatschappelijke behoefte vanuit de bevolking (6)

Door een specifiek persoon, namelijk (naam of functie): (1)

Door een specifieke organisatie, namelijk (naam of type): (2)

Anders, namelijk (7) _____

Display This Question:

If Op wat voor manier zijn maatregelen tegen hittestress binnen de gemeente onderdeel van het beleid? != Niet

Q19 Wordt er rekening gehouden met hittestress in het plaatsen van voorzieningen voor kwetsbare groepen?

Ja (1)

Nee (2)

Display This Question:

If Wordt er rekening gehouden met hittestress in het plaatsen van voorzieningen voor kwetsbare groepen? = Ja

Q20 Bij welke voorzieningen wordt er rekening gehouden met hittestress? (meerdere antwoorden mogelijk)

- Bejaarden- en verzorgingstehuizen (1)
- Medische instellingen (2)
- Psychische zorginstellingen (5)
- Kinderopvang (4)
- Sociale woningbouw (3)
- Scholen (6)
- Winkelgebieden (7)
- Kantorencomplexen (8)
- Anders, namelijk: (9) _____

Page Break

Q11

Hittestress kan verschillende gevolgen hebben. Zo kan het leiden tot verminderde (arbeids)productiviteit van de inwoners uit de gemeente en een hoger sterftcijfer tijdens warme periodes.

Sommige van deze gevolgen zullen voor uw gemeente wel aanvaardbaar zijn en andere niet. Geef daarom bij de volgende vragen per consequentie aan of dit voor uw gemeente aanvaardbaar of onaanvaardbaar is.

Page Break

Q23 Geef per rij aan of u het aantal dagen per jaar waarop de productiviteit van inwoners uit uw gemeente verminderd is als gevolg van hittestress, aanvaardbaar of onaanvaardbaar zou vinden. Als u deze vraag niet kunt beantwoorden kunt u deze overslaan.

	Aanvaardbaar (1)	Onaanvaardbaar (2)
1-7 dagen per jaar verminderde productiviteit (1)	<input type="radio"/>	<input type="radio"/>
8-14 dagen per jaar verminderde productiviteit (2)	<input type="radio"/>	<input type="radio"/>
15-21 dagen per jaar verminderde productiviteit (3)	<input type="radio"/>	<input type="radio"/>
22-28 dagen per jaar verminderde productiviteit (4)	<input type="radio"/>	<input type="radio"/>
Meer dan 28 dagen per jaar verminderde productiviteit (5)	<input type="radio"/>	<input type="radio"/>

Q24 Geef per rij aan of u het percentage mensen dat er extra sterft in uw gemeente tijdens een hete periode aanvaardbaar of onaanvaardbaar zou vinden. (Voorbeeld: Normaal sterven er in augustus 100 mensen in uw gemeente, tijdens een hete maand stijgt dit aantal naar 110; 10% extra sterfte) Als u deze vraag niet kunt beantwoorden kunt u deze overslaan.

	Aanvaardbaar (1)	Onaanvaardbaar (2)
1-5% extra sterfte (1)	<input type="radio"/>	<input type="radio"/>
6-10% extra sterfte (2)	<input type="radio"/>	<input type="radio"/>
11-15% extra sterfte (3)	<input type="radio"/>	<input type="radio"/>
16-20% extra sterfte (4)	<input type="radio"/>	<input type="radio"/>
Meer dan 20% extra sterfte (5)	<input type="radio"/>	<input type="radio"/>

Page Break

Q26 Bent u geïnteresseerd in een kennis- en discussiebijeenkomst met andere gemeenten over hittestress?

Ja, ik ben geïnteresseerd! (vul dan uw e-mailadres in) (1)

Nee, bedankt. (2)

Page Break

Q17 Bedankt dat u de tijd heeft genomen om de enquête in te vullen!

Voor vragen en/of opmerkingen over deze enquête of mijn onderzoek kunt u contact opnemen via leon.heger@student.ru.nl

Q18 Indien u op de hoogte wilt blijven van de resultaten uit het onderzoek kunt u hieronder uw e-mailadres achterlaten.

End of Block: Default Question Block

Developed with the usage of Qualtrics Survey Software

Appendix IV. Survey results

The results of the survey per municipality can be consulted in the attached file.