

Information about the usage of information

– and its role in municipal work with climate adaptation

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Abstract

This study has looked at eight municipalities in Scania and how they use climate related information in their work with climate adaptation, and what information they would like to have access to in order to take the next step. The municipalities were chosen on the basis of population and are no extreme cases; rather they are examples of an average Swedish municipality. How the usage of information looked like in the different municipalities were identified by interviewing people working with these questions. Overall the usage of information does not differ that much between the municipalities. They use to large extent the same material and the same providers of information consisting for instance of the County Administrative Board, the Swedish Meteorological and Hydrological Institute (SMHI), and the experiences from other municipalities in both Sweden and abroad. There are some local differences, likely depending on the geographical and political situation of the municipalities. Information is not the main contributor for measures taken but is not regarded as an obstacle either. Actions tend to be reactive, indicating that experiences to some form of extreme event are more important than information about proactive measures when it comes to implementing measures. Obstacles for implementation can be aspects regarding the financial, legal and/or organisational situation of the municipality. The information that the municipalities want access to, mainly involves examples from other municipalities to get an understanding of what works and what does not. Other wishes involved for instance more resources and updated legislations.

Keywords: information, climate adaptation, municipality

“Information is a source of learning. But unless it is organized, processed, and available to the right people in a format for decision, it is a burden not a benefit”

William Pollard

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Chapter 1 – Introduction

In this chapter you will be introduced to the study. The research questions and demarcation will be presented together with an outline of this report.

1. Introduction

I have, several times during my education, encountered what has been called the linearity problem. This is the problem that emerges when you assume that a relationship between two factors is linear when in fact it is not. This in my experience results in oversimplifications of the topic and causes you to miss aspects of the bigger picture. In some cases there is a clear linear relation between cause and effect, for example; the harder you hit a ball the longer it will fly. In other situations there is no linearity, like for instance between the time that you study and the amount that you learn. You can study for hours and not learn anything and you can quickly look at a new concept and understand everything instantly.

With this in mind I started to think about information and especially information regarding climate change and what role information about this topic plays in our society. The understanding of the challenges we are facing, have risen over the years and now the data indicate that we have a global warming which also is most likely caused by human activities (IPCC, 2013). In what way has this information affected our society? Has more information led to more actions? Has the experience gathered from different climate catastrophes been used by others in their work of making our societies more resilient? Do we have a form of linear relationship here between the amount of information and measures taken, indicating that in order to do more, you need access to more information? From these kinds of initial reflections I started designing the outline of this study and how it in some way could contribute to the growing body of research dealing with climate related information and the communication of it (Amundsen, et al., 2010; Archie, et al., 2014; McNie, 2007; Measham, et al., 2011; Naustdalslid, 2011).

Climate change is in many ways a global problem and the effects will be felt at all levels. Sweden for instance is likely to experience more heavy precipitation which will lead to problems with floods. Also a rising in sea level is thought to affect coastal regions in southern Sweden and the general rise in temperature is expected to have impact on, for example, both agriculture and forestry (SMHI, 2015, p. 37).

Climate adaptation is necessary to handle all these expected (and unexpected) local challenges. I was interested in a local approach and in Sweden the municipalities have the responsibility to make plans and take adaptation measures for a changing climate (Plan- och bygglagen, 2010:2, 3 §). This made me interested to focus on municipalities and to consider the role information plays in the work of a municipality.

A survey presented in 2011 by the Swedish Association of Local Authorities and Regions revealed that of the 180 municipalities who participated, few had access to all the material they needed (for example flood maps or height data) to be able to make climate related decisions in the planning process (Sveriges Kommuner och Landsting, 2011, p. 15). Some municipalities had all they needed and others had some of what they needed. The result also indicated that it is important that the material used by the municipalities are locally adapted and presented in a way, making it easy to use and understand (Sveriges Kommuner och Landsting, 2011, pp. 15, 21). Having access to information that are presented with the user perspective in mind, are thought to be an important step to better deal with climate-related risks and the concept of climate services, which have received a lot of attention in recent years, might be one way to do this (Vaughan & Dessai, 2014, p. 588). Climate services have different definitions and one of them is that:

“A climate service is a process of developing and delivering climate information in such a way as to meet a user’s need” (World Meteorological Organisation, 2011, p. 37)

Before developing climate information, one has to know what kinds of climate information that are in need of being developed. Combine this with the adaptation responsibility of the municipalities and I therefore, in this study, ask a couple of municipalities in Sweden, what information they want to have and study how they use information in their work with climate adaptation. By analysing the usage of climate information and how it differs, I hope to find a small piece of the puzzle on what role information plays in the daily climate work of a municipality. By doing this I also hope to provide an indication of what kinds of information are in need of development to improve our capacity to handle climate-related risks.

1.1 Purpose and research questions

The main purpose of this study is to investigate how municipalities use climate related information. By also investigating the difference between them and what information the municipalities want to have I hope to find an indication of what may be missing and needs to be developed in order for the municipalities to improve their work with climate adaptation.

I investigate this by asking the questions:

- How do municipalities use climate related information in their work with climate adaptation?
- What sort of climate information do the municipalities want access to in order to improve their work with climate adaptation?
 - Why do they want that information?
 - How would they like it to be presented?

1.2 Outline, definitions, demarcations

The report is structured in the following way where this chapter is an introduction and presents the research questions, demarcations and definitions. The following chapters then present the method used (chapter 2), how the material has been analysed (chapter 3), the result of the report (chapter 4) and a discussion over the findings (chapter 5) before a conclusions of the study (chapter 6).

In my research questions I mention climate related information, an expression that I am using throughout this report. In this study it means all kinds of information that can help a municipality with their climate adaptation. Climate adaptation is defined by IPCC as:

“The process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects.” (IPCC, 2014, p.5)

Climate related information in this study refers therefore to local or regional climate models, flood predictions, different reports with useful knowledge and information, mapping of urban heat islands or really anything that in some way can help a municipality with their work with climate adaptation.

Why I have chosen to make the demarcation to only look at adaptation is partly due to my interest in the local challenges and partly because it might be easier to translate information into concrete actions when dealing with adaptation instead of mitigation (Rayner, 2010, p. 617). Climate change can in some cases be

regarded as a modern environmental problem as opposed to the more traditional ones (Naustdalslid, 2011, p. 246). The more traditional problems, like toxic pollution from a factory, were more visible to the local environment and were also more linked in time and space; those who caused the problem were also those who had to suffer the consequences. Climate change on the other hand is not clearly visible and the cause and effect are not linked in time and space in the same way which makes it harder to grasp as a problem. Because of this, measures related to climate adaptation are thought to easier be implemented than measures aimed at mitigation since adaptation measures are similar to the traditional environmental problems (Naustdalslid, 2011, p. 244).

Chapter 2 – Methodology

This chapter explains what I have done, my working process, how I have answered my questions, what choices have been made as well as an explanation of why these choices have been made.

2. Methodology

2.1 Multiple case study

I have chosen to investigate my questions by doing a multiple case study. This is because a case study is a good method to use in an investigation when a “how” question is to be answered (Yin, 2009, p. 10). It is a method that is widely used and is an exhaustive method in that it might reveal things that other approaches would not be able to catch, but it is also a method criticized for lacking rigour and objectivity (Rowley, 2002, p. 16). There are countless different ways that one can answer a research question and every method has its advantages and disadvantages.

There are advantages by looking at one case since one can focus on a unique or critical or extreme case in great detail. One of the disadvantages though is the difficulty to put these cases into a larger perspective, which is easier when studying multiple cases (Baxter & Jack, 2008, p. 550). In a multiple case study one analyses several cases in order to understand similarities and differences. I quickly realized that if I were to only look at one municipality I might get a good feeling on how that municipality works but would not be able to tell anything about the larger perspective. I deduced that I needed more than one case and decided therefore to do a multiple case study analysis. The general thinking behind the method is not that different from an ordinary case study. Since more than one case is studied, the generalizability is, however positively affected (Greene & David, 1984, p. 78) but since I only look at 8 municipalities (see section 2.2) I will not be able to generalize my result anyway. Due to this qualitative approach I am only able to provide an initial understanding of what kinds of information being used and sketch the outline of any possible patterns.

Other alternative methods that I considered were for instance a more quantitative study with different kinds of surveys but since climate information can be classified as a complex subject I decided to perform interviews instead. Interviews can be regarded to be more suitable than surveys since you then get a better contact with the respondent resulting in a more accurate result (Esaiaasson, et al., 2007, p. 258ff). I also received a recommendation from a person working with different municipalities, to perform interviews instead of a survey for two different reasons: 1) municipalities tend to get plenty of requests to participate in different studies, leading to an inability to participate in all of them, and 2) the common ability to mix up mitigation and adaptation measures which could lead to misunderstandings when answering questions in a survey (Borgström, 2015). A survey might have been preferable if I only wanted to know what kinds of information that the municipalities wanted to have but since I also wanted to investigate what the situation looks like I deduced that a more qualitative approach with interviews would serve me better since I then reduce the risk of misunderstandings. There are disadvantages with interviews as well, such as the interviewer effect where the person doing the interview unconsciously with gestures or emphasizing on certain words, might affect the respondent and in that way influence the result (Esaiaasson, et al., 2007, p. 265).

To analyse my results and the information I acquire from the municipalities I constructed some analytical questions. In multiple case studies you can use propositions (Greene & David, 1984, p. 77) or issues (Stake, 2006, p. 10f), in order to help with the cross-site analysis and this worked as an inspiration for me. I formulated three analytical questions and these are questions I ask the material I have gathered in order

to find the underlying pattern and ultimately answer the main research questions of this study. How it all fits together can be illustrated by figure 1 below. More information about this analytical approach is discussed more in depth in chapter 3.

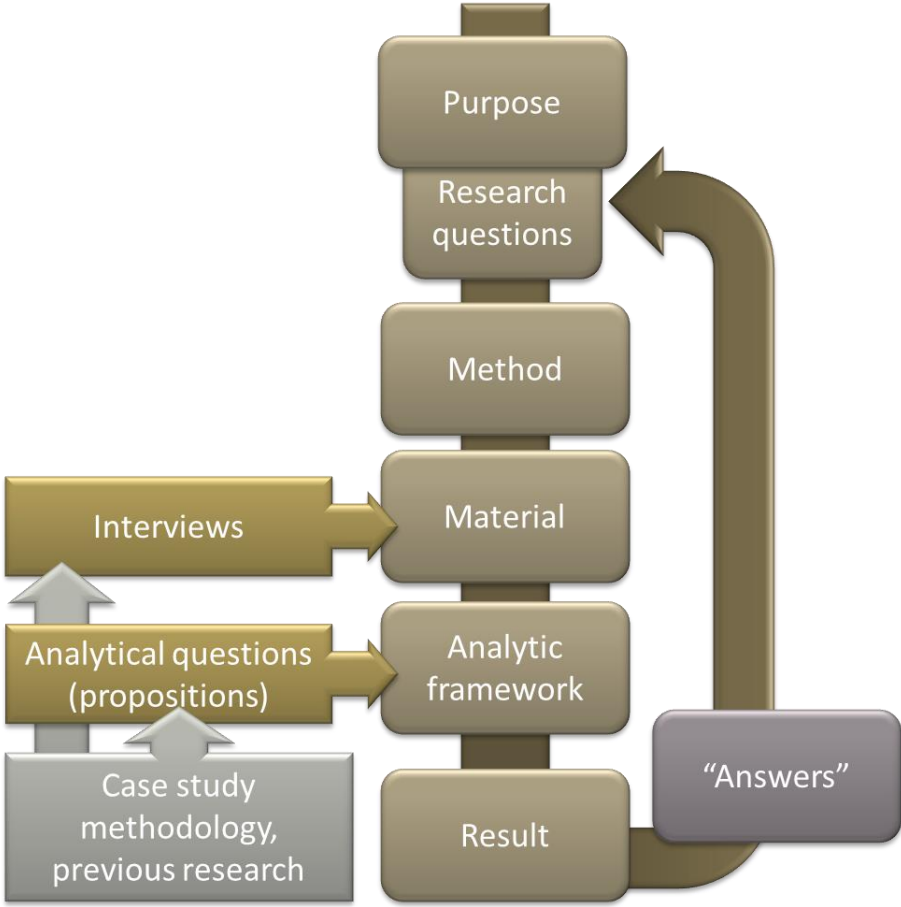


Figure 1: The relationship between the different parts of the study.

2.2 Sample selection

In a qualitative multiple case study, one usually chooses between 4 and 10 cases since too few do not give enough information and 15 – 30 cases provide more information than what is feasible to handle (Stake, 2006, p. 22f; Eisenhardt, 1989, p. 545). You also need diversity between the cases, which means that I need both municipalities that have progressed their work and those who yet have not made it as far. Every municipality has different abilities when it comes to the work related to climate adaptation. Some have done more than others (Sveriges Kommuner och Landsting, 2014) and in general the larger municipalities tend to have a wider approach to their climate work (Sveriges Kommuner och Landsting, 2007). In order to assess how far a municipality has made it, I used the municipal ranking from 2014 performed by Miljöaktuellt (Miljöaktuellt, 2014a). This allowed me to get a basic indication to which municipalities have made it further than others with climate related work.

Since there is a difference between large and small municipalities when it comes to available resources that can be allocated on climate adaptation I decided to look at an average municipality to make my comparison. By doing this demarcation, I realise that I lose the ability to generalize my results to large and small municipalities. On the other hand, by focusing on a group of municipalities that have similar

conditions when it comes to available resources I eliminate some factors that might interfere in how the usage of how information differs.

I decided to look at municipalities in the County of Scania because interviews were a part of my approach and I wanted to be able to visit them in person. The fact that I have chosen to only look at Scania might influence the answers to my question; what kinds of information they want to have. Due to the geographical position, information regarding snow and avalanches will probably be much less common than if I would have asked other municipalities in another geographical region.

Scania County consists of a total of 33 municipalities too many for a multiple case study which means that another demarcation needed to be made. I decided to look at an average municipality and in Sweden a municipality has on average a population of around 33 000 inhabitants (Ekonomifakta, 2014). To get an interval that was not too large or too small I started by taking an interval of $\pm 10\ 000$ which gave me a range in population from 22 500 to 43 500¹. In the County of Scania, the municipalities in table 1 fall within the range in population stated. They are 9 in total, which fall within the previously recommended interval of 4 to 10 cases. If there would have been more than 10 municipalities or fewer than 4, then I would have changed the interval in population testing both $\pm 15\ 000$ and $\pm 5\ 000$. This sample selection can be regarded to be a mix between a stratified sample and an information- oriented selection (Flyvbjerg, 2006, p. 34).

In table 1 there are also other kinds of information included, like the geographical difference, if the municipality is a coastal one or located inland and the placement in the municipal ranking. This is included to illustrate that there is a variation in size and in risk vulnerability but still these are average municipalities located in the same region. In other words, these municipalities together offer diversity across context, provide good opportunities to learn about complexity and are relevant members of the process that is being studied (Stake, 2006, p. 23ff).

Table 1: A list of municipalities in the sample, alongside general information like size, population and geographical location.

Municipality	Size (km ²)	Population ²	Municipal ranking ³	Coast	Inland
Staffanstorp	107	22 627	249		X
Landskrona	140	43 073	128	X	
Vellinge	142	33 807	95	X	
Höganäs	143	25 084	123	X	
Kävlinge	153	29 600	157	X	
Trelleborg	341	42 837	49	X	
Ystad	352	28 623	134	X	
Eslöv	421	31 920	82		X
Ängelholm	422	39 866	210	X	

2.3 Material used

In a case study one looks at different kinds of information in order to get the general picture (Baxter & Jack, 2008, p. 554) and I have performed both interviews and looked at some municipal documents. I

¹ The additional 500 in each end are included to make sure I also take into account those municipalities that when rounded up/down to the nearest thousand would be included in the sample.

² (Region Skåne, 2013)

³ (Miljöaktuellt, 2014a)

have looked at every municipality's comprehensive plan where I have focused on paragraphs dealing with environment, risks and climate adaptation. Other documents dealing with climate related issues that were handed to me or recommended during the interviews have also been used. For a complete list of documents used see Appendix 1.

Interviews were performed with individuals at the municipality who are responsible or in other ways well versed with the climate work of the municipality in order to get as relevant information as possible. These persons can be regarded as "centrally placed sources" (Esaiasson, et al., 2007, p. 291ff) and they were identified by investigating the municipal homepages. An email was sent to the environmental manager or climate strategist with a polite request if they wanted to participate in the study by being interviewed or could recommend someone else who would be better suited to answer my questions. If none with this title were found on the homepage, a general email to the municipality was sent to ask who they recommended that I contacted. If no contact had been established after the email, I followed up with a phone call after a week.

Table 2 is a compilation of the titles of the persons I interviewed and which municipality they work at. The dates for the interviews are also included. All municipalities in my sample were able to participate except for Ängelholm. It is worth noticing that in the process of finding these persons to interview, many have noted on the complexity of climate adaptation and that it is hard to find one person with the overall responsibility and knowledge. Some were even concerned if they were the right person to answer my questions.

Table 2: The title of the person I interviewed at each municipality and the date of the interview.

Municipality	Title (personal translations)	Date
Staffanstorp	Climate adaptation strategist	2015-03-09
Landskrona	Ecologist, Environmental department	2015-03-02
Vellinge	Project leader on sea-level rises	2015-03-23
Höganäs	Environmental expert / ecologist	2015-03-18
Kävlinge	Social strategist	2015-03-18
Trelleborg	Climate and vulnerability coordinator	2015-03-19
Ystad	Environmental and climate strategist	2015-03-04
Eslöv	Environmental manager	2015-03-17
Ängelholm	-	-

Almost all interviews were performed under similar circumstances. Although there are no set rules on where you should perform an interview I strived for to have it in a place where the persons I interviewed felt as comfortable as possible (Esaiasson, et al., 2007, p. 302). I visited 7 out of the 8 municipalities I interviewed at their respective municipal office. This allowed for the possibility of them showing me pictures or illustrations of different things on the computer or showing tables in different reports. Höganäs was the only municipality I did not visit. Due to high workload in Höganäs it was better suited to perform the interview over the phone. The interviews were recorded and afterwards a comprehensive summary of the main points were written.

2.4 Other remarks

Previously mentioned challenges regarding interviews have been considered and of course not entirely eliminated. Since I knew more at the last interview than I did at the first one, an unconscious change in how I handled the interview might have occurred. On the other hand, since I am not approaching the municipality as someone who has all the answers, but rather as someone who is interested in their work, I am not positioning myself in any hierarchical position which otherwise might have influenced the attitude of the person I interviewed and thus also the answers.

The interview questions (see Appendix 2) were constructed using as simple language as possible to eliminate the risk of misunderstandings. I used open questions and allowed the persons being interviewed to answer as spontaneously as possible. I also used the general tip to ask for advice from persons more experienced with formulating questions when creating my interview guide (Esaiasson, et al., 2007, p. 272). The assistance and input of my supervisors were very valuable in formulating the questions and structuring them in an appealing way. The questions were formulated with the analytical approach in mind to provide an overlaying structure to the work. For further information of how the analytical framework were formulated see chapter 3.

Another thing worth mentioning is something regarding the Swedish climate adaptation portal. When analysing the material after the interviews I realized how few had mentioned the Swedish climate adaptation portal. I then realized that it might have been included in SMHI. I cannot answer if the climate adaptation portal was included when SMHI were mentioned and this is because of a mistake from my part. I in this case should have asked a follow up question and asked the municipalities to specify. This never occurred to me during the interview but rather is something that I realized when afterwards analysing the material.

Chapter 3 – Analytical framework

In this chapter you will learn about how I approach my material and how I have analysed it in order to answer the research questions in this study.

3. Analytical framework

At the end of section 2.1. I mentioned that I had constructed some analytical questions in order to analyse the gathered material and that I also decided to use questions instead of propositions. This approach however, is inspired by the usage of propositions. Propositions are statements, hypothesis or kinds of expectations based on previous theories and investigations to what the findings of the study might look like (Rowley, 2002, p. 19). The propositions are often helpful to put boundaries on the study and keep it within feasible limits (Baxter & Jack, 2008, p. 551) and this notion appealed to me.

Previously the propositions were constructed when the data had been collected because having an idea of what the result might be in advance could lead to bias and limitations in the findings (Eisenhardt, 1989, p. 536). The propositions were therefore constructed after the data had been collected and initially investigated, and then fine-tuned by comparison between the cases (Greene & David, 1984, p. 77).

Another alternative is to construct them early in the process of the study. By translating the research questions into propositions, the collection of data is limited and more focused and can be used to support or undermine the propositions (Rowley, 2002, p. 18). A common mistake in this approach is to include too many propositions which result in a time consuming analysis when all propositions have to be looked at when the gathering of the data has been performed (Baxter & Jack, 2008, p. 552).

In this study I constructed three questions in advance, which I am aware of might bias the result but due to inexperience with cross-case analysis I deduced that it would help me to have a clear outline from the start. The questions, summarised in the figure 2 below, are the framework that I have used when analysing my results. I am aware that there exist other pieces of the puzzle and that I, during the time I have available, am not able to capture the entire picture. What these questions can do for me is similar to what a prism can do to light. When you shine white light through a prism it splits into the different colours of the rainbow. In similar way, these questions are able to divide the gathered stream of information into smaller parts that are simpler to study, making it easier to reveal possible variances and patterns and in doing this, facilitate the analysis.

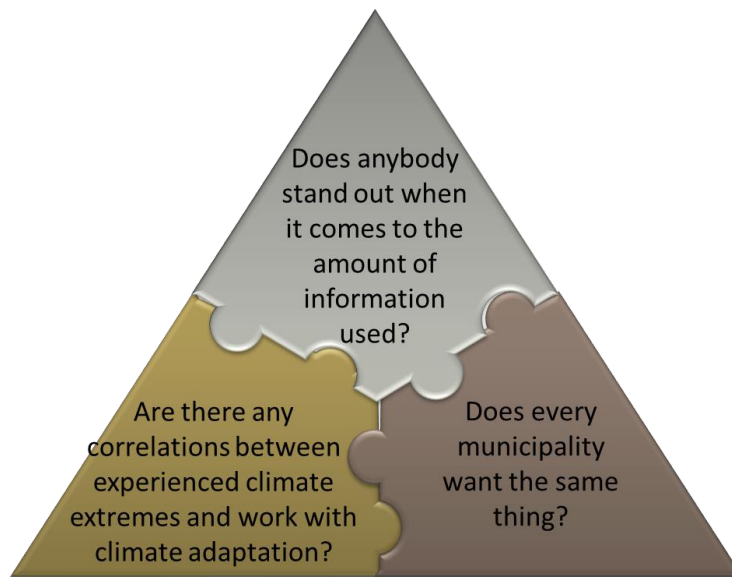


Figure 2: Summary of the questions I asked my material.

The **first** question: “does any municipality stand out when it comes to the amount of information used”, is asked mainly to see which kinds of information are used. For instance, climate models are thought to be underutilized to support decision making (Weaver, et al., 2013, p. 40), which make it interesting to see if any of the municipalities in my sample use any climate models.

The Swedish Association of Local Authorities and Regions have done a survey which illustrated that some municipalities had everything they needed while others had access to very little of what they needed (Sveriges Kommuner och Landsting, 2011, p. 15). What is the situation in the municipalities I have investigated in this study? Do they use roughly the same things and the same amount or are there some who stand out in any regard? Are there municipalities who regard information as a barrier⁴ (Archie, et al., 2014, p. 405ff) or is it other aspects like leadership or competing priorities (Measham, et al., 2011, p. 900ff) that are more important than information when it comes to the municipal work of planning and implementing climate adaption measures?

The **second** question: “are there any correlations between experienced climate extremes and work related to climate adaptation”, is developed as a result from statements that coastal municipalities have done more work than other municipalities (Länsstyrelsen Skåne, 2014, p. 12). This since the coastal regions is more vulnerable to changes in climate, due to the immediate effects from rising sea-levels. Since I have municipalities in my sample where some are located along the coast and other inland, I thought it would be interesting to see if there is some truth to this statement and if the coastal municipalities actually have done more work. Combine this with the overall approach that actions tends to be reactive instead of proactive (Amundsen, et al., 2010, p. 276; Länsstyrelsen Skåne, 2014, p. 13) and you might have a situation where it does not matter how much information you have; you need to experience something first in order to take actions. If you have experienced something, it tends to be easier to afterwards make changes (Næss, et al., 2005, p. 135; Zahran, et al., 2008, p. 558).

The **third** question is: “does every municipality want the same thing?” During the latter part of my education when lecturers from different organisations have talked about the challenges with climate change and climate adaptation, one common theme has been that of money and other resources. Where is the money going to come from? Many municipalities in Scania would like to see a greater financial support

⁴ An example of this can for instance involve lack of information

from the state (Länsstyrelsen Skåne, 2014, p. 42). This is not something unique for municipalities in Scania since also the Swedish Association of Local Authorities and Regions wants to see greater investments in climate adaptation (Sveriges Kommuner och Landsting, 2011, p. 23). If they all seem to want more financial resources, is the same also true when it comes to information; does everybody want the same thing? There are some indications that there are some differences in the wishes but I still find it to be an intriguing question to ask. For instance, in some cases the information provided by different organisations and authorities is thought to be too general to be used in planning (SMHI, 2015, p. 87) which have led to some requests of better availability of for instance local-scale climate scenarios (Pilli-Sihvola, et al., 2014, p. 8). In other cases more climate information is not wanted and climate scenarios are not thought to be that useful (FOI, 2012, p. 49). Useful information is something that is often being requested and overall there is a need to make the climate information user-friendly to facilitate climate adaptation (Feldman & Ingram, 2009, p. 17; McNie, 2007, p. 31; Vaughan & Dessai, 2014, p. 588).

I think that these three questions have the right level of detail. They are not too broad and not too specific. Because of this I think they can provide me with enough perspectives to answer the questions of how the usage of information differs between different municipalities and what sort of information is requested to progress adaptation efforts.

Chapter 4 – Result

This chapter presents the result of my interviews. Section 4.1, 4.2, and 4.3 will each focus on one of the analytical questions presented in chapter 3 whereas section 4.4 will discuss the ways to present the information and section 4.5 will sum it all up and raise the gaze by looking at the research questions of this study.

4. Result

4.1 The differences in information used are small

I have chosen to divide the climate related information used by municipalities and present the result in four tables dealing with physical information (for instance maps and climate models), theoretical information (mainly reports from different organisations), shared information (different kinds of networks) and other kinds of information that have come up during the interviews.

The tables are ordered where different kinds of information, networks or sources are listed in the column furthest to the left. If a specific municipality has mentioned any of the things listed or indicated that they work with it then I have given them an “X” in the corresponding cell. An empty cell signifies that I have not been able to find any information regarding that in my study, and that is important to note. It does not mean that the kind of information (or source or network, depending on the tables in focus) is not used in the municipality. As previously stated, climate adaptation is a difficult subject which involves many aspects of the municipal work and there might very well be other individuals at the municipality with another responsibility who work with something that the person I interviewed were unaware of. To compensate in some regards for this I have combined my interviews by looking at some documents given to me or recommended during the interview. These documents were scanned in order to see if they could provide me with some additional information not mentioned during the interview or confirm something that was stated. A list of the documents used in this study can be found in appendix 1.

4.1.1. Physical information

The physical types of information are listed in table 3 below. Two cells are coloured black due to the fact that mapping of the [sea] bottom topography can be regarded as irrelevant for municipalities located inland.

Table 3: Compilation of the use of physical information

Physical	Eslöv	Höganäs	Kävlinge	Landskrona	Staffanstorps	Trelleborg	Vellinge	Ystad
Maps	X	X	X	X	X	X	X	X
Flood maps	X	X	X	X		X	X	
Aerial photograph	X			X	X		X	X
Bottom topography mapping				X				

Maps are something that everybody uses in one way or another. I have not separated the different mapping programmes mentioned into different categories but instead stayed with the overarching

terminology of “maps”. Staffanstorp uses maps to a large extent and they are well versed with for instance Geographic Information Systems (GIS) (Staffanstorp, 2015), Kävlinge wants to be better at using GIS (Kävlinge, 2015) and Eslöv stated that they have access to maps and aerial photograph and are thinking about working more with it in the future (Eslöv, 2015).

Flood maps of different kinds are something that has been generated in many municipalities to identify risks and to illustrate vulnerable areas. These flood maps require some underlying information like height data and projections of changed precipitation patterns and/or rising sea level. In Landskrona, the person I interviewed was quickly able to show me how he generated a map on the computer, illustrating where the sea level would be if the sea would rise with 3 m (Landskrona, 2015). He also stated that climate models have not been used since it is hard to see the use of it.

Municipalities tend to look at climate projections of for instance how much the sea level is expected to rise (Höganäs municipality, 2012; Landskrona, 2015; Vellinge, 2015) and then use their height maps, maps of infrastructure and properties to deduce what the impact and damage are going to be. The resolution of these maps varies and the person in Trelleborg stated that they would like to have better resolution in order to plan for more effective measures (Trelleborg, 2015). Different kinds of consultants tend to play a role here in providing the municipalities with some of the maps (Landskrona, 2015; Staffanstorp, 2015; Ystad, 2015).

4.1.2 Theoretical information

Table 4 below lists different sources of theoretical information mentioned by the municipalities. One municipality stated that there exists a great deal of information about the problem but not that much about the solutions (Höganäs, 2015). Another stated that she was drowning in reports and that there sadly was not time to read it all (Ystad, 2015).

Table 4: Compilation of the use of theoretical information

Theoretical	Eslöv	Höganäs	Kävlinge	Landskrona	Staffanstorp	Trelleborg	Vellinge	Ystad
County Administrative Board	X	X	X	X	X	X	X	X
SMHI	X	X	X	X	X	X	X	X
EU	X		X				X	
Swedish EPA	X							
Climate tools				X	X			
IPCC							X	
MSB ⁵	X						X	
SIG ⁶								X
SGU ⁷		X			X			X
SKL ⁸			X					
Student Theses				X		X		

⁵ Eng: Swedish Civil Contingencies Agency. Swe: Myndigheten för samhällsskydd och beredskap

⁶ Eng: Swedish Geotechnical Institute. Swe: Sveriges Geotekniska Institut

⁷ Eng: Geological Survey of Sweden. Swe: Sveriges Geologiska Undersökning

⁸ Eng: Swedish Association of Local Authorities and Regions. Swe: Sveriges Kommuner och Landsting

There is no municipality that really stands out in this table. They are all provided with information from the County Administrative Board and SMHI. There are some differences depending on what situation the municipality is in and what challenges they are facing depending on their geographical position (see box 1). Depending on the situation they find themselves in, different organisations may play a more or less important role, resulting in some municipalities mentioning some organisations above others. Formulations like government agencies were used in some cases which indicate that there might be more sources than those included in table 4.

I have not included the report from the Swedish government called “Sweden facing climate change – threats and opportunities”, from 2007 in table 4, even if it has been called the bible when it comes to climate adaptation (Landskrona, 2015). The reason is because it was not directly mentioned during most of the interviews. However it is often included in different municipal reports (Höganäs municipality, 2012; Landskrona municipality, 2009; Trelleborgs municipality, 2013). This indicates that the document is used, but since it was written in 2007 I assume that it has become such a standard source for many municipalities that it is almost too obvious and therefore not worth mentioning during an interview. It has also been said that the local reports tend to be better than the national ones since they have a more local approach which makes them easier to use (Trelleborg, 2015; Ystad, 2015).

Another thing not included is the Swedish climate adaptation portal. This portal is a collaboration between a number of organisations, not least governmental authorities already mentioned. That combined with the uncertainty that some municipality might not have mentioned it because they thought it to be included in SMHI, has led me to not include it in table 4. It was mentioned though during two of my interviews (Staffanstorp, 2015; Ystad, 2015) where one (Staffanstorp, 2015) also stated looking at the equivalent homepage in Denmark⁹.

Student theses were mentioned by two municipalities as a way to find out more information on a specific subject (Landskrona, 2015; Trelleborg, 2015). Since students have the time to dig deeper into a certain problem they can either illustrate things that otherwise would have gone unnoticed or function as an initial study for a larger municipal project (Landskrona, 2015). What I could deduce, the municipalities using student theses did not contact the universities to suggest topics for student theses;

⁹ See: www.klimatilpasning.dk/

Box 1: About the municipalities

Figure 3 below shows a map over Scania and the coloured areas are the municipalities I have worked with in this study. Every municipality find themselves in a specific situation which partly is a result of the historical background of the municipality. Ystad has suffered from problems related to erosion for many years which have given them many tools through experience and coloured the adaptation focus of the municipality. Vellinge with its peninsula and experienced floods are in similar ways very much aware of what can happen and they have decided to protect the peninsula.

Eslöv is just starting the process of formulating a new comprehensive plan and aims to include more climate adaptation in it and they are interested in what others have done. Kävlinge, on the other hand, has a relatively new comprehensive plan and they are instead looking at how to incorporate and mainstreaming climate adaptation in the everyday work of the municipality.

Trelleborg has finished a large inventory and are about to start taking measures. Staffanstorp focuses on communication to the inhabitants and constructing and maintaining networks, but the person working with these questions are going to retire within a few years.

Landskrona has taken some measures but points towards the financial challenges and also some legal disputes when different interests collide. Höganäs is pointing towards the political situation of the municipality and they have, just like Vellinge decided to protect the coast.

I realize that I have only scraped the surface and am not able to completely encapsulate the situation of every municipality. In general however the geographical position and the political history of the municipality affect to some extent what situation they find themselves in today.



Figure 3: Map over Scania where the municipalities I interviewed are marked.

rather, the students approached the municipality and asked to do their theses in cooperation with them.

4.1.3 Shared information

Networks play a vital role in all municipalities in this study and they use them to look at each other, to exchange knowledge and experience. They tend to look for cases in a similar situation as themselves both in Sweden and on an international level (Vellinge, 2015; Ystad, 2015).

In table 5, the networks mentioned during the interviews are listed. The black boxes once again point out the municipalities that are not relevant for that particular network, for example Eslöv and Staffanstorp who are located inland are not relevant for the network “erosion damage centre” which only looks at coastal erosion. The parenthesis around some of the “X.s” is to indicate that the network was not mentioned during the interview. By looking at the membership list of these networks, I found that they are members. The simplest explanation why they were not mentioned is probably because they did not come to mind during the interview. It might of course also suggest that those networks are not considered to be that important for those municipalities. Why the networks were not mentioned I do not know and therefore I decided to show their membership in this way.

Table 5: Compilation of the use of shared information

Shared	Eslöv	Höganäs	Kävlinge	Landskrona	Staffanstorp	Trelleborg	Vellinge	Ystad
County Administrative Board	X	X	X	X	X	X	X	X
Other municipalities	X	X	X	X	X	X	X	X
Climate municipalities	X						(X) ¹⁰	
EDC ¹¹		X	(X) ¹²	(X) ¹²		X	X	X
Cities Resilient							X	
The sound water cooperation		(X) ¹³	(X) ¹³	X			(X) ¹³	

Under the label “County Administrative Board” organisations like Climate interaction Skåne,¹⁴ Environmental interaction Skåne¹⁵ and Skåne Association of Local Authorities are included since they are a part of the regional network working with climate related issues.

Networks with other municipalities are essential when dealing with rivers or streams, which flow through many municipalities. In those cases the networks work as a vessel for sharing knowledge but also as an arena for solutions (Kävlinge, 2015; Staffanstorp, 2015). Networking with local organisations like water and sanitation companies is also important since they know where the pipes are and have a good understanding of where the challenges are located (Landskrona, 2015).

¹⁰ (Klimatkommunerna , 2013)

¹¹ Personal abbreviation for *Erosion damage centre* (Swe: Erosionsskadecentrum)

¹² (Ystads kommun, 2014)

¹³ (The Sound Water Cooperation, u.d.)

¹⁴ Personal translation of Klimatsamverkan Skåne

¹⁵ Personal translation of Miljösamverkan Skåne

Regarding the networks with other municipalities there are mainly Swedish ones, often in the region but many also mentioned Copenhagen as a source of information, a place to visit for inspiration and an interesting city to study (Kävlinge, 2015; Staffanstorp, 2015; Trelleborg, 2015; Ystad, 2015). The difference in scale was mentioned as well as the awareness that there is a difference in resources available (Ystad, 2015). Also the larger municipalities in Scania like Malmö, Helsingborg and Kristianstad were mentioned as sources and examples to study (Landskrona, 2015; Vellinge, 2015).

4.1.4 Other kinds of information

In table 6, other kinds of information are listed. It can for instance be about a study visit to another town in Sweden or abroad. It can involve participation in a pilot study in cooperation with a university or an organisation. From what I have found, experiences gathered from pilot studies often provide the municipality with valuable information since it links to the municipality and offers local relevant information. The information acquired in this way can then be spread through the existing networks and be of use also for other municipalities.

Table 6: Compilation of the use of other kinds of information

Others	Eslöv	Höganäs	Kävlinge	Landskrona	Staffanstorp	Trelleborg	Vellinge	Ystad
Conferences & seminars	X		X	X	X	X	X	X
Historical observations				X			X	X
Newsletters					X	X		
Study visits		X	X			X	X	X
Pilot project					X			X

Every municipality work with the accumulated information gathered and experienced over time, that is not what is meant with historical observation here. Historical observations here are information regarding a specific topic that has been investigated, measured or studied earlier and which now can provide the municipality with an additional source to draw information from. If, for instance due to the geographical location, the municipality has been forced to early deal with something, then more data have been collected on that topic and can today be used in the work with climate adaptation. One example of this are flood related problems experienced on the peninsula in Vellinge municipality (Vellinge, 2015).

All these tables (3, 4, 5 & 6) offer an initial indication of how the usage of information looks like in these municipalities, but they do not capture the entire picture due to the complexity of climate adaptation. The tables for instance are unable to capture how often maps are used, how many pilot studies a municipality have participated in or how strong certain networks are. They provide an initial illustration of what information is used, not to what degree. If one sums up all the X; s (excluding the one put in parentheses) you get the result presented in table 7 below.

Table 7: Sum of all the X presented in table 3, 4, 5 & 6. The numbers in the lower row are the total number of X possible for that municipality.

	Eslöv	Höganäs ¹⁶	Kävlinge	Landskrona	Staffanstorp	Trelleborg	Vellinge	Ystad
Sum of X	12	8	10	13	11	10	15	13
Sum of possible X	23	26	26	26	23	25	26	25

Figure 4 to the right shows the first of my analytical questions presented in chapter 3. From what I have found, I would say that none of the municipalities in this study stands out when it comes to the usage of information. All use the networks with other municipalities and all are a part of the regional networks. Reports from different organisations are used with small differences depending on the situation of the municipality. Maps are used by everyone in some way, although some use it more than others.

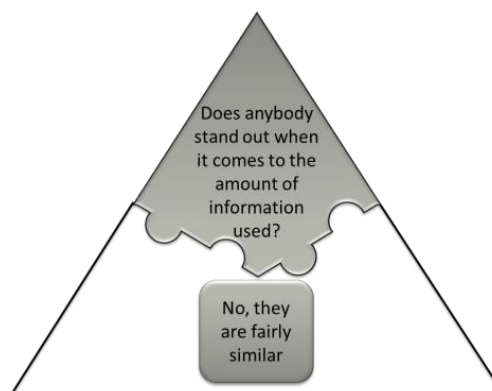


Figure 4: The first of my analytical question with corresponding answer.

I have also deduced that a factor that influences the usage of information at the municipality depends on who is working with these questions. If someone has worked a long time at the same municipality, he or she becomes well versed with the work and the organisation and manages to acquire an understanding of the problems, risks and where solutions are needed. This study indicates that the background of the person responsible (if there is one person responsible), the contacts and networks as well as the personal interests he/she brings to the work are all things which influence the range of information used. For instance subscriptions to different newsletters can be something you do out of personal interest and they can provide you with additional information, which you otherwise might have missed or found out much later. Also memberships in other organisation, like in the case of Staffanstorp where the person I interviewed was also a member of the Federation of Swedish Farmers (LRF), offers input that can be used in the work at the municipality (Staffanstorp, 2015).

4.2 Actions tend to be reactive

Table 8 below presents a list of the municipalities, what extreme weather events they have experienced and what measures they have taken. I have divided the measures into physical and theoretical measures. Physical measures include for instance embankments and theoretical measures focus more on the organisation of the municipality, restrictions, recommendations, inventories and so on.

¹⁶ Comment: The somewhat lower number in Höganäs might be a result due to the shorter interview performed over the phone.

Table 8: A compilation of events experienced by the municipalities and what measures have taken.

Municipality	Experience	Measures	
		Physical	Theoretical
Staffanstorp	Floods caused by heavy rains	Pump stations	Checklists to medical personal what to do during a heatwave. Communication to the municipal inhabitants.
Landskrona	Floods caused by heavy rains and damage due to erosion, storms	Repairs of damages, caused by erosion and storms, on the island of Ven.	Inventory and identification of issues (local climate profile)
Vellinge	Floods both from heavy rains and rising sea-levels.	Embankments, measurement stations of groundwater levels	Action plan for a 1 m rise in sea level over the next 100 years. Investigation of adaption measures to handle heavy rains.
Höganäs	Problems with erosion (especially in combination with storms)	Embankments	Inventory and identification of issues
Kävlinge	Floods caused by heavy rains and erosion damages	Storm water dams	Inventory and identification of issues, green areas in planning, no new construction below the 3masl limit
Trelleborg	Floods caused by heavy rains, heatwave	None by the municipality but the harbour have taken measures like moved the power supply, and adapted breakwaters for 100-year wave.	Inventory and identification of issues – all presented in a climate adaptation plan.
Ystad	Problems with erosion	Beach nourishment, embankments	No new construction below the 3masl limit.
Eslöv	Floods caused by heavy rains	Have taken measures at viaducts to better handle floods.	Have identified the problems and work to include climate adaptation in the new comprehensive plan.

Almost every municipality has experienced floods and other kinds of water-related problems. Since a majority of my sample consists of coastal municipalities, this result is perhaps not that surprising. Overall water-related issues are more common among the municipalities in this study, both when it comes to problems experienced and the focus of the solutions. During three of the interviews the necessity to not only focus on the challenge of too much water but also looking at how to secure the water supply during a heatwave was also pointed out (Eslöv, 2015; Staffanstorp, 2015; Trelleborg, 2015).

A majority of the actions taken are focusing on floods, and erosion which might be a result of the number of coastal municipalities in the sample but also as a result of the reports from the County Administrative Board. In the regional adaptation plan – main focus is on floods (rising sea level), erosion, sewer and drainage and drinking water supply, since these factors are said to have big effects on Scania (Länsstyrelsen Skåne, 2014, p. 11).

Besides water-related issues, many have worked with identifying the risks simply by going out in the field and investigating how it looks like for instance along the coastal line, which facilities that are threatened, what can be done, what needs to be done and so on (Höganäs, 2015; Kävlinge, 2015; Landskrona, 2015; Trelleborg, 2015; Vellinge, 2015; Ystad, 2015). This information is then implemented in different kinds of plans dealing either with future targets or planning for new buildings or neighbourhoods. For instance, some stated that they are very restrictive when it comes to allowing for new constructions beneath 3 meter above sea level (masl) (Kävlinge, 2015; Ystad, 2015).

After identifying the risks, one of the municipalities went through them and made prioritizations, stated when measures should be taken and which sector was responsible (Trelleborg, 2015). They then presented this in a climate adaptation plan (Trelleborgs municipality, 2013) which is thought to be an initial guidance in the municipal work with climate adaptation (Klimatanpassningsportalen, 2014).

Most actions by the municipalities are done in response to an extreme event and can therefore be regarded as reactive actions. This goes in line with what the county administrative board had concluded about measures being mostly reactive (Länsstyrelsen Skåne, 2014, p. 13). Reactive actions are in some cases hard to completely avoid since an extreme event might illustrate flaws that previously have gone unnoticed. In one case, for instance a heavy rainfall illustrated a previously unknown threat (Vellinge, 2015). This event has then led to investigations and thoughts on how to prevent similar consequences in the future. Proactive measures are rarer even if there are exceptions like for instance a pilot study regarding heatwaves in Staffanstorp¹⁷ (Staffanstorp, 2015). Staffanstorp also commented on the common theme that when talking about climate adaptation you often habitually end up thinking about floods and water related challenges (Staffanstorp, 2015). A broader approach and a broader perspective are thought to generate better solutions (Staffanstorp, 2015; Trelleborg, 2015).

Figure 5 shows the second analytical question presented in chapter 3. Since most of the actions are reactive I would say there are some form of correlation between experiences and work related to climate adaptation. The municipalities in this study have all had experiences and they have all taken some form of measures to reduce the impact of similar events. This goes in line with the articles mentioned in chapter three stating that if you had experienced something it was easier to take action afterwards.

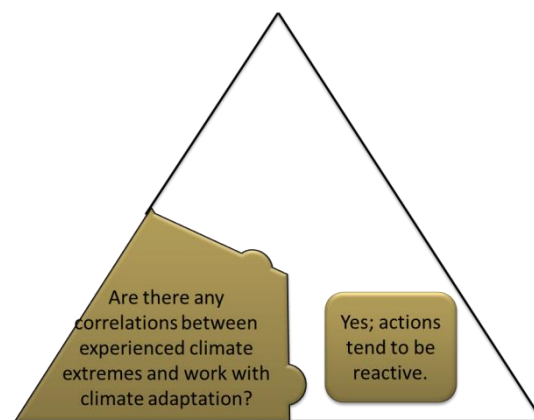


Figure 5: The second analytical question with corresponding answer.

4.3 Different wishes from different municipalities

Overall, the wishes tend to be in line with the suggestions presented in a report by SMHI where problems like financial, legal and organisational challenges were highlighted (SMHI, 2015, p. 291). These obstacles are also mentioned in some of my interviews during which many mentioned the financial aspect (Landskrona, 2015; Staffanstorp, 2015; Trelleborg, 2015; Vellinge, 2015), pointed towards the legal aspects where legislation is not updated for climate adaptation measures (Staffanstorp, 2015; Vellinge, 2015), and the need for national actions (Höganäs, 2015; Vellinge, 2015). These things emerged after commenting that the amount of information is not the issue (Landskrona, 2015; Vellinge, 2015; Ystad, 2015). Höganäs

¹⁷ For more info about the pilot study see (Arbets-och miljömedicin, 2014)

pointed out that there exist a lot of information about the problems; what is needed is information on different types of solution-oriented actions (Höganäs, 2015) in combination with the other aspects mentioned above. In table 9, the wishes from the municipalities are presented and also in what way it would facilitate the work at the municipality if these wishes were fulfilled.

Table 9: A compilation of the wishes and in what way they would facilitate the work of the municipality

Municipality	Wishes	Why
Staffanstorp	That healthcare and schools were included much earlier in the planning process.	If different actors are included in the planning process they can bring with them important input instead of presenting these ideas as complaints later on.
Landskrona	More easy accessible height data.	It should be easy to access the data and manipulate it with a computer at the office. Also easier presented since today it takes some time to get into it.
Vellinge	Action plans from the government. Money. Updated legislations.	The law is not adapted for the measures that need to be done. Money, since it deals with protection of national borders the municipality should not carry all the responsibility.
Höganäs	National organisation who keep the municipalities up to date. More solution oriented information.	More solution based information makes it easier to implement the measures and affect the politics.
Kävlinge	Access to tools where one can perform analysis with temp and precipitation changes. Seminars with other municipalities.	This is seen as one small step on the path to a more integrated adaptation work within the municipality.
Trelleborg	More local information of the effects. Be a part of all networks to see how other municipalities work.	Local details make it easier to plan specific measures.
Ystad	One national organisation that has the responsibility for climate adaptation. One organisation that compiles the information.	It would be easier to have a clear starting point when one searches for information and to have the ability to turn to one organisation for an overview of the issues.
Eslöv	More examples from other municipalities. Checklist not to miss anything.	Everything that can be used to facilitate the implementation work on the municipality will be of use since it would reduce cost and workload.

Figure 6 shows the third analytical question and since according to table 9 the wishes are not the same from all municipalities, the answer to this question is no, every municipality does not want the same thing. There are a variety of wishes of which some regard financial and legal aspects and others deal with the organisational situation both at the state and at the local level. Since they face different challenges depending on the geographical and political situation the difference in wishes tend to reflect this and are likely the reason why the wishes vary.

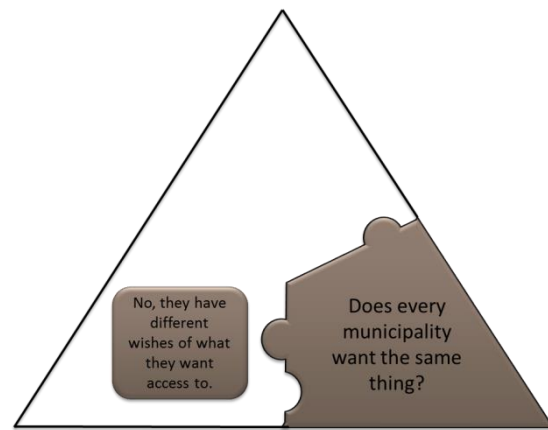


Figure 6: The third analytical question with corresponding answer.

4.4 How should the information be presented

Some of the wishes involved the organisational work of the municipality and trying to find one with the overall responsibility (Kävlinge, 2015; Trelleborg, 2015), or getting other sectors involved in the planning process (Staffanstorps, 2015). When these aspects, as well as the financial, legal and the need of national actions, were mentioned, there were no discussions of how this should be presented. That question mainly targeted information and something that appeared to be a general thought was having information accessible from their own computers when they need to work with it (Eslöv, 2015; Kävlinge, 2015; Landskrona, 2015; Ystad, 2015). Some mentioned the opportunity of having a homepage where you could search for information, study examples and have access to different tools (Eslöv, 2015; Kävlinge, 2015). Having all information in one place is thought to facilitate the work (Ystad, 2015). Another aspect is that the information should be free since the municipality might not be willing to pay for it (Höganäs, 2015).

Communication to the inhabitants is also thought to be an important aspect since when things happen many turn to the municipal office for guidance (Staffanstorps, 2015; Trelleborg, 2015). When asked, seminars and conferences were partly thought as a possible way to learn what other municipalities are doing (Kävlinge, 2015; Trelleborg, 2015; Höganäs, 2015) but also as a way to communicate the work of the municipality out to the inhabitants (Eslöv, 2015). Updates on homepages, reports (Trelleborg, 2015) and visits to schools to inform the children and by doing this, transferring informing to the parents, were also thought to be possible ways to inform the inhabitants (Staffanstorps, 2015).

4.5 Summary

The previous sections in this chapter have included the result and the answers to the analytical questions formulated in chapter three. The analytical questions as well as the answers to these are summarized in figure 7 below.

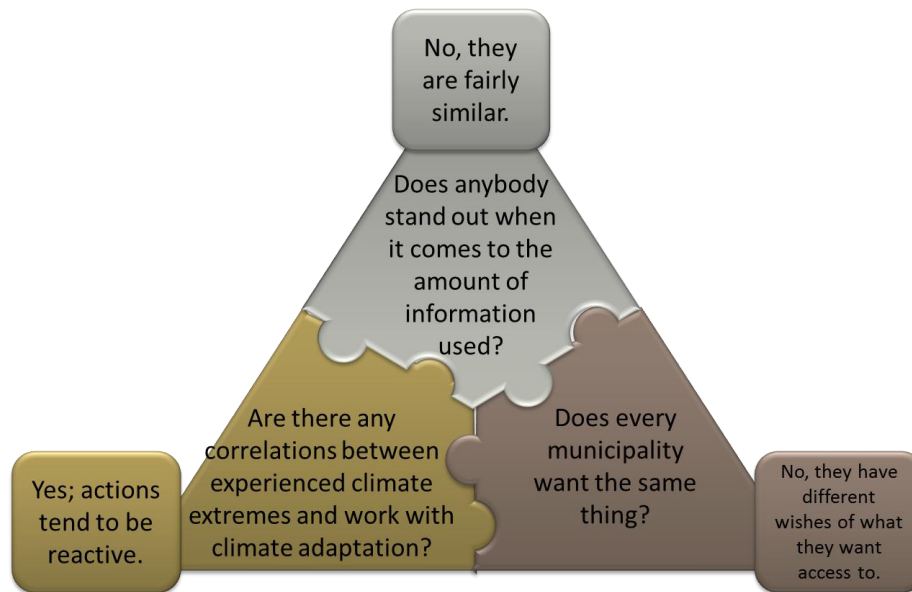


Figure 7: The analytical questions combined with the answers deduced from this study.

The perspectives these analytical questions have provided me with, have helped me answering the main questions of this study. The first research question was:

- How does municipalities use climate related information in their work with climate adaptation?

I have found that municipalities use climate related information to identify different risks and to get an understanding of what the situation looks like today and might look like in the future. The usage of information does not differ that much between the municipalities investigated in this study. It differs in some regards but that is mainly on the detailed level since the overarching pattern seems to be that the most used sources are maps, the County Administrative Board, SMHI and networks between the municipalities. What generates this differences between the municipalities is likely a combination of who is working with the questions and the overall situation of the municipality regarding for instance geographical or political factors. Also information does not seem to be the most important factor when it comes to implemented measures. Rather, experienced events tend to be the biggest contributor. This goes in line with previous cases mentioned in chapter three in which it appears to be easier to take actions if you have experienced something first.

The second research question of this study was:

- What sort of climate information do the municipalities want to access in order to improve their work with climate adaptation?
 - Why do they want that information?
 - How would they like it to be presented?

Most wishes were linked to organisational aspects both within and outside the municipality. There seems to exist enough information about what is happening and about the problems but a lesser amount about what to do about it. This was particularly highlighted by Höganäs (2015). Others also want access to more information about what other municipalities are doing and more examples of what works and what does not (Eslöv, 2015; Kävlinge, 2015; Trelleborg, 2015). Knowing what works and what does not can save both time and money. Examples from other municipalities seem to be something that is valued very high since all tend to look at other municipalities in either Sweden or abroad to find both knowledge and inspiration. It is important to note that the wishes I have got might only reflect the opinion of the persons I have interviewed and therefore be coloured by the experiences and obstacles encountered during their work.

How the information should be presented involved conferences and seminars as well as the possibility of having access to the examples and information at their own computer. Reports were not mentioned as a way to present the information. All municipalities have received information in the form of reports and even if there are plenty of them, none stated that they did not want reports. This I interpret as reports still being a viable option to present the information even if there might be better ways to communicate some kinds of information.

Chapter 5 – Discussion

In this chapter I will discuss some questions, aspects and thoughts that have appeared during the study. Suggestions for further research will also be presented.

5. Discussion

To have been given the opportunity to go out and investigate how the usage of information differs at different municipalities have been extremely interesting. I have found some answers to the questions I primarily asked but since answers always nurture new questions I now have more questions than I had at the beginning of this study. Some of them will be discussed in the last section in this discussion, section 5.3 – further research. Before that I will discuss some aspects of the results as well as some perspectives of climate adaptation that have emerged during this study.

5.1 The results

In the introduction I mentioned the linearity problem and I also raised the question; “if there is a linear relationship between information and measures taken?” The answer to that question is still, I do not know. More information does not seem to be the key to implementing more measures today but if I would have asked the questions ten years ago or ten years from now, perhaps the situation would have been another. The survey from the Swedish Association of Local Authorities and Regions mentioned in the introduction might be an indication of this. That survey are from 2011 and it looked at many more municipalities than I have and either the situation have changed over the last four years or I managed to interview 8 of the municipalities who stated that they had what they needed back in 2011. I cannot draw any major conclusion from the survey from 2011 since I lack knowledge of how it has been performed and other details but I think that time is an aspect worth to keep in mind when thinking and talking about the usage of information. Even if information does not seem to be the most important factor for implementing measures it still plays an important role for the municipality to create a picture of the risk situation of the municipality.

The pattern identified in this study indicates that there are some key players and organisations that provides the municipalities with a lot of information. From this result I cannot make conclusion about whether the situation is the same in larger or smaller municipalities compared to the ones I have studied. I postulate though that the identified pattern where the County Administrative Board, SMHI and other municipalities, plays an important role is also fairly similar in other cases. On the detailed level there are some differences in the usage of information as a result of for instance the difference in threat exposure between the municipalities.

When it comes to the measures taken, once again it is worth mentioning the fact that climate adaptation is a topic that spreads through many sectors of the municipality. For example, many commented that they imagined, knew or were convinced that heat related problems were included in the work done by the social department of the municipality (Kävlinge, 2015; Landskrona, 2015; Vellinge, 2015; Ystad, 2015). The fact that I have not talked to any individual working in the social department on any municipality might have an effect on my result and point it in a more technical and water oriented direction. There might be more measures taken on heat related issues than captured by this study.

This technical focus is an interesting aspect of climate adaptation though. In most municipalities I talked to environmental managers or someone similar since those were the ones I thought worked with these issues and therefore contacted them to perform my interview. In other municipalities I was directed to someone else whom the municipality regarded to be better suited to answer my questions and that person never worked in the social department of the municipality. Initially I did not think too much about it but when people I interviewed started to mention that the social sector worked with climate adaptation as well, the question why I was not directed to any of those individuals began to grow in my mind. I have no answer to why this have been the case, I can only speculate on different reasons. Perhaps it is easier to point towards physical measures like an embankment or another technical solution than it is showing off a checklist or working routines which apply during a heatwave. If this is true then it is an open question to why this should be the case. Another reason might be that there exists measures but they are not regarded to be adaptation measures, rather just things that have been implemented under another name.

5.2 Climate adaptation

A municipality I talked to during this study pointed out the importance not to make climate adaptation some kind of trump card that can overrule other restrictions or values (Höganäs, 2015). I agree that measures should not be implemented just on the basis of climate adaptation in itself but if the measure goes against other values, then how good of a measure is it? One of the largest benefits of adaptation measures is that if implemented correctly it will be beneficial to many aspects of society. Still, there might emerge conflicts of interest and then I think it is important to look at the situation from many different perspectives. Can any other solutions be found that eliminates the conflict? If not, why? Does enough information about the situation exist or is it something that needs further investigations? Have other municipalities encountered similar problems, if so how did they solve it?

When talking about climate adaptation one municipality also talked about the importance of having a discussion regarding investments today versus danger tomorrow (Eslöv, 2015). This I think is an aspect that is very important to discuss since it is a matter of prioritization and what you should prioritize with a limited amount of resources. One municipality mentioned that they tried to identify solutions that were beneficial to as many people as possible (Staffanstorps, 2015), which I think is a good path to follow.

Another thing that also is interesting when talking about climate adaptation is how to evaluate it and measure how good a country, a region or, in this case, a municipality is. As an initial indication for this study I used the municipal ranking performed by Miljöaktuellt. If I would have done it today, I would have used a report published in May 2015 that focused on climate adaptation and ranked the Swedish municipalities and is based on material gathered from a survey (Roth & Thörn, 2015). The difference between the two rankings can be seen in table 10 below.

Table 10: The difference in ranking between (MiljöAktuellt, 2014a) and (Roth & Thörn, 2015). A blank spot indicates that the municipality did not participated and did not receive a placement. In MiljöAktuellt the placement goes from 1-290 and in Roth & Thörn from 1-165.

Municipality	Ranking used from MiljöAktuellt	Ranking from Roth & Thörn, 2015
Staffanstorp	249	36
Landskrona	128	28
Vellinge	95	
Höganäs	123	94
Kävlinge	157	105
Trelleborg	49	7
Ystad	134	
Eslöv	82	

There were 125 municipalities who did not answer the survey and Vellinge, Ystad, and Eslöv were three of these (Roth & Thörn, 2015, p. 68). It would have been interesting to see where they would have ended up on the list. I am not going to make any speculations or attempt to guess their placement. Since 125 municipalities did not answer the survey in the latest report, the placement goes from 1 to 165. The municipal ranking performed by MiljöAktuellt is constructed of two parts where one is based on a survey and the other on key numbers from different organisations (MiljöAktuellt, 2014b). This means that if one municipality do not answer the survey they still get a placement in the ranking of all the 290 municipalities in Sweden. Staffanstorp for instance did not answer MiljöAktuellts' survey but still received key numbers resulting in the low ranking in MiljöAktuellts investigation.

5.3 Further research

One way to think about this study is as in figure 8 below were different kinds and sources of information used by a municipality can be viewed as different containers. This study has investigated which containers being used by different municipalities and which are not and this can be seen as a good starting point for further investigations. The next step is then to investigate and look deeper into these containers and see how deep they are in order for instance to evaluate how much information is available. Is the information in need of updates? Who is responsible for the specific containers and are there containers, having a lot of information that needs to be translated to better meet the user's needs? This study have only scraped the surface and more studies regarding the usage of climate related information are needed to fully grasp the situation and to guide and aid the transition into a more sustainable and resilient society.

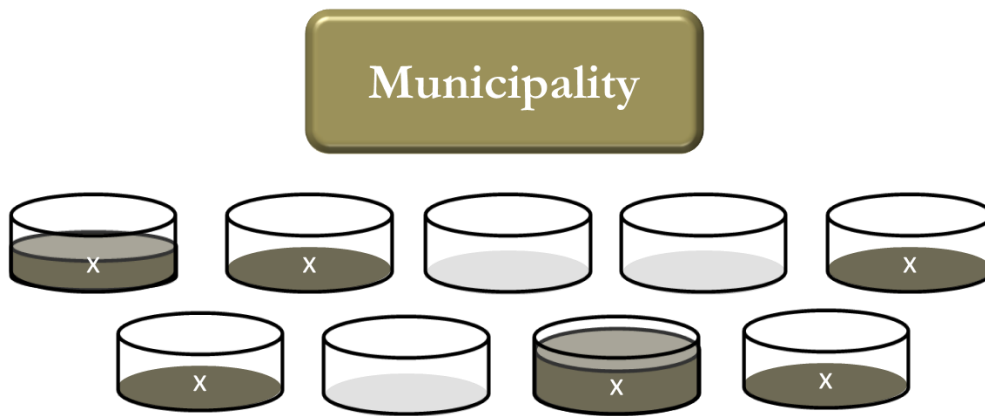


Figure 8: An illustration of the contribution of this study showing different kinds and sources of information as containers. If something is being used by a municipality I have as in previous tables marked it here with an X. The depth and other details is not investigated in this study and can be seen as starting point for future studies.

If I were to take this study as a starting point and design another one there are a couple of things that I would like to look closer at where one of the most interesting ones are the networks between municipalities. Networks were part of the wishes in some municipalities despite the fact that all stated that they used other municipalities and existing networks as a source of information. This leads to questions on how these networks are constructed, how well they are used and if they can be used more effectively? I think that would be something interesting to investigate and then also look closer at and include the Danish networks. Many mentioned Copenhagen and Danish organisations like DMI and DHI and it would be interesting to see how well established the networks across the strait are and what Swedish and Danish municipalities could learn/teach each other.

In another study it would also be interesting to see how a municipality with one individual (or group of individuals) having the overarching responsibility would work and what the advantages and disadvantages of a situation like that would be. This would be interesting since many of the municipalities investigated in this study lacked a person in that role. Analysing the advantages and disadvantages of having one person in charge could yield possible recommendation of necessary qualifications required to work in that position. Since I assume that larger municipalities have one or more individuals working with climate adaptation, those municipalities would be a good starting point and then look at how something similar could be applied in smaller municipalities.

Finally, it would also be interesting to look at if the situation is similar in other parts of the country and by doing this; further investigate the role of the County Administrative Board. Does the situation differ when you look at another County Administrative Board who might be responsible for more or fewer municipalities? Another aspect would also be to include time and return to do a similar study in a few years to see if the situation has changed in any direction.

Chapter 6 – Conclusion

This last chapter will summarize the study.

6. Conclusion

This study has looked at eight municipalities in Scania in southern Sweden and by interviewing the municipalities, a pattern illustrating the information landscape has emerged. The overarching pattern is similar in every municipality containing characters like the County Administrative Board, SMHI as well as other municipalities in both Sweden and abroad. The difference in the usage of climate related information is mainly on the detailed level where the political (commitment & attention), historical (experienced events) and geographical position (threat exposure) of the municipality appears to play a role.

Information is not the main contributor for measures taken but it is not regarded as an obstacle either. Actions tend to be reactive, indicating that experiences to some form of extreme event are more important than information about proactive measures when it comes to implementing a measure. Obstacles for implementation can be aspects regarding the financial, legal and/or the organisational situation of the municipality.

What the municipalities want access to vary to some extent and involve both more resources and more information in the form of examples from other municipalities. Information of what is happening to the climate is not what is required, but rather more information and examples on what to do about it, preferably presented on a homepage or through conferences or seminars. This I think is where we need to invest both time and resources. To find the examples that perhaps never were intended as adaptation measures but actually are, and to try new ideas in the form of pilot studies which can teach us what works and what does not. This I think will provide us with valuable information in the upcoming years and it is important to remember that the flow and amount of information is never a constant, the knowledge will continue to grow when more studies are performed. This study is a snapshot of how the situation looks like today and can both be a starting point as well as a reference point for further research. A starting point to further investigate the importance of different kinds of information and a reference point to see how the situation might changes in the future. With new information originating from different studies in this research area it is important to communicate this information to the municipalities to make sure that they are updated with the latest research. With effective channels for communication and strong networks between municipalities and different organisations in our society I think we will be well equipped to handle the challenges we are facing.

References

References

- Amundsen, H., Berglund, F. & Westskog, H., 2010. Overcoming barriers to climate change adaptation - a question of multilevel governance?. *Environment and planning*, Volume 28, pp. 276-289.
- Arbets-och miljömedicin, 2014. *Beredningsplan och varningsystem för höga värmeböljor/ höga temperaturer i Skåne*, Lund: Klimatsamverkan Skåne.
- Archie, K. M., Dilling, L., Milford, J. B. & Pampel, F. C., 2014. Unpacking the 'information barrier': Comparing perspectives on information as a barrier to climate change adaptation in the interior mountain West. *Journal of Environmental Management*, Issue 133, pp. 397-410.
- Baxter, P. & Jack, S., 2008. Qualitative Case Study Methodology: Study Design and Implementation for Novice Researchers. *The Qualitative Report*, Volume 13, pp. 544-559.
- Borgström, F., 2015. *Mejlkontakt*. Lund : Klimatkommunerna.
- Eisenhardt, K. M., 1989. Building Theories from Case Study Research. *The Academy of Management Review*, 14(4), pp. 532-550.
- Ekonomifakta, 2014. *Regional Statistik*. [Online]
Available at: <http://www.ekonomifakta.se/sv/Fakta/Regional-statistik/Din-kommun-i-siffror/Oversikt-for-region/?region=1231>
[Accessed 12 Februari 2015].
- Esaiasson, P., Gilljam, M., Oscarsson, H. & Wägnerud, L., 2007. *Metodpraktikan: Konsten att studerasambälle, individ och marknad*. 3:4 ed. Vällingby: Norstedts Juridik AB.
- Eslöv, M., 2015. *Erika Fjelkner Miljöchef* [Interview] (17 mars 2015).
- Feldman, D. L. & Ingram, H. M., 2009. Making science useful to decision makers: climate forecasts, water management, and knowledge networks. *Weather, climate and society*, 12 June, pp. 9-21.
- Flyvbjerg, 2006. Five Misunderstandings About Case-Study Research. *Qualitative Inquire*, 12(2), pp. 219-245.
- FOI, 2012. *Kommunpolitikens och kommunchefer syn på klimatförändring och anpassningsbehov*, Stockholm: FOI.
- Greene, D. & David, J. L., 1984. A research design for generalizing from multiple case studies. *Evaluation and Program Planning*, Volume 7, pp. 73-85.
- Höganäs municipality, 2012. *KlimatPM Stigande havsnivåer & erosion i Höganäs kommun*, Höganäs: Höganäs municipality.
- Höganäs, M., 2015. *Richard Åkesson - Miljöskakunnig* [Interview] (18 mars 2015).
- IPCC, 2013: Summary for Policymakers. In: *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA
- IPCC, 2014: Summary for policymakers. In: *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 1-32.
- Klimatanpassningsportalen, 2014. *Anpassningsplan*. [Online]
Available at: <http://www.klimatanpassning.se/atgarder/planera-for-anpassning/anpassningsplan-1.5916>
[Accessed 16 mars 2015].
- Klimatkommunerna , 2013. *Medlemmar*. [Online] Available at: <http://www.klimatkommunerna.se/sv/Medlemmar/>
[Accessed 17 april 2015].
- Kävlinge, M., 2015. *Jesper Bergnordh - Sambälsstrateg* [Interview] (18 mars 2015).
- Landskrona municipality, 2009. *Landskronas Miljöredovisning 2009*, Lund: Landskrona Stad.
- Landskrona, M., 2015. *Olle Nordell - Kommunekolog* [Interview] (2 mars 2015).
- Länsstyrelsen Skåne, 2014. *Regional handlingsplan för klimatanpassning för Skåne 2014*, s.l.: Länsstyrelsen Skåne.
- McNie, E. C., 2007. Reconciling the supply of scientific information with user demands: an analysis of the problem and review of the literature. *Environmental science & policy*, Issue 10, pp. 17-38.
- Measham, T. G. et al., 2011. Adapting to climate change through local municipal planning: barriers and challenges. *Mitigation Adaptation Strategy Global Change*, Issue 16, pp. 899-909.
- Miljöaktuellt, 2014a. *Kommunranking 2014*. [Online]
Available at: <http://www.kommunranking.se/2014/Result>
[Accessed 5 februari 2015].

- MiljöAktuellt, 2014b. *Så gjorde vi kommunrankingen*. [Online]
Available at: <http://miljoaktuellt.idg.se/2.1845/1.567056/sa-gjorde-vi-kommunrankingen-2014>
[Accessed 17 maj 2015].
- Naustdalslid, J., 2011. Climate change - the challenge of translating scientific knowledge into action. *International Journal of Sustainable Development & World Ecology*, 12(3), pp. 234-235.
- Næss, L. O., Bang, G., Eriksen, S. & Veatne, J., 2005. Institutional adaptation to climate change: Flood responses at the municipal level in Norway. *Global Environmental Change*, Issue 15, pp. 125-138.
- Pilli-Sihvola, K. et al., 2014. Communication and use of climate scenarios for climate change adaptation in Finland, Sweden and Norway. *Local Environment*, 13 September, pp. 1-15.
- Plan- och bygglagen, 2010:2
- Rayner, S., 2010. How to eat an elephant: a bottom-up approach to climate policy. *Climate Policy*, 10(6), pp. 615-621.
- Region Skåne, 2013. *Om skåne - Statistik och kartor*. [Online] Available at: <http://gis.skane.se/Befutveck.htm>
[Accessed 5 Februari 2015].
- Roth, S. & Thörn, P., 2015. *Klimatanpassning 2015 - Så långt har Sveriges kommuner kommit. En enkätundersökning och kommunranking*. Stockholm: IVL Svenska Miljöinstitutet.
- Rowley, J., 2002. Using Case Studies in Research. *Management Research News*, 25(1), pp. 16-27.
- SMHI, 2015. *Underlag till kontrollstation 2015 för anpassning till ett förändrat klimat*, Norrköping: SMHI.
- Staffanstorp, M., 2015. *Marie-Louise Folkesson - Klimatanpassningsstrateg* [Interview] (9 mars 2015).
- Stake, R. E., 2006. *Multiple case study analysis*. New York: The Guilford Press.
- Sveriges Kommuner och Landsting, 2007. *Klimatarbetet i kommuner, landsting och regioner*. [Online]
Available at: http://webbutik.skl.se/internt/artiklar/5126/klimatarbetet_i_kommuner_landsting_och...bilaga.pdf
[Accessed 10 februari 2015].
- Sveriges Kommuner och Landsting, 2011. *Kommunernas arbete med klimatanpassning*, Stockholm: SKL.
- Sveriges Kommuner och Landsting, 2014. *Nätverk, Klimatanpassning*. [Online] Available at:
<http://skl.se/samhallsplaneringinfrastruktur/planerabyggabo/regionalplanering/klimatanpassning/natverkklimatanpassning.3497.html>
[Accessed 10 februari 2015].
- The Sound Water Cooperation, n.d. *The Cooperation*. [Online] Available at: <http://www.oresundsvand.dk/english/>
[Accessed 17 april 2015].
- Trelleborg, M., 2015. *Aniiba Ljung - Klimat och hållbarhetssamordnare* [Interview] (19 mars 2015).
- Trelleborgs municipality, 2013. *Klimatanpassningsplan för Trelleborgs kommun 2013*, Trelleborg: Trelleborgskommun.
- Vaughan, C. & Dessai, S., 2014. Climate services for society: origins, institutional arrangements, and design elements for an evaluation framework. *WTREs Climate Change*, Volume 5, pp. 587-603.
- Weaver, C. P. et al., 2013. Improving the contribution of climate model information to decision making: the value and demands of robust decision frameworks. *WTREs Climate Change*, Volume 4, pp. 39-60.
- Vellinge, M., 2015. *Per Jublin - Projektleddare havsnivåbörningar* [Interview] (23 mars 2015).
- World Meteorological Organisation, 2011. *Climate knowledge for action: A global framework for climate services - empowering the most vulnerable*, Geneva: WMO.
- Yin, R. K., 2009. *Case Study Research: Design and Methods*. 4:a ed. Thousand Oaks, California: SAGE Publications Inc.
- Ystad, M., 2015. *Mona Ohlsson Skog - Miljö- och klimatstrateg* [Interview] (4 mars 2015).
- Ystads kommun, 2014. *Medlemmar*. [Online]
Available at: <http://www.ystad.se/boende--miljo/natur-miljo-och-klimat/erosionsskadecentrum/medlemmar/>
[Accessed 17 april 2015].
- Zahran, S. et al., 2008. Vulnerability and capacity: explaining local commitment to climate-change policy. *Environment and Planning C: Government and Policy*, Issue 26, pp. 554-562.

Appendix

Appendix 1: Municipal documents

Municipality	Document
Staffanstorp	<ul style="list-style-type: none">• Perspektiv 2038 Framtidens kommun 2011-10-24
Landskrona	<ul style="list-style-type: none">• Översiktsplan 2000+ Landskrona 2002• Landskronas Miljöredovisning 2009
Vellinge	<ul style="list-style-type: none">• Vellinge Översiktsplan 2010 Sammanfattning 2013-01-23• Höga havsnivåer Falsterbonäset samt områdena vid Höllviken/Kämpinge – Handlingsplan för skydd mot stigande havsnivåer
Höganäs	<ul style="list-style-type: none">• Översiktsplan för Höganäskommun 2002• Klimat PM Stigande havsnivåer & erosion i Höganäs kommun 2012-01-24
Kävlinge	<ul style="list-style-type: none">• Kävlinge kommuns Översiktsplan 2010 – en sammanfattning.• Dagvattenpolicy för Kävlinge Kommun 2014-05-12
Trelleborg	<ul style="list-style-type: none">• Översiktsplan 2010 Trelleborgs kommun• Klimatanpassningsplan för Trelleborgs kommun 2013• Klimatanpassningsåtgärder i Trelleborgs kommun. Nulägesrapport 2013-2014
Ystad	<ul style="list-style-type: none">• Översiktsplan Ystad kommun 2005-11-17• Tillägg till översiktsplan Handlingsplan för förvaltning och skydd av kusten – i perspektivet av ett förändrat klimat 2011-02-17
Eslöv	<ul style="list-style-type: none">• Översiktsplan Eslövs kommun 2002-02-25• Energi- och Klimatplan för Eslövs kommun 2011

Appendix 2: Interview questions

1. Vilken typ av information använder ni er utav/hjälper er i ert förebyggandearbete med att göra kommunen mer anpassad och motståndskraftig till ett förändrat klimat?
 - Hur är informationen presenterad för er (workshops, artiklar, mjukvaror, rådata...)?
 - Känner ni att ni får för mycket information? För lite?
2. Vilken/vilka är det viktigaste åtgärder ni vidtar/har vidtagit för att anpassa kommunen till ett förändrat klimat?
3. Har er kommun råkat ut för någon extrem väderhändelse i form av exempelvis översvämningar, skyfall, värmeböljor eller liknande?
 - Om ja -> Vad hände? Fungerade eventuella anpassningsåtgärder som planerat?
 - Om nej -> Tror ni att ni skulle kunna hantera det med dagens anpassningsåtgärder?
4. Har ni upplevt några särskilda, generella, hinder för ert klimatanpassningsarbete?
 - Är hindret relaterat till brist på information/hade hindret kunnat minskas om ni hade haft tillgång till mer information?
 - Om ja, vilken typ av information?
5. Om ni fick önska, vad skulle ni vilja ha tillgång till för information för att underlätta ert arbete idag?
 - Varför vill ni ha just den informationen?
 - På vilket sätt skulle den hjälpa er?
 - Hur vill ni ha den presenterad?



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