Municipal Responses to Climate Change Emergencies

The Swedish and Danish cases

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Preface

The municipal responses to climate change emergencies are as far as we know indeed a very locally influenced in their potency and the specific local preconditions are one of the key agents facilitating that particular response. In the project Municipal Responses to Climate Change Emergencies (MuniRes) the concrete response or the lack of it is in focus. This paper is one of several background documents for the final outcome of the project which are Municipal Guidelines for European Municipalities. Each of the partners involved in the project produce their own case study reports with perspectives on the municipal responses corresponding to their research interest. The idea is to gather the outcomes from the case studies and compile the guidelines from those best practices found in each of the municipalities, in order to produce user friendly and easy readable guidelines on how to amplify and structure the municipal response towards the climate change induced threats and risks facing society.

This paper presents the cases from Sweden and Denmark as well as an overview of the Nordic climate change adaption policies. The case studies have been developed in cooperation and with the advice from the project advisory partners. The following advisory partners have been involved in the present cases presented in the paper:

Sweden

- Lund municipality
- Kristianstad municipality
- The Swedish Network of Municipalities on Climate Change
- The Swedish Association of Local Authorities and Regions

Denmark

- Greve municipality
- Hedensted municipality
- Local Government Denmark

Baltic Sea Region

- The CIVPRO Civil Protection Network

Stockholm, October 2008

Front-page:
Flooding in Kristianstad 2007. Water level 1,63 meter above normal. Photo: Patrick Olofsson

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Introduction

This paper is structured around four case studies conducted in Sweden and Denmark. Furthermore the different preconditions for the municipalities are presented and analysed. All of the inputs and analysis in this paper are made with the end product in mind which is the Climate Change Guidelines for European Municipalities.

Climate Change Guidelines for European Municipalities

The project aims to survey and investigate, in greater detail, the local level responses to climate change in Sweden, Finland, Germany, Italy, Lithuania and Denmark, especially in flood-prone municipalities (both inland water and coastal) in order to identify the main (perceived) challenges and the currently existing best practices. On this basis the goal and objective of the project is to develop, in cooperation with selected municipalities and other stakeholders, ***Climate Change Guidelines for Flood-Prone Municipalities*** *specifically relating to the question of how to take the climate change-related civil protection vulnerabilities, particularly rising water levels, drainage issues and the effect of heavy rains etc., into account in municipal spatial planning in a more integrated manner.*

This is the formulation from the project application and this is the main concept of the project in which the final outcome will be the **Climate Change Guidelines for European Municipalities** (The name has been modified during the project life time to be more fitting with the overall aim and focus of the project.) The focus on municipalities and the local level is motivated with the knowledge on that climate change is a process and not a project limited in time and space and furthermore that climate change effects appear and are local in their occurrence. The idea behind producing guidelines is the assumption that the knowledge on how to adapt and how to integrate climate change in to the daily operations is limited on the local level since the occurrence and impacts of climate change are highly variable due to local preconditions. This fact means that national policies are hard to adjust and that municipalities are in many ways forced to lead the way for climate change adaption. However the way in which municipalities should act and with which means are highly individual.

With this very nature of climate change in mind and with the knowledge on the municipal preconditions to work with climate change, the need for some sort of guidelines is obvious. This has been confirmed in earlier studies conducted by Nordregio. The mission is therefore to produce, in cooperation with partners and stakeholders, use friendly climate change guidelines for European municipalities. The style and structure of the guidelines will be aimed at providing guidance and to display different examples on how we as a community can proceed to develop a more concrete climate change response. In order to get this knowledge on the municipal preconditions and to formulate fitting, adaptable and use friendly guidelines several case studies have been preformed. Furthermore a form of stakeholder interaction has been used as a method to achieve the desired results and to disseminate the guidelines on a European scale.

Stakeholder interaction in the MuniRes project

The research project has been structured with the receiving municipalities in mind. When the project consortium was established this fact was also reflected. A mix of research partners and associated/advisory partners has therefore been strived for in putting together the project consortium. Inherit in the project description and as a central theme of the project is to develop and disseminate the guidelines, therefore policy, praxis and research have been mixed to make sure to cover the whole range from research to actions and implementing measures. Furthermore the national organisations in the project will also play a key role in the dissemination of the end product.

More concretely during the project a number of case studies have been preformed. The cases have been used in several ways. At first they have served as study objects in which the research institutions in the project have carried out interviews, desktop studies and observations in order to report and analyse the municipal preconditions and also asses the potential inputs to the guidelines. Furthermore the cases have also served as advisors. They have been an important part in reviewing the guidelines and to provide the researchers with comments and input in order to bridge the gap between research, policy and practice. This is also an important quality aspect to consider as the municipalities and other associated partners, represents the users of the guidelines. Throughout the duration of the project several workshops and seminars have been held in which the concept of the guidelines have been discussed and input have been provided. This whole process of stakeholder interaction has proven very useful and has been constantly ongoing throughout the project. The process it self is part of the objective of the project as this way of working ensures a continuous and prolonging way of working since the whole style of the project becomes more process oriented and less project focused. The word process is key to the project as many municipalities are used to work project focused and not process focused. By working in a process the municipalities make sure to capture and adopt the dynamic and constantly changing nature of climate change.

In the project the following partners have been involved:

Lead partner: Nordregio, Nordic Centre for Spatial Development

Research Partners:

- University of Helsinki, Aleksanteri Institute, Finland
- Helsinki University of Technology, Laboratory of Geoinformation and Positioning Technology, Finland
- Emergency Services College, Finland
- ISIG – Institute of International Sociology of Gorizia, Italy
- INFRASTRUKTUR & UMWELT, Germany

Advisory Partners:

- The Swedish Association of Local Authorities and Regions
- Kristianstad Municipality, Sweden
- Lund municipality, Sweden
- The Swedish Network of Municipalities on Climate Change
- Local Government Denmark
- Greve municipality, Denmark
- Hedensted municipality, Denmark
- The Association of Finnish Local and Regional Authorities
- Helsinki municipality, Finland
- Kitilä municipality, Finland
- Flood Protection Centre, City of Cologne, Germany
- Panevezys municipality, Lithuania
- Klaipeda municipality, Lithuania
- The Environmental Centre for Administration and Technology (ECAT-Lithuania)
- The CIVPRO Civil Protection Network

Climate change development and framework for action

This part of the report elaborates the preconditions for the municipal responses to climate change. Several national policies and other factors that play a crucial role for the municipalities will be presented. In being a European project the guidelines and case studies reflects this fact but to find the European dimension have proven to be more than easy. As earlier concluded, the climate change issue are challenging the governance structures and the problems of policy development are rather obvious with the climate change issue being such a local phenomena. Therefore the climate change issue are pushing for bottom up approaches. However the framework for in which this approach should be applied is varying from country to country and is influenced by local traditions and other political and administrative factors.

Municipal confusion and uncertainty regarding climate change

Looking at the climate change issue from a municipal or community point of view the issue might appear very abstract. This is the case for many municipalities. Since long the research has been focused on climate change as a global phenomenon and the local effects and impacts of climate change have been rather undiscovered. Therefore municipalities have been unable to grasp the magnitude of climate change. Now however research has enabled more detailed and precise local level forecasts and assessments of local climate change impacts. The fact that the issue is being more graspable and that municipalities are being forced to work in a bottom up manner can be said to constitute a shift from global to local. However this new way of viewing the issue and the way it must be handled constitute a big challenge facing all sectors in society.

Global to local

There is an increased consent around the causes of the observed global warming and its reasons as IPCC (Intergovernmental Panel on Climate Change) writes (IPCC 2007). Earlier there has been doubt regarding the human impact on the climate but IPCC states that the rising global temperatures the last 50 years is caused of increased concentrations of greenhouse gases in the atmosphere. This can be directly transferred to human impact and over exploration of the global natural resources. This is what now accelerates the climate change and will continue to do so during many centuries ahead. In the report it is also concluded that since the mid 20th century the concentrations of carbon dioxide in the atmosphere has increased with 35 percent. The effect of this increase means that the ocean level, as a result of among other things for example increased glacial melting, between the years 1963 and 2003 have ascended with 8 centimetres in average and is now accelerating. With warmer oceans the number of extreme weather events becomes more common in the form of cyclones, storms and floods. Furthermore, the number of heavy rains increases as well as the occurrence of extreme heat. This means that it is not impossible that the Arctic ice cap in the future disappears entirely during the summer months.

In the different future scenarios presented by the IPCC, the average temperature increase until year 2095 can be as much as 4 degrees Celsius. Such a increase of the average global temperature would mean that the ocean level rises with approximately 0,8 metres, however with the reservation that if the Greenland ice melting is accelerated the ocean level ascend further. Finally it is also made clear by IPCC that the CO2 emissions will stay in the atmosphere during next thousand years ahead. With the

IPCC reports there is an increased global consensus about that the global temperature will increase with 2 degrees Celsius.

The effects of the climate change have for many years been investigated and a lot of research has been carried out. With the reports from IPCC there is a growing global consensus regarding the causes of climate change. Now the climate change issue will partially enter a new phase where the perspective is shifted. Focus is shifted against how the climate change objectives and aims will be implemented. However there is still little knowledge about and concrete proposals on how we should adapt ourselves to the climate change.

The climate change issue has to a large extent been up for discussion in a global forum, through UN for example, but the concrete work for the adaptation to the climate change takes place at the local level. This has meant that the question partially has been treated and channelled out in the form of a top down manor where the aims for the climate change issue has been decided globally but the implementation takes place on the local level. This is why the local level is of big interest since the bigger part of the concrete climate change related work is taking place there.

The effects of climate change are in IPCC's report clearly presented in scientific terms. In another report, the Stern Review Report on the Economics of Climate Change, put together by Nicholas Stern on behalf of the English government, focus lies on the economic consequences of climate change (Stern 2006). Stern the former chief economist for the World Bank, states that we with an immediate and powerful commitment in the climate change issue can avoid the most serious consequences of climate change. Like IPCC Stern states that the increase of average global temperature with 2 degrees Celsius is unavoidable and that focus now must be aimed on what can be done in order to reduce the effects and to adapt the society to the climate change. The economic consequences of no action will result in a decrease of global GDP with at least 5 percents a year. Stern puts this in contrast to what it would cost to take measures in order to avoid the most serious effects of the climate change. This would according to Stern amount to 1 percent of global GDP a year. Therefore, the economic advantage of taking adequate measures in the climate change issue today by far exceeds the enormous costs that would arise with no action. The economic consequences will become big if we do not act but the human effects of no action becomes even bigger because people's elementary possibilities of surviving decreases considerable as a result of drought, floods and extreme weathers.

The clarity of the economic consequences of climate change becomes clear and Stern also stresses that there is no conflict in sustaining economic growth and a more active response to climate change. There is rather according to Stern big advantages financially to have an active response and in the long run this is crucial for economic growth. To make this possible Stern calls for global consensus in order to act upon the threats we are facing. Stern also calls for a clearer and more offensive global framework for higher climate change aims where incentives are created for a more progressive technology development. All countries have an important role to play within the climate change issue, however Stern states the industrialised and the richer countries must take a bigger part of the economic burden in the work of adapting society to the climate change.

Turning point on climate change?

There is a great deal of uncertainty on municipal obligations related to the climate change issue. Since there seems to be a lack of clear juridical guidelines on municipal climate work. Although there exists some stimulating measures by the state in order to stimulate municipal incitement on an increasing level of engagement. These were some observations made in 2007, when Nordregio in cooperation with students from the Department of Human Geography at Stockholm University conducted a total survey of Swedish municipal climate work, with a response ratio of 100 percent. The study was a first step in a larger project to understand municipal response on climate change issues. The purpose of

the study was to identify those municipalities with the highest response, measured by the level of how active and concrete their work is. The results gave a unique overview and pinpointed the challenges and hardships facing Swedish municipalities. Furthermore the results have been used to further develop research ideas and to formulate new networks within the Swedish climate change scene. The results were published in a Nordregio working paper (Langlais et al, 2007). Nordregio's ambition is to make an annual follow up of this survey and this fall the second edition of this survey was completed and the outcomes of that will be further described in the section *Turning Point 2 Persisting uncertainty and confusion regarding climate change adaption in Swedish municipalities. Which are the next steps?*

The survey in 2007 was carried out with the assumption that it is happening more than one might think on the Swedish municipal level in their response to the climate change issue. Contrary to previous research studies, there is evidence of an increasing municipal response that is both concrete and active. Some municipalities are more active than others, the question was why some more than others tend to respond more actively and concretely?

In order to investigate these assumptions the survey was conducted using the methodology of Grounded Theory. Thereby the goal was to, as far as possible, minimize preconceived notions. While conducting the interviews a so called "citizens perspective" were adopted, in other words we wanted to know what would happen if a regular citizen would call the switchboard and ask for the person in charge of climate change related issues? Since we were determined to get a response from all municipalities, approximately more than one thousand phone calls were performed. This has resulted in a total response ratio of 100 percent, which in this context must be considered as unique. This survey differs from previous similar research since we have adopted a qualitative approach on an otherwise typically quantitatively researched topic. Prior research has also tended to focused on a smaller population than in this case.

The result of the survey did not entirely give a surprisingly positive picture of the level of activeness among the municipalities in their work on climate change but also clearly shows the challenges they are confronted with. The purpose of the survey has primarily not been to focus on the causes behind the municipal response but we have gained a general picture on possible factors of explanation. An entire scale of different degrees of climate work is present in Swedish municipalities. Some municipalities are permeated by their climate work while others do no more than the law obliges them to. A large number of municipalities claim that they have environmental goals, specific climate work plans and programs for acting under work which soon are to be decided upon whether to implement. Furthermore, among the most common concrete measures on the climate change issue mentioned are ecocars, district heating, establishing energy plans, courses in ecodriving among municipal employees and energy consultation for firms and the public.

Moreover the results as earlier mentioned showed that a big confusion exists on the municipal obligations and also regarding their possibilities to instigate climate change measures. This fact is reflected in the fact that in the efforts to reach the proper person to interview, we were connected to a variety of different people. This underlines a trend, namely that a specific person in charge of climate change related issues only existed in a handful of municipalities. In some municipalities we ended up interviewing janitors in charge of indoor climate working for the municipality and in one case a person working in a greenhouse growing vegetables for the local schools, since we did not find anyone more suitable to talk to. Although in most cases the person we ended up interviewing was either an Agenda 21 coordinator or an Environmental controller.

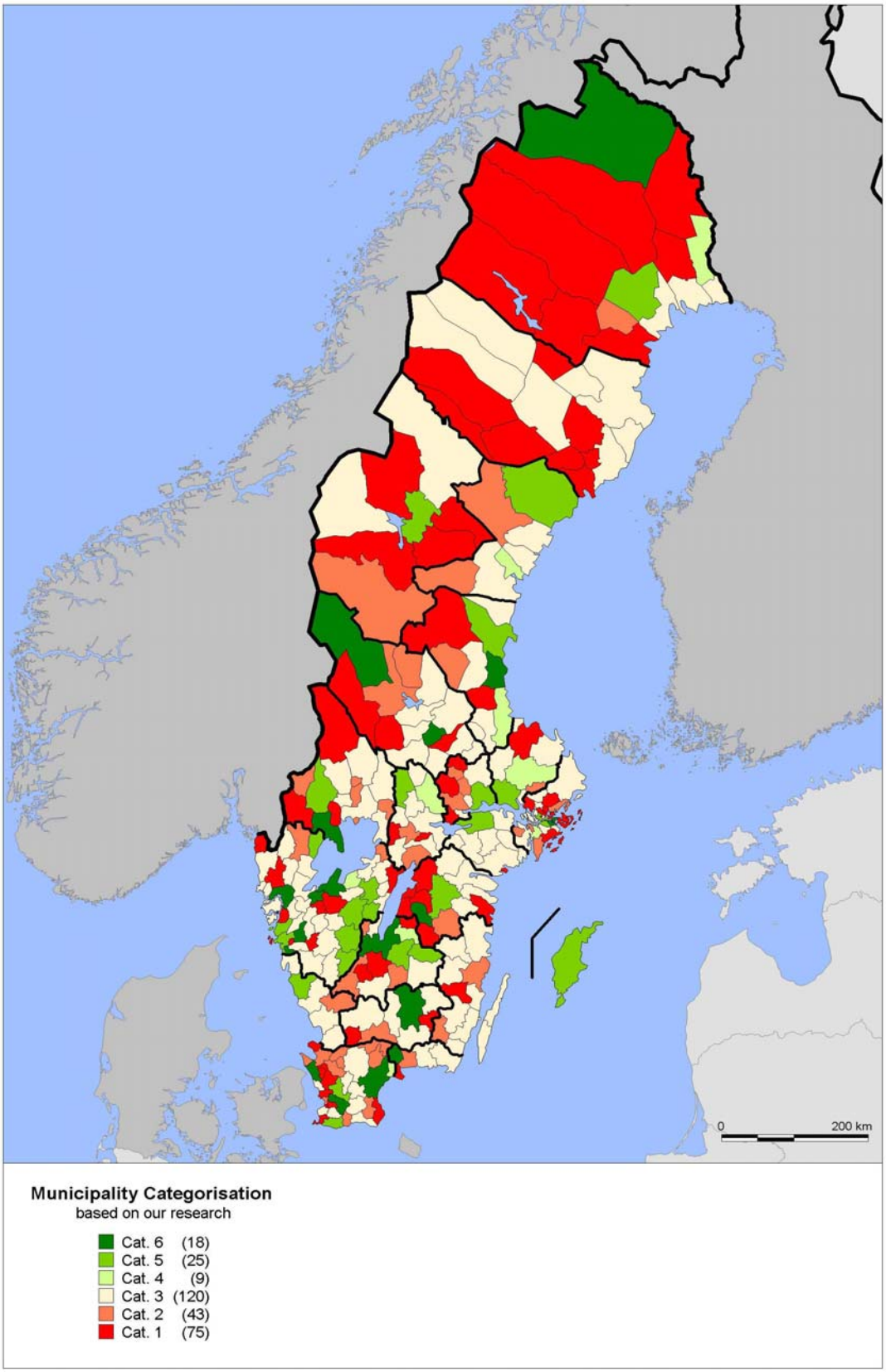


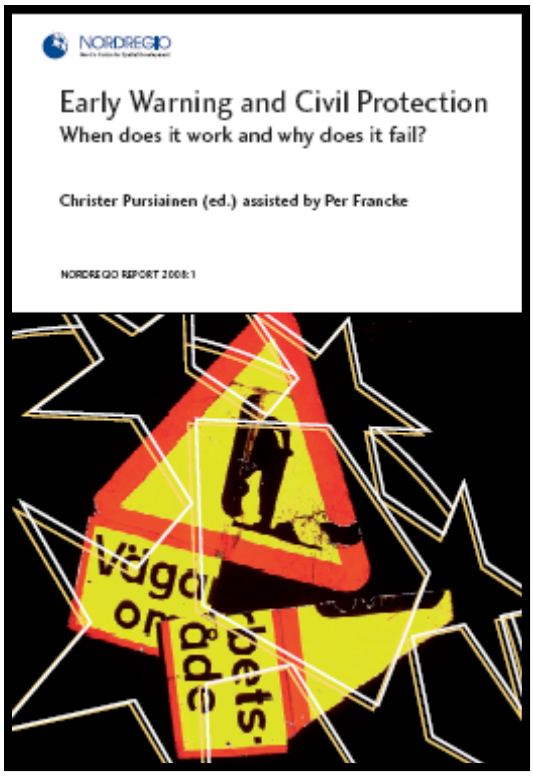
Figure 1 All Swedish municipalities categorized by their level of response 2007. Category 6 is the most active municipalities

The results showed that those municipalities most active tends to be located near water. Another interesting tendency is the existence of a paradox when it comes to small municipalities and their climate work. Some smaller municipalities claim that they are not able to have an active and concrete work on climate change related issues because they are too small and thereby lack the resources. While others say that the very fact that they are small give them opportunities in their work since they are not hindered by too much bureaucracy. The survey also showed that a specific pattern is evident among suburban- and commuting municipalities mostly in the Stockholm- and Malmö area, having a lower degree of climate engagement than the average municipality. A lot of times the municipalities blame the through way traffic, which they do not have the resources to affect. A further argument among the most inactive municipalities is the lack of political will. In relation to these interviews the need for clearer goals has often been expressed. The national environmental quality objectives are criticized by some for being to abstract and not applicable for their municipality.

The tendencies and trends we have identified correspond with the notion that the explanation factors are to be found in social processes at the local level. The importance of further studies within the field is underscored by the fact that the effects caused by climate change put higher demands on society to adapt. The big challenge is to get all municipalities to act now. The cost of future destruction caused by the climate change is far bigger than the investments that can be made today in order to partly restrict and to be prepared for the damages that will come. A big challenge is to get people in power and actors to realise this. It is thereby important to focus on the actors participating in processes in the municipal climate work because they largely affect the municipal response on the climate issue.

Several rationalities for local level climate change response

A project entitled *Civil Protection Early Warning: From Weak Signals to Response* carried out by and coordinated by Nordregio in 2007 has been an important point of departure for the MuniRes project. The project focused at developing risk assessment/management systems and improving knowledge and expertise especially from the perspective of Civil Protection early warning. In more detail it investigated, reviewed, compared, evaluated and developed early warning systems in general as well as within three issue areas of Civil Protection, namely Floods, Critical Infrastructure Protection and Maritime Safety (Pursiainen et al. 2008).



The project dealt particularly with the "bottleneck" puzzle of an early warning. This is the period between the first, sometimes rather "weak" signals, on the one hand, and the response, on the other hand.

One of the chapters in a book published by Nordregio, compiling all the case studies in the project, entitled *Climate Change Emergencies and Municipal Planning: the Case of Mariestad in Sweden* focused on the situation of a municipality ignoring the early warning signals. In the chapter a housing development project instigated by the municipality was in focus and in which the municipality have chosen to ignore the very obvious threat of flooding. The area for the housing development is situated on the shore of lake Vänern (Sweden's largest and

Europe's third largest lake), one of Sweden's most flood prone areas. The planning and building of Sjöstaden (Sea Town), a highly modern housing complex in Mariestad, is a very complex project in which the municipality have been investing a lot of prestige. Mariestad wanted to brand the municipality and also try to attract new inhabitants with new, modern and attractive sea side living. This was a very strategically decided project as Mariestad wanted to "brand" itself and to build on its vision of being "the pearl of Vänern." Despite the direct early warnings provided by the Swedish Commission on Climate and Vulnerability as well as other sectoral authorities, and intensive media and other public attention, Mariestad decided to continue with its Sjöstaden project ignoring the early warning signals. The municipality however does not consider that it underestimates the flood risk as there are already are buildings at places where there are risks of floods. All the responsibilities for climate change was in Mariestad's view something that the national authorities should handle.

The case contradicted the usual view that the "local is best" and that those in the community are those who know most about how to solve local problems. At the same time, the case also illustrated the difficulties municipalities have in translating the global reports and the guidance provided by global actors like IPCC. Furthermore the idea to brand the municipality also proved that several rationalities are at play and that the obvious and rational from an "objective" point of view is not entirely true as the local rationality is nested in several local aspects. Even though the signals arrived, the receiver (Mariestad in this case) chose to ignore them due to a local rationality.

The study has been a big inspiration for the MuniRes project as it highlights the climate change dimension in civil protection terms with the idea of signal to response and the bottlenecks. These bottlenecks are crucial to understand in order to formulate and develop the Climate Change Guidelines for European Municipalities to be as user friendly and also to make sure that the target the right issues.

National Adaptation Strategies in the Nordic Countries

As a part of the MuniRes project a Nordic overview have been performed to further highlight the municipal and local level preconditions for working with climate change. The overview covers all the five large Nordic countries.

The Nordic countries have since long been at the forefront regarding work on environmental and sustainability issues. This tradition is indicated by the ambitious national target to reduce greenhouse gas emission as well as implementing actions and introducing new technologies to spur the usage of renewable energy sources. Furthermore this field is an important business opportunity to export Nordic environmental solutions with technologies and knowhow. By having this tradition combined with strong research environments regarding sustainability and climate change issues, the Nordic countries have good opportunities to develop strategies and implement actions in order to face the global climate change challenge. Even though the Nordic countries in many respects share similar societal structures and display cultural similarities, there are different approaches and developments regarding climate change in the Nordic countries.

Climate change adaptation strategies are appearing on the political agendas of all of the Nordic countries. But the degree, to which adaptation strategies are becoming institutionalised at national level in concert with measures for the mitigation of greenhouse gases, differs among the Nordics. The national, regional and local settings dictate the prerequisites for the development of climate change strategies and this fact reflects the national processes of developing climate change strategies. Those countries largely affected by extreme weather and natural disasters have perhaps been more

proactive regarding climate change adaptation. One major outline and similarity amongst the Nordic countries is that they are all in the process of developing or finalising adaptation strategies.

In general Finland is the forerunner regarding climate change adaptation as they adapted their strategy about two years before their Nordic neighbours. In 2007 Sweden presented their first strategy and proposal for the upcoming proposition in 2008 and then followed Denmark with their release of their strategy in March 2008. Norway and Iceland are in the process of finalising their adaptation strategies.

The visibility of the Nordic countries as the forerunners in climate change adaptation will be displayed in 2009 with Sweden's presidency of the European Council in the latter half of 2009. This is also illuminated by the fact that Copenhagen is the hosting city of the fifteenth Conference of the Parties (COP) to the UNFCCC and the Fifth Meeting of the Parties (MOP) in 2009. This is a big opportunity for the Nordic countries to project themselves as the forerunners in the climate change issue. Furthermore it's also an opportunity for long-term image-building, since the "best practices" of the Nordic countries in terms of climate change mitigation and adaptation will be at the centre of international media attention.

Denmark

Traditionally the Danish work on climate change has been rather heavily focused on mitigation and adaptation has for the most part been rather undeveloped. The fact that mitigation has been at the top of the Danish climate change agenda has made Denmark into a pioneer and forerunner within renewable energy production and development. Furthermore Denmark has been quite spared from any major weather and climate related disasters which might be one of the factors behind the large mitigation focus. However in the development of adaptation and mitigation has been ongoing for several years and the linkages between them are now becoming more and more evident.

The first steps towards a climate change strategy

The Danish efforts towards developing a national strategy for adapting to a changing climate began in 2001. The Danish Energy Authority began work on a report regarding climate change adaptation based on a wide spread body of literature, including scientific reports and other national and international examples of climate change and this was done in order to form a knowledge platform for future strategy development. This report was sent to the Ministry of the Environment in 2002 (Dansk Tilpasning till et ændret klima).

The relationship between mitigation and adaptation where highlighted in a brochure published in 2004 by Ministry of the Environment and the Environmental Protection Agency in Denmark entitled "Adapting to the Climate of the Future". In the brochure it was concluded that: "Adaptation to and mitigation of climate change are not a question of either one or the other – but rather of both". (2004:5). On September 5, 2007, just after one of the worst periods of flooding events in Denmark in the summer of 2007, the Danish government presented its first draft of a national climate change adaptation strategy "Strategi for tilpasning til klimaændringer I Danmark- Udkast". The main message and guiding principle put forward by the report is "Why wait to adapt?" The idea is that the national strategy should be a tool to help coordinate ad hoc measures for both public and private actors in order to face the societal challenges of climate change. The focus of the new draft strategy on independent, but coordinated, ad hoc measures of actors on various levels underscores the importance of having all actors on board in the national adaptation strategy.

Final strategy released

After the release of the draft version of the climate change adaptation strategy, it was issued out for public debate until the middle of October 2007. Comments from citizens, NGO's and public and private stakeholders where welcomed. The final strategy "Strategi for tilpasning til klimaændringer i

Danmark" was released in March 2008 by Connie Hedegaard, Danish Minister for Climate and Energy (the first minister on climate change in the Nordic countries). As in the draft version the motto "Why wait to adapt?" is still the guiding principle backed up with an over all reasoning around sustainable development with focus on ad hoc measures.

The strategy concludes that Denmark will experience more extreme weather conditions with overall higher temperatures and also more rain. Furthermore the strategy also raises the issue of raising sea levels which potentially can largely have an impact on Denmark's many costal communities. These more generally described impacts and weather scenarios are then broken down by sector. Each sector has its own responsible ministry that have the responsibility to implement the actions needed to fulfil their sectoral goals regarding climate change.

On one hand the strategy focuses on a sectoral approach but this approach is the supplemented with a cross sectoral approach in order to nurture and induce cooperation across sectors and amongst actors and stakeholders. In order to achieve success with this approach three main strategies are listed which include:

- Establishment of a climate adaptation internet portal for the distribution of climatic and other earth sciences data, as well as assistance with decision-making processes and economic tools of analysis
- A research strategy focusing on adaptation issues and production of new socio-economic models and tools for adaptation needs, including a coordination unit for research on climate adaptation
- Organisation for further efforts, including a cross-ministerial coordination group for climate adaptation coordination horizontally across sectors and vertically among administrative levels, as well as a knowledge centre for climate adaptation under the Ministry of Environment.

Finland

Finland is the first Nordic country that has adopted a climate change adaptation strategy. In 2001 the parliament decided that the current, general strategy on climate change needed to be supplemented with a special strategy for adaptation. The preparation work for the strategy began in 2004. In the process leading up to the climate change adaptation strategy, three major topics where guiding the process forward:

- The build up of knowledge on the effects of climate change in Finland
- The need for adaptation measures regarding the effects of climate change
- The need for adaptation regarding international and non Finnish issues

In the process of getting the strategy in place, several actors and stakeholders were involved. A working group consisting of representatives of ministries and research institutes and coordinated by the Ministry of Agriculture and Forestry prepared the strategy with an input from stakeholders, experts and the research community. Also, at the time of the strategy preparation the FINADAPT consortium, funded by the Ministry of Environment, was making the first in-depth studies on Finnish adaptation regarding climate change issues. The draft strategy was then modulated by the different actors involved in the process, before it was adopted as the national strategy on climate change adaptation in the first half of 2005 (Ministry of Agriculture and Forestry 2005).

The national strategy on adaptation to climate change was published as a separate document and the central parts of it were included in the Finnish national strategy on energy and climate, which was given to the parliament in 2006. In the strategy some specific prioritized measures were pinpointed in

order to enhance the overall adaptation capacities. In general these measures are focused on cross-sectoral cooperation and mainstreaming, strengthening research and building capacity to cope with extreme weather events (Ministry of Agriculture and Forestry 2005). The implementation of the strategy started in 2005 and the strategy will be renewed in 6 to 8 years time. An evaluation process will start during 2008 to asses the implementation part of the national adaptation strategy.

Actors and sectors in Finnish adaptation on climate change

The practical implementation of the adaptation strategy is carried out on a sectoral basis, with various kinds of strategies and programmes for its implementation. To take climate change adaptation issues into account, there is a need for long term planning together with the normal 5-10 years planning cycle. Private sector adaptation measures are expected to take place in the future. The ministries are also actors in adaptation through their planning and guidance of their administrations. Several ministries have started implementing the strategy. Ministry of the Environment has prepared an adaptation programme that contains practical adaptation measures. The Ministry of Agriculture and Forestry is mainstreaming adaptation into its plans and programmes, including the National Forest Programme. Stakeholders as well as regional and local level authorities are also getting active and starting their adaptation work.

Ongoing processes and the way forward

Finland is in many ways the Nordic forerunner regarding climate change adaptation in the sense that they actually have adopted a strategy on adaptation. But the actual adaptation also needs to take place. With this notion and following the development of the adoption of the climate change adaptation strategy, the Climate Change Adaptation Research Programme (ISTO) was launched by a joint effort of Finnish ministries. ISTO is coordinated by the Ministry of Agriculture and Forestry Ministry of Agriculture and Forestry (2005). The programme funds individual projects during the period 2006-2010 and the overall aim of the programme is too facilitate more in-depth and concrete adaptation measures and to aid the implementation of adaptation strategies. Furthermore the aim is to tackle the lack of integration regarding climate change adaptation work between the different actors. The conducted research is supposed to feed in to the various strategies on climate change adaptation in order to evolve and further enhance the strategies. An evaluation of the implementation and a prescription of additional measures will therefore be carried out on the basis of the state of knowledge resulting from research and experience. The evaluation process of the ISTO programme will be carried out in 2008 and 2010. The first midterm evaluation was released in June 2008 and the results showed that the projects conducted within the programme are found useful for the work on adaptation. However the funding of the programme has been smaller then expected and therefore all the planned projects in the respective sectors have not yet been started. The final evaluation will be carried out in 2010.

The future for Finland's Climate change adaptation strategy

After the newly appointed government was installed, the newly elected Prime Minister of Finland, Matti Vanhanen took the initiative and launched work on a foresight report on Finland's energy and climate policy. The work on the foresight report is headed by the Green Party's Member of Parliament Oras Tynkkynen and the process of developing the report will run parallel and feed in to the new Finish climate and energy strategy. The final report will be submitted to the Parliament in spring 2009. In the development of the foresight report the Finnish Environment Institute (SYKE) will deliver twelve thematic background papers. The first paper, released in June 2008 focused on the possibilities of integrating and mainstreaming climate change into the different policy areas (Finnish Environment Institute 2008).

In the coming year all the initiated initiatives with the energy and climate foresight report and the coming energy and clime strategy as well as the ongoing work on climate change adaptation will cross fertilize and feed in to each other. Regarding climate change strategy development in Finland it can

therefore be said that there are two major processes in place, with the climate and energy strategy as well as the foresight report, and a third not yet formally started process of developing a new climate change adaptation strategy. Both the foresight report and the climate and energy strategy will have elements of adaptation in them but to which extent remains to be seen.

Iceland

Having been highly sensitive to climate changes throughout the centuries, Iceland has a long history of taking adaptive measures. Specific climate change adaptation measures in Iceland have so far been quite minimal, as the threats to Iceland are assumed to be fairly minimal. Furthermore the impacts haven't been thoroughly mapped upon till now. Instead the emphasis has been on mitigation efforts. Regarding mitigation efforts Iceland are in a league of its own, with over 70% of the total energy production comes from renewable sources. Within this area of renewable energy production Iceland have enormous potentials for production of renewable energy due to the very special geological setting (Ministry of Environment. 2007).

Thus Iceland's potential climate change adaptation strategy has thus far not been seen as a political strategy in itself, but rather as part of the general long-term climate change strategy, including mitigation as formulated in the document "Iceland's climate change strategy Long term-vision 2007-2050", published by the Ministry for the Environment in February 2007. Seen together, adaptation and mitigation are related to governmental strategies and objectives in a range of other areas vital for Iceland, such as economic affairs, energy issues, transport, fisheries and developmental aid.

Regional differences caused by climate change I Iceland are important to acknowledge as for example some regions of Iceland are far more dependent on the fishing industry, for instance, and thus more vulnerable to fluctuations due to climate change (Iceland's fourth national communication on Climate Change Under the United Nations Framework Convention on Climate Change, 2006). In terms of infrastructure the most important adaptation measures will probably mean changes in the design and/or operation of hydropower stations, dams, harbours, bridges and other structures that are affected both negatively and positively by changes in the flow of rivers and a rise in sea level (Iceland's fourth national communication on Climate Change Under the United Nations Framework Convention on Climate Change, 2006). Furthermore some communities and other structures close to the shore have already been designed to take flooding precautions into account with respect to future climate change in Iceland.

A new climate change strategy underway

Two scientific committees were established after the release of the current strategy in 2007 and the first committee had the objective of reporting on the impacts of climate change in Iceland. Furthermore the second committee focused on the possible climate change mitigation options. Included in the work of the first committee was the task of illuminating issues with respect to potential adaptation to climate change. The committee had the 4th Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) and previous Icelandic reports on climate change, in particular "Climate Change and its Effects" which was issued in 2001 as their point of departure for the new report. The two committees, apart from being scientifically anchored, also worked closely with a broad array of Icelandic stakeholders and actors.

The report from the committee on the impacts of climate change was released in the beginning of August this year. In that report, which at the moment is only available in Icelandic, follows a more detailed description of the impacts of climate change then the description given in the climate change strategy released in 2007. The general conclusion reached by the scientific committee are that the impact of climate change is largely already being felt in Iceland and that future climate change will have a considerable impacts on the Icelandic society. The report focuses on the new climate and environment that Iceland will have in the future. This forecast is then broken down and the impacts

following the new climate are described according to different sectors. The change in the environment will for example have large impacts on the fisheries as different species of fish migrate and spawn according to changes in water temperature. Furthermore, as the average temperature rises the glaciers will retreat and more water due too glacial melting will be released in the rivers and that will increase the risk of flooding. However glacial retreat will have some positive effects as it will lead to uplift which in some parts of the county will counteract rising sea levels and furthermore the hydropower generation will benefit from the melting glaciers. One of the main recommendations for action put forward but the committee is to establish better risk management practices in order to cope with the enhanced flood risks. In the work for better risk management one important component identified by the committee is to also make sure that continuous monitoring of sea level rise, natural ecosystems and vertical movements are in place and are made available to planning authorities and other affected stakeholders.

This report on the future impacts of climate change in Iceland will be one important part in the formation of a new Icelandic climate change strategy that is due to be released this fall.

Norway

The Norwegian approach and development towards a climate change adaptation strategy differs slightly from it's Nordic neighbours. Although there is now strategy on adaptation in place yet, lots of actions have been implemented. Research on climate change and adaptation has a special status in Norway and large research programmes such as RegClim and NORKLIMA have been set up to spur the pace of research on the effects of climate change and possible adaptation measures.

Getting started

One important starting point for climate change adaption in Norway was the release of a preliminary study to a national adaptation strategy. It was published in 2004 by CICERO (Centre for International Climate and Environment Research) and in the report in three possible models for organizing the adaptation process were outlined:1) a process led by central authorities; 2) A process coordinated by an interest organization; or 3) A research-based process implemented by a group of interest and research organization.

Thus far the main actors on the Norwegian climate adaptation scene have been national ministries, research institutes and local and regional authorities. A seminal turning point in the Norwegian efforts to deal with climate change adaptation came in August 2005 with the convening of an inter-departmental seminar on climate change adaptation organized by the Ministry of Environment. As a follow-up to the seminar the "Report on vulnerability and adaptation to climate changes within sectors in Norway" was published in 2006. This can be regarded as one of the first steps towards a national adaptation strategy. The Directorate for Civil Protection and Emergency Planning (DSB) under the Ministry of Justice and the Police also has a special responsibility for the coordination of risk and vulnerability planning. The challenge is thus to create the conditions for coordination and transfer of information, both vertically from national to regional and local level, and horizontally, between authority levels and other actors such as research institutes.

Ongoing and future adaptation activities

In May this year the Norwegian Government released a report (Klimatilpasning i Norge - Regjeringens arbeid med tilpasning til klimaendringene) stating the guiding principles for the future work on climate change adaptation. In the report the structure and content are very similar to the Danish climate change adaptation strategy. The overall aim of the Norwegian work on climate change adaption is to reduce society's vulnerability to climate change and too strengthen Norway's capacity to adapt to climate change. The main goal is the divided in to three sub goals:

- Mapping of the Norwegian vulnerability to climate change and integration of climate change in spatial planning
- More knowledge on climate change and climate change adaption in Norway
- Spur coordination, information and too heighten the level of knowledge and awareness

In the report the climate change impacts and the need for adaptation is described in general and then they are broken down by sector. With this report the government invited stakeholders, researchers, public and private actors to comment on the suggestions and actions put forward in the report. This first round of comments closed in July this year and after the comment deadline the feedback received will be used in order to revise and reformulate the report. This report forms that basis for the development of the Norwegian climate change adaption policy.

Even tough it may seem that Norway are a bit behind it's Nordic neighbours regarding strategy development it is not the case on all areas. Norway hasn't got the thick and exhaustive climate change strategy as Sweden, Finland and Denmark but they have chosen a different approach and have been very proactive regarding research and are a bit further down the line then the rest of the Nordic countries. Furthermore it seems like the report will not end up being a thick and exhaustive report but rather form a basis for the future climate change adaptation work in general for Norway.

Sweden

In the summer of 2005 the Swedish government issued a commission called "Klimat- och Sårbarhetsutredningen." (Swedish Commission on Climate and Vulnerability) (Miljödepartementet 2007) Their mission was to analyze the Swedish societal vulnerability regarding the effects of an accelerating climate change on critical infrastructures such as water supplies, transport infrastructure and energy production among others. An important objective for the commission was to bring all the effected and responsible stakeholders/public authorities together in order to establish an efficient organization for the work on adaptation on climate change issues. The final memorandum was presented in early October 2007.

The future work on Swedish societal adaptation to climate change seems to be more aimed at the regional and local level rather than to establish and formulate national strategies. This possible future approach differs from the other Nordic countries by being more focused on decentralizing the responsibility. Parallel to the "Klimat- och Sårbarhetsutredningen" the Swedish government has also issued a range of other more mitigation focused commissions and reports. For instance there have been focus on developing tools and providing support to the Swedish municipalities to spur the roll out on renewable energy production that has been partly hindered by overall to complicated processes and this applies especially to wind power. All these initiatives are leading up to the upcoming governmental climate change proposition that is due to be released during this fall. The proposition will have a rather general scope and will encompass adaptation as well as mitigation issues.

First adaptation strategy released

Since 2000 the Swedish government has issued a number of proposals on issues relating to climate change, mainly dealing with vulnerability and crisis management (Miljödepartementet 2006). The first clear step towards an adaptation strategy was taken in 2005 when the governmentally induced commission "Klimat- och Sårbarhetsutredningen" was launched. The commission was rather top-down focused with initiatives and the guidelines coming from the national level have been rather focused on the actors at the national level. The structure of the commission followed the structure of responsibility among the Swedish public authorities. Furthermore the actors are divided into their corresponding sector and this is in general the approach to divide by sector. The commission itself was divided into four main sectors or thematic areas, technical infrastructure and spatial planning,

agriculture and forestry, health and water resources, flooding of the great lakes (Mälaren, Vänern, and Hjälmaren). In general the Swedish work on climate change adaptation is to a large extent focused on water related issues such as flooding.

When the final memorandum of "Klimat- och Sårbarhetsutredningen" was released in early October 2007, the result was a thorough description of the presumed effects and possible future societal challenges due to climate change. However, little is actually presented on the concrete efforts needed for adaptation. Furthermore the suggested actions were presented according to sectors and include strengthened research; new legislation regarding building standards and responsibility; clearer regional responsibility regarding the coordination of adaptation to climate change (Miljödepartementet 2007). The latter mentioned suggested action is perhaps the most interesting. With this statement Sweden differs from the other Nordic countries in that there in the future might be an increased focus on the regional level in the work on adaptation. Therefore a new national strategy on adaptation to climate change would seem more unlikely. In their role as coordinator, the regions and county administrative boards will ensure that the local and regional variations are included in the work for adaptation. The Environmental Protection Agency would have the overall responsibility for co-ordinating the work and reporting on the progress made in each sector.

Ongoing processes and future plans for climate change adaptation in Sweden

With the release of the "Klimat- och Sårbarhetsutredningen" a year long process of discussions, hearings and commenting was instigated in order to gather and collect comments on the report for the upcoming proposition on climate change due to be released this fall. In relation and parallel to the "Klimat- och Sårbarhetsutredningen" a number of other climate change related commissions and reports have been issued. All these reports and results from the committees will for the basis for the upcoming proposition in which "Klimat- och Sårbarhetsutredningen" is the one dealing with adaptation.For instance, in January 2008 The Climate Committee will release their report on how Sweden can improve and develop their policy on climate change. Looking further ahead, in 2009 Sweden will have the EU presidency and this coincides with the new negotiations for a new framework agreement under the UNFCCC. This is a big opportunity for the Nordic countries and Sweden in particular to project themselves as the forerunners in the climate change issue.

Case studies

In the project the case studies are used in two was as describe earlier. Firstly they are cases selected for research but equally as important they are advisory partners and represent the stakeholders that the project has as its target for the Climate Change Guidelines for European Municipalities.

The selected cases have all been chosen on the basis of their climate change related work and their possibility to provide important and fruitful input to the guidelines. All the municipalities presented in this report, Greve and Hedensted municipalities in Denmark and Kristianstad in Sweden, are all in some way affected by flooding. However they all have their differences and particularities that provides useful input to the guidelines. Kristianstad is perhaps the most well known Swedish climate change municipality and have been working with the issue for a long time. Furthermore they are one of a few Swedish municipalities that have actually implemented adaptation measures to counter the impacts of climate change with their barrier building. The Danish municipality Greve is one of the most flood prone municipalities in Denmark and are one of only a few Danish municipalities that have experienced flooding which is a quite new phenomenon in Denmark. Greve however have instigated several measures to mitigate the consequences of future flooding. By making strategies, establishing scenarios and models as well as adopting a system for constant surveying, makes them a forerunner in climate change work in Denmark. The other Danish municipality Hedensted is a relatively small rural municipality with no large scale flooding but the have adopted a very proactive approach. As one of the first, if not the first, municipality in Denmark Hedensted have worked to achieve a sort of climate change mainstreaming in where they are making climate change an integral part of the municipal strategy development.

The reason behind only having one Swedish municipality as a case study is that we chose to make an update and second edition of the Turning Point study covering all the Swedish municipalities. This gives us a unique possibility to really reach out to all the municipalities and with a few key questions pinpoint the challenges, hardships and possibilities that municipalities face in Sweden regarding climate change. The results from this years study are more applicable as they can be compared to the results from last year. One interesting aspect in this context is that we from this study have gained an understanding for municipal climate change related work and in this project one of the main interests have been to use the experiences with the Swedish cases to see how and if they are applicable to other European countries. Even though all European countries have their on traditions and models for how to work with climate change, several likenesses have been observed.[1]

During the project duration the cases have therefore been used in different ways in order to provide the best possible input to the guidelines. During the first part of the project the cases have been studied more as a usual case study in a research project where interviews have been conducted and municipal strategies and documents have been analysed. In the second phase more intense discussions through seminars, workshops and meetings have been held to extract the most interesting and food for thought giving material to integrate into the guidelines. Furthermore the guidelines have been produced in several draft versions that have been continually discussed and assessed during the second half of the project.

The Danish cases

In general for Denmark there haven't been that many climate change emergencies and therefore the focus for the Danish climate change debate have been largely focused on mitigation and reduction of CO2 emissions. Furthermore water resource management have also been at the top of the Danish

[1] More about the Turning Point studies on page 28.

climate change agenda but adaptation and preparedness actions in different shapes and forms have been quite absent compared to the other Nordic countries. One important aspect of this development is the recent municipal reform that merged 275 municipalities into 98 and in this process the municipalities received a larger responsibility for the municipal planning and for other municipal activities.

After this reform the structure and roles for the national level and the municipal level have been rather vague. The municipalities have been given more responsibility but feels that they can cope with the situation and need support form the national level. An example can be found in one of the case study municipalities Greve where the extreme flooding events in 2002 and 2007 put an immense pressure on the municipality and called for immediate actions to cope with the large water masses. During the period of the flood inhabitants needed to be evacuated and critical infrastructures where threatened and partially out of function. Therefore the resources needed to cope with this event where lacking. Even though this event was hard to forecast the aftermaths have been very costly and the municipality have had to bear the burden themselves and haven't received any support from the national authorities.

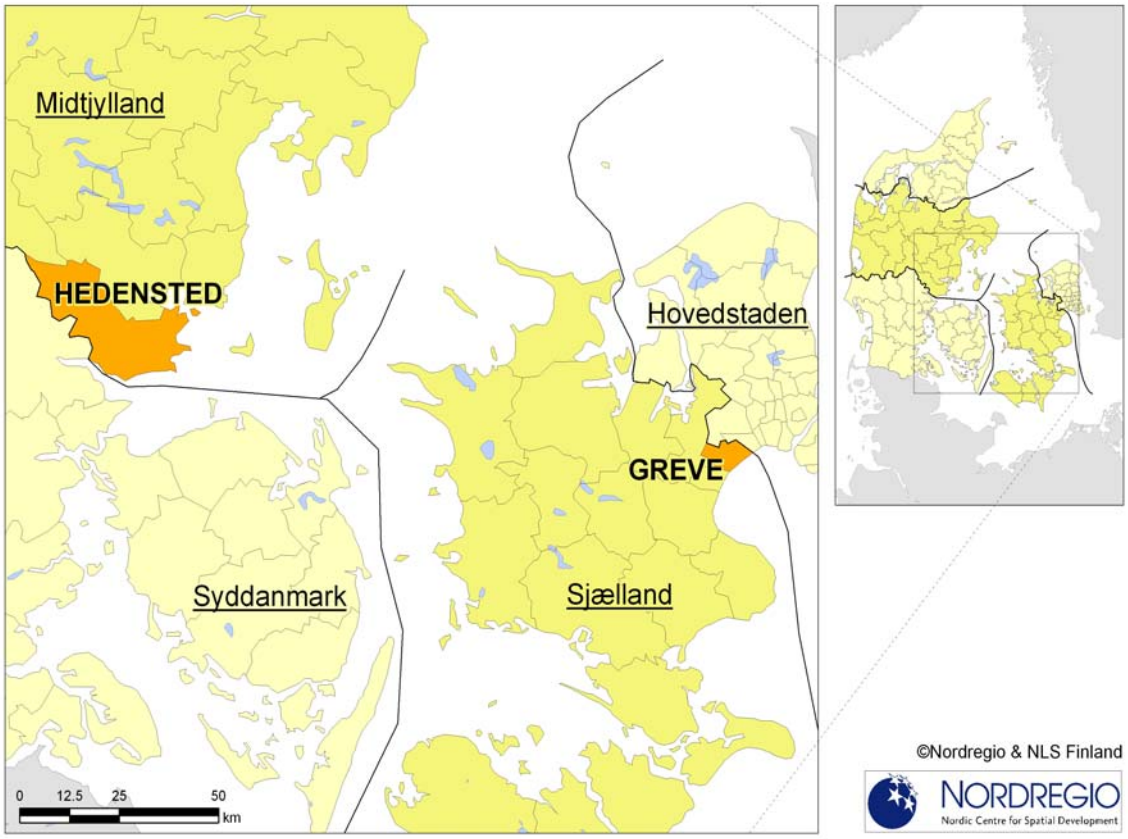


Figure 2 The Danish case study areas Greve and Hedensted

Greve municipality adopting autonomous adaptation measures to cope with the rising water levels

One Danish municipality that have been forced to instigate large scale adaptation measures is Greve municipality. Located on the cost in the southern parts of the greater Copenhagen area and situated in lowland terrain, Greve can be said to be one of the most flood prone areas in Denmark. Due to climate change more high intense rain will cause more frequent flooding. The municipal council of Greve has therefore decided to upgrade the capacity of the existing rainwater system to be able to carry 30 % more water. However the planned adaption measures are costly and Greve will have to bear large costs to adapt to climate change.

In the last few years there have been two major flooding events, 2002 and 2007. Historically Greve have been speared of such events in the past but the threat is growing. During the last flooding episode in the summer of 2007 evacuation was needed in order to protect the citizens. The situation put the local rescue services under pressure as the flooding wiped out some of the critical infrastructures temporarily and for some time communications and electricity was not functioning. The consequences following the disruptions in communications and electrical supply meant that the local rescue service couldn't manage the situation due to lack of coordination and resources. One of the respondents where describing the situation as chaotic and that the rescue services was coordinated by people using their loud voices. Several homeowners criticised the municipality for not doing enough during the flooding to protect their homes. But according to the interviewed officials little or nothing could have been done to mitigate the flooding as it came more or less as a total surprise.

Figure 3 Flooding in Greve 2007. Photo: Greve municipality

Following the severe flooding events, Greve are investing largely in building capacities to cope with future flooding events. The first step was to launch a large scale evaluation of the flooding in 2007. The report presented the reasons behind the flooding as well as listing future needed measures to cope with future flooding (Greve municipality 2007). Furthermore the earlier angry homeowners and Greve inhabitants will now receive constant updates and flood alerts through the official municipal homepage[2]. The homepage is the main source of information for the inhabitants regarding flooding.

The need for dialogue is perhaps obvious but there is another reason why this is needed in Greve. In Denmark the municipal water utilities are financed with a fee provided by the inhabitants. This fee finances maintenance and development of the water infrastructures (sewer systems, fresh water supplies etc.) and as identified in the evaluation the local water infrastructures couldn't cope during the flooding so therefore they needed to be upgraded. Hence the dialogue. The municipality needed to launch the dialogue not just to inform the public but also to gain acceptance for the raised fees that are needed to adapt the municipal water infrastructures to climate change. This is the financial instrument that the municipalities have when the national authorities won't provide the needed funds for investments.

Adaptation of the city to climate change is performed using a so called strategy model developed by Greve municipality. The model is used to help prioritize in which areas of the city to adapt first, second and so on. The strategy model combines a digital terrain model with a hydraulic model. The hydraulic model covers streams and sewers systems. Using different rain scenarios and basic flows in the streams, the model calculates which areas will be flooded first and this is crucial knowledge to have in order to put the necessary adaptation measures into place. Furthermore, the implementation of the model is supported by continuous surveying of the streams and the sewer system to calibrate and validate the model performance and to alarm in case of high water levels in specific areas. The vision of Greve is to have a model of the total water system. Greve are therefore developing a model for the groundwater system, which will be combined with the strategy model. All these actions are coordinated with the implementation of the EU flood directive in order to predict future flooding and to mitigate the societal impacts of flooding.

Even tough Greve is investing heavily in adaptation measures to mitigate future flooding the problem won't be solved. Flooding will always be present in Greve but with the right measures and with an active planning Greve will be able to make sure to limit the personal and property damages caused by flooding. One step towards such a situation is the development of a sort of flood evacuation maps. With these maps the municipality will be able to locate appropriate places to direct the flooding water masses to in order to save other parts of ht municipality. One such example mentioned by the municipality is to make some recreational areas, such as football pitches, into flood buffers as places which can be allowed to be flooded to save other parts.

[2] More about the dialogue on: http://www.greve.dk/Oversvoemmelsesinfo

Figure 4 Example of adaption measures in Greve. Due to the flooding in 2007, a barrier along a stream has been build to prevent future flooding. Photo: Greve municipality

The development of the Greve strategy model is perhaps the trade mark of Greve. They use different technical tools to provide better knowledge of the local preconditions concerning flooding which also leads to a better starting point for implementing adaptation measures. But in this context it should be stressed that Greve have done this all on their own and have to bear large costs for the adaptation to the climate change induced flooding. As in the case of Hedensted, the respondents in Greve several times underline that they have had to bear all the costs and that the national authorities are leaving it up to them to carry out climate change and flood protection measures.

Hedensted municipality adopting a proactive approach and mainstreaming climate change adaptation

A small rural municipality situated on the eastern Jutland coast with close to 46000 inhabitants. The municipality is newly formed after the Danish municipal reform and is comprised of three earlier individual municipalities (Hedensted, Juelsminde and most of the former Tørring-Uldum municipality). Hedensted is the largest city but the overall urban structure of the municipality is rather scattered and several small rural villages are situated around Hedensted. The two larger neighbouring cities Vejle and Horsens are large labour market centres and most of the Hedensted inhabitants commute to those cities. Due to the rather scattered urban structure and the long distances the inhabitants have to use their cars for transportation.

The municipality is situated on lowland with large plains and this is due to the ice age where these formations arose. Further south and east the landscape is more varied and undulating. This fact means that the municipality have rather problematic geological preconditions as the combination with the lowlands means that the groundwater level is standing quite high and in case of heavy rains and costal flooding the ground can't cope and handle the increasing water masses. Furthermore in the last few years the frequency of flooding events and raising ground water levels have increased, mostly due to larger amounts of rain but also due to melting snow which increases the total amount of water that needs to be handled (Hedensted municipality, 2008a). Even though no major flooding emergencies have taken place Hedensted, the municipality are one of the early adaptors and pioneers when it comes to adaptation activities and preparing for a changed climate.

Figure 5 Flooding in Sandbjerg Vig, Hedensted. Photo: Birger Brix

One of the main problems and challenges according to the municipality have been to establish scenarios and to try to make the climate change impacts more concrete and usable in the municipal planning and strategy development. As they don't have a scenario backed by the national authorities they feel that they are unable or hindered to proceed with strategy development. Furthermore the municipality are requesting help with making more accurate surveys and studies on the municipal climate change impacts indicators such as groundwater levels, sea level raise and drainage system analysis. At the time being the municipality are forced to pay large amounts of money to hire consultants to do the job even though there are national statistics and figures available. One innovative approach which the municipality is using is to involve the inhabitants by making them to report in observed flooding. Ever though Hedensted have come quite far they still have a lot of work to do regarding mapping and calculating the effects of climate change. Or as they said in an interview: -we are aware and have good knowledge regarding what we can see above the ground, but underground it is a completely different story.

As described above there are a lot of challenges facing Hedensted but despite the large challenges they have been really proactive and instigate lots of interesting measures. Behind the success of Hedensted being an early adaptor is as they describe it mainly due to good local knowledge on the municipal preconditions, knowledge sharing and a municipal consensus culture. With the municipal reforms in the beginning of 2007 Hedensted identified climate change as one of the key issues for the future. As a coincidence and deriving from the municipal reform process the Danish government together with one of the largest research foundations as well as other stakeholders started a process called Plan 09[3]. This programme supports the newly formed Danish municipalities in their work on establishing new municipal plans and strategies for their future development. As perhaps the only clear climate change related project Hedensted started a project on mainstreaming climate change adaptation into spatial planning (Hedensted municipality 2007).

The reason behind their focus on climate change adaptation is largely due to what they call a local consensus culture where the knowledge about climate change issues are high among the municipal officials and also that the municipality wants to be proactive. Hedensted have also managed to involve most of the municipal sectors and actors and they have as they say a holistic view on this issue where the success lies in involving the municipal actors, from the inhabitants to the leading politicians. Furthermore Hedensted several times in interviews and meetings emphasised the importance to make sure to treat the climate change issue as a process rather than a project. Treating climate change as a project ensures that the issue gets treated in a long term perspective and continually ongoing in the municipal daily operations. In this context the new municipal responsibility for spatial planning and overall increased responsibility for the municipalities played a large role as Hedensted noticed that they wouldn't get that much support from the national authorities and that the needed to take their part of the responsibility. Behind this argument lies the conviction on that climate change is a process and not a project limited in time and space and furthermore that climate change effects appear and are local in their occurrence. In this context where several problems have been identified mostly due to the lack of national support, Hedensted have noticed that the is a growing network on the local level where municipalities are cooperating more with each other instead of looking for national support. In the project Hedensted is running under the Plan 09 programme, there is also a clear obligation stating that Hedensted should deliver and spread their experiences and knowledge regarding how to mainstream climate change adaptation into municipal work. This view that the municipalities are leading the way in Denmark is underlined by Hedensted and they say that this situation has partly been induced by the municipal reforms and the withdrawal of the national level leaving the municipalities in charge.

[3] More about Plan 09 at: www.plan09.dk/

Figure 6 One of several awareness rising measures created by Hedensted. A municipal field excursion guide on the local climate change impacts and future risks. Source: Hedensted municipality 2008

Within the Plan 09 project a big part consist of awareness rising. As a part of the project and in order to raise awareness on the local impacts of climate change and the need for adaptation measures Hedensted has adopted a very straight forward approach. As a part of their work to raise awareness and gain acceptance of the magnitude and importance of climate change measures to counter the impacts, the municipality developed an excursion trip for civil servants and politicians (Hedensted municipality 2008b). Each of the participants in the excursion was given a compendium with maps and figures explaining the local impacts that where shown during the excursion. Twelve different stops were made to present and discuss the very local preconditions and the future impacts of climate change at that stop. The present and potential impacts then became much more concrete and understandable when displayed in reality. This very hands-on approach has proved very useful and the knowledge on the local climate change impacts and the understanding for the need of corresponding measures rose considerably and has contributed to Hedensted's success in working with climate change.

Figure 7 One example on the topics of the excursion showing water supply adaption measures. Source: Hedensted municipality 2008

Swedish cases

In Sweden only one case has been selected for in-depth studies. Besides Kristianstad municipality as a case study another study was made. The reason for this is that in stead of having two cases as in Denmark it was decided to make an update and second edition of the Nordregio study Turning Point[4]. The guiding research questions behind the Turning Point studies have been the following:

- *How* and *why* has climate change action at the municipal level emerged? What – and who – has made it meaningful for municipalities to take steps, even the most minimal, beyond those they are *ordered* to perform (by, for example, the national government, among others)? Are there discrete, identifiable influences that lead to more tangible results, and have more power, than others?
- Which municipalities in Sweden are acting most concretely? Who is doing what? Are any of their actions especially innovative when considered from an international perspective? Do they demonstrate that they understand the scientific "story" and knowledge about climate change in different ways?
- As programmatic responses proceed, are specific spatial and regional development impacts (changes in employment, mobility, etc.) generated that can be of concern in Sweden and in the countries of the Nordic and Baltic Sea regions? How does that feed back to the originating municipalities? Can planners cope with explanations provided by different combinations of interdisciplinary studies, or with the need to develop 100-year plans?

The gathered results provide a unique overview of the municipal climate change activities in Sweden and also frame the atmosphere in which they work. Furthermore the results also pinpoint and highlight the future challenges and needs for the municipalities. To perform this second edition of the study was also coordinated with the idea of providing guidelines input. Therefore some of the questions where formulated to provide us with valuable input to the guidelines.

Besides the Turning Point 2 study, Kristianstad selected to be a case study in the project. The reason for choosing Kristianstad as a case is that besides from being one of the most flood prone areas the municipality runs a major project where new levees and pumping stations are being built along Helge å to cope with future flood risks. They are also constantly working to improve forecasts and mapping of risks. Besides working a lot with climate change adaption Kristianstad also work to reduce the release of greenhouse gases. The municipality adopted a climate strategy in 2005 and in 1999 the executive committee of Kristianstad municipality unanimously decided to declare it will strive to become a Fossil Fuel Free Municipality. Projects like district heating, pellets heating, biogas for vehicles, solar heating, energy efficiency measures, promotion of bicycling and public transports and climate information has affected the release of carbon dioxide by 134 000 tones, compared to a situation where no measures had been taken. To sum up, Kristianstad are in many ways the forerunner in climate change related work in Sweden.

[4] The report from the first edition of the study can be found at : http://www.nordregio.se/Files/wp0703.pdf

Turning Point 2 Persisting uncertainty and confusion regarding climate change adaption in Swedish municipalities. Which are the next steps?

Still there is a great deal of uncertainty among the Swedish municipalities regarding climate change related work. Even though the municipal responses seems to have increased with more municipalities working with climate change issues, climate change adaptation and transport issues are prevailing as the main future challenges. These are some of the main findings in the second edition of the annual Nordregio survey on climate change response in Swedish municipalities. The preformed study, which includes a 100% response ratio from the Swedish municipalities, further maps the contours and pin point the challenges ahead for Sweden's 290 municipalities. The complete results of this second edition of the Turning Point study will be published in a separate Working Paper by Nordregio in the end of the year.

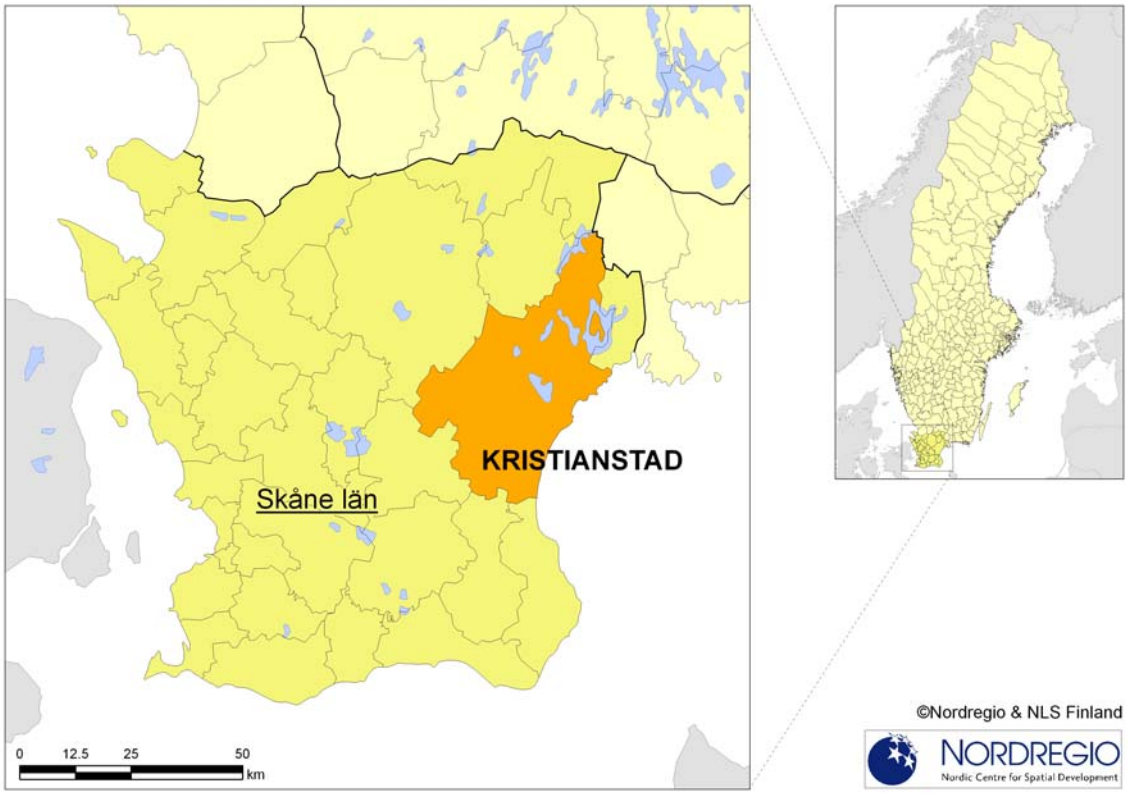
Deriving from last year's study, where the results showed that there where a great deal of uncertainty on the municipal obligations related to the climate change issue as well as a high variability in the climate change response among the municipalities, acted as a point of departure for the second edition. The results from last years study have been widely used by Nordregio as an empirical base for forming new research projects and applications. In this years survey a number of new research questions were formulated to access new dimensions of climate change response in Sweden. One of the main interests in this second edition was to in cooperation with the Nordregio research project *Another climate: gendered structures of climate change response in selected Swedish municipalities* map and explore the linkages between climate change and gender in Swedish municipalities.

In line with the results from the first edition of the survey the municipalities are mostly preoccupied with mitigation activities. Typical measures include ecocars, district heating and establishing energy plans. Energy is the main focus for the municipalities and this is mostly due to tradition and economic incentives. Swedish municipalities have managed to save lots of money by reducing the oil dependency and to adopt new renewable energy sources. Several success stories can be found and Swedish municipalities are in general good at mitigation measures. However when questioning the municipalities on their climate change activities only a few mention adaptation. Several municipalities mention the dilemma that they don't, in their view, seem to have the same incentives and economic advantages as when they invest in mitigation measures.

In early October 2007 the Swedish government presented final memorandum of "Klimat- och Sårbarhetsutredningen", a study on the presumed effects and possible future societal vulnerabilities and challenges due to climate change. The memorandum clearly highlighted the vulnerabilities and the need for adaption measures in Sweden. However little was mentioned about actual concrete measures. Now a waiting game has commenced in which the Swedish municipalities await the final directives from the government that will form the future Swedish climate change policy and present the prerequisites for climate change adaption. This fact has meant that the municipalities are in a state of catch 22 where they are waiting for directives before they dare to launch and invest in new costly adaptation measures. Which are the next steps towards climate change adaption in Sweden?

Coping with the pressuring waters. Kristianstad, a Swedish forerunner in climate change adaptation

One of the biggest challenges facing Swedish municipalities is to adapt to climate change. However a few municipalities are leading the way in Sweden and Kristianstad in the south of Sweden can be said to be a forerunner regarding adaption measures in Sweden. Due to its quite special preconditions and the fact that large parts of the city centre are located on areas previously recovered from the sea. Since long Kristianstad have been protecting it self from the pressuring waters but with accelerating climate change the situation calls for new adaption measures for future protection.



The city of Kristianstad once founded by the Danish king Christian the IV in 1614 was at the time an important fortress and place for markets and trade in the bigger region Skåne. Situated near the Baltic Sea and on the river Helge å, Kristianstad at that time was designed to use the surrounding waters to protect the city from aggressors. In 1860 land was recovered from Lake Hammarsjön to encompass the growing agricultural production. In the middle of the following century this slot of land was then used for the sprawling city. This development has meant that the water has been transformed from being a protection for the city into to now being a major threat for its future.

Figure 8 Flooding in the river Helge Å, February 2007. 1,63 meters above normal water level. Photo: Patrick Olofsson

In being situated on several places actually below sea level, the city can be classified as one of the most flood prone areas in Sweden. Parts of town with more then 10000 inhabitants, the hospital and other critical societal infrastructures are located in those areas. These places are located in zones ranging from 2 meters below the sea level to places 2 meters above the sea level. During the last century there have been two major flooding incidents where the water rose above the 2 meter level. In 1905 the highest measured water level was observed when the water stood 2.23 meters above normal. In 2002, the most recent major flooding situation and also perhaps the worst occurred when the water stood 2.15 meters above sea level. The situation was very severe and the old protective barriers where not far from bursting and such a situation would have called for a large scale rescue operation where thousands of people would have needed to be evacuated and several critical infrastructures would have been threatened or wiped out.

In 1999 a thorough risk analysis was carried out regarding the possibilities of a major flooding event in Kristianstad. The embryo of this work was developed in the 1980ies and in 2001 the first results where presented in a plan to protect the city from flooding. However the project of building new levees and pump stations to protect Kristianstad reached full speed just after the flooding event in 2002. In this project to protect Kristianstad, a total of 200 million SEK will be spent on the new barriers as well as establishing models for constant mapping of risks and improved forecasts. In this project, which is planned to be completed in 2012, Kristianstad receives financial support from the Swedish Rescue Services Agency (SRSA). When finished, the new barriers and levees will protect the city from a +3.7 meter flooding situation. At present the project have come half way with about five more kilometres of walls to build.

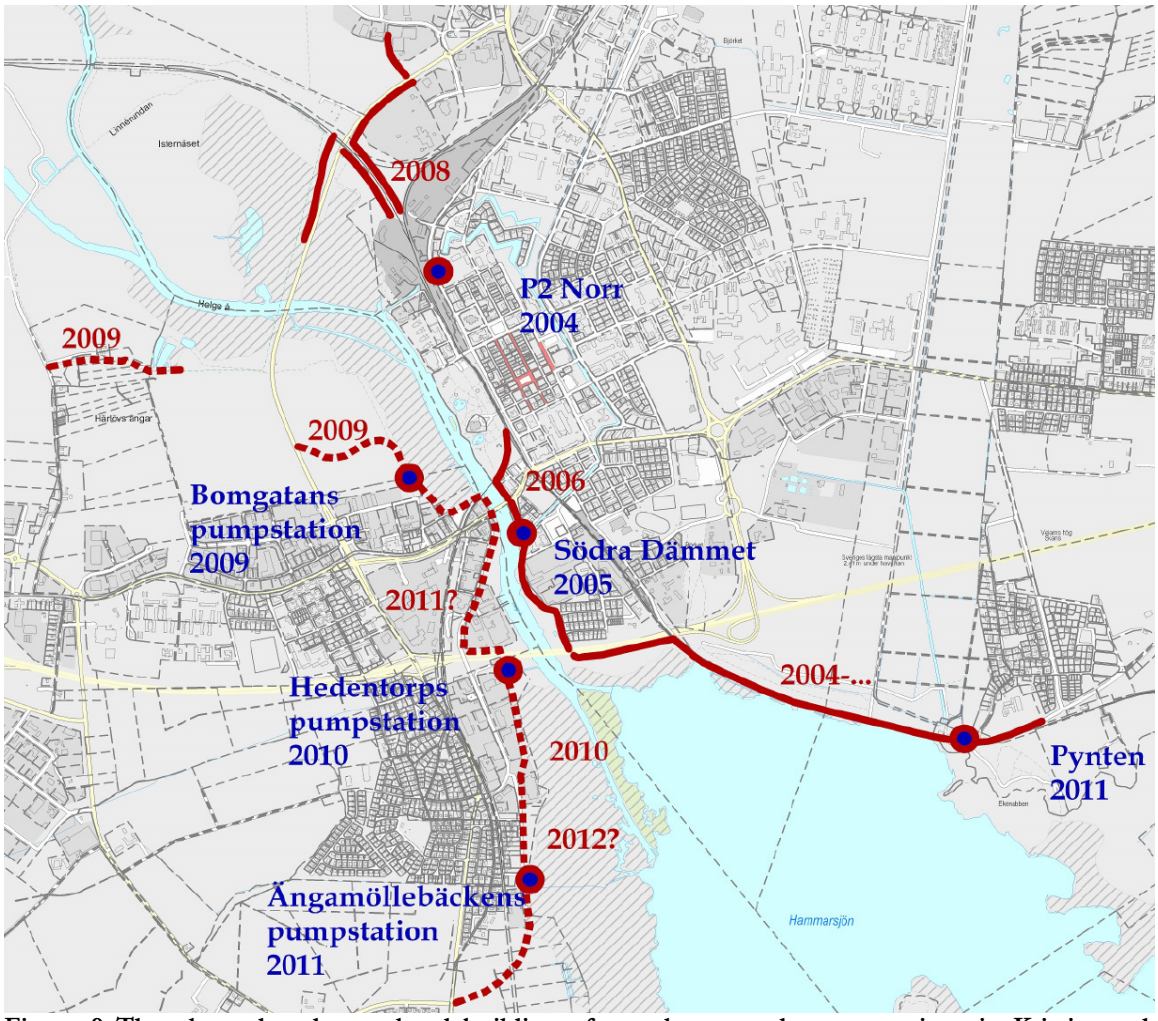


Figure 9 The planned and completed building of new levees and pump stations in Kristianstad. Source: C4 Teknik, Kristianstad municipality

Kristianstad's barrier building is perhaps the most evident and concrete adaptation project among Swedish municipalities. Although adaption is the hardest aspect of climate change to tackle for Swedish municipalities and the level of adaption is often the result of some unexpected events or based on the persistence of a few well informed individuals. This is also the case in Kristianstad. The municipality have been aware of the threat of a major flooding and that the barriers and levees in the future would have to be upgraded in order to cope with the future projected flooding scenarios. Even though the vulnerability and risks have been known and investigate for long, the real process of actually adapting to the new and forecasted flooding levels accelerated after the 2002 flooding when the magnitude of and the potential damages where displayed on a large scale. One of the respondents in an interview also told about a situation where they during the flooding invited the mayor out on a field trip to observe the flooding. This episode was a real eye-opener as one interviewed person described it.

The latest project that Kristianstad is preparing is a more focused climate change adaptation policy. Earlier projects with a focus on adaptation have been carried out in an ad-hoc manner and mitigating local risks. Therefore a more overarching climate change adaptation strategy is being developed. The development of the strategy follows the structure of the Swedish national report from the Swedish Commission on Climate and Vulnerability. In this strategy, local climate change scenarios and forecasts will be developed as well as a proposal on adaptation and mitigation measures to counter

the impacts of climate change. However as the draft strategy must be approved by the municipal council in order to further develop the draft version into a more thorough strategy. The person in charge of the climate change adaptation strategy, also interviewed in the case study, had high hopes on that the strategy development proposal would be welcomed but the politicians with their control over the budget will decide up on the level of ambition.

By developing a municipal mini version of the national report from the Swedish Commission on Climate and Vulnerability, Kristianstad would most defiantly be one of the first in Sweden and perhaps in the whole of Norden to develop such a strategy. Besides pioneering the adaptation strategy work, Kristianstad is also involved in an interesting project developed by the Swedish Network of Municipalities on Climate Change. The project is called climate coaching and Kristianstad takes part as a sort of mentor that will support smaller and less successful municipalities in their quest for developing a higher level of climate change response. In total Kristianstad have been active in coaching six municipalities.

Figure 10 Barrier building in Kristianstad January 2008. Photo: Hans-Åke Ström

Conclusions and guidelines input

The process of stakeholder interaction in the MuniRes project has proven to be a very fruitful approach. By working closely with the cases not only as objects for studies but also as stakeholders and receivers of the end product and outcome of the project, the partners and stakeholders have created a forum for interaction between research and practise. One of the main identified challenges for the municipalities has been that they can't grasp and reformulate research and global forecasts into something applicable on the local preconditions. With this approach we make sure to bridge that gap and also provide us as researchers with new insights and perspectives on local climate change work. This spirit of cooperation and close interaction lives on in new networks and several partners in the MuniRes project are in the process of developing new ideas for research projects.

Below follow some of the main observations the forms the framework and preconditions for in which the municipalities have to adjust to and work within. Furthermore the comments and inputs provided by the cases and other selected stakeholders are summarised.

General case observations and needs for the future

All the studied cases are showing some sort of similarities. Even tough they are situated in different countries and have totally different preconditions many of the identified challenges and issues are the same. Some of the main similarities regarding the needs are:

- Lack of national support
- Large municipal responsibilities
- No common scenario to adapt to
- No standardised methods for mapping and surveying climate change risks
- Inter-municipal cooperation and experience sharing
- Getting started with implementing adaptation measures
- How to cost the impacts of climate change and the needed adaption measures?

Something that all the cases have targeted is the lack of national support. Many times they feel that they are given huge responsibilities but that the lack the support and means to full fill them. This issue corresponds with the idea about the discrepancies between different levels. However it is clear that the initiative must come from the local level but they need the support to act. This issue becomes very clear when looking into adaptation measures since few municipalities have instigated such measures due to high costs and deficient knowledge on the local climate change scenarios and impacts.

Guidelines input

In the interviews and meetings with the cases as well as deriving from the Turning Point 2 study several inputs has been collected that will provide valuable input to the development of the Climate Change Guidelines for European Municipalities. Once again the municipalities are quite unite in their views on what the guidelines need to have in order to be successful. Below follows a few of the most crucial points brought forward by the municipalities:

- Work with climate change as a process. Not like a project!
- Climate change is dynamic. So is knowledge.
- The knowledge is out there. It just needs to be packaged right for the municipalities so that they can use it.

- The guidelines should provide examples on efficient and successful municipal work on climate change. Inspiration is needed.
- Make sure to collect and assemble solid local knowledge on the local preconditions regarding climate change
- Awareness rising and involvement of stakeholders
- The guidelines should be able to induce and facilitate workshops and seminars on municipal level
- Cross sectoral cooperation to mainstream climate change
- Better to act now and take the costs today then tomorrow
- Climate change brings new time perspectives. The old long term is the new short term.
- There are some positive aspects of climate change

The perhaps most central part of the guidelines input is the idea of working with climate change as a process. Many municipalities are used to work in a project manner and that something starts with A and ends with B. However the nature of climate change demands a new perspective. Society must adapt to the situation with a more variable climate and also acknowledge that constantly adopt new knowledge and to live in tune with climate change.

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Persons interviewed

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- **Michael Dahlman**, Planning coordinator, Kristianstad municipality
- **Elin Dalaryd**, Municipal climate change information coordinator, Kristianstad municipality
- **Anders Pålsson**, Fire engineer and coordinator of the flood control, Kristianstad municipality
- **Lennart Erfors**, Climate change project coordinator, Kristianstad municipality

- **Ann-Sofie Eriksson**, Head of Section Sustainable development and Planning, The Swedish Association of Local Authorities and Regions
- **Ulf Johansson**, former Head of Growth and Community Development Division, The Swedish Association of Local Authorities and Regions

- **Birgit Paludan**, Hydraulic Engineer, Greve municipality
- **Knud Edinger**, Head of Municipal Water Utility, Greve municipality

- **Niels Rauff**, Planner, Hedensted municipality
- **Tom Laursen**, Head of Emergency Management, Hedensted municipality

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