

Learning to Change the Rules of the Game

Institutional capacity for social learning in Helsingborg's climate change adaptation process

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Abstract: 400 words

Adapting to climate change impacts is crucial as changes due to climate change are already locked in and will occur independently of reductions of greenhouse gas emissions. Recent studies in climate change adaptation literature have cited that social learning is beneficial for increasing adaptive capacity. The capacity for social learning is governed by the degree of flexibility of the institutional context of the climate change adaptation process. This study looks at the City of Helsingborg's climate change adaptation process and the institutional capacity for facilitating social learning to increase adaptive capacity. Viewing climate change as a process unveils the interactions between social, ecological and technical systems, a main tenant of sustainability science. This study finds that the institutional conditions for social learning in Helsingborg came about as a direct result of a flexible climate change adaptation plan pushed through by dedicated civil servants from the Planning department. The reflexivity between learning and institutions is confirmed; allowing institutional space for social learning creates a reinforcing loop which widens the institutional capacity for learning. Double loop learning caused by disjuncture allowed for institutional change that supports reflexivity.

Keywords: Social learning, institutional capacity, climate change adaptation, adaptive capacity

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1.0 Introduction

Climate change effects are already being felt around the world. Societies need to start adapting to these effects. Developed nations must also learn how to cope with the effects of climate change, such as sea level rise and flooding. In order to do this they must figure out how to accommodate adaptation within their institutional structure. Social learning has been shown to increase adaptive capacity in the face of climate change and has the potential for overcoming many challenges to adaptation (Pelling et al., 2008) . Institutions are the rules and norms that govern our behavior and have been shown to have an effect on learning, but developed countries tend to suffer from inflexible institutions that have been shown to limit individual capacity (Wamsler & Lawson, 2012).

The thesis is based on a case study of institutional capacity for social learning for increased adaptive capacity in the municipality of Helsingborg, Sweden. This study takes the “process” of climate change adaptation as its focus. Viewing adaptation as a social process unveils the underlying psychological, social and cultural aspects that if not taken into consideration threaten to stifle adaptation for climate change in developed countries (Wolf, 2011). Thus, this study aims to find out how institutions influence the process of climate change in Helsingborg, Sweden and if there is potential for social learning.

1.1 Research Questions

1. To what extent has social learning taken place in the climate change adaptation planning process in Helsingborg and how has it contributed to increasing the adaptive capacity of the municipality?
2. How flexible is the institutional framework for adapting to sea level rise, flooding and precipitation in Helsingborg? Does it facilitate or constrain learning for adaptation?

2.0 Methodology

2.1 Planning Process as Lens for Climate Change Adaptation in Helsingborg

The focus of this study is on the planning process at the local level due to its importance for implementing climate change adaptation measures in Sweden. Local level has been identified as the key determinant of change in policy making, planning and decision making for CCA in Sweden. The County Administrative Boards are responsible for coordinating adaptation within each region but the main work will take place at local level in spatial planning (Storbjörk, 2010). Due to Sweden's decentralized government system, municipalities have autonomy over their risk management and planning measures and thus are the most important governing body when adapting society to climate change (Johansson et al., 2009).

The planning process provides an excellent lens to evaluate the institutional capacity for social learning. This is because the planning process involves coordinating and meeting with a variety of stakeholders and agencies in order to come to collective decisions on how to use the land in a way that reflects what the city and people value. Responsibilities of the planning department important for climate change adaptation include: disseminating information about flood risk to housing and infrastructure developers and protecting the city with hard infrastructure in the form of sea walls and other hard infrastructure. Planners frequently engage with stakeholders across levels on a day to day basis; from the decision makers at the top level to the citizens on the ground. Consequently, the planning process demonstrates features of climate change policy development of top down and bottom up deliberation and discussion amongst various stakeholders (Wilson, 2010). The planning process establishes networks between private companies, individual citizens and decision makers and provides the possibility for discussion and deliberation. Therefore, the field of spatial planning is an area where social learning is expected to contribute to knowledge acquisition and policy formation (Wilson, 2010).

In order to answer my research questions three main methods are used in this study: A literature review on the institutional conditions that favor social learning for climate change; a literature review of climate change adaptation plans in Helsingborg, with special attention to the origins of and effects of the Pre-Memorium Climate Change Adaptation document (PMCCA); and semi-structured qualitative interviews with major actors involved with planning for adaption to sea level rise and flooding in Helsingborg (list of interviewees will be presented below).

I analyzed the interviews and relevant planning documents according to the framework provided by Gupta et al. (2010) for institutional capacity for learning, in particular social learning. The framework was used to examine the institutional conditions necessary for social learning as part of the climate change adaptation planning process in Helsingborg. Focusing on the interactions between actors in the adaptation process of Helsingborg made it possible to analyze the affect that institutions had on developing social learning for increased adaptive capacity.

2.2 Epistemology

The epistemological perspective of this research is constructivism. Social learning is based on constructivist ideas of learning, that knowledge is socially constructed (Kilvington, 2005). The methodology employed for this research was driven by a constructivist view of knowledge acquisition. This means that individuals or groups construct a reality based on social interactions. An objective reality does not exist and instead there are multiple realities based on individual interpretation. This research considers the researcher and the participants as co-creators of the findings.

2.3 Case study selection: Helsingborg municipality

Helsingborg was selected as a case study due to its vulnerability to sea level rise and flooding due to climate change, as well as its relative effectiveness at planning for sea level rise in Sweden (Oelreich & Svenfelt, 2012). Studies estimate sea level rise for Helsingborg city can reach between 0.8 and 1.6m by 2100. The municipality is one of a handful that has assessed its risk to sea level rise beyond the year 2200 (von Oelreich et al., 2013). The municipality has also developed a specific planning document for climate change adaptation (Helsingborg, 2012), which is not common among coastal municipalities in Sweden, as one third of coastal municipalities in Sweden lack guiding planning documents and two thirds do not discuss sea level rise beyond 2100 (Helsingborg, 2012; Oelreich & Svenfelt, 2012). Understanding what has contributed to Helsingborg being at the forefront of climate change adaptation planning, and whether social learning played a part in the process, made Helsingborg a particularly interesting case study for this study.

Helsingborg also has a long history of exposure and necessity of learning to live with risks associated with climate induced sea level rise, storm surge and flooding. Helsingborg is located in the Skåne region of Sweden, which has been identified as an area that will be affected by sea level rise (Oelreich & Svenfelt, 2012). Furthermore, there have been major storms in recent memory which have struck Helsingborg, causing flooding and property damage. Notable storms include the Advent

Storm of 2011 and Storm Sven of 2013 which came close to flooding sensitive infrastructure such as the Knutpunkten train station and caused considerable flooding and damage to the Strandvägen and Råå communities. Flooding has also been a major concern for Helsingborg evidenced by the 200 floods which occurred in 2007 due to prolonged rainfall. These weather events demonstrate in a visceral way the devastating effects that climate variability and change can have on Helsingborg and call for research into the process of adaptation and how it can be facilitated to increase adaptive capacity in Helsingborg.

Critical infrastructure is at risk, and this makes research into effective ways to facilitate climate change adaptation a current and practical concern. In addition to the high price housing located on the coast, mainly Strandvägen, Helsingborg also houses high risk critical infrastructure that is fundamental for the well-being of society and extends to other counties as well (Helsingborg, 2012). Among the sensitive areas identified as having high risk for flooding are the central trains station Knutpunkten, the energy production company Öresundskraft which provides heating, electricity, and broadband to customers in the region, the chemical company Kemira, and Sweden's second largest port. The threat of flooding from sea level rise and increased precipitation is especially concerning for Helsingborg's long term sustainable development due Helsingborg's flagship development project, H+¹.

2.4 Semi-Structured Interviews

Ten Semi-structured, qualitative interviews were conducted to gauge the institutional capacity for social learning for increased adaptive capacity at the municipal level (see Table 1). This follows the directions provided by Gupta et al. (2010) as issues of learning are best observed through face-to-face interviews. Interviewees were chosen based on their affiliation with the climate change adaptation process in Helsingborg. First the lead organizer of the climate change adaptation plan was contacted and then a snowballing interview method was employed as he recommended other key actors in the process. An interview guide was created with prompts about questions which sought to elucidate the institutional capacity for learning based off of the framework provided by Gupta et al., (2010) and complemented with additional factors that were considered pertinent to understanding social learning. The guide was used as a script that was followed to a general extent in order to emphasize the generality and perspectives of interviewees and to avoid pigeon holing responses (Bryman, 2012).

¹ H+ is the largest urban renewal project in Helsingborg which will be finished in 2035. Source: <http://www.helsingborg.se/startside/trafik-och-stadsplanering/statsutvecklingsprojekt/h/>

The interviews were analyzed using the software MAXQDA. The codes used correspond with the criteria provided by Gupta et al. (2010) for institutional capacity for learning within the process. Emergent codes were also used as patterns that were relevant were found within the text. These emergent codes are: participation, communication, leadership, disruption and flexibility.

Table 1. Role and organization of interviewees.

Role	Organization
Ecologist, Strategic Planner	Planning and Technical Services Department, Strategic Planning
Chief of Strategic Community Development	Executive Committee
Project Leader	H+ Development
Fire Engineer	Fire Department
Architect	H+ Development
Wastewater Specialist	NSVA
First Deputy Chairman, Planning Committee	Green Party
Deputy in the City Council	Green Party/Rescue Services
Chief Technical Officer	Helsingborg's Port AB
Environmental Officer	Helsingborg's Port AB

2.5 Literature Review

A literature review was conducted of academic literature pertaining to social learning for climate change adaptation. The review took Pelling & High's work on the relationship between social learning and climate change adaptation as a starting point (2008). Climate change adaptation literature dealt primarily with vulnerability and impacts (Adger, 2006), indicators for vulnerability (Smit & Wandel, 2006), and definitions for adaptive capacity related to learning (Carpenter et al., 2001; Gallopín, 2006). The literature on social learning (Armitage et al., 2008; Olsson, Folke, & Berkes, 2004; Pahl-Wostl, 2009) and its relationship to climate change (Nilsson & Swartling, 2009) were found in the adaptive co-management literature. Institutional factors effect on climate change adaptation in a Swedish setting were found in the environmental policy literature (Glaas, 2013; Storbjörk, 2010).

1.6 Limitations

There were limitations to this study that should be acknowledged. Firstly, the topic of institutional capacity for social learning in a climate change adaptation context should involve citizens of Helsingborg. Unfortunately, I was not able to secure any interviews with citizens in the primary affected areas of Råå and Strandvägen. The effect on the individual and their ability to adapt is a crucial aspect for judging the effectiveness of climate change adaptation.

In addition, the issue of language can be seen as an inevitable limitation. Four out of the 10 interviews acquired were conducted completely in Swedish. These were later translated to English during transcription and analyzed. Although I am a native Swedish speaker, the translation process unfortunately provides opportunities for a subjective slant on the data. Furthermore, the interviews conducted in English with native Swedish speakers presented a challenge when it came to technical words. Some words, such as the name for particular agencies, do not translate to English, and thus there may be some slight loss of meaning.

3.0 Theory

The premise of this thesis is that facilitating social learning can contribute to adaptive capacity at the local level in Sweden. Institutions governing the municipal planning process can enable social learning (Adger, 1999). Social learning is one important aspect of adaptation that contributes to increased adaptive capacity.

3.1 Climate Change Adaptation, Adaptive Capacity, and Vulnerability

To begin, an overview of climate change adaptation and its components will be presented with special focus on strengthening adaptive capacity to decrease vulnerability to climate change impacts.

Climate change adaptation means reducing risk to hazards brought about by climate change. The IPCC (2014) defines adaptation for human systems as “the adjustment to actual or expected climate and its effects which moderates harm or exploits beneficial opportunities”. Climate risk (R) is a function of hazard (H) and vulnerability (V) and lack of capacity to reduce or avoid hazards and minimize existing vulnerability (LC):

$R = H * V * LC$ (Wamsler & Lawson, 2012).

Although climate change is not a risk by itself, the climatic change caused by anthropogenic greenhouse gas emissions may increase the probability of hazards that are worsened by location specific vulnerabilities (Wamsler & Lawson, 2012). These location specific vulnerabilities are determined by a combination of geophysical, biological and socio-economic conditions that are susceptible to the adverse impacts of climate change (Glaas et al., 2010). In short, climate change adaptation is essentially the process of reducing the vulnerability (V) of socio-ecological systems to the negative effects of climate change.

Vulnerability has been widely recognized to be composed of three aspects: exposure, sensitivity and adaptive capacity. Exposure and sensitivity refer to the susceptibility to the adverse effects of climate change. Exposure can be conceptualized as the degree, or extent to which a system is exposed to a perturbation but its validity as a component of vulnerability has been disputed by some as it is not an attribute of the system itself but rather of the relationship between the system and perturbation. Sensitivity is the amount of transformation of the system per unit of change in the disturbance (Gallopín, 2006). Another conceptualization is that exposure reveals what part of the system is at risk to climate change induced events such as sea level rise, while sensitivity indicates how robust a certain part of a system is to climate and societal effects (Glaas, 2013).

In this paper, I take the definition of vulnerability that considers vulnerability as a function of exposure, sensitivity and adaptive capacity. There is some variability in how coping capacity and adaptive capacity is defined, but there is a consensus that adaptive capacity focuses on longer-term and more sustained adjustments (Gallopín, 2006). Learning is a sustained adjustment that has been cited as a component of adaptive capacity. Carpenter et al. (2001) relate adaptive capacity to the existence of institutions that facilitate learning in the form of experimentation and innovation. Pelling & High (2005) also see adaptive capacity in terms of learning that is a product of social relationships that are governed by institutions.

3.2 Learning for Climate Change Adaptation

The importance of learning for climate change adaptation will be presented in this section. More specifically, how organizations charged with dealing with climate change will need new learning approaches to deal with the complexity and uncertainty of climate change impacts.

Climate change is an incredibly complex problem that depends on coordinated and collective action from decision makers at different levels. This inter-sectorial complexity calls for a learning approach and collective decision making and action that is iterative and multi-directional rather than linear and

supply driven (Tanner et al., 2013). Local decision making for climate change adaptation needs to draw from a diverse range of perspectives and engage with a range of stakeholders in order to create flexible and adaptive responses in the face of uncertainty. The most resilient systems are characterized by their capacity to learn after disruption and retention of structure and function in the face of stress (Folke, 2006). Social learning offers strategies for the co-creation of knowledge in the context of climate change adaptation. Learning can overcome many barriers to adaptation such as difficulty in recognizing signs of climate impacts due to difficulty in detecting them and their underlying uncertainty, preoccupation with other pressing concerns that divert attention from growing signs of climate impacts (IPCC, 2012).

Implications of climate change include external stressors, such as flooding, internal stressors, such as damage to physical structures, or indirect stressors. A learning perspective on adaptation emphasizes both the physical adaptive measures and the institutional modification as valid adaptive strategies (Pelling & High, 2005).

The climate change adaptation process at the municipal level in Sweden involves a range of organizations and actors that will benefit from learning from one another. Establishing social networks and a space for discussion between these organizations has the potential for fostering “learning to learn” about climate change. This means that each organization, through discussion with each other, co-produce knowledge, reflect on their experiences and learn how to make adjustments to deal with the uncertain nature of climate change impacts. Learning from experience and taking measures to adapt reflects a shift in resilience thinking from a reactive complex system to a proactive, agent centered human-environment system engaged in learning for adaptation (Becker, 2014).

3.3 What is learning?

A major challenge in working with learning for improved resilience of socio-ecological systems is how to precisely define and conceptualize learning (Armitage et al., 2008). Learning theories differ. Some emphasize individual learning and others emphasize group learning. In order for climate change adaptation to be effective it is necessary to consider both individual and group (social or institutional) learning (Fazey et al., 2005).

Armitage et al. (2008) provides a great overview of the different learning theories relevant for climate change adaptation. There are three main theories of learning: experiential learning based on

Kolb (1974), transformative learning based on Mezirow (1995, 1996, 2000), and social learning based on Argyris and Schön's (1978) work on organizational and loop learning. It is outside the scope of this paper to discuss the difference in these learning theories.

This study is based primarily on Argyris & Schön's (1978) looped learning approach of single loop learning (correcting routine errors), double loop learning (examining underlying values and policies) and triple loop learning (designing governance norms and protocols); it is worth mentioning that triple loop learning is not strongly established in the literature (Armitage et al., 2008).

Unfortunately there are many conflicting definitions of learning in the literature and of the definition of single, double and triple loop learning which makes it challenging to draw definitive conclusions on the potential for learning for climate change adaptation. For the purposes of this study, learning is a process that:

- is influenced by the social context and institutions in which it takes place (Wenger, 1998)
- results from patterns behind individual experiences of informal learning through practice, reflection and sharing and that can be amplified at the organizational level (Tanner et al., 2013)
- can happen for organizations without individual members having learned (Pelling et al., 2008).
- is based on reflecting on experience for future action (Kolb, 1984).

3.4 Social Learning Definition

This study focuses on social learning and its potential for collective action in the face of the wicked problem of climate change. Similar to learning, in general, social learning is a contested concept that suffers from ambiguity in both its expected outcomes and its preconditions. Therefore a concise definition is necessary to avoid confusion.

This paper takes the definition of social learning that is presented by Reed et al. (2010), which states that social learning is a process that: 1) demonstrates that a change in understanding has taken place among individuals involved; 2) disseminates this change in understanding to wider social units or communities of practice; 3) occurs through social interactions within a social network. The change in understanding can vary in depth from changes in routines to changes of epistemological beliefs and worldviews.

Social learning is commonly misconstrued with the factors that contribute to it, especially participation and pro-environmental behavior. The existence of participation and pro-environmental behavior within a process does not mean that social learning has taken place. Furthermore, social learning does not always have to be pro-environmental, as social learning can also produce the opposite effect to learn to ignore climate change related hazards (Reed et al., 2010). The role of technology is also worth mentioning. Social learning does not have to be face to face, but can also produce a change in understanding in wider social units due to mass media, such as through a newspaper or website. Technology then can provide a means for communication to wider social units, an essential aspect of social learning as it may be possible for social units to learn holistically even when the individuals within the social unit do not (Reed, 2010).

3.5 Institutional perspective on learning

Social learning is dependent upon the institutional architecture that governs the interactions between individuals. I will, therefore, focus on the institutional aspects of social learning, particularly as it relates to the planning process and the communication between planning agencies and the community. The institutional perspective unveils the normally disregarded rules, norms and culture that govern interpersonal relationships that constrain or enable social learning for adaptive capacity. There has been little research done on assessing institutional ability to enable adaptive capacity (Gupta et al., 2010).

Adaptive capacity is determined by the capacity of institutions to facilitate learning, experimentation and innovation (Carpenter et al., 2001). In other words, institutions (formal and informal rules, norms, customs and values) have influence over the type of learning that can take place to increase adaptive capacity. Institutions provide the rules and norms, which govern the way that individuals act in a social setting and thus are ever present in shaping how social learning filters experience. Environmental perceptions and behavior, for example, are explained better by social networks and the constraining institutional architecture than by a lack of information (Pelling et al., 2008).

3.6 What are institutions?

The term institution is thrown around frequently within the literature on climate change adaptation leading to confusion about its actual definition. This conceptual confusion has been recognized as a barrier to successful institutional development for capacity building (Skoog, 2005).

This study adapts the definition of institutions provided by the Institutional Dimensions of Global Environmental Change (IDGEC) program. It defines institutions as:

“systems of rules, decision-making procedures, and programs that give rise to social practices, assign roles to the participants in these practices, and guide interactions among the occupants of the relevant roles”. (Young, 2003)

Organizations are “manifestations of institutions, such as specific departments, associations and agencies” (Dovers & Hezri, 2010, pp. 222). Institutions (formal and informal rules) guide the behavior of organizations (actors), while organizations are also the main agent for institutional change (North, 1990). Government organizations, such as a planning department, are the manifestations of institutions that implement government policies through on the ground management (Dovers & Hezri, 2010).

Institutions can be divided into both formal institutions and informal institutions.

3.6.1 Formal Institutions

Formal institutions are the official rules that are formally agreed upon by a collection of individuals and enforced by an external authority and determine the flexibility of organizations, particularly in developed countries. They are consciously designed by humans and commonly written down in codified form, such as constitutions, laws, and policies (Skoog, 2005). Previous studies have shown that the formal institutional setup can either facilitate the management of a specific issue, such as climate change adaptation, or negatively influence it by creating an inflexible setup (Carter, 2011; Glaas, 2013; Håkon Inderberg, 2011; Storbjörk & Hedrén, 2011; Mosello, 2015). In this paper formal institutions represent the formal rules of the planning process, including the guiding policy documents for climate change adaptation to sea level rise. They also represent the overarching goals for sustainable development of the planning department and city as a whole that are represented within the municipal comprehensive plan. Institutions can be categorized according to function and to the types of activity they regulate, and in this case, that means including the institutions that define the relationship between governmental agencies and between the governmental agencies and its citizens (Skoog, 2005). The formal rules are the formal policy documents for climate change adaptation, and the institutional avenues for public participation through detailed plans.

3.6.2 Informal Institutions

Informal institutions come about spontaneously through human interaction and are the self-enforced customs, norms and values of society and hold great potential for increasing adaptive capacity to climate change through social learning. Informal institutions are not enforced by a formal authority but instead are sanctioned internally through public disapproval (Skoog, 2005). In other words, instead of having a regulatory body such as the police, which insures that a person abides by the established formal institutions; those who bypass informal institutions will face the public outcry of his peers and may run the risk of social exclusion by violating trust. This is because informal institutions evolve internally through customs and social interactions and emerge from overarching meta-rules that are hard to change, making it possible to predict behavior (Kasper and Streit, 1998). In this case, informal rules of climate change adaptation pertain more to socio-cultural values and norms.

Though informal and formal institutions are robust to change, they can be restructured because the same agency that sustains them also makes them possible to be changed (Gupta et al., 2010). This dialectic between individual agency and institutions applies to organizations as well. According to Wenger, learning is a social phenomenon and organizations are environments that inhibit or enable learning based on the formal and informal institutions that govern them. Organizations use their agency to “renegotiate institutions and institutions in turn shape the agency’s operation” (Pelling et al., 2008).

3.7 Importance of institutional flexibility

Flexible institutional and organizational arrangements encourage the reflection and innovative responses necessary for producing social learning for climate change adaptation. The institutional environment is a critical enabling factor for climate change adaptation (Tanner et al., 2013). Climate change adaptation needs knowledge management that facilitates collaborative and improvisational learning that can only take place within a flexible institutional context (Tanner et al., 2013). Therefore, in order to tackle climate change there needs to be efforts to move away from rigid institutional structures that provide little space for reflection and adjustment. This is difficult as most planning processes at the municipal level tend to function on inflexible general plans rooted in bureaucracy that focus on prescribed technical solutions. A flexible institutional framework allows for communication channels and forums that share knowledge, incorporate local knowledge and supports social learning (Osbaahr, 2007).

Resilience theory also provides support for the need for flexible institutional context. This is worth mentioning since the proactive nature of learning for resilience is what distinguishes a human-environment system from a reactive biological system and is often equated with adaptive capacity (Gallopín, 2006). According to Thapa et al., (2008), “institutions that are rigid, lack flexibility and focus on constant yields without considering change lead to systems that break down easily in the face of disturbances”.

Pelling et al.(2008), drawing on complexity theory and systems theory, postulate that the ideal state for social learning occurs within the ‘shadow system’ between structured formal institutions and informal and flexible institutions that provide an ideal space for learning and innovation (2008). Shadow systems are informal interactions that take place outside of the formal institutional framework but interact and influence them (Pelling et al., 2008). These shadow systems can be informally organized meetings and agreements surrounding climate change adaptation strategies that present an opportunity for social learning in the form of deliberation and discussion and that have an effect on the formal climate change policy documents. This is based on the idea that overly structured and rigid processes extinguish the creativity and innovation that occur when actors are placed in an informal context (Cundill et al., 2014). In that respect, social learning can be enhanced for higher adaptive capacity by using informal networks to communicate and share ideas vertically and horizontally (Cundill et al., 2014).

3.8 Institutional factors that influence social learning

There are few frameworks that provide a way to assess the institutional capacity to promote social learning of organizations such as the municipal planning agencies.

Gupta et al. (2010) identified learning capacity as one of the dimensions that institutions must enable in order to support overall adaptive capacity. To assess institutional capacity to support learning, Gupta et al. (2010) identified five criteria: trust, single loop learning, double loop learning, discussion of doubts, and institutional memory. Throughout the remaining of the thesis I will use these criteria to explore institutional learning for climate change adaptation in Helsingborg.

It is important to reiterate the dynamic that exists between institutions and actions to change institutions. This idea that institutions shape social practices while those same social practices reproduce and influence institutions is based on structuration theory; agents are embedded and constrained by larger structures and at the same time use their agency to influence those same structures (Giddens, 1984).

3.8.1 Trust

Trust is a condition that has been shown to favor social learning and is influenced by the institutional context and the social interactions that they foster (Nilsson & Swartling, 2009). The institutional framework needs to be flexible enough to allow for the building of trust between actors. Lack of trust is also a major barrier for interagency collaboration. Trust, along with communication, is also cited as a relational variable that influences sharing of knowledge for social learning and allows for the establishment of social networks (Henry & Volla, 2014).

Adaptive co-management literature notes that trust can also be built by boundary organizations, which are brought together by informal social networks (Nilsson & Swartling, 2009). Trust is not only engendered by social learning but also plays a role in facilitating the establishment of social networks crucial for social learning. Trust has been found to increase adaptive capacity in empirical observations and support the power of relational capabilities of shadow systems (Pelling & High, 2005) A lack of trust leaves little room for social learning to occur.

3.9.2 Doubt discussion

Conflicting goals are a main challenge for climate change adaptation at the local level but also present an opportunity to be reconciled through social learning and deliberation. If changes in goals occur after deliberation it may mean that social learning has produced a change in individual perception and redefined self-interests, leading to cooperation and coordination (Nilsson & Swartling, 2009). The ability to discuss doubts without censorship is an institutional aspect that promotes learning. Different actors may have their own priorities across sectors that do not align and the only way to learn to reconcile is to have the ability to openly express doubts. Having the ability to openly discuss disapproval is important for social learning.

3.8.3 Single Loop Learning

Single loop learning is the basic correction of errors and improving of standard practices without changing guiding assumptions or calling into question established routines (Pahl-Wostl, 2009). Single loop learning does not involve reflecting on world views or critically reflecting on assumptions of guiding practices (Tanner et al., 2013). Pahl-Wostl (2009) gives examples of single loop learning for changes in governance routines that involve institutions. These include: not calling into question established institutions, strictly following existing regulations in order to justify established routines, and creating new by-laws to accommodate exception (Pahl-Wostl, 2009). An example of single loop learning would be to increase the height of dikes, without considering if dikes should be used in the

first place. On an institutional level this would mean adjusting the formal policy to create new working groups to solve problems. Social learning is conceptualized as moving stepwise from single to double loop learning (Pahl-Wostl, 2009).

3.8.4 Double Loop Learning

Double loop learning is a factor in social learning and is determined by a flexible institutional architecture that supports critical reflection. Double loop learning fosters social learning by challenging existing assumptions, moving away from expert driven knowledge and technical fixes (Johannessen & Hahn, 2013). It involves critically reflecting about basic assumptions and worldviews and unlearning old habits, creating responses that are learning based. Double loop learning is achieved through critical reflection of experience and is a backbone of iterative/loop learning (Kolb & Fry, 1975). Double loop learning within an organizational setting can be applied to the planning process. The institutional architecture must allow for skilled reflection process that is also related with institutional memory and discussion of doubts. As mentioned before, the criteria for assessing institutional capacity for social learning are mutually interdependent and reinforcing and thus, if the institutional framework is flexible enough to allow for discussion of doubts and reflection of institutional memory then double loop learning has a higher chance of occurring.

3.8.5 Institutional Memory

Institutional memory is stored experiences to previous crises that are found within the affected population and the decision makers and is crucial for learning at the institutional level (Berkes 2007). Mandated progress reports are an example of institutional memory. In the case of climate change adaptation, institutional memory can be found both within formal monitoring and evaluation and within the memory of civil servants who have experience working with this issue. It is important for long term adaptation that knowledge is documented, as it can be a resource for organizations for continuing climate change adaptation in the future and will make the municipality less dependent on the individual civil servant (Glaas, 2013). In order to properly increase the capability to learn, and critically reflect on previous experiences some permanence of staff is needed. Staff turnover can be an indicator of institutional memory.

4. Results

The results section will first present how the climate change adaptation process functions in Helsingborg, with special emphasis on the emergence of the PM Climate Change Adaptation policy (PMCCA) which was decided on as the guiding policy framework for climate change adaptation in Helsingborg in 2012. Then it will examine how this plan provides the institutional flexibility necessary for adapting to the complex and uncertain effects of climate change by creating an Action Plan working group (APWG) charged with coordinating the main stakeholders from different sectors of society; this includes the private sector, public sector, and landowners.

Next, the assessment of institutional capacity for learning will be presented based on the framework provided by Gupta et al. (2010). There is evidence of all 5 criteria presented by Gupta et al. (2010). The presence of these criteria is an indication that the institutional framework of formal rules and policies and informal social networks are conducive to facilitating learning.

4.1 The Climate Change Process in Helsingborg

4.1.1 Helsingborg's Climate Change Adaptation Policy: Guiding documents

There are documents across levels that have led to the current climate change adaptation process in Helsingborg (see Table #2). The principal document that drives climate change adaptation in Helsingborg is the Pro Memorium Climate Change Adaptation (PMCCA). It has been produced as an addition to the Comprehensive Plan 2010 (CP 2010), which is a working tool for politicians and city planners in Helsingborg that gives guidelines for urban planning and development. The PMCCA is an addition to the comprehensive plan that provides the underlying foundation for climate change adaptation in Helsingborg and guidelines for the physical adaptation of beaches, piers, infrastructure and buildings against rising sea levels, increased rainfall and heat waves (Helsingborg, 2014). Its contents present vulnerability and risk assessment reports with a main focus on sea level rise and flooding, and corresponding strategies for adapting to climate change in Helsingborg. It is considered as an action plan for adaptation and also presents strategies for the horizontal coordination between agencies for establishing climate change adaptation as a priority across sectors (Helsingborg, 2014).

The comprehensive plan embodies the vision and goals of Helsingborg, and provides the guidelines for development in Helsingborg. It is a formal institutional document that governs the behavior of

planning agencies. The Comprehensive Plan 2010 is the first plan that has actively accommodated the uncertainty of climate change. It does this by laying the foundation for “rolling comprehensive planning” (Helsingborg, 2014). This means that it allows for questions that are general and all-encompassing in nature, such as climate change, to be investigated further. These further investigations are known as “Fördjupningar” or “deepenings”. This allows for the plan to stay up-to-date and flexible to include new information as it becomes available on sea level rise, for instance. The PMCCA is one such “deepening” to the comprehensive plan.

The previous comprehensive plan was the CP 2002, which had been the guiding document for development until 2010, and it did not consider climate change. According to a strategic planner responsible for initiating the PM Climate Change Adaptation, the Advent Storm of 2011 and Storm Sven of 2013, as well as heavy rainfall in 2007, “gave respect” to the climate change issue in Helsingborg. He argues that that these major storms “accelerated” the process of incorporating climate change in planning documents in many municipalities, including Kristianstad, Karlstad, and Sundsvall. Once the PMCCA was adopted by the City Council in 2012 it became “necessary to consider climate change questions at the highest political level in Helsingborg”. When asked about how it came to be he responded that there were two formal documents that led to the possibility of the creation of the PMCCA: the Swedish Government Official Report on Vulnerability and Climate Change (SOU) in 2007 and the Comprehensive Plan 2010 for Helsingborg. The SOU 2007 was the first national document to address climate change adaptation and provide guidelines for municipalities on how to adapt. This was important since Sweden lacks strong centralized steering of climate change adaptation that results in unclear goals and division of responsibility (Glaas, 2013). The SOU 2007 provided a formal policy document that raised priority of climate change for the municipalities. Making the CP 2010 a “Fördjupnings PM” (deepening) aims to make climate change accessible in order “to invite broad dialogue and support for the purpose of deepening a complex question” for (Helsingborg, 2012).

The PMCCA is a collection of risk and vulnerability assessments and provides the guidelines for how to reduce vulnerability to sea level rise and flooding. It determines that for Helsingborg to be safe from storm surge during extreme rainfall and wind that the city will adopt a projection that estimates a sea level rise of +3.5 meter by 2100 above current sea level.

The risk analysis for sea level rise for 2100 in Helsingborg was calculated by collaboration between the Swedish Meteorological and Hydrological Institute (SMHI), the Delta Committee, and the Swedish Geotechnical Institute (SGI). The report projects a global sea level rise of +1 meters from 1990-2100

and a permanent sea level rise of up to +2-4 meters for 2200. The time horizon to adapt for was chosen as 100 years and the standard adaptation measure is to set at +3.5 meter above sea level minimum for all structures and +4 meter for vital public facilities. The +3.5 meter limit is the most robust option and means that piers and sea walls should be raised to at least this level to protect against the worst case scenario which involves factors such as wave height and wind speed. This new figure presented by the PM Climate Adaptation has already resulted in a change to the General Plan. The original projection from 2010 proposed a safety margin of +3.2 meters.

Table 2. List of documents important for climate change adaptation in Helsingborg; description, year adopted, and level.

Document	Description	Year adopted	Level
the Swedish Government Official Report on Vulnerability and Climate Change (SOU 2007)	National study on climate change and vulnerability.	2007	National
The Comprehensive Plan 2010 (CP 2010)	Guides development in Helsingborg. First comprehensive plan to incorporate climate change. Operates on a "rolling" basis which allows for "deepenings" on issues of importance.	2010	Municipal
PM Climate Change Adaptation 2012(PMCCA)	A "deepening" for the CP 2010. Guides adaptation plans across Helsingborg. Signed into policy in 2012. Responsible for APWG.	2012	Municipal
Measurement List (ML)	List of measures for climate change adaptation. Designates responsibility and payment. Currently only studies.	2014	Municipal: Produced by APWG
Planning Map	Layered map of all risk and vulnerability studies.	In progress.	Municipal

4.1.2 Operational Action Plan: The creation of the adaptation 'process'

Following the PMCCA call for increased horizontal coordination among governmental agencies, a team was created to implement the action plan for climate change adaptation. This team is known as

the Action Plan working group (APWG), a team of relevant actors whose purpose is to develop, plan and coordinate climate change adaptation measures. The leader of the group tasked with coordinating among the different actors explained how the process works. Its main goal is to put the results of the investigations the PMCCA to use. It is composed of a “steering group”, that determines what should be done and a “review panel” which implements the process on the ground and keeps track of progress. The cross-sectorial level steering group, made up of “the main bosses” of the actors involved, coordinates and makes plans for adaptation, while the “review panel” is composed of lower level civil servants that carry out the work stipulated by the steering group and keeps track of progress. Progress is kept track of by the “measures list” (ML) and is displayed on an interactive map on the municipal website.

The actors involved include a mix between sectors and agencies (see Table #3). The actors include the governmental agencies of Executive Committee, the Environment Committee, the Fire Department, and the Planning and Technical Services department. The private actors are the chemical company Kemira, and two groups of landowners (the Southern Landowners and Kärn Real Estate). Municipal companies are Helsingborg’s Port, the water services company NSVA², and the energy company Öresundskraft³. This organization is essentially the materialization of the “process” of climate change adaptation in Helsingborg. It is where explicit climate change adaptation planning takes place through discussion and deliberation and where it is expected to produce a collective action plan for adapting to climate change until 2100. This organization, therefore, provides the opportunity for social learning for climate change adaptation. According to the PMCCA, this organization should reduce vulnerability by creating “a learning process in the organization” for increased adaptive capacity. Meaning that the process should be able to respond quickly to new climate change scenarios while maintaining its commitment to the collective goals of each actor (Helsingborg, 2012).

4.1.3 How the climate change adaptation process works: the Action Plan Working Group

The Action Plan working group (APWG) is an organization that coordinates knowledge production between agencies at the local level (See Fig. #1). It promotes horizontal integration through knowledge co-production. It is flexible because it is governed by the PMCCA and does not depend on

² NSVA is a water services company owned by six municipalities; Bjuv, Båstad, Helsingborg, Landskrona, Svalöv and Åstorp. (<http://www.nsva.se/>)

³ Öresundskraft is a Swedish energy company that supplies electricity, district heating, natural gas, district cooling, and broadband services. It is owned by the City of Helsingborg (www.oresundskraft.se).

direct steering from the political process. According to the official in charge of the APWG, the process works because the formal policy documents decided by the politicians, such as the CP 2010, are long term and inflexible. He goes on to explain how APWG is flexible when he said:

“What does change quite often is the part that we work with. There are no politicians in this process. There are no formal decisions. This is on an understanding between different actors”.

Table 3. List of Actors involved in the groups that make up the APWG. Divided by sector.

Actors of the Climate Change Action Plan Working Group of Helsingborg		
Sector	Steering Group (number of representatives)	Review Panel
Governmental Agency	Executive Committee (3)	-Planning Department -Unit for Safety and Security
	Environmental Committee (1)	-Strategic Environment Unit
	Planning and Technical Services Committee (1)	-General Plan Unit -Detail Plan Unit -Urban Environment Unit -Operation and Maintenance
	Fire Department (1)	Fire Department
Municipal Company	NSVA (1)	NSVA
	Öresundskraft (1)	Öresundskraft
	Helsingborg Port (1)	Helsingborg Port
Private Company	Kemira (1)	Kemira
Landowners	Kärnsfastigheter (1)	Kärnsfastigheter
	Fastighetsägarna, Syd (1)	

The representatives from the different organizations in the steering group are “quite a high level of people” and they ensure that climate change is given significant priority within their organizations. This demonstrates the role that informal institutions play in the APWG. Actors face public scrutiny as a penalty, as any failure to meet their commitments will be displayed on the virtual ML as incomplete.

The APWG works together to determine the time scale, responsibility, cost and payment for each adaptation measure. It was established one year ago and is in the early stages, as most of the measurement list is currently comprised of preliminary investigations. The main purpose of this group is to collectively “identify flood risks and necessary measures linked to rising sea level and torrential rain” (Helsingborg, 2012). The agreed upon adaptation measures are found on the ML, which is reviewed twice a year by a steering committee and a review panel. Twice a year a steering committee decides on the measures and a review panel reviews the measures.

The ML describes the type of measure, who is responsible, the estimated cost, schedule and which actors are involved in the work. The intended measures are then placed within an administrations budget or a corporate budget and implemented by the responsible party. The ML is illustrated by a map that can be found on the municipal homepage (www.helsingborg.se) and shows ongoing projects interactively along with information about responsibilities, planned activities, and general information about climate change and climate change adaptation.

The question of whether social learning can occur and be sustained by communicating with wider social units depends on the institutional capacity for social learning. The lack of complete informality may mean that the institutions are too inflexible to produce social learning. Furthermore, in order for social learning to infiltrate society to increase individual adaptive capacity the learning achieved within this process must be communicated to the general public.

The flexibility of the institutional context will determine if social learning is achieved. If the capacity to learn is present then the social learning produced will have the potential to transform into real results for adaptation on the ground.

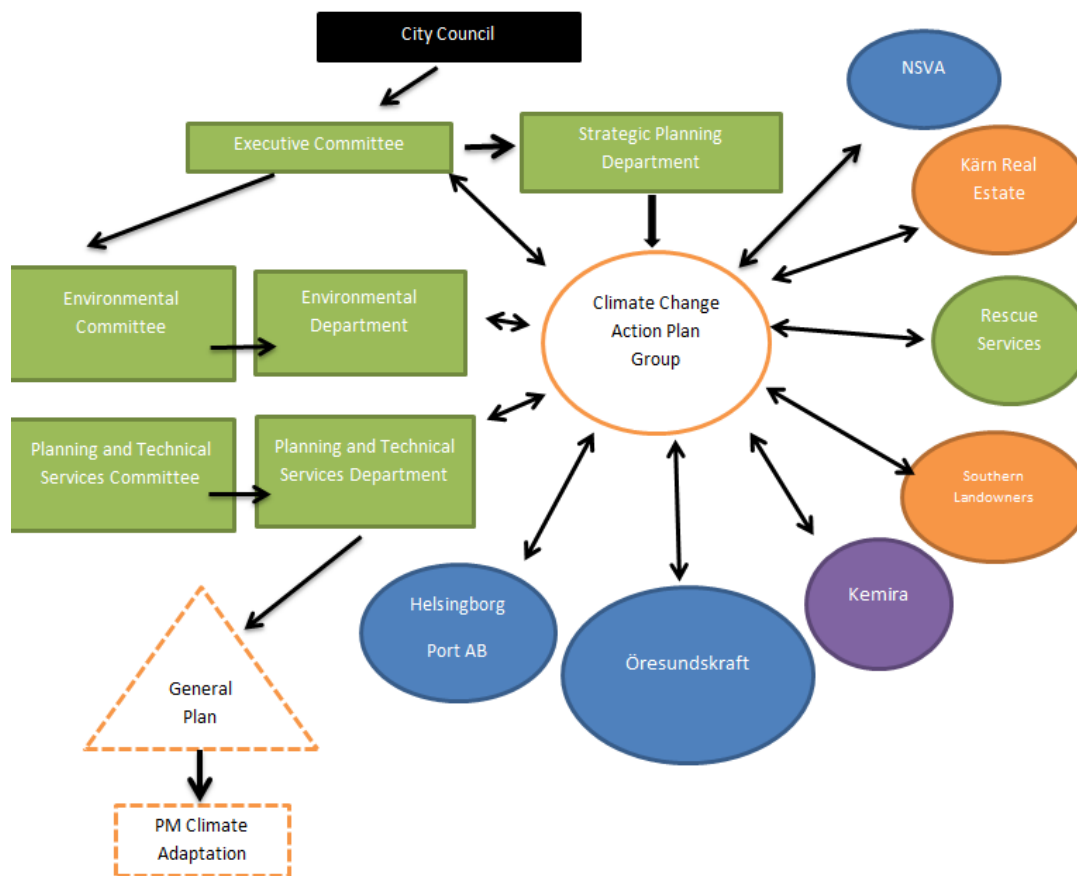


Figure 1: A chart demonstrating where the Action Plan Working Group (here shown as Climate Change Action Plan Group) fits within the formal organization of Helsingborg. The dotted lines represent the CP 2010 (as General Plan) and PMCCA and the arrows represent the dialogue. The climate change adaptation process opens up a space for discussion between governmental agencies (shown in green) municipal companies (blue) and private actors (orange).

4.2 Institutional Capacity for Social Learning

This section will present the findings from the 10 semi-structured interviews from those involved in the climate change process. Institutional capacity for learning was determined based on the framework put forth by Gupta et al. (2010) which states that in order for institutions to be flexible enough to allow learning then it needs to demonstrate institutional capacity for: trust, discussion of doubts, institutional memory, single loop learning and double loop learning. As it will be demonstrated below, the study finds that each of these criteria is present within the climate change process and that the institutional context is flexible enough for learning to occur.

4.2.1 Trust

The interview data suggests a high amount of trust between the members of the process. A main factor contributing to this are informal institutions and social networks between members of the climate change process. Decision makers have a high amount of trust in the civil servants working at the environmental agencies. There is also trust between the members of the APWG that the different actors will do their part. On the other hand, there appears to be a lack of trust in the formal organizations responsible for providing climate change prediction, mainly from SMHI.

The short sighted political priorities due to the four year election cycle has been recognized as a barrier to adaptation in Swedish municipalities (Storbjörk, 2007). This is supported by a statements from the politicians interviewed who stated that mitigation was of a higher concern than adaptation, who were mainly focused on installing more bike lanes and that “politics tend to favor other things than climate change”. According to the official in charge of the APWG, there is a “broad understanding” that climate change adaptation deserves attention so “the risk of changing the policy” based on election cycles is quite low. The political buy-in has spurred the creation of the APWG and this is in large part due to the trust placed in the civil servants involved in the process.

A politician from the Green Party in Helsingborg further elaborated on the trust that the politicians place in the civil servants, stating that those working in the environmental department “are really good...they have really good knowledge and they are really working hard to make things happen”. It is common place for decision makers to send out a draft of a motion to civil servants before it is presented in order to request their opinion and make changes to the motion based on these recommendations. This iterative feedback process is conducive to learning. She elaborated by stating the “civil servants, those working in the city” have the most influence over the decision making process, because “as a politician we have a lot of trust in them”.

Trust between organizations to fulfill their commitments outlined in the ML drives the APWG process in Helsingborg. There is a trust between the different organizations involved in the APWG to fulfill their responsibilities as no official state regulations or sanctions exist to force members to comply. When asked what would happen if an organization decided not to fulfill its commitment outlined in the ML, the lead official of the APWG responded “then we have a problem” but went on to say that, though the process is barely a year old, he is encouraged by the enthusiasm and commitment shown by each member. Informal institutions are not enforced by a formal authority but instead are sanctioned internally through public disapproval (Skoog, 2005). In this case, trust is an informal institution that drives the APWG process.

Interviewees' relationship with one another seemed to be strictly professional. Nevertheless, evidence for social networks between departments was discovered, as three major actors had previously worked together to create the PMCCA within the planning department, before recently being moving to other organizations involved in the process, such as NSVA and the Executive Committee. There appears to be mutual respect and trust between them, albeit at a strictly professional level.

The main source of distrust can be found with the validity of climate change predictions, especially with the predictions of sea level rise. The representative from the water company NSVA, who is in charge of adapting the wastewater systems, expressed his frustration with the lack of clarity of the SMHI sea level rise predictions, calling them "weak" and not "sufficiently clear". He displayed outward distrust toward the predictions and called into question their motives, stating that SMHI was unreliable because there were "politics involved" and they do not want their predictions of risk to "scare the big corporations". The strategic planner at the Planning department also corroborated this concern, stating that SMHI predictions were too conservative. He was concerned that the goals of the consultants, which were to be as valid as possible or face scrutiny from the scientific community, and the goals of the planning agency, to use the precautionary principle and prepare for the worst, were misaligned. Overall the findings support institutional patterns that support mutual respect and trust, and an overall trust in the APWG process in general.

4.2.2 Discussion of Doubts

An institutional openness towards uncertainties facilitates the institutional capacity for learning within an organization (Gupta et al., 2010). The doubts discussed are of separate natures but involve who pays for adaptation, openness about uncertainty of climate change, and open expression of doubts stemming from a mistrust of SMHI predictions. Discussion of doubts means the institutional acceptance of uncertainty and conflict of opinion and that there is no censoring or pressure for not voicing their opinions when they have doubts. The main doubts mentioned in the process are: the uncertainty of climate change, the climate change predictions and their validity, and who has responsibility for the costs of adaptation. The findings suggest that each of these doubts are discussed openly between actors and may result in formal policy changes.

Doubts about uncertainty to climate change projections are discussed openly. A strategic planner noted that "the preconditions can change at any moment and we don't know" while the wastewater

specialist from NSVA stated that he has openly and vocally expressed his skepticism about SMHI projections during meetings. This mistrust in SMHI predictions runs the risk of becoming maladaptive, as it works against the trust criterion for institutional capacity for social learning. To fix this there should be more dialogue to quell suspicions. Uncertainty does not stop the planning department from developing however, as all interviewees expressed their commitment to robust solutions. The lead architect of H+ summarized his view on uncertainty when he said “if you need to predict everything you can’t build anything”.

The last doubt that many interviewees mention is a question of how much responsibility the municipality has for covering costs for adaptation measures and how much rests with the landowners and companies. This doubt is frequently discussed during meetings, as supported by statements from the civil servant in charge of the Action Plan. The respondent from the Fire department also mentioned that doubts about responsibility are discussed during meetings and that individuals should be responsible for preparing for storms by buying pumps and generators. This also reveals a conflict between formal legislation and informal norms. The prevailing idea is that the municipality has the responsibility to handle climate change issues. The legislation says, however, that every landowner is responsible for his own plot of land but civil servants at the municipality believe that “it’s unreasonable to say that now it’s only your responsibility... as a municipality we need to take care of the larger picture and overall solutions”. The Action Plan, which is decided upon by all members of the process, is where the discussion of doubts regarding cost and payment takes place and solutions are made. The Action Plan provides a section for who is responsible for payment of the measure and where this money will come from. Thus, the deliberative nature of the process naturally allows for open doubt discussion. Mistrust of predictions, however, may be a sign of maladaptive social learning.

4.2.3 Institutional Memory

Collective memory of the consequences of climate related events are short lived within Helsingborg. The general population seems to forget quite quickly after a storm has happened making the importance of an institutionalized method for adaptation necessary for long term sustainability. The short term consciousness of the general public is mentioned by a politician, who said that public discussion about climate change only happens “when the storms come” and then after “one or two weeks” people forget about it. An institutional constraint for adaptation in Swedish municipalities is “a lack of systems to document knowledge” which could be a resource for organizations and make

the municipality less dependent on individual officials (Glaas, 2013). Consequently, institutional facilitation of a monitoring and evaluation tool is critical.

The comprehensive plan system in Helsingborg was cited by interviewees as too inflexible due to the fact that there is no formal mandate for when it should be updated and usually comes at the discretion of the politicians. The innovation of the “rolling plan” and “deepening” system of the new CP 2010 was cited by interviewees as a major step forward for institutional memory. The official in charge of wastewater management for NSVA stated that the detailed planning process “was not flexible enough to keep track of new updates on risk” but that because of the new Action Plan working group a new system has been proposed in the form of an online “Planning Map” that continuously updates the CP 2010 with risk analysis and keeps an up to date record of which areas are prone to flooding.

This “Planning Map⁴” currently being populated with information has the potential to drastically improve the institutional memory of the climate adaptation process by keeping track of climate adaptation measures, mainly physical, that are installed with the purpose of lasting longer than a normal staff employment period. It will also serve the function of contributing to individual awareness for climate change risk by informing the public if they live in a risk prone area. This is going to be an important step because previously new homeowners threatened to remove physical adaptation measures placed years before to protect them because they weren’t aware of the protection they provided. The “Planning Map” would remove this risk by keeping track of implemented measures and can be retrieved at any time.

Currently, the APWG’s LM is the most important source of institutional memory for the adaptation process. The LM provides institutional memory by keeping track of the surveys and physical measures that have been put in place, as well as who is responsible for implementing them. This list is available to the public in the form of a map from the City’s website. It serves the dual purpose of institutional memory and division of responsibilities which were two major challenges before the creation of the current adaptation process.

The main source of informal institutional memory comes from the Planning and Technical Services Department and its staff. The strategic planner responsible for the PMCCA has been working there for 35 years and keeps track of progress with a “special map” where he has “put in everything that

⁴ This innovation is still in its infancy, however, and is not fully functional at the present moment.

has happened". He has been taking informal follow up notes on the entire development of the climate change adaptation process.

The development of the "Planning Map" has the possibility of altering the institutional process of how Helsingborg creates its General Plan and providing up-to-date information about climate risks to the public.

4.2.4 Single Loop Learning

Single loop learning means refining "actions to improve performance without changing guiding assumptions and calling into question established routines" and is viewed as the first incremental step before double loop learning can take place (Pahl-Wostl, 2009). For climate change adaptation in Helsingborg single loop learning can involve requesting better climate models to define the height of piers, for instance. Contrary to the literature, however, the findings suggest that single-loop learning is a result of double-loop learning that was responsible for the overhaul of the comprehensive plan process. This is supported by interviewees from the Planning department who stated that they "first started working with questions about climate change with the creation of the Comprehensive Plan 2010". Single-loop learning involves fixing errors in implementation associated with the measures provided by the PMCCA.

The PMCCA outlines mainly technical fixes and this requires a big change for the Planning and Technical Services Committee who have the responsibility to come up with hard infrastructure solutions. At the Planning and Technical Services Department the main technical response is raising vulnerable structures to +3.5 meters, an incremental change that doesn't question underlying assumptions. When asked about how Helsingborg plans to adapt to sea level rise a common response was "raise the pier, simply, up to a level that is in the PMCCA".

Short-term incremental changes in routines are demonstrated by the efforts to increase individual adaptive capacity. These short-term measures include improving the speed of early warning systems, requesting that homeowners purchase pumps and generators, and installing flood prevention measures on streets.

Single loop learning arises from reflecting and learning from experience and the new institutional set up of the APWG that brings different actors together supports this. The meetings held with the members of the APWG provide this opportunity in a social context. An interviewee from the Fire Department gives an account on how reflecting on experience from storms has led to the fixing of routines for storm preparedness:

“what I think is very important is when we have these weather events or happenings that we sit down together, the different responsibility sectors, and discuss what consequences we each had, and discuss the solutions and management in the short term and long term. So we learn from the events that have occurred (...) there is a dialogue going all the time. To evaluate the event and learn from those happenings for adaptation”.

This reflection on the experiences and that inspires action is single loop learning. The reorganizing of conceptual models and paradigms stemming from platforms for dialogue and innovation following a crisis are “key to the stimulation of learning to deal with uncertainties” (Folke et al., 2005). In this case paradigms have not yet been reorganized, but single loop learning has occurred. The members of the APWG are not changing the underlying assumptions or changing any process radically, but merely taking the opportunity provided by the formation of the APWG to discuss and deliberate. The set-up of the APWG was a materialization of double loop learning from the guidelines found in the PMCCA.

4.2.5 Double Loop Learning

Double loop learning implies changes in assumptions underlying institutional patterns (Gupta et al., 2010). This cross-sectorial process which exists as part of the climate change adaptation planning has potential for social learning and innovation. The question remains whether or not this process of deliberation of adaptation measures forms a ‘learning cycle’ capable of producing double loop learning. Formal policy circles are mainly restricted to single loop learning (Paul-Wostl, 2009), and single loop learning is an important aspect of social learning. However for a more thorough and inclusive social learning to take place, double loop learning is necessary. According to Pahl-Wostl (2009) a process qualifies as a learning cycle to support double loop learning when:

- It is at least a partially informal network of actors with open participation and where rules on how the group operates are negotiable.
- It is focused on a specific issue and willingness to experiment with a range of solutions.
- It qualifies as a community of practice; with a shared identity and goal of gaining knowledge through sharing information and experiences (Wenger, 1998).

The organizational process for adaptation in Helsingborg may run the risk of being more of a formal policy circle rather than an informal network of actors. However, APWG is based on the idea of sharing experiences and ideas about how to adapt to climate change, a specific issue that affects each actor and motivates knowledge production. The fact that this process, even if it is not completely controlled by the City Council, has requirements for participation and preexisting rules

and thus cannot qualify as a completely informal network, but this is not detrimental to its learning capacity. Its emphasis on co-producing knowledge through deliberation between sectors that is based on trust make this organization an innovative solution for horizontal coordination problems.

The climate change process in Helsingborg is not completely informal and it does not include opportunities for open participation from the general population. Notwithstanding, it demonstrates the aspects of informal networks that are essential for learning: access to new kinds of knowledge and supporting multiple ways of interpretation. It is also flexible in that its members include completely private actors, such as Kemira, who participate free willingly. Finally, the formal mandate provided by the PMCCA and support from the politicians should be seen as a benefit, as a strong link to formal policy processes has shown to increase learning capacity and adaptability (Pahl Wostl, 2009). While informal networks have some advantages, in the case of Helsingborg, a close link to formal policy processes has the possibility of increasing the effectiveness of learning. A questioning of assumptions on the scenarios used for climate change modeling has been present in the planning process.

The establishment of the climate action group from the PMCCA represents an innovative approach to coping with sea level rise and flooding and is a result of double loop learning. Key individuals in the Planning and Technical Services Department recognized that the established formal policies were not sufficient for handling the risk that sea level rise presented and pushed for an institutional change. They then “took the initiative and requested in 2010, after the Comprehensive Plan was adopted, that [they] needed to do a deeper study about climate aspects” which resulted in the PMCCA.

Its creation also reflects a change perception on climate change in general. An interviewee remarked on how the discussion about climate change occurs “in a different way today than 10 years ago” and how it changed from “something bothersome to handle” to an imperative issue. This is mainly due to the recent flooding experiences that prompted a reflection and a change in underlying assumptions about the seriousness of climate change and how it is handled.

Double loop learning is also shown by coming up with adaptive solutions to infrastructure that emphasize living with floods, as opposed to merely protecting against them. The perception of “feeling safe behind embankments” is a prevailing paradigm that has been shown to prevent double loop learning and social learning in Kristianstad (Johannessen & Hahn, 2013). The H+ project has shown that they have overcome this ‘stationary’ paradigm to flood management. Buildings in the H+ development plan need to be planned based on the +3.5 meters sea level rise projections as a minimum requirement, but this is subject to change. Once the buildings are built they cannot be

raised, thus the architects have questioned the frame of keeping water out by making sure that “it is tight and waterproof instead”. Waterproofing the buildings to be more adaptive to floods as opposed to protecting against them demonstrates a change in thinking associated with double loop learning. The creation of the PMCCA as a “deepening” document that allows the previously inflexible comprehensive plan to has changed the way planning is done, and questions the traditional planning method of making a document for a predetermined period and not adjusting it until that period is over. This reflects double loop learning which has had far reaching consequences in the institutional capacity for learning in Helsingborg, as the majority of the criteria have come about as a *result* of this institutional change.

5.0 Discussion

5.1 Reflection on Learning in Helsingborg

The framework provided by Gupta (2013) was intended to reveal the institutional factors that may lead to social learning within the climate change adaptation process in Helsingborg. However, due to the recent development of the APWG organization, it seems that the framework turned out to show both the effects and causes of the new comprehensive planning system. The APWG provides a forum for the co-production of knowledge, based on trust and regulated by public scrutiny. Trust in the civil servants has led to the creation of the group, and it also plays a role in regulating the process, as the monitoring and evaluation is conducted by the ‘review panel’ and is broadcasted through the website. Institutional memory takes place with the ML and in the form of a new “Planning Map” which promises to keep track of measures implemented to ensure long term sustainability. The ability to discuss doubts without censorship has also occurred within the meetings. Single loop learning has taken place as a result of the double loop learning which established the “rolling” CP 2010 and made possible the addition of a guiding document in the PMCCA, which in turn, created the APWG. The research has revealed that the criteria provided by Gupta (2013) are mutually reinforcing and do not occur independently without influencing the others. The framework has been useful to understand the institutional flexibility as a function of the CP 2010 and how the APWG has solved many institutional constraints to learning in a Swedish setting. In order to delve deeper and fully understand the factors influencing social learning within the climate change process I suggest that the criteria of disjuncture, leadership, the reflexivity of learning, and public participation be added to the framework.

5.2 Importance of Disjuncture for Social Learning and Institutional Change

The addition of a clause on climate change into the CP 2010, a product of double loop learning, produced formal institutional change that led to the innovation of the APWG. This contradicts research that states that social learning occurs in step wise fashion, from single loop learning to double loop learning (Pahl-Wostl, 2009). Thus, it is relevant to explore what factors led to the spontaneous double-loop learning that produced the CP 2010. According to Reed (2010), learning is considered social when a change in understanding takes place that goes beyond the individual and becomes situated in larger communities of practice through social interactions. The creation of the CP 2010 was proposed by individuals in the municipal government, became situated in larger communities of practice, as evidenced by the different sectors involved in the process, and occurred through deliberation and discussion among actors within the municipal government. It can be said that social learning was the cause for this institutional change. But what triggered this social learning? Based on the interviews it is clear that the major storms and floods that struck Helsingborg around the time the CP 2010 was written sparked the institutional learning cycle.

Nine out of the 10 interviewees stated that the recent storms, mainly the Advent Storm of 2011, were responsible for the current climate change adaptation process. One interviewee from NSVA stated that Helsingborg does not have the most advanced adaptation process because “there are cities that have been affected worse by different catastrophes”. Interviewees frequently stated that storms help “get the process going faster and brings the question up earlier” and that Helsingborg was “heavily affected by what happened to Råå and Strandvägen” because it “was the worst our society had experienced”. The storms continue to serve as an instigator for action, but now the planning agencies are better suited to take action, as demonstrated by the leader of the APWG stating that recent flooding events have helped them in “pinpointing three key areas” that need adaptation measures. The storms are also responsible for putting climate change in the public eye since they demonstrated the consequences of flooding. The project leader of H+ summarized the effect the storms had on climate change adaptation when he said that “they have awakened us”.

I argue that based on my findings for Helsingborg a disjuncture may be necessary to get the learning process going. A ‘disjuncture’, or an event that puts us out of harmony with our social context, is necessary for learning to occur at the individual level (Jarvis, 2012). Of course, learning at the individual level is not the same as learning at the organizational level, but it is still required to “provide varied options for producing change when a major crisis delegitimizes the former rule system”(Williams, 2008). Furthermore, individual agency and learning plays out on the organizational

level and organizational agency shapes institutions, which in turn shape organizational agency (Pelling et al., 2008). Thus, analyzing the conditions that cause a reflection of experience on an individual level gives insight to social learning in organizations and their ability to change societal institutions.

Major storms in 2011 and 2013 caused major flooding and destruction to the Strandvägen and Råå communities in Helsingborg and nearly flooded the train station. These disasters, or disjunctures, and their learning response can be explained with Kolb's theory of experiential learning. Kolb's (1984) learning process is based on having a concrete experience that spawns learning as one reflects on these experiences and derives abstract concepts from reflection, leading to active experimentation. An experience is caused by a disjuncture that breaks the "harmony between us and our world" and, along with social interaction, makes up the fundamental conditions for the experiential learning process to occur (Jarvis, 2012). Therefore, the disasters that occurred in Helsingborg were of a sufficient magnitude to provide opportunities for learning to improve policy and practice. The storms and damages that ensued led to a concrete experience for Helsingborg's society, causing a reflection on this experience, and the active experimentation of creating the PMCCA and APWG.

5.3 Participation

Based on the interviews it appears that this organizational learning has not spread to the general population. This is evidenced by the lack of overall participation and concern shown by citizens. This notion is supported by the official from NSVA who stated that there is "definitely a need for more public participation" and that he is alarmed by the comment sections of local online newspapers that claim climate change isn't happening. The project leader from H+ states that there are two opportunities to participate in the detail plan process but that "not many people" participate and it is usually the politicians or the agencies who act. The low levels of participation by citizens could be explained by institutional barriers. A politician from the Green Party explained that in Helsingborg you cannot hand in a motion if you are a citizen directly to the decision makers, but are required to go through a political party first. Officials frequently mentioned that the homepage is the only means of communication to the general public about climate change adaptation. The comments section of local newspapers is also frequently mentioned as a medium for citizens to express their opinion.

5.4 Reflexivity of Learning

The institutional capacity for social learning was made possible by the double loop learning that occurred in the CP 2010. An institutional space for social learning was opened when the CP 2010

became the first plan to work on a “rolling basis” with the ability of new information on climate change scenarios to be easily integrated (www.helsingborg.se). This change of routine questioned the underlying assumptions of how the planning process was done and made it possible to be continuously updated with new risk and vulnerability studies. This adjustment started the process of learning reflexivity between the APWG and the formal institutions that govern it. Gupta et al. (2013) lists trust, institutional memory, discussion of doubts, single-loop learning and double-loop learning as criteria for institutional capacity for social learning. These criteria determine the overall flexibility of the institutional framework. However, it is well known that a dialectic exists between social learning at the organizational level and institutions that govern their behavior (Pelling et al., 2008). Therefore, it may be that the evidence of the 5 criteria in Helsingborg actually represents, and are products of, the double loop learning that occurred on the institutional level. This double loop learning that was instigated by a disjuncture (i.e. the storms), was enough to start the process of social learning (See Fig #2). The release of the SOU 2007 also provided national guidance which supported the creation of the CP 2010.

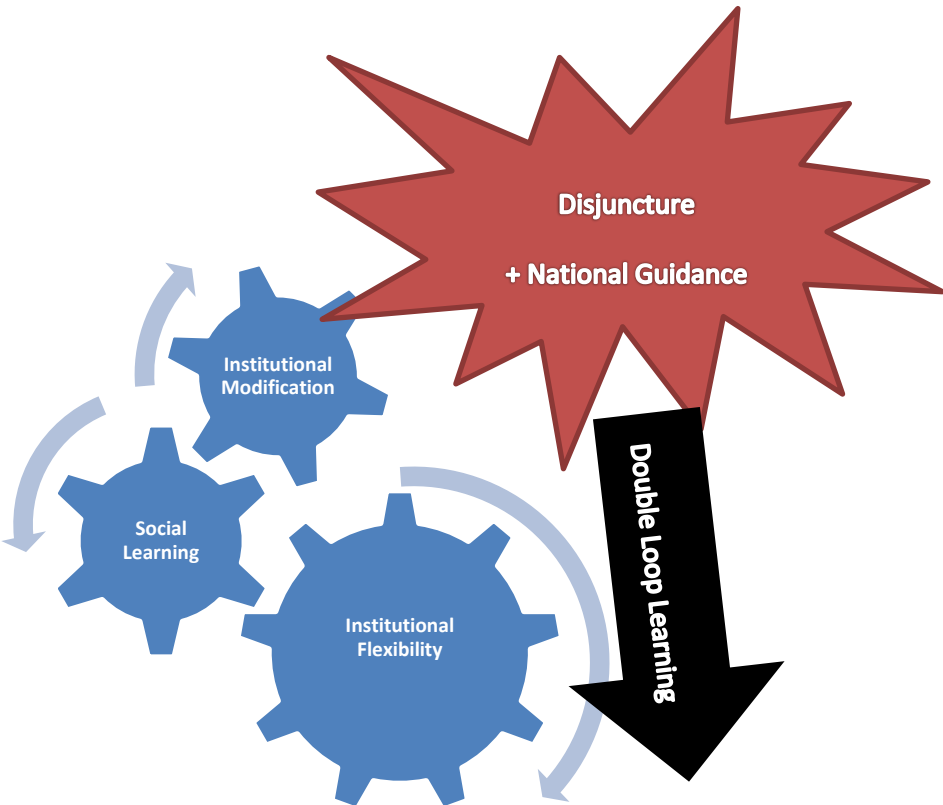


Figure 2 Diagram explaining the reflexivity in the planning process. Double loop learning caused by disjuncture and national guidance leads to the institutional flexibility (Gupta et al. (2013) framework) that facilitates social learning. Social learning then modifies the formal institutions. (Based on author’s analysis of social learning process for climate change adaptation in Helsingborg)

Double loop learning has precipitated due to the institutional space and dialogical engagements made between the members of the Action Plan working group, and this learning is now reflexively altering institutions once again. Developing a comprehensive plan in Helsingborg is required by law under the Planning and Building Act and it is reviewed by the City Council to determine if the plan is current or if a new one needs to be made (www.helsingborg.se). The City Council decisions are rooted in conservative institutional frameworks that are too slow to keep up with the constant influx of climate change information. A politician from the Green Party involved with the City Council supported this as she said, “the discussion can go on forever because we will never agree until we are drowned by the water”. The Climate Action group is an innovative solution to the conservative nature of politics. The leader in charge of coordination of the Climate Action group reiterated this point when he said that the “document that is decided by the politicians won’t change that often” and neither will the comprehensive plan which is “also quite long term” and stated that the key to implementing the quick changes needed to stay ahead of climate change is that “there are no politicians in this process”.

The ‘Planning Map’ concept is a change in formal institution produced by the flexibility provided by the Action Plan group. The emergence of a new group for the General Plan 2017 that is going to work primarily with climate change questions aims to make the process more flexible by incorporating the investigations conducted in the ML. The comprehensive plan process will be changed to become “a living document” that is able to “continuously update” and that is free from the restraints of the decision making process. In order to produce the transformation of institutions to make them capable of allowing society to adapt fast enough there needs to be a balance of absolute rigidity and total flexibility (Gupta et al., 2010). The dialogue and communication produced due to the creation of the CP 2010 provided a space for flexibility within Helsingborg’s planning process which promises to create such a balance. If this “planning map” is accepted then it will most likely provide even more space for innovative learning and experimentation.

5.5 Leadership

Leadership is given its own dimension for institutional adaptive capacity under the institutional capacity for learning framework, and it is therefore considered separately from social learning. Leaders facilitate changes in institutions and are drivers of change by facilitating collaboration between different actors (Gupta et al., 2010). In the case of Helsingborg, leadership was found to be instrumental to the learning process. It is known from prior research in Kristianstad, Sweden that having “individuals with high technical competence acting as facilitators of a process is one of the

most important mechanisms to foster social learning” (Johannessen & Hahn, 2013). The institutional criterion for social learning is distinct from general learning presented in the framework provided by Gupta et al. (2010). I suggest that given the importance of leadership for social learning, leadership should be added as a criterion to the framework. Room for leaders who encourage collaboration is a critical element for institutions to be conducive for social learning. The use of informal networks and interpersonal connections between the leader of the Action Plan group and key individuals with technical competence and institutional memory within the Planning and Technical Services Department has contributed significantly to the institutional capacity for social learning in Helsingborg.

The waste water specialist at NSVA attributes the success of the process to leadership, stating “in the beginning it starts with people who have their own personal engagement and are burning to answer specific questions and dedicate themselves to questions that start a working group”. In the case of Helsingborg, this leader is a strategic planner that works within the Planning and Technical Services Department named Widar Narvelo. In his own words “with Climate Change Adaptation and these types of questions I have followed them out of my own interest the entire time”. This leader is given credit by the other interviewees for taking the initiative to start investigations into risk and vulnerability to sea level rise and flooding, which ended up becoming the basis for the PM Climate Change Adaptation. When asked if storms were primarily responsible for the advancements in the process the fire engineer at the Rescue Services responded “Widar started this process” because “he was the one who was responsible for the PM Climate Change Adaptation”. The second step is creating a plan to implement the PMCCA. That is what Magnus is in charge of now.” Magnus Ydmark is in charge of the coordination among actors for climate change in Helsingborg and had previously worked in the Planning and Technical Services Department with Widar. The institutional space provided by the new CP 2010 was capitalized on by dedicated individuals within the planning department to produce the PMCCA and the current organization for implementing it.

5.0 Conclusion

The aim of this thesis was to explore how the planning process in Helsingborg is taking place and whether the process allows for social learning, considering social learning an important aspect of adaptive capacity. It sought to explore the relationships that formal and informal institutions had on the adaptation process in Helsingborg. Pelling & High's (2008) definition of adaptive capacity as arising out of social learning embedded in social relationships reveals the underlying institutional constraints on adaptation, especially in developed countries that tend to have more formal and restrictive institutions that may prevent adaptation. Through my research in Helsingborg, I have confirmed that flexible institutional structure is necessary for learning. In Helsingborg, that has taken the form of new organization arrangements for climate change adaptation (e.g. the Action Plan working group) and new and flexible tools for planning (e.g. the "Planning Map") I have also given examples of how double loop learning can be facilitated and its relation to disjuncture. Suggestions for further research include how to spontaneously create social learning without a need for crisis.

It is too early to tell if social learning has occurred in all members of the organization as the process is still in its infancy. Only time will tell to see if the organizational learning will spread to the general public. However, it is apparent that leadership, trust, and informal and interpersonal relationships have had much to do with the success of the process in collective action for climate change adaptation in Helsingborg. As stated by Pelling et al. (2008), learning how to learn can be an adaptive measure on itself. But this depends on if you can learn to change the rules of the game.

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Appendix

Appendix 1- Interview Guide

Interview Guide: Climate change adaptation and societal learning

1. Interviewee background – social context
(Name, approx. age, gender, company, position, years with company)

Please tell me a bit about yourself and how long you have been working in this department.

How often is sea level rise and increased precipitation discussed in your work?

Have you considered and changed your plans due to warnings of sea level rise?

How often do you have contact with Vidar Narvelo?

Keep answers short if possible to around 2 – 3 minutes.

2. **(Overview of the process, priority of climate change, main policy documents)**

2.1	How does coastal zone planning and flood prevention planning work in your department?
2.2	What priority does climate change adaptation have in your department?
2.3	What are the main guiding policy documents for your department? Does it include climate change adaptation to sea level rise?
2.4	What actions are currently being taken to reduce risk for sea level rise and increased precipitation due to climate change in Helsingborg?
2.5	Does the public/ citizens participate in the planning process and how?

2.6	How much money is invested in climate change adaptation to sea level rise for your project?
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3. External knowledge – (expert driven, local participation, co production of knowledge)

3.1	What information is used to make decisions about climate change adaptation initiatives and priorities, and where does that information come from?
3.2	What type of information is provided by the public and what is that used for?

4. Power relations

8.1	Who has the most decision making power in your department? Where do the major decisions come from?
8.2	How does the planning process take place between different government levels (municipal, regional, national)? What guides the process? (key documents at European, national level)

5. Communication

10.1	How is the risk of sea level rise and intensified extreme weather events communicated to the general public?
10.2	Are there initiatives relating to changing the behavior of individuals or help them better prepare for the impacts of climate change?

6. Is the current institutional framework flexible enough to allow for learning? (3.2 and 3.3 help answer flexibility) (monitoring and evaluation for progress check and impacts)(Who does the monitoring and evaluation and how are results used)(is new information used to adjust project)(sign of flexibility is adjusting based on evaluation)

3.1	Are there codes of behavior and professionalism that employees in the planning process need to follow?
3.2	Do you agree with the current process? Are there any areas that you would like to change or do things differently? If so, how would you go about voicing your doubts and disapproval?

3.3	Do you have discussions about the validity of the process with your coworkers and if it is the right way of doing things?
3.4	What monitoring and evaluation procedures does your department have in place? Who is responsible for monitoring your progress? How are the results from the evaluation used?
3.5	Are there mechanisms in place to adjust projects along the way based on evaluation from progress reports?
3.6	Have the monitoring and evaluation of your progress changed since climate change came into the picture? Are long term investments now being reevaluated depending on the latest climate change predictions? Are goals being changed based on climate change?

7. **Single Loop learning** - fixing errors from routines and coming up with alternative actions, ability of institutional patterns to learn from past experiences and improve routines

4.1	What are the main challenges you encounter when attempting to implement climate change adaptation for sea level rise in Helsingborg?
4.2	How would you go about solving those challenges? What if the solution to a problem does not fit within the guiding policy document?
4.3	Have you used experiences from recent extreme weather events to guide new plans?

8. **Double Loop Learning**

Evidence of changes in assumptions in underlying institutional patterns

4.1	Have you ever changed your assumptions about how the climate change adaptation process should work after a discussion with your colleagues?
4.2	How often are the goals and guiding policy documents revisited and who is part of this process?
4.3	Has your department/division changed the climate change adaptation goals recently?

9. Trust

Institutional patterns that promote trust and mutual respect

5.1	How does this department cooperate with the other departments with respect to climate change adaptation?
5.2	Does your department use information generated by other departments to make decisions?

10. Institutional memory (monitoring and evaluation) (turnover)(generational memory)

Institutional provision of monitoring and evaluation processes of policy experiences

6.1	How are results from progress reports used?
6.2	How long are the normal contracts for your department? Is there a high turnover of people?

11. Discussion of Doubts – Institutional openness towards uncertainty

7.1	How do you go about discussing doubts about the planning process for your projects?
7.2	How has the uncertainty of climate change impacts influenced your process?

12. Informal institutions (citizen based organizations)(projects outside of work) (who is there)(codes of conduct and norms)

7.1	Do you take part in informal activities with other actors or citizens involved in the planning process? Are there citizen based organizations or groups involved in any project related to climate change adaptation projects? Are you involved in any project outside of work?
7.2	How would you describe your relationship with your colleagues involved in the climate adaptation process? How about those from the national level?

7.3	Are you involved in initiatives related to climate change adaptation outside of the municipal planning department?
7.4	Are there any local climate change adaptation initiatives besides through the planning department?