CLIMATE ADAPTATION IN LOCAL GOVERNANCE: INSTITUTIONAL BARRIERS IN DANISH MUNICIPALITIES

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Data sheet

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Abstract: Climate change and climate adaptation constitutes a key challenge for contemporary planning and politics. In Denmark, climate adaptation policy is formulated nationally, but implemented primarily at the municipal level. This study therefore examines the ability of climate adaptation capacity of local governments, aiming to uncover institutional barriers for adaptation to climate change. Methodologically, the study combines literature review, in-depth case studies of three municipalities and a survey among all Danish municipalities. We find that political and executive leadership are crucial for ensuring sustained attention to climate adaptation in local policy making. Furthermore, experience with climate change events such as flooding also to tend to place adaptation higher on local decision-making. Finally, the study shows that larger municipalities are better equipped in the form of expertise and financial resources to take a proactive and long-term approach to climate adaptation.

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Summary

This study examines one of the key challenges for contemporary planning and politics, namely the formulation and implementation of policy actions to manage the impacts of climate change and the promotion of climate adaptation. In this report, we focus on local level government, as the local level plays a key role for implementation of climate adaptation policies. In Denmark, national climate adaptation policy has set up a framework while the national policies are implemented at local level, where the policies are modified to local conditions and local climate vulnerabilities. We take as a point of departure that the ability of local government to provide adequate policy responses to environmental stresses such as climate change is intimately linked to the institutional setting of local policy making and planning. Hence, we investigate institutional barriers for adaptation to climate changes in local government. The study has been conducted during 2012-2013, and involved a literature review, case studies of three Danish municipalities and a survey involving all Danish municipalities.

The study has showed that one of the foremost determinants of proactive local climate adaption policy is political and executive leadership at the local level. Where leadership took up adaptation, attention could be kept also after immediate experiences with flooding, and climate adaptation policy was promoted and placed high on local agendas, ensuring that adaptation issues were appeared within other policy areas, e.g. urban development, land use planning and business development.

Leadership that was quick to frame climate adaptation measures and policies as also benefitting other policy areas paved a way for giving priority to climate adaptation measures that may be costly and/or involve conflicts over space. Thus the ability to recognize and take advantages of synergies in the short and long term investments was important and opened options for acting quicker, for example with inclusion of water retaining green and blue spaces in development of urban areas, and with new architecture in regeneration.

In addition the size of the municipality was significant. The larger municipalities had built and could maintain expertise that they felt were necessary to handle the complexity associated with adapting to climate change, including within anticipated areas rather than remaining with addressing areas where events had shown it necessary to implement actions. Furthermore, the larger municipalities could invest the resources necessary for developing and implementing a long term strategy to adapt the area and minimize the risks and costs associated with present and future climate changes. In addition, the larger municipalities could facilitate and take advantage of networks with other governance institutions, business, public associations, etc. within challenging areas of adaptation. Moreover, it was striking how significant prior experience with climate adaptation was for pushing adaptation up on local policy agendas.

Moreover, some adaptation measures, such as allocation of green spaces to water retention, involved conflicts over land use stretching far into other policy areas and where these sensitive areas were not addressed, it blocked to some extent local adaptive actions.

We would like to express sincere thanks to the participating municipal planners and policy makers who invested time and energy in providing data for our research. Furthermore, we wish to thank the former Coordination Unit for Research in Climate Change Adaptation Research.

Sammenfatning

Dette studie undersøger en af de væsentlige udfordringer på den politiske dagsorden og i den fysiske planlægning - formuleringen og implementeringen af politikker til at håndtere klimatilpasning. Undersøgelsen fokuserer på kommunerne, idet det lokale niveau spiller en afgørende rolle i klimatilpasningsindsatsen. I Danmark udgør den nationale klimatilpasningsstrategi en ramme for klimatilpasning, men den nationale politik implementeres på det kommunale niveau, hvor den tilpasses lokale forhold og sårbarhed over for klimaforandringer. Analysens udgangspunkt er, at det lokale niveaus kapacitet til at formulere tilstrækkeligt effektive politiske svar på miljørelaterede udfordringer, såsom klimaforandringer, hænger tæt sammen med den institutionelle indretning af kommunale beslutnings- og planlægningsprocesser. Studiets overordnede formål er derfor at afdække institutionelle barrierer for tilpasning til klimaforandringer i danske kommuner. Det er gennemført i 2012-2013 og omfatter et litteraturreview, casestudier af tre danske kommuner og en spørgeskemaundersøgelse blandt alle danske kommuner.

Studiet viser, at politisk og forvaltningsmæssig ledelse på det lokale niveau er en af de væsentligste forudsætninger for en proaktiv klimatilpasningspolitik. Hvor kommunale ledere adresserede klimatilpasning, lykkedes det at fastholde opmærksomheden på indsatsen også efter, at en akut klimahændelse med fx oversvømmelse var håndteret og overstået. Klimatilpasning fik her en fremtrædende placering på den politiske dagsorden, således at tilpasningsbehov fik opmærksomhed også inden for andre politikområder såsom byudvikling, fysisk planlægning og erhvervsudvikling. Når den kommunale ledelse vinklede klimatilpasningstiltag som en indsats, der havde positive effekter også på andre politikområder, banede det vej for en prioritering af til tider omkostningstunge klimatilpasningstiltag eller tiltag, der indebar potentielle konflikter omkring arealanvendelse. Evnen til at opfatte og udnytte synergier i både kort- og langtidsinvesteringer var vigtig og åbnede op for hurtigere handling, for eksempel ved at integrere grøn og blå infrastruktur til vandopsamling i byudviklingen og i ny arkitektur. Omvendt viste casestudierne, at tværsektorale konflikter om arealanvendelse, der ikke blev adresseret, i nogen grad udgjorde en barriere for en effektiv klimatilpasning.

Studiet viser endvidere, at kommunestørrelse har betydning for klimatilpasningskapaciteten. Større kommuner har opbygget den nødvendige viden og ekspertise til at håndtere den kompleksitet, der er forbundet med klimatilpasning, herunder det at kunne foregribe og planlægge i forhold til fremtidige problemfelter og ikke blot kendte og erfarede problemer. Dertil kommer, at større kommuner har bedre muligheder for at investere de nødvendige ressourcer i at udvikle og implementere en langsigtsstrategi for tilpasning og derved kan reducere de risici og omkostninger, der følger af klimaforandringer. Store kommuner har også bedre mulighed for at bidrage til og udnytte netværk med andre offentlige institutioner, private aktører og organisationer.

Endelig er det tydeligt, at konkret erfaring med klimaforandringshændelser og tilpasning har stor betydning for om klimatilpasning kommer højt op på den lokale politiske dagsorden.

Vi vil hermed gerne takke de kommunale politikere og ansatte, som bidrog med tid, energi og viden til projektets dataindsamling. Endvidere ønsker vi også at takke KFT for den økonomiske støtte til forskningsprojektet i håb om at både KFT såvel som vores forskning fortsat fremmer samfundsvidenskabelig forskning i klimatilpasning.

1 Introduction – climate policy integration and local governance

This study examines a pressing issue in contemporary planning and politics, namely the vast challenge of adapting to the impacts of climate change. The changing climate influences conditions for life across a range of areas, and policy-makers from the local to the European scale are faced with the complex challenge of managing the impacts of climate changes and assisting societies in the transition to these new conditions, and, where possible, take advantage of the changing climate.

The ability of societies to manage the impacts of climate changes is closely connected to the ability of political systems to include climate adaptation policy issues in other policy areas, cf. the EU Strategy on Adaptation to Climate Change (COM (2013) 216 final). Integration of climate adaptation policy implies that policies of other policy areas do not have adverse effects on climate adaptation policies, i.e. block or obscure climate adaptation policies or may even have positive interplays between policies. Such an integration of climate adaptation concerns is premised on the ability of policy institutions to coordinate and work across classical sectoral policy areas, based on developed procedures, structures and competencies to support cross-sectoral policy perspectives in areas with relevance for climate change adaptation. Hence, successful climate adaptation policy is conditioned by integration of climate adaptation policy into other policy areas across sectorial divides.

Moreover, management of the impacts of climate changes is based on the ability to act in areas where experience is limited and knowledge is uncertain. Adaptation and climate change impacts include complex social, technical and political issues that, under conditions of uncertainty, directly or indirectly are central for taking action against the impacts of climate changes at societal level, and adjust policy instruments and policy objectives to novel or amended knowledge. The management of impacts is therefore also based on the capacity of policy institutions to understand and address such complex and at times uncertain issues which amplify the challenges related to adaptation.

In many countries, including Denmark, the management of impacts of climate changes has centred on direct adaptation, i.e. physical and technical adjustment of societal systems and structures to cater for more frequent extreme weather events, higher precipitation and higher sea levels. At the same time, adaptation has to a lesser extent addressed the structure, character and interplay of the social, political and economic institutions of societies, and even less so from the perspective of ensuring a coherent and integrated climate adaptation policy.

Different approaches conceptualise societal adaptation and adaptive capacity. A classic way to evaluate the adaptive capacity of a society is the extent and availability of economic, social and natural resources. Addressing a global scale, recent approaches however equally emphasise the ability of societies to mitigate adverse stresses and mange vulnerabilities, i.e. linking to coping capacities and resilience, as for example discussed by Berman et al. (2012). This directs attention to the ability of societies to redirect and imple-

ment a range of governance functions, successfully altering core societal structures and dynamics such as urban developments in wetlands. Such a governance capacity is perceived as reaching across the public private divide and as fundamental for the adaptive capacity of societies, and, following World Resources Institute, at a minimum including production and distribution of knowledge; development and adjustment of measures aimed at the private sector; and innovation and advancement of participatory measures to include citizens in the planning of adaptive actions and policies (Dixit et al., 2012).

In a Danish context, actual and explicit adaptation policies aimed at managing the impacts of climate changes have a relatively short history, while managing the risk of flooding due to severe storms and even hurricanes especially in the South Western part of Denmark has a century long history. For all municipalities, management of water related impacts has been the dominant concern and in the major part of the Danish municipalities (80 per cent), municipal plans and / or local wastewater plans address adaptation to increased precipitation (Hellesen et al., 2010).

Concomitantly, climate adaptation was overshadowed by climate mitigation debates, and often climate adaptation was presented as a sub-theme under climate change mitigation. The policy context for implementing adaptation policies changed with the reform of local government in 2007 The reform redrew the map of local governance and merged the former 174 municipalities into 98 and decentralized a range of tasks, including new tasks in the fields of planning and environmental policy, to the local level, accelerating the challenges for local adapting policies. Until then, water management was a municipal policy area and integrated in local administrations. After the reform of local governance, the state however privatized local water management through establishment of water companies in all municipalities (water companies may cover more than one municipality) separate from the municipal organisations.

In 2008, Denmark launched its first national climate adaptation strategy, *Strategy for adapting to climate changes in Denmark* (Danish Government, 2008) in which climate adaptation was put on the agenda at national and local level. Focus in the strategy is on presenting a range of options that local government can take in order to prepare for a changing climate of the future, and on assessing the risks of impacts for particular types of Danish landscape and society. No specific obligations are attached and the strategy presents climate changes as an opportunity for the future as well as introduces a range of threats and risks that have to be countered. Critics complained that the strategy was s too unambitious, too short-sighted and vague (see e.g. IDA, 2012; Danish Society of Nature Conservation, 2009).

By 2012, the strategy was followed by a specific action plan, *How We Manage Cloudbursts and Rains* (Danish Government, 2012). The Action Plan requires each Municipality to develop a local action plan to adapt to climate changes in a short and medium term perspective. To assist local government in the process, the Action Plan establishes a national task force with detailed and specific expertise in local adaptation issues, as well as a web-based mapping of risks for flooding, rain falls and storm surges in various time perspectives from 5 to 100 years, modelled according to IPCC 2007 scenarios (Danish Government, 2012). As a further support following the launch of the 2012 *Action Plan*, the Planning Act was amended with the option for local govern-

ance to make Climate Plans (Klimaplaner) with mandatory, locally specific regulations, positioned alongside the Local Plans (Lokalplaner) under the Municipal Plan (Kommuneplanen). This change of law responded to uncertainty among municipalities as to how far they could include climate adaptation related regulations in the municipal and / or local plans (Hellesen et al., 2010). In parallel with plans and regulations, the national level in Denmark exerts strong influence on local government through the annual *Financial Agreement for Municipalities* (Aftale om Kommunernes Økonomi) between the Government (i.e. Ministry of Finance) and Local Government Denmark (Kommunernes Landsforening). The annual *Financial Agreement for Municipalities* provides the framework for local policy through mandating policy actions, economic compensation schemes and binding agreements on specific issues such as water management, environmental protection, schools and welfare services. In the *Financial Agreement for Municipalities* 2008-2011, adaptation has not been a targeted issue, while the 2012 Action Plan was directly linked to the *Financial Agreement for Municipalities 2013* (Danish Government and Local Government Denmark, 2012). The Annual Financial Agreement 2013 specified as a novel issue climate adaptation among mandatory priority tasks for the municipalities, whereby all municipalities were obligated to map risks of flooding and high risk areas and to develop climate adaptation plans by December 2013. Moreover, the *Financial Agreement* allocated Euro 0.33 bill (DKK 2.5 bill) to investments in waste water infrastructure in 2013 (Danish Government and Local Government Denmark, 2012).

At the local scale, municipalities must translate overall strategies for adaptation to tangible actions. In Denmark, the sectoral organisation of municipalities, the 2007 reform of local government and the extensive Danish coastline is a basic framework condition for performing this task (Hellesen et al., 2010). In addition, the privatisation of water management has led to the establishment of local water companies that are in charge of water and waste water infrastructures, as well as of securing payment from the private households. Thus, for many municipalities, the organisation of municipal government, water as a main issue, and subsequently also the more or less formalised structures of collaboration with the private water companies are at centre stage of local adaptation to climate change.

With the national 2012 *Action Plan*, all Danish municipalities are required to complete a comprehensive plan for local climate adaptation by December 2013, either as a supplementing plan to the Municipal Plan or as integrated in the Municipal Plan (Danish Government, 2012). Each municipal plan must include a mapping of the risks associated with climate changes at vulnerable localities of the municipality and specify local actions that address relevant impacts of climate change in the particular context of the municipal governance structure. Moreover, the national strategy opened the formulation of local climate plans as a possibility for municipal actions, i.e. that specific planning requirements could be justified solely with reference to climate impacts. By January, 2014, the local climate plan had been through the mandatory public hearing in half of the 98 municipalities while the remaining would be subject to the public hearing during the first half of 2014 (klimatilpasning.dk, 2014).

Since the 1990s, environmental policy has increasingly been approached as an issue that crosses the boundaries of sector policies and reaches across multiple levels of policy making, reflecting af sustainable development perspective (Lafferty and Howden, 2003). The spatial, time and societal perva-

siveness of climate change mitigation and impacts has placed climate policy issues within an equally integrative agenda, both in policy practice and within the academic literature.

However, in Denmark local government often, although to varying degrees, is organized along sectoral lines, leading to compartmentalised policy structures (Jensen et al., 2013; Bækgaard, 2008). This indicates latent barriers for local climate adaptation being integrated into other relevant policy areas and equally calls for a need for innovative approaches to developing climate adaptation policies.

In this study, we examine the capacity of local government to manage the experienced and anticipated impacts of climate changes; specifically, we *investigate which institutional barriers and enablers of local governance condition the capacity for climate adaptive policy actions.*

In line with theoretical approaches of new institutionalism, we define institutions as formal and informal rules that guide and constrain behaviour (North 1990; Söderberg 2011; Hall and Taylor 1996). Specifically, we examine patterns of interaction among actors, ideas and knowledge, policy instruments, and decision making procedures. Although, this definition explicitly does not include organisations units we do examine the organizational setup on climate adaptation. We do so by investigating the priority granted to and organisation of, and the expected / implemented measures that concern the local management of climate adaptation as well as collaborations and networks set up to support this.

Our approach is based on research questions that specify the overall objective and on the literature review presented in chapter 2, thus the concrete methods behind the study follows from the research questions and the literature review. The methods are discussed in chapter 3.

We focus on local governance in Denmark, and due to the emerging character of local climate adaption policy and to the scale of the research project, the study has an explorative character. To specify the objective of the study, the overall objective has led to the formulation of three research questions, and these are the questions addressed in this report:

- Which barriers and enablers impact on the ability of local governance to develop solid and apposite policy responses to meet the challenges of climate change;
  - This analysis rest primarily on the data from the literature review

- How do local governance institutions manage the challenge of climate policy integration
  - The analysis of this question is mainly based on the case studies and the survey

- How governance institutions condition adaptive policy making
  - The analysis of this question is mainly based on the case studies and the survey

This allows us to draw some tentative conclusions as to why some institutions of local governance are more successful than others in developing policy responses.

After this introduction, Chapter 2 discusses the theoretical basis of the study through presenting the literature review before the chapter 3 introduces the data collection methods behind the study. In chapter 4, the three case studies are presented and preliminary findings are drawn. In the following chapter 5, the results of the survey among Danish municipalities are presented. In the final chapter 6, findings across the literature review, the case studies and the survey are discussed and concluded upon. The interview and survey methods are documented in appendix a, b, c and d.

2 Literature review of local governance of climate adaptation

The aim of the literature review is to assess which issues, paradoxes, institutional and thematic relations that in the literature have been identify as significant for local institutional capacities to manage the impacts of climate changes; which institutional barriers for local climate adaptation can be identified, and which tools (methods) may minimize the identified barriers. The literature review 1) informs the document analysis and the interview guides, and 2) serves as basis for the positioning the analytical approach and the study in the field of climate change adaptation policy analysis.

Literature was collated based on searches on climate change adaptation, local / municipal / urban governance, cross-sectoral climate change adaptation, climate change policy integration, institutional barriers / drivers. A further presentation of the method behind the literature review is provided in chapter 3.

The literature review is structured across the included literature according to significant and recurring issues, summarized in the following sections:

- Significance of climate related events
- Perception of climate adaptation
- Integration of climate adaptation policy across sectors and policy areas
- Organisation of local public climate adaptation policy and stakeholder and / or citizen participation
- Leadership
- Position on local policy agenda
- Local action space
- Adaptive capacity of local government
- Framing and access to and lack of relevant knowledge
- Driver(s) behind adaptation activities and the focus of the actions

2.1 Significance of climate related events

Several of the studies that we have reviewed direct attention to the significance of previous experiences with the impacts of climate change, or extreme weather events in general. In one study, Pelling et al.(2008) include prior experience in the social learning taking place as basis for building capacity to cope with climate change impacts (Pelling et al., 2008). Næss et al.'s research on Norwegian municipalities that have been accustomed to flooding demonstrate how the 'habit' of recurring climate events may lead to flexible institutional attentiveness and response. In the case of Skedsmo Municipality, it was demonstrated how a flood can create a momentum for flood protection and represent a window of opportunity that spurs local action both in terms of emergency measures during the flood and in the form of measures to prevent future floods. In the years before 1995, Skedsmo had given a low priority to emergency preparedness due to a strained financial situation (Næss et al., 2005).

The type of municipality furthermore mixes with the significance of prior experience. Dodman & Satterthwaite (2008) stress how the general conditions of, in their case, cities blend with the way experience influence institu-

tional responses to climate related events for different stakeholder groups. Cities concentrate people, built environments, dwellings, social, cultural, political and economic activities, and flows of information, people, goods, resources, wastes, etc. The concentration and complexity of cities imply that disadvantaged groups of the urban population most likely are particularly vulnerable to climate change events (Dodman & Satterthwaite, 2008).

2.2 Perception of climate adaptation

A second, and very basic, issue of the included literature is the perception of climate change adaptation across different institutional actors, governance systems and scales. This issue concerns on the one hand which events or trends that are cognitively linked with identifying climate change impacts, including how severe, urgent and pervasive these are or may become, and which policy actions that are considered to be adaptation actions.

Based on a review of social science literature, Smit & Wandel identify adaptations that are considered as responses to risks associated with the interaction of environmental hazards and human vulnerability or adaptive capacity. In the climate change field, adaptation analyses have been undertaken for several distinct purposes. Impact assessments assume adaptations to estimate damages to longer term climate scenarios with and without adjustments. Evaluations of specified adaptation options aim to identify preferred measures. Vulnerability indices seek to provide relative vulnerability scores for countries, regions or communities (Smit & Wandel, 2006).

Adaptation is by Adger et al. (2005) defined as 'adjustment in ecological, social or economic systems in response to observed or expected changes in climatic stimuli and their effects and impacts in order to alleviate adverse impacts of change or take advantage of new opportunities' (p. 78). Adaption involves building adaptive capacity and/or implementation of adaptive decisions, and is thus further seen as 'a continuous stream of activities, actions, decisions and attitudes that informs decisions about all aspects of life, and that reflects existing social norms and processes' (Adger et al., 2005: 78). Moreover, the authors make a basic distinction between reactive and anticipatory adaptation, while claiming that individual actions are constrained by institutional processes, e.g. regulatory structures, property rights, social norms associated with rules in use (Adger et al., 2005).

Classification of deliberate adaptation takes departure in that measures that share the loss, bear the loss, modify the event, prevent effects, change use or change location. This gives three types: reduction of sensitivity, e.g. farmers changing crops, increasing storage capacity; alteration of exposure, e.g. by increased hazard preparedness; increasing resilience of social and ecological systems (Adger, Arnell & Tompkins, 2005). Smit & Wandel (2006) go further and classify adaptive actions along four dimensions (Smit & Wandel, 2006:288): timing relative to climate impacts: anticipatory, concurrent, reactive; intent: autonomous or planned; spatial scope: local, regional, national, European; form: behavioural, informational, institutional, technological; degree of adjustment: minor alterations to abandonment of activity (Smit & Wandel, 2006).

Also addressing the implication of how climate change and adaptive actions are perceived by local government institutions, Jensen et al. (2013) stress in a comparative study of a Danish and a Dutch case of climate policy how framing of policy issues is a political action and that particular framings place

climate change problems in particular cause-effect relations, assign agency and responsibility, and show possible ways forward. Framing of climate policy happens at multiple scales and serve to enable policy actions as well as to condition and limit policy actions. Framing is innately linked to the different forms of knowledge that are included in policy making and planning and changes over time and may push new developments as in the case of Copenhagen or block fundamental changes as in the case of the Green Heart, i.e. the central green area of drained, agricultural land between the large cities in the Netherlands (Jensen et al., 2013).

Adaptations at local scale are considered as responses to risks associated with the interaction of environmental hazards and human vulnerability or adaptive capacity. In the climate change field, adaptation analyses have been undertaken for several distinct purposes. Impact assessments assume adaptations to estimate damages to longer term climate scenarios with and without adjustments. Evaluations of specified adaptation options aim to identify preferred measures. Vulnerability indices seek to provide relative vulnerability scores for countries, regions or communities (Smit & Wandel, 2006).

As an additional and more pragmatic dimension to consider, Ivey et al. (2004) demonstrate implementability of adaptive strategies, i.e. the ability of the organisation to implement measures, to be significant for the ability of local governance institutions develop measures and policies to adapt to climate changes (Ivey et al., 2004).

Whereas the study by Jensen et al. (2013) focus on the cognitive construction of climate change impacts as policy problems, a study conducted by Næss et al. (2005) identifies a focus on technical barriers stemming from local power structures and/or barriers constituted by limited social learning as important. Næss et al. (2005) stress institutional factors as crucial in climate adaptation policy and against this backdrop, their study focusses on the local government capacity to make decisions that reduce local vulnerability to future floods, in particular municipal institutions and their interactions with institutions at other geographical and 'managerial' levels (Næss et al., 2005). The paper specifies structural disincentives to proactive flood management, including a perception that the national government should step in and cover the costs of damages when large natural disasters strike, enhanced by experiences that in some cases, flood reparations after e.g. the 1995 flooding were in themselves seen as a benefit to the community (Næss et al., 2005).

Furthermore, Measham et al. (2011) find that while priority and attention to climate adaptation are significant, climate adaptation is still often confused with mitigation due to that climate adaptation policy in actual local policy practice is not embedded in planning practise. Barriers are identified that relate to in particular leadership, institutional context and competing planning agendas (Measham et al., 2011).

2.3 Integration of climate adaptation policy across sectors and policy areas

Analysing climate adaptation policies and strategies, we confront an inherently complex policy area which furthermore is marked by strong uncertainty and high urgency; the former not to be understood as uncertainty of the knowledge it-self but rather in the lifespan of the knowledge that concerns the actual impacts of climate changes at a global level as well as in localized areas. While climate change already appears to cause catastrophic events,

the larger consequences of climate change are often framed with a view to 2050 or even the end of the century. Combining with the uncertainty about how, when and where climate change will show presents a challenge for bringing climate adaptation to the forefront of crowded policy agendas. At the same time the complexity of climate change underscores a need for bringing climate adaptation out of the position as one among many pressing environmental policy areas, and engage measures and decision making across a range of sectors and levels of policy. This places climate policy integration in a key position while a robust, elaborate and operationalized conceptualization of climate policy integration is only emerging (Adelle & Russel, 2013), and in many cases in the form of mainstreaming linked to sustainability policies (Swart & Raes, 2007; Jordan & Lenshow, 2010) or as an important aspect of development policies (Gupta, 2010). A fuller understanding of the position and role of knowledge and forms of knowledge as ever-becoming truths may provide another brick in building such a solid conceptualisation.

Mickwitz et al. (2009) define climate policy integration (CPI) on the basis of the classic definitions provided by e.g. Lafferty and Hovden (2003). In this conception, CPI concerns 'the incorporation of the aims of climate change mitigation and adaptation into all stages of policy-making in other policy sectors; complemented by an attempt to aggregate expected consequences for climate change mitigation and adaptation into an overall evaluation of policy, and a commitment to minimize contradictions between climate policies and other policies' (Mickwitz et al., 2009). They stress that CPI can be measured through the extent to which specific criteria are met (Jordan & Lenschow, 2010; Mickwitz & Kivimaa, 2007).

However, Adelle & Russell (2013) advance a more process-oriented perspective on CPI, which is more aligned with our approach. They differ between 'traditional environmental/climate policy to include 'command and control' type regulation and environmental/climate policy integration to consist of 'softer' modes of governance such as strategies, policy appraisal, budgetary tools and voluntary instruments' (Adelle and Russel 2013:2). Referring to Lafferty & Hovden (2003), the basic point of departure for the authors is that 'the concept [of CPI] clearly implies a relatively strong revision of the traditional hierarchy of policy objectives' (Lafferty & Hovden, 2003: 2), thereby implying both theoretical and practical (i.e. policy relevant) basic defining feature; that the challenges of climate change are so fundamental and severe that their management implies a rethinking of policy and the way policy institutions work. Jordan and Lenschow (2010)'s framework for conceptualizing *environmental* policy integration, apply three dimensions to narrow down CPI; CPI as an understanding of and a commitment to include climate policy objectives in policy making across sectors, as a process of governing or as an outcome of policy.

CPI, as a basic understanding underpinning policy making, directly refers to the vital aspects of forms of knowledge in framing and processes of policy learning which condition the field of policy options (Jensen, van Bommel et al. 2013). The second dimension, approaching CPI as a continued process of governing includes the logic of intervention of climate policies, involving both institutional mechanisms for coordination as well as policy learning as a latent but entrenched part of governing. In this respect, integration of new policy framings or re-framing processes across policy sectors inherently involve policy learning, enhancing or building sector capacities for addressing

or managing climate policy issues (Hertin & Berkhout, 2003). While climate mitigation studies repeatedly point at the urgent need for not only adjustments and incremental policy learning, but for fundamental social, economic and political transitions (Bulkeley, 2013), it is however an open question whether climate adaptation issues can be managed through a re-articulation of policy-making with inclusion or repositioning of other forms of knowledge than were previously dominating, i.e. a reframing of policy making.

Thus, integration of climate policy issues may cover climate adaptation (and climate mitigation), and entails both coordination across sectorial policies and acknowledgement of climate policy issues through learning processes that involve a range of different modes of organizational learning (Storbjörk, 2010), and through forms of knowledge that link climate issues to other policy issues. It covers the situation where climate policy issues are considered and to varying degree granted priority when policies are developed within other relevant policy areas. Framing or re-framing of policies, i.e. in developing adaptive policies, evolve around the in-/excluded, particular forms of knowledge which shape the adaptation policies through e.g. what is authorized as knowledge, what is sound, good and legitimate policy, who are legitimate policy actors (Jensen et al, 2013)

Jordan and Lenschow (2010) note that assessment of environmental policy integration (EPI) as a policy outcome is largely lacking in the literature, though the authors do point to evaluation criteria such as creation of administrative capacities or evaluation bodies. But standards for measuring the degree or character of CPI are underdeveloped in the literature.

Also Kok & de Coninck (2007) demonstrate how the inter-linkages between climate adaptation policy and other policy areas, including land use, energy and water, embed opportunities for enhancing adaptation and adaptive capacity. However, existing (international) policy institutions are often not 'designed to promote mainstreaming' (Kok & de Coninck, 2007:588).

2.4 Organisation of local public climate adaptation policy and relevance/scale of stakeholder and/or citizen participation

A range of studies further address the organisation of climate adaptation policy actions. These studies include issues such as who is responsible, how significant is the organisational setting and location of climate adaptation in local climate adaptation governance, which role for citizens and for participation, and which issues emerge across different levels of climate policy making and planning.

In many studies, it is significant that climate change adaptation involves a diverse landscape of actors from individuals, firms and civil society, public bodies and governments at local, regional and national scales, and institutional agencies (Adger, Arnell & Tompkins, 2005). In a study reported by Measham et al. (2011), the authors stress the network based nature of local climate adaptation policy – local government depends on other key local actors to implement adaptation measures, leading to that also local climate adaptation policy is based on multi-level governance (quote p891), affecting the role and responsibilities in climate adaptation policy. This is a diffuse area, since the mandates for local government are changing and at times lack clear definitions (Measham et al., 2011).

Furthermore, the institutional setting of the local area exhibits a myriad of interests, mandates, roles and resources (human and financial). A main challenge is to define frequently competing needs and to prioritize access to water in a collaborative manner that meets critical needs in both human and ecological communities. The paper finds that planning for collaborative climate adaptation policy may receive a low priority among other daily duties, among some water managers, municipal and other, while this is challenged by the potential severe threat of water shortage (Ivey et al., 2004).

Dodman & Satterthwaite also stress that adaptation in practice depends on the active engagement of local stakeholders as well as a supportive national government. The former include citizen groups, NGO's, utility providers such as water managers and infrastructure providers (Dodman & Satterthwaite, 2008). Also Dixit et al. strongly stress the active involvement of private actors with a special focus on civil society actors. In their analysis, it is of key significance that participatory measures are developed and practiced by planning and local policy institutions. Participation should be firmly rooted among civil society actors and include these at early stages of policy development and be promoted by availability of relevant and sufficient knowledge (Dixit et al., 2012).

The analysis conducted by Measham et al. uses a framework based on the notion of 'community-based adaptation', i.e. locally focused, participatory and drawing on normative preferences of the local community. Communities are included as social groups that co-exist in spatial settings and which are determined by factors such as gender, ethnicity, class and gender rather than their mere location. This is based on recognition of the place based nature of impacts, stakeholder interests, losses, gains and capacities, including diverse perceptions of climate adaptation (Measham et al., 2011).

Also Ivey et al. (2004) addresses existing organisation and networks at local level and demonstrate that specific roles in climate policy making may have great influence. In their study it was revealed that when organisations have widely understood and unambiguous roles in local water management this served as an obvious point of collaboration (Ivey et al., 2004). The study moreover suggests that both participation/community involvement and specific institutional designs may enhance local abilities to manage climate changes impacts. This is reflected by Agrewal (2008) who highlights the role of institutional partnerships in facilitating adaptation and drawing from social network analysis it presents a conceptual toolkit to analyse institutional partnerships and their impacts on resource access of vulnerable social groups (Agrewal, 2008).

Another key issue is the sectorial or compartmentalized organization of environmental policy issues in many local governance institutions, including for climate adaptation issues (Jensen et al., 2013). To develop adaptive measures to manage the impacts of climate change may also push for more collaboration across policy sectors while the effect of this is often conditioned by networks among local policy makers and leadership (Jensen et al., 2013). The lack of formal or informal ways of rooting climate policy in a cross-sectorial approach is also identified as blocking the transformations needed to manage climate change, while this takes time and energy, i.e. must be considered an investment, but is often halted by over-burdened staff (Burch, 2010).

Institutional interaction stems from the interaction between benefits of action and the costs of inaction. For institutional interaction, adaptive decisions often are taken within the environmental realm of decision-making and it is crucial how strong the actors who define and frame adaptive actions are. Significantly, the Adger et al. show how 'politics of construction of scale are often ignored' in climate adaptation policy analyses (Adger et al., 2005:80).

Næss et al. (2005) demonstrate in their case study that the institutional structure often puts flood management at the centre of conflicting interests. Flood-prone areas are commonly very attractive lands for agriculture, industry and residents. Municipal governments are keen to attract investors, and there is a willingness to take the risk of damages. For example, Bærum Municipality near Oslo recently allowed a local company to construct a building in a flood-prone area, after the company threatened to relocate its operation. The political cost of not allowing investments may be large in terms of job loss. In addition, the paper stresses that actions carried out after the floods are typically focused on expensive, large-scale technical measures, often at the expense of environmental or other concerns without a strong political voice in the current power structure. Several of these measures conflicted with environmental interests and recreational activities (e.g. fishing) (Næss et al., 2005).

Another study found that in the included cases, climate adaptation was either individually or grouped with other environmental issues integrated in the strategic planning of the municipality (Measham et al., 2011).

2.5 Leadership

Some studies stress that local leadership determine the success of local adaptive policies. Burch (2010) shows that local leadership is central in strategies that manage to overcome institutional barriers for successful implementation of climate adaptation measures. Burch relates leadership to organisational culture and demonstrates that in her case studies, to be successful a leader 'must impose their own values and assumptions upon the organisation, leading to a culture that defines for future generations the types of leadership and core values that are deemed acceptable' (Burch, 2010: 293). Also Measham et al. finds that the opinions and value systems of the mayor or chief planner were influential in shaping other actors' engagement and commitment to climate adaptation policy (Measham et al., 2011).

Furthermore, leadership is important to promote a general awareness across the municipal organisation of the character and importance of adaptive policies, demonstrating priority by e.g. leadership in cross-sectorial working groups, initiatives in strategic projects, etc. and thus also concerns integration of climate policy issues (Jensen et al., 2013). In Burch's study, this aspect was reflected in policies for hiring staff; new employees were selected also due to their shared values of the importance of climate adaptation and of cross-sector collaborations (Burch, 2010). Kern & Bulkeley show for multi-level issues of climate change, networks of local governance and municipalities that crosses national borders within Europe may serve as 'leader' in putting climate policy issues on the agenda (Kern & Bulkeley, 2009).

Leadership was additionally shown to impact on whether climate adaptation policy issues pushed for the formulation of a climate plan/strategy at local level , or the extent to which adaptation issues became integrated in lo-

cal / regional strategic (Burch, 2010) or visionary (Jensen et al., 2013) plans. In Burch's study, this lead interviewees to suggest that climate issues should be allocated to the mayor's office rather than remain an environmental planning area, while Jensen et al. demonstrate the change imposed by a mayor taking up climate policy as a major issue and integrating this in a city's (Copenhagen's) future development and urban identity.

2.6 Position on local policy agenda

The study conducted by Næss et al. (2005) demonstrates that the actual policy measures developed and implemented reflect local power structures. When strong local political and economic interests coincided with state level willingness to pay and provide support, flood prevention measures were implemented rapidly at the expense of environmental and other goals that had weak political representation at the local level. In spite of protests from environmental NGOs, technical measures became the preferred policy solutions in both municipalities. Moreover, adaptation issues can amplify existing conflicts over objectives between public and private actors (Adger, Arnell & Tompkins, 2005).

The urgency occurring after the floods resulted in an 'event-driven' pattern of responses where consequences of the measures were not thoroughly assessed before implementation. Many outcomes are a result of incidental circumstances and perceived opportunities and may be regarded as 'garbage can' type decisions (Næss et al., 2005). In the years before 1995, Skedsmo had given a low priority to emergency preparedness due to a strained financial situation (Næss et al., 2005). New perspectives have emerged within the institutional structures in line with broader societal changes, and these changes have been reinforced by the climate events. Despite the learning and changes in world-view apparent at the national level, the integration of new perspectives, tools and guidelines in actual planning at the local level appears sketchy. Some local measures have even been carried out contrary to these perspectives (Næss et al., 2005).

A study further found that in case studies that the position of climate adaptation in the local governance institution was influenced by being one among many other priority areas and other competing interests at local level. This in some cases implied that other issues were considered more immediate concerns, placing climate adaptation lower on the agenda and decreasing the commitment allocated to climate adaptation policy. Many local actors considered climate adaptation an environmental issue locating climate adaptation among other pressing environmental problems. Moreover, climate adaptation was either individually or grouped with other environmental issues integrated in the strategic planning of the municipality (Measham et al., 2011).

Additionally, the demands that local governments face are diverse, many and mixed, and climate adaptation policy thus appears distant on the 'crowded' agendas, where other policy objectives have higher priority. Lafferty and Hovden (2003) also identified traditional policy hierarchies as a barrier for environmental policy integration which according to Adelle and Russell potentially is also the case for climate policy integration (Adelle and Russel, 2013). The range of stakeholder interests is highly heterogeneous at local level thus making consensus the more difficult (Measham et al., 2011).

Also Kok & Coninck (2007) stress that while there is an increasing acknowledgement of the necessity to integrate adaptation issues in other policy areas, there at the same time 'is a risk that the [adaptations] issues get buried in other agendas, with the result that the issues loses attention' (Kok & Conick, 2007:597).

2.7 Local action space

Focussing on institutional abilities to initiate and conduct local climate adaptation in many studies also involve a multilevel governance perspective, in particular the relative importance of climate adaptation policies at national and local level, respectively, and moreover how useful national adaptation policies are in guiding, advising and supporting local policy actions.

Measham et al. find in their study that local governments are represented as institutional units that have a key role in initiatives of climate adaptation policy (Measham et al., 2011). The paper argues for three critical roles for local institutions, understood as governing bodies, in managing climate adaptation; structuring responses to local impacts of climate change; mediating between individual and collective responses to climate change impacts/vulnerability; and governing how resources are provided for facilitating responses (Agrewal, 2008).

Measham et al. (2011) direct attention to that unclear national climate adaptation policies or national adaptation policies that do not appear ambitious enough to tackle local climate impact challenges serve as institutional barriers to local climate impact management. In the study, national policy making process was experienced as too slow in incorporating new knowledge or in meeting the uncertainty and risks associated with climate change (Measham et al., 2011). Also Burch show inconsistencies and at time contradictory policies between the regional/national (federal) level of policy and planning to be a barrier and frustration for local climate adaptation policy (Burch, 2010).

Focussing on urban governance of climate adaptation, Dodman & Satterthwaite (2008) stress that as they provide the legislative, financial and institutional basis for adaptation actions, higher levels of government have a key role in facilitating urban adaptation (Dodman & Satterthwaite, 2008).

Ivey et al. (2004) here demonstrate three aspects of the relationship between local and national climate adaptation policy that have major implication for local government and its ability to respond to the impacts of climate change, namely that jurisdiction must be clearly stated and understood; local organisations must have authority to select and implement adaptive measures; and there needs to exist support from senior government agencies (Ivey et al., 2004). Næss et al. (2005) show in their study of the two Norwegian municipalities how the current institutional framework for flood management in Norway gives weak incentives for proactive flood management at the municipal level, especially due to the centralized institutional structures in Norway. To a great extent, it is the municipal actors who are implementing agents for adaptation policies, while these are determined at the national level. A common perception is that large-scale flood events are outside the responsibility of municipalities and that damages due to climate related events should be covered by the national government (Næss et al., 2005).

Pelling et al. stress that to provide space within and between local organisations for individuals to develop private as well as officially sanctioned social relationships may be revealed as a pathway to enable social learning (Pelling et al., 2008), also reflected by Storbjörk's study (2010). Agrewal (2008) in a parallel argument argue that if adaptation is inevitably local, there is a great need to involve local institutions more centrally in planning for and implementing adaptation policies and projects, i.e. the role of local institutions in designing, supporting, and implementing adaptation (Agrewal, 2008). Moreover, the multiple linkages among external interventions and local adaptations can only be understood through a focus on the mediating role and linkages among different institutions in a given territory, and their influence on production and adaptation possibilities (Agrewal, 2008).

Furthermore, Adger et al. stress that the rules and underlying decision-making structures affect the legitimacy of the climate adaptation policy, legitimacy here represents the acceptability of decisions and mode of decision-making for participants and others who are affected by decisions. Legitimacy of decisions improves the chances of successful implementation (Adger, Arnell & Tompkins, 2005).

2.8 Adaptive capacity of local government

Ivey et al. understands adaptive capacity broadly to be 'the potential or ability of a system, region, or community to adapt to the effects or impacts of climate change' (Ivey, Smithers et al. 2004 :3566), which embraces the ways in which climate change and possible measures to adapt to its impacts are understood, conceptualised and integrated into the norms and practices of climate policy making / planning (Smit and Wandel 2006, Burch 2010, Adelle and Russel 2013). Moreover, studies of the adaptive capacity of particular governance institutions stress the role of knowledge as vital for understanding and improving the adaptive capacity of especially local and regional governance institutions (Nilsson & Persson, 2003).

To Tompkins and Adger, adaptive capacity is based on notions of resilience and adaptation, and the analysis of adaptive capacity specifies conditions that potentially reduce vulnerability to climate impacts (determinants of adaptive capacity) (Tompkins and Adger, 2005).

Dodman & Satterthwaite link adaptive capacity to the character of existing governance institutions, where features of good governance are especially significant; decentralisation and autonomy, transparency and accountability, responsiveness and flexibility (Dodman & Satterthwaite, 2008).

Factors that determine adaptive capacity are interacting and not mutually exclusive. At a very general level, these comprise a cocktail of (Smit and Wandel 2006 :287)(Kelly & Adger, 2000):

- Perception of and experience with adaptation / climate change impacts
- Extent and form of climate policy integration
- Managerial ability, including leadership and formal institutions
- Financial resources, including budgets, allocation of funds
- Technological resources and innovation,
- Available knowledge and the use and integration of knowledge,
- Infrastructure, including for surface / waste water, but also communication, transport and energy

- Institutional environment, including robustness of institutions, climate adaptation policy institutions at other policy levels, political system
- Political culture and framework, e.g. flat or hierarchical, trust, tradition for participation
- Engagement with stakeholders/the public, including citizens, business, communities, associations, other local governance actors
- Networks (professional and governance) and, for adaptive capacity at household level, in particular also kinship and social networks

Smit & Wandel (2006) stress that it is important to recognize that successful climate change adaptation and vulnerability reduction are rarely undertaken with respect to climate change alone, and vulnerability reduction appears to be most effective if undertaken in combination with other strategies and plans at various levels (Smit and Wandel 2006 : 289).

Adaptations are manifestations of adaptive capacity and it is perhaps instructive for evaluation of adaptive capacity to classify adaptive actions along five dimensions (Smit and Wandel 2006 : 288):

- Timing relative to climate impacts: anticipatory, concurrent, reactive
- Intent: autonomous or planned;
- Spatial scope: local, regional, national, European;
- Form: behavioural, informational, institutional, technological; and
- Degree of adjustment: from minor alterations to abandonment of activity.

Ivey et al. identify three elements that potentially add to capacity building; enabling set of institutional arrangements with a clear management, structure and hierarchy; community development including participation by members of the public, and business and commercial interests; and improved knowledge of the nature and pace of climate change and its impacts that aid communities in understanding their vulnerability to climate impacts (Ivey et al., 2004).

Furthermore, an adaptive perspective on development will require the willingness to experiment, capacity to take the risk of making mistakes, and flexibility to make space for social and institutional learning (Agrewal, 2008).

Adger et al. (2005) defines efficiency, effectiveness, equity and legitimacy as central while also stressing their contested and value-laden grounding. Additionally, actions which increase adaptation for one actor, may at the same time have unintended spill-over effects and/or unwanted externalities for other actors. Conflicts over allocation resources for adaptive measures reflect varying ideas about development and progress at a societal scale. For public government, a public sector agency can externalise spill-over effects and/or adverse effects of adaptive measures – ignore these – whereby they are located outside the realm of climate adaptation policy and become somebody else's problem (Adger, Arnell & Tompkins, 2005).

For Adger et al. (2005) three aspects of climate adaptation measures and policies are incremental and express fundamental features of adaptive capacity; effectiveness, efficiency and equity and legitimacy. Effectiveness concerns adaptive actions' capacity to achieve stated objectives. This involves complex behavioural feedbacks from society, incl. uncertainty of how novel measures, incl. new technologies, will work. Further, effectiveness is dependent on actions taken by others, and on uncertainty about future climate change and society. Indicators are robustness to uncertainty, and flexibility.

Efficiency concerns the costs and benefits of successful climate adaptation policy. Significantly, however, this often concerns 'far more too economically efficient adaptation than a simple comparison of quantified costs and benefits' (Adger et al. 2005: 82).

Equity and legitimacy stresses how climate adaptation policy from the start is unfair due to its cross-generation scale. It is intimately linked to the uneven spatial distribution of environmental changes and to the uneven distribution of political and social changes that follow climate change. Equity is thus a question of 'who gains and who loses from any impact or adaptation policy' (Adger et al. 2005:83), and related to the principles of desert (who deserves), need and equality. In particular, reactive climate adaptation policy may reinforce social and economic inequalities.

Successful implementation of climate measures also concerns learning as acknowledged by Bulkeley (2013). The precise role of leaning, how it takes place and the effect of different types of learning in different areas of the governance institution that at local level manages climate change is however not addressed more than at a general level.

Presenting a framework for National Adaptive Capacity, Dixit et al. (2012) address societies' adaptive capacity at a global scale, i.e. across the North – South divide and across cultural differences. Dixit et al. stress the interaction of civil society in developing and implementing effective and dynamic policy responses to the impacts of climate changes. In particular, the participatory measures practiced by planning and local policy institutions should, according to the National Adaptive Capacity Framework, be firmly rooted among civil society actors and include these at early stages of policy development. Availability of relevant and sufficient knowledge and development of motivating measures that are directed at both market and civil society private actors are stressed as significant (Dixit et al., 2012).

2.9 Framing and access to and lack of relevant knowledge

Some studies also address the role of adequate and relevant and accessible knowledge which include issues such as the framing and forms of knowledge included in climate adaptation policy, access to relevant knowledge and uncertainty of knowledge. Several studies emphasis different forms of knowledge related to climate change and climate change actions as a way to framing and understanding local policy paths and future development. Knowledge on the position and relevance of action against the impacts of climate changes and actions to reduce climate changes was shown to have impacts beyond the individual policy problem and impact on the long-term goals and capacities of policy institutions (Jensen et al. 2013; Burch, 2010). Also the representation of climate adaptation as a policy problem was in studies found to be influential, where for example the framing of a particular adaptive policy issue as a safety or development increased the position of climate adaptation policy (Jensen et al., 2013; Measham et al., 2011).

In Ivey et al.'s study, they identified a lack of belief in relevant knowledge on local hydrological conditions which was thought to remain elusive (Ivey et al., 2004). In case studies of capacity to develop and implement adaptive policies, Measham et al. found that for many local policy institutions, information was not experienced to be sufficiently useful, credible or relevant.

The more specific information was reported as more powerful in promoting climate adaptation policy (Measham et al., 2011).

Enhanced local institutional capacities through external intervention focussed on information and new technology, financial support, institutional coordination and access (Agrewal, 2008). With a similar focus, Adger et al. point at communication of climate change info and building awareness (Adger, Arnell & Tompkins, 2005).

Dixit et al. stress the key role of sufficient, relevant and accessible knowledge, not only for local policy institutions but also for the active contribution from private actors, especially civil society (Dixit et al., 2012).

2.9.1 "Real" driver(s) behind adaptation activities and the focus of the actions

Some studies focus on what they term the 'real' drivers of climate change adaptation, most often indicating external pressures, but also including institutional dynamics

Næss et al. identify institutional factors as crucial for efficient climate adaptation policy, in line with social capital, since institutions affect the social distribution of vulnerability and determine management of 'climate-sensitive aspects of society'. Institutions are defined according to Young 1998 as 'systems of rules, decision-making procedures and programs that give rise to social practices, assessing roles to the participants in these practices and guide interactions among the occupants of the relevant roles'. The paper addresses how resources underpinning adaptive capacity can be translated into actions that reduce the societal vulnerability to climatic and other stressors. Institutional factors are stressed as crucial in climate adaptation policy and on this backdrop, the paper focus on the local government capacity to make decisions that reduce local vulnerability to future floods, in particular municipal institutions and their interactions with institutions at other geographical and 'managerial' levels (Næss et al., 2005).

Also Ivey et al. consider the context important. In their paper they stress that adaptive capacity is dependent on the interrelated features of the wider social, political, economic and institutional environment and community related characteristics and the nature and resources of a particular organisation (Ivey et al., 2004). In a parallel analysis, Agrawal identifies two main drivers of climate adaptation policy – local institutions and lack or too slow actions at national/international level.

2.10 Summary – findings of the literature review

The above literature review has revealed different institutional factors that influence local governments' ability to address the impacts of climate changes successfully, some of which are barriers for adaptation activities and some of which promote and enable adaptation activities.

Most of the issues and factors that we identified in the literature are, of course, connected. However, ten issues appeared to have received special attention in social science studies of barriers for climate adaptation policy. Prior experiences with climate impacts have a key role and significance for placing adaptation on local agendas and providing leaning for how to develop adequate responses in local contexts. This issue is connected to the

way that adaptation issues are perceived and adjusted to fit local policy discourses, as well as how adaptation challenges are interpreted and linked to specific measures and actions at local level.

Integration of climate policy issues (CPI) within the area of adaptation was stressed as fundamental for successful and effective climate adaptation actions and for developing effective measures to manage climate impacts. CPI however also showed to be slowed down by structural and process characteristics of local government, and this links to the issues of organisation of local government and of climate adaptation policy at local level and to the position that adaptation policy (potentially) have on local policy agendas, including the priority given to adaptation policy issues.

In particular, leadership was stressed as pivotal for adaptation policy issues to be acknowledged, developed and granted funding and attention on a continued basis in the complex setting of local government. Furthermore, leadership is stressed as necessary for keeping adaptation issues in the local development policy and prevent it from ending as one among several environmental policies.

One key area here is access to relevant and adequate knowledge, which conditions local adaptation actions, including as awareness rising, as providing data for specified actions and as basis for institutional learning. Moreover, the relation to national policy making and the state and the mode of policy making was emphasised to enable of prevent the development of local responses to a changing climate. Thereby, the relation between state and municipalities is plastic and contextualised.

As one way to merge most of the above issues, the adaptive capacity of local government was stressed as an essential, dynamic and contextualised area for developing solid and successful adaptation actions at local level of policy making and government.

For our study, this means that these ten issues provide the basic framework for our data collection and choice of methods. This is reflected in the next chapter, where we discuss and present the mixture of qualitative interviews and policy document analysis and quantitative survey that have been used for data collection.

3 Methods, data and analytical approach

The study has been conducted on the basis of a literature review, in-depth analysis of three case studies and a survey covering all 98 Danish municipalities. The research questions and the literature study have specified the *institutional barriers and enablers in public local governing institutions and the following adaptive capacity of local government* as key aspects of the analysis, and thus this study has examined the adaptive capacity of local government, i.e. institutional set-up of climate change adaptation measures in local scale decision-making, the character and degree of climate policy integration and how the challenge of adaptation was managed, in order to specify barriers and enablers of adaptation at local level decision-making. In a Danish context, actual and explicit adaptation policies aimed at managing the impacts of climate changes has a relatively short history, while managing the risk of flooding due to severe storms and hurricanes especially in the South Western part of Denmark concomitantly has a century long history. Thereby, investigations of adaptive governance at local scale is exploratory and concomitantly aimed at identifying the what, whom and how of local adaptation to climate changes.

The research questions thus have a qualitative as well as a quantitative dimension, determining the design of the study and the choice of methods for data production.

3.1 Literature review

Based on the initial research questions and on climate policy integration literature, literature for the literature review was compiled using Google Scholar and a targeted search in relevant journals, including Climate Policy, Environmental Governance, Environmental Policy and Planning, Planning Policy and Practice, Global Environmental Change. Furthermore, snowballing based on the assembled and on known literature supplemented the search.

With a focus on local government / governance, variations of the following keywords directed the search:

- Institutional / adaptive capacity; climate
- Institutional barriers; climate
- Local level / governance climate adaptation
- Local adaptive capacity
- Sectorial local governance; climate change adaptation
- Climate change adaptation policy; local institutions

Moreover, additional literature was included on the basis of snowballing, i.e. through references in already included literature. Review of the literature was structured according to recurring key factors that influence local governance capacity for adapting to the impacts of climate change, and the factors that potentially impede such local adaptation, or alternatively enhance adaption. Moreover, the review focused primarily on literature that examined local adaptation policy / actions in Europe / North America.

3.2 Case studies

Case studies provides in-depth knowledge of essential aspects of a research problem (Yin, 2000; Flyvbjerg, 2001) and enables a context-based sensitivity to variations in governance organisation, local networks, pool of experience with climate change impacts and pro-active local policy actions. The case studies must therefore be selected according to that they a) had experiences with climate change impacts; b) that they had initiated the work with developing a local adaptation approach; and c) that they were located by the coast of the sea, a fjord or a major watercourse. In design of the case study approach, we focussed on factors influencing adaptive capacity of local governance that surfaced during the case studies and further on related factors that the literature review identified as being of particular relevance for local governance institutions' management of climate change impacts:

- Significance of history of climate related events
  - Experience with impacts of climate change, including extreme weather events
- Perception of climate adaptation
- Organisation of local climate adaptation policy (emerging in cases)
- Local action space
  - The extent and character of national regulation regarding local climate adaptation policy
- Local government decision-making capacity
  - Local governance structure and culture
  - Parallel and competing urgent local agendas (emerging in cases)
  - Managing and steering adaptation sustainably
  - Leadership
- Access to or lack of relevant knowledge
- Relevance / scale of stakeholder and / or citizen participation (emerging in cases)
- Key driver(s) behind adaptation activities and the focus of these activities

Three cases were selected for in-depth case studies. Criteria of selection were that the municipality was in process with developing the Climate Adaptation Plan and that the municipality had prior experience with weather events that potentially can be ascribed to the changing climate. Moreover, the variation on the following parameters determined our selection of cases:

- Experience with climate adaptation planning
- Organizational structure of the municipal administration in order to have variation as to degree of sectoral government structure
- Structure of collaboration with water utility
- Size

In Denmark, municipalities at the coast and along the main watercourses are most prone to flooding and to rising sea levels which are the most immediate impacts of climate changes in Denmark, and thus a coastal location was furthermore criterion for selecting the municipalities.

Data for the analysis was produced through policy document analysis to identify institutional barriers for local level climate adaptation policy, supplemented by qualitative in-depth interviews to further specify the meaning of key aspects of the policy discourses on climate adaptation, and to probe into details and ambiguities of the policy documents. Furthermore, the combination of several qualitative methods for data production served as trian-

gulation, ensuring the robustness of the findings (Bowen, 2009). These forms of data production are discussed below.

In chapter 4, the three case studies are presented and in the next chapter, the survey among the Danish municipalities is reported.

3.3 Analysis of policy documents

In conducting the study, we used a qualitative approach to examine the institutional barriers for climate adaptation in local governance and compiled the data through policy document analysis and qualitative interviews. We chose qualitative methods in order to produce data on the meaning and perceptions of key institutional actors who have experience with adaptive policies and measures, and especially with identifying and managing the problems encountered in developing the local climate adaptation policy (Denzin & Lincoln, 1998). In addition, with a qualitative methodology we also include a critical potential in the analytical design (Alasuutari, 2009; Sharp & Richardson, 2001). The aim was thus to gain access to the relevant representations rather than producing a representative overview (Kvale & Brinkman, 2008) of the perception, experience and of institutional barriers for local governance climate adaptation policy.

Policy document analysis is a form of document analysis (Bowen, 2009) and focusses on policies as these are represented by policy institutions in public and semi-public texts. Policy documents thus rarely if ever express the perceptions and position of a single policy actor but rather of the institution that develop and implement policies. Policy document analysis reveals ways in which policies emerge as political actions in the text and elicits the sometimes blurred and/or implicit governing logic of the policies (Packer, 2010), including the stated causal relations, intervention and relations to other policy measures/areas that constitute a policy (Andersen, 1995). Being a text analysis that includes political documents, the policy document analysis may moreover identify tensions and contested issues within and between governing actors and institutions (Sharp & Richardson, 2002), as well as drivers as these are seen (identified/addressed) by the governing institution.

The initial step in a policy document analysis is the compilation of an archive that comprises the relevant policy documents (Sharp & Richardson, 2001). We included policy documents such as published plans and strategies, in particular the four yearly municipal plans and environmental plans, council reports and popular presentations of the municipal adaptation initiatives which were collected for the period mid-2000-2012. They were selected to cover the sectors most significant for local climate adaptation, including environment, water management, green spaces, A21, urban development (including buildings, regeneration and land use planning of future areas). Due to the desire and confidentiality of the two smaller towns, these policy documents have been kept anonymous in the list of references. Most policy documents were available online and the rest were handed out by interviewees, others we retrieved through our interviewees and internal references in already included documents (snowballing).

The texts were analysed through content analysis and coding (Bowen, 2009). The initial content analysis (Fereday & Muir-Cochrane, 2006) established an overview of the issues identified in the analytical approach. In addition, it was noted when issues not anticipated in advance had a recurring or strong

position for the policy institutions' understanding of climate adaptation and local climate adaptation policy (Kvale & Brinkmann, 2008).

The coding process consists of a return to the texts where a set of predefined categories were identified through a meticulous re-reading. The categories were chosen to represent key aspects of the object of study (Kvale & Brinkmann, 2008), i.e. of institutional barriers for climate adaptation policy at the level of local governance and inspired by adaptive capacity theory, followed a framework that merged policy actors, climate policy integration and framing of local governance of climate adaptation.

3.4 Qualitative interviews

As policy documents are political statements, the document analysis in general however only reveal the excluded positions by their absence. Moreover, the more specific details and nuances of significant issues and themes are often omitted from the text. Thus, we also included qualitative interviews that were conducted as semi-structured and open-ended expert interviews.

Qualitative in-depth interviews are useful to reveal the experience of people and the meaning that people make of these experiences, in particular contexts (Knox & Burkard, 2009). In our case, the interviews enabled us to gain access to the experience of people who work with the object of investigation in practice, i.e. with managing climate adaptation planning and policy in local governance. As we investigate topics that are specific to individual policy institutions and as climate adaptation still is a rather novel policy area at the level of local governance, the interviews furthermore served as source of information on the progress and dynamics, events and details related to local level climate adaptation policy and related governance issues.

Inspired by multiple interview approaches (Knox & Burkard, 2009; Seidman, 2013), the interviews followed in general a three step progress. The first step consisted of the interviewee positioning him or her-self (explicitly) in relation to the institution which she or he represents and to the topics of the interview. In the second step, the interview focussed on the experiences of the interviewee relevant for the topics of the interview, while the third step probed into the (institutional) meanings that the interviewee ascribed to key issues and instances (themes, events, instances, relations). Of course, in practice the three steps were greatly overlapping and the line between them blurred. Following the analytical process of the document analysis, the interviews were analysed through content analysis and to some extent through coding.

Interviewing experts, we took advantage of semi-structured and open-ended interviews attuned to the interviewee in his or her context (Kvale & Brinkmann, 2008) as a municipal policy-maker. In line with Kvale & Brinkmann (2008) we focussed on the dialogue on subjects that inform our study rather than strictly following a pre-defined set of questions, making space for potentially unexpected issues related to the topics we investigate. In order to ensure that the subjects we needed were covered, the interviews were guided by the same basic interview guide (included in Appendix A) that was adapted to the individual interviewee, in order to allow for the context specific setting of the interview (Kvale & Brinkmann, 2008).

Relevant interviewees were specified as local scale climate adaptation policy makers, and included municipal civil servants and planners who jointly rep-

resented both leaders and those who engaged with climate adaptation issues at an operational level. Furthermore, local politicians and representatives of the local water management companies have been interviewed. The interviewees were contacted by telephone, followed by an introductory email that specified the purpose of the study, the research team and why they were selected for interview. Furthermore, the email offered confidentiality which was accepted by almost all the interviewees, and thus the quotations presented in the report have mock names. A total of 5-7 local policy-makers for each of the case municipalities were interviewed and the interviews were recorded and selected sections transcribed, supplemented by follow-up telephone interviews.

4 Analysis of climate change adaptation in local governance – three cases

In this chapter we present the three case studies of the study which together with the survey presented in the next chapter provide the empirical data for the study.

The 98 municipalities of Denmark are typically based on towns and cities and are have a minimum of 20,000 inhabitants, except for a few minor island governments. The three case studies in our study each represent a particular size of municipality and city while all three are located in proximity to water and have a coast line, though in different parts of the country.

4.1 Case no. 1: The large urban coastal municipality

This case study concerns the second largest city in Denmark, Aarhus, and the city is not presented in anonymous terms, due to its uniqueness in a Danish context and due to an explicit request among the interviewees to be identified.

Aarhus Municipality was included as case municipality in the study due to its continued actions to alter the urban landscape in ways that relate to the position of Aarhus by the sea and around River of Aarhus, and its large investments in adaptation technologies, the multiple issues included in its adaptation planning and its experience with several major floods since 2005. Moreover, as the second largest municipality, Aarhus serves to represent big coastal municipalities.

4.1.1 Introduction to the municipality

This case study covers Aarhus Municipality, which in its adaptation policy has a strong focus on the city of Aarhus. Aarhus is a medium sized city and the second largest in Denmark, with app. 315,000 people living in the municipality (Ministry of Interior and Economy) and 661,000 people in the city-region[1] (Aarhus Municipality, 2011). The municipality covers an area of 469 hilly km2 (Aarhus Municipality, 2010) and three major streams run through the municipality, of which the largest is River of Aarhus (Aarhus Å) (Aarhus Municipality, 2007). The historic centre of the city is located in the river valley of River of Aarhus, with the city stretching inland from the coast of Eastern Jutland. A large harbour area with a former industrial port and ship yard is currently being transformed to a new, mixed urban area with housing, university departments and business. The municipality covers the city of Aarhus and the suburban areas in the proximity. Located in a large bay on the east coast of Jutland, Aarhus is the major town in west Denmark and is connected to a string of towns to the north and especially to the south along the coast, forming the East Jutland City Region.

Aarhus' historic centre is around the monumental cathedral dates back to the 900s and is situated along the River of Aarhus. North and south of the

[1] This is a 2006 number, based on the population of the former Aarhus County, and is based on a commuting time of up to app 1½ hour in this context taken to be equivalent to the administrative unit of Central Denmark Region (Region Midtjylland). As for Copenhagen, the municipality covers only the most urban area of the city region.

harbour, housing areas line the coast, with the second stream in the south of the municipality and the third, Egaa, in the north. Along Egaa the suburb of Lystrup is located while the coastline to the south features an upscale residential area. The municipality has made major investments in opening up the River of Aarhus over the past decade. During the last century, the river was tunnelled and hidden under roads, houses and other urban constructions while it now has been excavated and restored. Providing places for restaurants, cycle paths and spots for dwelling along its banks, and reintegrated in urban life, it gives the city a different atmosphere and 'feel' (interview municipal planner).

The city is member of the Smart City Network and the municipality has signed up as climate municipality with the Danish Society for Nature Conservation (Danmarks Naturfredningsforening). Aarhus is home to the second largest university in Denmark, with a large campus and multiple educational programs and high profile research centres within the human, social and natural sciences. The local government has adopted an overall climate strategy which states that climate change must be a priority area of the municipality (Aarhus Municipality, 2011). Moreover, Aarhus has made binding collaborative network with the city of Harbin in China and expects much from high tech and green exports (interview municipal planner).

Climate change impacts

In Aarhus, the impacts of climate changes are primarily water-related. Due to the location in a river valley and the extensive coast line, flooding and sea-level rise are anticipated to be the main impacts of climate change. The old city centre hosts a range of buildings, including the cathedral, of great cultural and historic value which is at risk of flooding. In 2006, heavy rains made River of Aarhus flood parts of the city and in 2007 a storm and high water pushed the water of the Baltic Sea through the Danish Straits and Oresund to the west and was only 10 cm from flooding the low-lying city centre. Moreover, a nationally broadcast heavy flood of the northern suburb of Lystrup in August 2012 was escalated by an elevated stretch of motorway, in effect keeping the water of the cloudburst in the area, and served to illustrate the scale of the risks involved as well as the complexity of addressing it (interviewee municipal planner; interviewee Aarhus Water).

Structure of the municipality

The municipality is organised into 6 departments, each headed by a political leader, a Rådmand. In governance structure, Aarhus Municipality together with Copenhagen Municipalities are the only ones in which the administrative departments are headed by elected officials with an executive civil servant serving below (Aarhus Municipality, 2013). The political positions as Rådmand are distributed among the political parties according to their electoral strength, hence political and ideological disagreement at times inhibits cross-sectoral collaboration. In other municipalities, the administrative departments refer directly to committees consisting of municipal advisers without the political go-between. In Aarhus, the mayor heads the Financial Department and currently, and traditionally, represents the Social Democracy.

Due to the sectorial division, the municipality experiences problems similar to many other municipalities where the compartmentalisation serves to halt coordination and integration of policies across policy areas. The political division of the local administration is, as in Copenhagen, under debate and

has, in conjunction with other aspects, initiated the formulation of an Agreement on Governing, Structure and Collaborative Culture (Aarhus Municipality, 2013) in the municipality.

The municipality is large and thus the municipal organisation is also placed in different locations. The policy making administrative units, directly under the political leaders as well as some operational parts of the administration are located in the city centre of Aarhus and in the southern parts of the city. The Technical and Environmental Department is housed in the latter location.

The political and administrative setup of climate adaptation planning/activities

Development of the climate adaptation plan is anchored in the Department of Technical Affairs and Environment. A steering group has been set up consisting of the heads of the planning and nature offices. Climate adaptation is placed in the Technical and Environmental Department where the Rådmand at the time of this case study was Bünyaain Simsek, the Liberal Party. The Technical and Environmental Department is organised in 7 sections where climate adaptation jointly with climate mitigation make up one of the four units administered by the section for Nature and Environment. Water and green spaces is also administered in the section for Nature and Environment while urban and land use planning is placed under the section for Planning and Buildings and the road infrastructure is placed under the section for Traffic and Roads.

Thus the management of local climate adaptation and the policies aimed at addressing adaptation are placed in a unit that also makes the climate mitigation policies of Aarhus. The unit has a staff of four full time employees and administers a range of projects as well as drafts the overall urban strategy for climate mitigation / adaptation in Aarhus (see below).

Relation to water company

Aarhus Water is a public water company, established when the state mandated a division between Danish municipalities and water management. The company is the second largest water company in Denmark and was established in 2009 as a shareholder company with Aarhus Municipality holding 51 per cent of the shares. After settling the structure during the upstart year, the Technical and Environmental Department and Aarhus Water work jointly on range of projects. Evaluation of adaptation measures in Aarhus must thus also include initiatives rooted in the water company (interviewee municipal planner; interviewee Aarhus Water).

Thus, the water utility is now a private entity which has been separated from the municipal government. But the water company is involved in a range of project based on collaborations with the Technical and Environmental Department. Interviewees at the municipality as well as at the water company report on trustful, amiable and beneficial relations between the two organisations, useful for the common interests in managing climate adaptation.

4.1.2 Climate change impacts and adaptation activities

Climate adaptation activities – levels of response, type of action

The local government has adopted an overall climate strategy which states that climate change must be a priority area of the municipality. Already, the

city's climate policy included climate adaptation and the municipal plan addressed flooding issues. Due to the location by the coast, River of Aarhus and the two major streams and by the east cost of Jutland, the present activities focus especially on flooding issues and storm surge issues.

Water management is targeted and comprise separation of waste water from built environment and surface water such that the sewage system will not be flooded, spreading infected water, nutrients and organic matter etc., during heavy rains while the surface water increasingly can be retained in basins, wetlands and green spaces. The municipality collaborates closely with the water company on developing efficient systems for separated waste water system, and over the past five years, the water company has established five major water retention basins with a joint capacity of 50,000 m3 water. After being retained in the basins, the water is directed to the cleaning pumps as capacity is freed. Increased capacity of pumps and water cleaning constructions is an aspect of these actions (Interviewee Aarhus water; Aarhus Municipality, 2013). As a novel element, targeted information and communication technology (ICT) systems are additionally included to monitor water intensities and channel these to free capacity in retention areas in other parts of the system. These are specifically designed for the topography and built environment of Aarhus.

As part of the restored River of Aarhus, the municipality has established a lock and pump by the mouth of the river which in times of storm surge can block sea water from moving up river and flood the historical centre further up the river of Aarhus (Aarhus Municipality, 2007; interview municipal planner). A large capacity pup is built into the construction which in times of heavy rains will pump water from the river into the sea to prevent it from overflowing the areas around the river banks. With a capacity of 18 m3/sec or 65,000 m3/hour, the pump is one of the largest in Denmark. The joint lock and pump is in a Danish context is a novel adaptation action. As expressed by leading planners, Aarhus receives regular guests who come to examine the useful and well integrated lock and pump. – show off useful for other eastern Jutland municipalities (interview municipal planner).

During the restoration of the port area, the dike was restored and improved and integrated in the developed harbour area where it serves as a greening area providing shade and shelter from sea gusts for the residents of the housing. To the south of the city, the housing areas are low-lying and at risk for storm surge and for rising sea levels. A local 'dike association' ('dige laug'[2]) holds responsibility for maintaining these dikes. The municipality pushes for enforcement of the dikes, and consider a climate plan that mandates enforcement of the dikes where these for example are made 1 meter higher (Interviewee municipal planner).

A strategy of involving business in innovation of adaptation technologies has been developed and connects to the projects involving the water company. The projects mainly focus on water issues (interviewee municipal planner; interviewee Aarhus Water).

[2] A 'dige laug' is a local association of landowners directly affected by potential storm surges, most often landowners with coastal plots, who have a joint interest in and a joint responsibility for ensuring the health of dikes in storm surge prone areas. Originally, these were formed autonomously by local citizens and this form of organisation has played a central and decisive role in water management of especially the North Sea coast of Western Jutland.

The municipality has made the mandatory risk mapping publically accessible online. This is combined with a dynamic monitoring system whereby the risk mapping can provide updated information at the scale of housing areas on risks of flooding.

In a different area, the municipality has taken initiative to establish an informal network among municipalities in the region that share topography and geography which are to collaborate on common issues of adaptation.

Stage of development of the climate adaptation plan

The adaptation plan is expected to consist of a risk mapping, including both a mapping of likely problem areas as well as a valuation of different assets, resulting in appointment of prioritized areas. Due in large part to the tight time schedule the interviewees expressed by concern to whether the climate adaptation plan would be finalised in detail by the deadline of end December, 2013. By spring 2013, the climate unit was still drafting the plan and acknowledged that it will be very hard to complete before the deadline. The involved planners point to lack of time and resources and that Aarhus prioritize better quality of the plan over finalising before deadline.

It is however expected that the approach, measures and initiatives of the plan will be developed, substantial and solid such that they can serve as source of inspiration for other towns on the eastern coast of Jutland. Mid-term results are published on ad hoc basis on the home page, and the municipality stresses the mapping of risks at household level which is considered to be of immediate use for residents.

Involvement of actors; allocation of responsibilities

The political level has not yet been involved to any great extent but backs the formulation of the strategy. Once the administrative level has finalised the strategy, it is subject to political discussion in the City Council which will amend and adopt it.

The climate adaptation plan is mainly developed in a special unit set up to manage climate change from both a mitigation and adaptive perspective which implies that adaptation is approached as part of the general climate management. In this unit, there is a strong emphasis on clean tech innovation based on triple helix projects where the municipality performs facilitation and identification of relevant areas for cooperation and innovation and relevant partners (interviewee municipal planner).

The distances are relatively short and in the daily activities interviewees report on close collaborative practices, centred on joint projects to manage water and waste water in Aarhus. In the experiences of both municipal planners and employees at the water company, long-standing collaborative relationships among people from the Technical and Environmental Department and from the water company enhance the projects, and make it easy to solve minor obstacles along the way. Since the water company was established and some of the former employees of Technical and Environmental Department started working there, planning issues of the Technical and Environmental Department has benefited largely form the personal relations and common perspectives. The development projects on which the water company and the Technical and Environmental Department collaborates in developing the climate adaptation strategy, address in particular separation of

rainwater and waste water, and are expected to possess an innovative potential.

Citizens are involved more as sources of information than actual policy actors, and are provided with access to detailed, online database and modelling of impacts of climate change in their particular area (interviewee municipal planner). By early 2013, the municipality initiated a process to improve the steering structure of the municipality and the interaction with citizens as knowledgeable experts on local matters is a particular focus area in the policy (Aarhus Municipality, 2013), and the inclusion of citizens as sources of information and as recipients of information may be seen to reflect this approach to citizen involvement.

Participation in a formal sense does not play a large role, rather the municipality integrates communication with citizens, partly as information on impacts and levels and options of response, including the web published interactive mapping of risks, and partly as invitation to report on local flooding incidents, the latter to calibrate models and to assess the actual water ways in extreme weather events such as cloudburst.

Knowledge

The municipality has generally had access to mapping tools and knowledge that allowed for the risk mapping. But overall guidance and methodologies for how to go about climate adaptation planning has been lacking as noted during the interviews.

In the adaptation strategy, citizens are included as sources of information that can provide data on real life developments when weather related events take place. This type of information serves to calibrate the existing models (Aarhus Municipality, 2011).

The knowledge provided by the Ministry of Climate, Energy and Building and by other national sources is seen as absolutely necessary for the mapping of risks and for development of models to predict the water movements in cases of extended rains or of extreme weather. The municipality however also assess the knowledge provided to be at a too general level. Furthermore, in practice the municipal planners do not find that the knowledge provided on how to manage the identified and experienced impacts of climate change is precise and context specific enough and thus they expand the use of consultants which is costly. To reduce this, Technical and Environmental Department has taken initiative to establish a network among the municipalities along the mid-east coast of Jutland that all have similar problems with flooding, soil types, run-off from the hills of Jutland, etc.

Citizens are, according to a key municipal planner, unique and absolutely necessary to gain knowledge on the movements of water at very local level which will make the modelling of water movements during flooding events more accurate. Apart from reported observations of citizens, this also includes photos supplied by citizens (interview municipal planner).

Also the network established to identify knowledge gaps and fill these in with joint expertise address a lack of knowledge.

Aarhus has hired planners with expertise from the west coast of Jutland that has a long standing history of managing extreme weather such as flooding of the sea and storms, and with this expertise follows also a pool of engineering based knowledge on grey solutions to manage climate change impacts. Clean technology and technological, engineering knowledge and models have a prominent position in the city's climate policy which over time may strengthen engineering-based approaches in the climate adaptation approach.

4.1.3 Analysis of climate adaptation policy and institutional setup (Findings)

Organisational setup

In its politics, Aarhus Municipality has treated climate adaptation as an aspect and focus area of climate change, in parallel with climate mitigation which has influenced the organisational context of the municipality's management of the challenges related to climate change. This means for example that international networks and relations mainly are perceived to involve Harbin as the Chinese friendship city with which Aarhus is establishing collaborative networks on business and teaching that also concern clean tech and energy friendly industries.

In this, the municipality is aware of its position as the second largest city in Denmark and as the main town in West Denmark, which it translates as a facilitating role. Thus, initiatives to establish joint networks with other municipalities in the region around filling in knowledge gaps and potentially establish a municipal counterpart to the extensive use of consultants Aarhus performs a leading role, as well as agenda –setter that guides the smaller municipalities.

Moreover, the good working relations with the water company have promoted innovative projects that are attuned to the local conditions and the solutions promoted by the municipality.

Planners express the benefits of physical proximity to land use planners and transport planners such that potentially adaptation adverse planning actions, e.g. specific location and construction of a road, may be prevented early in the planning process, through informal meetings and easy access to regular coordination and contact.

Approach to management of climate adaptation

To this point the climate change adaptation plan has set the agenda for adaptation activities, which until 2012 was subsumed under the climate policy; a position also reflected in the municipal plan. Separation of surface and sewage water is an established element of the plan, promoted jointly with the water company. The rationale is thus that during heavy rains and/or storm surges, the surface water can be managed through cleaning systems and through being directed into basins and other retention areas, thus preventing overflow of streams and the river, as well as of the sewage. Surface water is managed through green/blue spaces, grey infrastructure and ICT. Green and blue spaces and infrastructure are developed as part of urban spaces and neighbourhoods where they offer recreation and activity spaces while they during heavy rains retain water. Green spaces are especially developed along the river and the two major streams but also inclusion of wetlands, parks are on the agenda. Through the ICT systems the green/blue

spaces jointly with enforced pumps, is intended to relieve the sewage system.

As the exact tracks which water takes in events of heavy rains are uncertain, the municipality actively invites citizens to report on water levels etc. during flooding events. These reportings are subsequently integrated in the modelling of water flows, to improve their ability to predict flooding. This is clarified by images and simulations how serious the situation is, in order to make the technical and detailed knowledge accessible and relevant for a larger share of the public. The municipality anticipated the accessibility of risk mapping and the increased level of detailed information and predictions of water flows to motivate citizens and business to take adaptation issues into consideration during construction processes and design of e.g. gardens, and thus increase the optional and autonomous adaptation made by private actors.

Participation in a formal sense does not play a large role, rather the municipality integrates communication with citizens, partly as information on impacts and levels and options of response, including the web published interactive mapping of risks, and partly as invitation to report on local flooding incidents, the latter to calibrate models and to assess the actual water ways in extreme weather events such as cloudburst.

The established network among municipalities sharing similar climate impact conditions is based on the rationale that through pooling of knowledge, expertise and resources, more locally specific modelling and targeted actions can be developed and shared. To the municipality, the network potentially offers an arena for sharing of experience and knowledge, identification of future local challenges, for raising awareness and reaching common understanding of impacts that cross municipal boundaries. Moreover, the network provide space for Aarhus to act as agenda-setter and facilitator of adaptation related processes and issue-specific networks, whereby Aarhus assumes the role as a leading regional policy actor, in the anticipation that this is necessary due to the spread of water related adaptation issues.

The approach develops from /revolves around seeing adaptation as a business development opportunity and that the economics of adaptation are central, coined in the slogan that ‘adaptation must pay off at the bottom line of the budget’. Strong connections with Harbin surface as both an opportunity and a barrier since other international collaborations with e.g. cities that share size or conditions are over-shadowed by the efforts connected to Harbin. The participation in the Smart City Network potentially is the exception to this.

The strategy of involving innovative industries and businesses is based on the idea that adaptation must pay off, and preferably also potentially explore export options to especially Harbin, and that business development through clean-tech innovation is promoted through triple helix networks between relevant businesses, research institutions and the local authorities. This links to the innovation projects that the Technical and Environmental Department runs together with the water company, and the idea is to utilise the fruitful collaborative relations that already exists with the water company, in developing new or adapting existing technologies for management of waste water, and for separation of waste water and surface water.

At an early stage, coordination of policy actions is emerging as a dimension of the local approach to manage adaptation. Interviewees express plans to assess future land use planning of e.g. major road or rail projects or housing areas for adverse adaptive effects, preferably at national level as well as at local level. This is learned the hard way; many suspect that the construction of a new motorway north of Aarhus prevented water form running off the inland areas close by, causing the major flooding of Lystrup in the autumn of 2012.

Climate Policy Integration - inclusion of climate adaptation policy issues in other policy areas

Overall, until 2013 climate adaptation policy has not been prominent on the political agenda in Aarhus but rather been integrated as water management related to flooding of the river and streams, and to storm surge. Adaptation was included in a climate action plan which centres on climate mitigation, which establishes a relation between adaptation policy issues and smart, green urban growth.

Inclusion of adaptation issues is in general not very extensive, though, and mostly confined to the policy areas covered by the Technical and Environmental Department. Integration of adaptation policy concerns is thus mostly concentrated in areas of green spaces / nature management, and in areas of building regulation and transport infrastructure.

However, the general attention and priority given to regenerating the harbour area and urban spaces close to the re-opened River of Aarhus, make management of flood prevention an asset for urban development and provides an option for integrating adaptive infrastructures such as the dike and in novel urban development. Via the role of ICT in water management, this additionally connects Smart City initiatives in urban design and development.

Moreover to business development aimed at export (e.g. to Harbin), though the inclusion of adaptation technologies are seen as a potential more than part of targeted actions. Thus, in promoting business development strategies on the basis of triple helix collaborations which also centre on clean technologies aimed at managing flooding, climate adaptation concerns are tentatively integrated in the municipal strategy for business development and green growth.

Institutional barriers

The analysis revealed institutional barriers as well as potential solutions at several levels of local governance of adaptation. The lack of inclusion of adaptive issues in policy areas outside the technical and environmental department is a major barrier for developing comprehensive adaptation policies. Moreover, the collaborations with Harbin have a central position and promote climate mitigation rather than adaptation issues. Lack of detailed knowledge and innovation of locally specific adaptation technologies also showed to be a barrier.

Solutions or potential solutions developed by the municipality

The Technical and Environmental Department has developed solutions to these coordination and integration barriers. Significantly, through using green and blue spaces and the multiple functions these offer climate adapta-

tion issues are integrated in urban development and land use planning, as well as in recreational activities.

Actions taken additionally comprise the establishment of the regional network of municipalities in the proximity who shared types of flooding challenges, and the municipalities made joint efforts to produce the needed knowledge, and build expertise. The municipality initiative to establish a network among municipalities with similar adaptation challenges appears to address an experienced gap in knowledge and policy approaches, as well as it provides an arena for coordination and joint problem identification within especially water management and storm surges but potentially also on other adaptation issues. Moreover, the municipality developed a platform for inclusion of private actors in collection of experience-based data on flooding from private actors

Innovation projects managed in collaboration with the water company, and based on private technological innovation but with additional funding from the municipality is a policy action that aims to push adaptation technology to the agenda of private business.

As the majority of Danish municipalities, Aarhus often integrates strategies on mitigation and adaptation. Jointly with climate mitigation, climate adaptation has been included in the collaboration with the Chinese city of Harbin, thus receiving additional attention. Though adaptation is not a focus area in this collaboration, it holds the potential for pushing adaptation issues higher on the agenda while it equally may be pushed off the agenda.

4.2 Case no. 2: The medium sized coastal municipality

4.2.1 Introduction to the municipality

This medium-sized municipality is located inland, around a fjord in Jutland. It consists of a central town and a number of smaller communities with 1,000 to 3,000 inhabitants. Much of the area in the municipality is agricultural land.

It was included in the study as it has been actively engaged with climate adaptation issues, including participation in Local Government Denmark's project Climate Adaptation Plans and because its political-administrative organisation reflects, at least to some degree, cross-sectoral principles. First and foremost the administrative heads form a unified executive board. Second, the city council attempted to set up cross sectoral committees albeit with limited competencies (Interviews). Finally, the water utility is an independent, public company.

Climate change impacts

For this municipality climate changes are primarily water-related. The major town in the jurisdiction is located at the bottom of a fjord and has previously experienced flooding, not only from the sea but also from a big creek running through the town. More flooding are expected in the future, in the near term due to intensification of storms which, when winds are easterly, tend to press up water levels, and in the longer term due to rising sea levels. Flash flooding due to extreme rain has not yet caused problems, but is foreseen as a potential problem in the future. Moreover, groundwater levels may rise.

Rising water levels are expected to cause flooding of urban and agricultural areas; rising groundwater levels are expected to cause damages to buildings in lower lying areas, particularly around the harbour of the main town, increased leaching to water courses of nutrients and chemical substances, and possible water backlogs in sewage systems. In the worst case, rising sea levels may cause salinization of the groundwater.

However, heat in the form of heat islands is not expected to present problems due to the rather low degree of urbanisation of the municipality.

Structure of the municipality

The political structure is organized along sectoral committee lines typical of Danish municipalities. Climate change and climate change adaptation issues are dealt with primarily in the committee for technical matters and the environment. The council has a total of 7 committees. The mayor is a Social Democrat.

At the time this study was conducted that administration was organized according to a unified principle with the municipal manager and three department heads forming a joint board. Below this executive board, the administration was organized into four traditional departments: Culture and Recreation, Health and Social Services, Education and Labour Market, and Technical Affairs and Environment. This structure has been rearranged in 2014 but the sectoral organizing principle remains.

The political and administrative setup of climate adaptation planning /activities

Development of the climate adaptation plan is anchored in the Department of Technical Affairs and Environment. A steering group has been set up consisting of the heads of the planning and nature offices, the water utility and the head of the Technical and Environmental Department. But the day-to-day responsibility for development of the plan has been placed with two coordinators, one civil servant placed in the Office of Nature, who has been primarily responsible for risk mapping, and one civil servant placed in the planning office, who is responsible for coordinating the planning and decision processes (interview).

In their work to produce value maps and risk maps, the two coordinators have set up ad hoc working groups, involving members primarily from different offices in Technical and Environmental Department, but also civil servants from the Department of Culture and Recreation have been involved as well as the water utility and the local emergency services.

Relation to water company

The water utility is now a private entity which has been separated out from the municipal government. But the water company is involved in climate adaptation planning to a great extent and participates in working groups, the steering group and several other climate adaptation related fora.

4.2.2 Climate change impacts and adaptation activities

Climate adaptation activities – levels of response, type of action

The local government has adopted an overall climate strategy which states that climate change must be met in a creative manner, i.e. as an opportunity to implement new solutions in urban, land use and traffic planning (Klimatilpasning.dk, 2013). The declared principle is that increased water

levels should be viewed as a resource that allows for new recreational opportunities, more nature sites and new architecture.

In the current climate strategy, objectives regarding adaptation efforts concern coordination and foresight: climate change must be integrated into municipal planning in a holistic manner. In the climate action plan, climate adaptation measures consist primarily of a mapping of the water and sewer system in order to ensure adequate capacity in the future as well of mappings of areas at risk due to flooding, and areas that may potentially serve as storage and drainage basins.

A new climate plan is being developed. The parts pertaining to climate adaptation are expected to be adopted as they are currently laid out in the plan (interview municipal planner). The plan lists guiding principles and specific measures – some of which are in the planning stage, while some are listed as possible activities.

The principles include local handling of water, increasing the recreational value and quality of nature, reduction of impermeable surfaces and the use of roads, paths and squares for water storage and diversion, low-lying areas laid out as recreational areas that may serve as buffer, and establishment of greenery and plant cover to absorb water. These climate adaptation principles must be integrated into the municipal strategic plan, in local planning documents, in water and waste water planning, into discharge permits and in construction and renovation of roads.

Among specific projects are restoration and creation of wetlands, a new waste water plan and redevelopment of the harbour. The latter includes building sluice gates and changing the local building code to accommodate rising water levels. But also revising dimensions of drainage systems and rain water drainage basins are envisioned. A couple of new residential developments have been planned with climate adaptation in mind, primarily in the form of ensuring that surfaces and drainage basins are designed to handle water locally instead of running into water or sewer systems.

While measures taken so far have focused on water and water infrastructure, the language of climate adaptation plans and planners clearly reflect an integration discourse. As envisioned, integration cuts across strategic development, wastewater planning, nature conservation and to some extent road planning, but with water events as the focal point.

So far, however, implemented climate adaptation measures consist of smaller, single projects such as restoration of wetlands. A larger coordinated effort is expected to materialize in the wake of the preparation of the state-mandated climate adaptation plan to be finalized by the end of 2013.

The first step in the planning process is to map not only risks related to water but also link these to a mapping of valuable cultural and economic assets. This exercise has been challenging (interview municipal planner) since the national mandate came with no guidelines. With inspiration from other municipalities a multi-criteria valuation mapping has been developed, including human (individual / household level) costs such as health or social problems incurred by climate change, costs to society including economic losses stemming from blocked traffic or lost work time due to climate change events such as flooding, damages to nature including loss of nature habi-

tats / types, and damages to buildings and agricultural areas. Within each of these areas, potential damages are assessed on a scale from 1 to 5 and different criteria will be assigned specific weights.

Stage of development of the climate adaptation Plan

The adaptation plan is expected to consist of a risk mapping, including both a mapping of likely problem areas as well as a valuation of different assets, resulting in appointment of prioritized areas. Due in part to time constraints, the plan will not include actual climate adaptation measures and activities, but will describe the process for the further development of such activities.

Involvement of actors; allocation of responsibilities

The political level has not yet been involved to any great extent. Once the administrative level has finished preparing the risk map mentioned above, the city council will be invited to a half-day meeting to discuss the proposed risk plan. It is expected that the risk map will include a proposal for how to assign weights to different criteria as well. As such, the climate adaptation planning process appears to be very much in the hands of the administration. Administrators point out the importance of engaging politicians in climate adaptation discussions to pave the way for the necessary investments in adaptation activities and infrastructure (interview municipal planner).

The coordinators have been the primary drivers in developing the climate adaptation plan, while the head of the Technical and Environmental Department, who took office in June 2012, by all accounts has been instrumental in putting climate adaptation on the municipal agenda, highlighting the issue in his first meetings with department employees.

The two coordinators have exchanged experiences, ideas and knowledge with colleagues in other municipalities and at the regional level municipalities have cooperated in developing a template for the climate adaptation plans. As mentioned the approach to the valuation assessment was inspired by other municipalities.

The national level authorities played a role in the early stages, when the national consulting team visited and made a presentation on climate adaptation to the Technical and Environmental Department. But national guidelines have not offered much direction (interview), while the maps and registries, such as building registries, mad available from the national government overlapped with maps already available to the municipality.

Businesses and citizens have not yet been involved in the work and are not expected to be involved in any formal way until late stages when actual climate adaptation projects are conceived and implemented.

Yet, a climate council consisting of stakeholders such as utilities, local party members, large businesses and educational institutions form a network for climate policy discussions and actions, and the politician interviewed envisions that this council will be involved in climate adaptation policy discussions in the future.

Knowledge

The municipality has generally had access to mapping tools and knowledge that allowed for the risk mapping. But overall guidance and methodologies for how to go about climate adaptation planning has been lacking.

The municipality has gained gradual experience with adapting to water related issues due to rising water (interview). More importantly, for more forward looking experience and knowledge, it is involved in two research projects on climate adaption. One is a project on the role of agriculture in land use management; the other, an EU-funded project, concerns risks associated with and adaptation to rising groundwater. Moreover, the municipality has participated in a project involving a private company and a local college developing and testing permeable pavements.

4.2.3 Analysis of climate adaptation policy and institutional setup (Findings)

Organisational setup

The climate adaptation planning process so far has been primarily in the hands of two coordinators from different offices of the Technical and Environmental Department, although they have managed to call on municipal employees from other offices in the department and in one case from the Culture and Recreation department for participation in specific working groups.

The coordinators have the backing of a steering group involving the department head and two municipal offices, and the department head has been instrumental in placing climate adaptation on the agenda of the department as well as to some extent in raising awareness at the political level. Thus, while some offices previously would object to participating in meetings about climate adaptation policy, this has changed following the signalling from the department head that climate adaptation should be prioritised.

This set up has sufficed to allow the coordinators to move forward with the plan and to slowly include other actors in the work with the mapping exercise, but the process appears to be driven very much by the coordinators.

Approach to management of climate adaptation

To this point the state mandated climate change adaptation plan has set the agenda for adaptation activities over the last year. Thus, the dominant task has been related to the mapping of risk and the associated value assessment.

Climate adaptation policy revolves around water as the main problem. But this involves thinking about water as an interacting system. Hence, local handling of water is a primary principle to ensure that problems are not simply passed around.

Use of knowledge

So far the risk mapping and associated activities have drawn mostly on technical knowledge, although the valuation exercise has included new types of knowledge such as human and social cost. This knowledge originates with municipal staff.

While the municipality has been involved in research projects, this information has not yet been directly integrated into the climate adaptation planning.

Climate Policy Integration - inclusion of climate adaptation policy issues in other policy areas

Climate adaptation policy has not been prominent on the political agenda. Adaptation was included in a climate action plan that was adopted just be-

fore an international event hosted in the city (interview municipal planner). But according to one interview person it was a somewhat rushed effort based at least in part on a draft plan which had been developed by the water company. Apart from this plan, climate adaptation has not yet (2013) to any significant extent been incorporated into other policy discussions at the political level.

As for the administrative level, at this point climate adaptation rests almost entirely with the Technical and Environmental Department. Within this department climate adaptation is gradually being included into other policies. This holds particularly for physical planning. In fact, local plans have for some years gradually been adapted to rising water levels through requirements regarding minimum land heights. Likewise, wastewater plans have been gradually adapted to rising water levels. As the municipality has an actively cultural life with several large-scale events every year, planners have also begun to frame climate adaptation as a matter of ensuring that such events are not threatened by climate change events.

Recently, the department and the water company are looking for integrated solutions where climate adaptation activities may also serve other purposes, such as increasing nature assets or recreation or, where new ways of doing things, for instance road surfaces, may also facilitate climate adaptation. Local handling of water is a guiding principle. Moreover, the water company integrates climate issues in their decisions about renovation of water and sewer mains.

According to the new manager of the Technical and Environmental Department, his aim is for the municipality to pay more attention to integrated solutions in order to create a more 'interesting town' (interview municipal planner).

Institutional barriers

The analysis has uncovered institutional barriers as well as potential solutions at several levels of decision-making.

Firstly, the scarce attention to climate adaptation at the political level tends to limit the comprehensiveness of the climate adaptation at this point. Despite some flooding, politicians have not had a true climate change related wake-up call (interview). This does not mean that politicians do not care about the issue, but it has not become a politicized issue. Much of the climate adaptation policy activities will be financed through water fees and charges, reducing the pressure on or incentive for politicians to deal directly with the issue. The council is aware that a climate adaptation plan must be developed, but has so far left the task primarily to the administration (interview). In fact, the coordinator speculated that politicians will consider the valuation of assets and the weighting among human, societal etc. costs so complex that they may not even want it to be part of the political discussion (interview).

An obstacle to coordination across departments and therefore an obstacle to deeper integration of climate adaptation policy with other issues is a lack of a cross-cutting political committee with a budget. According to the politician interviewed such committees have successfully coordinated policy issues in the past, and the prospect for climate adaptation to have political ownership

across the municipality would be greater if it were anchored in such a cross sectoral committee.

Finally, existing norms both at the political and the administrative levels to exploit areas to their fullest in terms of developed square meters constitute a further constraint to integrated climate adaptation policy. Such norms must be changed to develop more of a vision of a liveable and interesting town, according to the department head. That would allow for integration of climate adaptation and other policy issues.

Secondly, the sectoral division of local government presents an institutional barrier as offices not directly charged with climate adaptation responsibilities have paid little attention to the issue even when opportunities for integrated planning might exist. Each office in the hierarchically and sectorally compartmentalized city government, as is typical, tends to focus on issues that are central to their task and for which they have money. Thus, the coordinators sometimes face an uphill battle trying to get other offices to assign time and attention to climate adaptation. However, this is slowly changing, cf. the section below. Within the Technical and Environmental Department the roads and transport office tends to be less interested in climate adaptation policy issues than has been the case for the nature and planning offices. This may be explained in part by the fact that new, more permeable road surfaces would involve new investments as well new requirements for maintenance, perhaps conflicting with the standards for roads that have guided the work of this office. Moreover, the roads section has a great need for funding and may not want to split what there is with climate adaptation policy activities. On the other hand, it is possible to coordinate maintenance of the water infrastructure with road maintenance.

Thirdly, regulation regarding the privatised water companies has inhibited the water company from engaging in more integrated climate adaptation in which water infrastructure may also serve other needs. It appears that such restrictions are being revised in response to criticism from among others the Danish Water Association who pointed out that such restrictions are counterproductive.

Fourthly, the national government while providing a rather flexible mandate and framework for local climate adaptation policy action represents a smaller barrier precisely due to its lack of leadership and guidelines (interviews). And the national implementation of the Water Framework Directive has not yet incorporated climate change adaptation. In fact, even measures under the WFD implementation such as wetland restoration that might confer climate adaptation benefits have been designed only with nutrient retention in mind, not with climate adaptation policy (interviews).

Solutions or potential solutions developed by the municipality

Solutions to these coordination and integration barriers have been developed by the two climate adaptation coordinators. One is the involvement of staff from other offices in ad hoc working groups in the development of the risk mapping. The two coordinators have been careful to involve other staff in a manner requiring limited time and attention; even so they perceive a gradual change in attention to climate adaptation policy issues across the municipal government, implying also that for instance the building inspection offices and the road offices are more likely to remember to think about

climate adaptation angles or even requirements to consider adaptation as is the case for new developments.

The other solution has been to engage in extensive exchange of experience and knowledge with other municipalities particularly in the region. This has helped overcome uncertainty about how to approach climate adaptation policy actions and has fostered spread and co-development of new solutions.

4.3 Case no. 3: The small, rural municipality by the coast

Case study no. 3 showed to be a challenge due to internal conditions at the municipality which involved more than the formulation of the climate adaptation plan and adaptation policy issues. Due to tensions and sensitive issues, this case study appears different and with less consistency, concerning a) our methodological foci; b) aspects that would enable identification of the municipality or our interviewees could be identified, and c) is based more on document analysis than on the interviews.

We have chosen to still include the case study since the sensitive issues are not unique to this municipality. The findings will therefore also be included in parallel with those of the other case studies, rather than in conjunction with these findings and those of the survey. The municipality was initially included in the study due to existing experiences with flooding, activities in networks to manage water and having expressed interest in collaborations with climate policy actors outside the local government organisation. In addition, its coastal location makes it at risk to suffer the impacts of climate changes such as rising sea levels and due to its size and geographical location, the findings are representations of local climate policy dynamics that take place in small Danish municipalities at a distance from the larger cities.

4.3.1 Introduction to the municipality

The municipality is located in a rural area by the coast and hosts more than 50,000 inhabitants. It has the main town at its the core with almost half of the population living here. The municipality also comprises smaller towns. Water tourism, nature tourism and outdoor life are prominent in the profile of the municipality that has received recognition for its open air recreation and tourism initiatives. As a rural municipality, it is moreover challenged by educational levels below national average, social inequality and declining trade, as well as difficulties in attracting knowledge intensive businesses and citizens.

The recent municipal strategy centres among other aspects on water qualities, liveable spaces and a healthy and active life. Key focus areas are to develop and opening up the centre of the main town and to develop the harbour area, in order to make the latter a more integrated part of the town and to stimulate tourism. Furthermore, stimulating creativity, innovation and knowledge, as well as developing the interaction between culture and nature are included in the municipal strategy.

The municipality is split into a few dozen communities of which one half is located in the main town while the other half is placed in rural hinterlands. Much of the main town's hinterland is agriculture and business is characterized by small industries. A business alliance has been formed to support local development and to take advantage of the place based opportunities and promote growth. The business alliance is in a tight network with local gov-

ernment. The municipality moreover participates in city networks that target sustainability issues.

Climate change impacts

For the municipality climate changes are mainly flooding and rising sea levels, including when these under specific weather conditions reinforce each other, and for example lead to storm surges. The main town has experienced flooding during the past decade and has in addition historical experience with storm surges (interview municipal planner).

Based on data and scenarios from both IPCC and Danish DMI, the municipality has modelled future storm surges for the territory covered by the municipality. This predicts an increase in floods from 1.67 meters above sea level every 100 years by 2011 to 1.85 meters above sea level every five years by 2061 (municipal homepage).

Structure of the municipality

The political structure is organized along sectoral committee lines typical for Danish municipalities, and divides the municipal administration into five policy areas, each governed by a Committee with members of the local Council. The Financial Committee is the most influential and environmental policies including climate change issues are governed by the Environmental, Climate and Traffic Committee and supported by the Technical and Environmental Department of the municipal administration. The administration is split between several physical locations where especially the Technical and Environmental Department is at distance from other departments.

The political and administrative setup of climate adaptation planning/-activities

Climate adaptation planning and policy is included in The Climate Plan which is based on a revision of the municipality's Climate Plan 2008, and the municipality integrates the compulsory Climate Adaptation Plan in the revised Climate and Energy Policy. This means that adaptation is seen and presented as one dimension of climate policy issues, in conjunction with climate mitigation policies that to a large extent focusses on energy efficiency and on renewable energy sources. The adaptation plan is moreover developed in parallel with the finalisation of the revision of the municipal plan. While climate is not a targeted area in the Municipal Plan 2013-2025, the municipality however presents the Climate Plan as an appendix to the Municipal Plan (Municipal Plan).

The climate and energy policy and plan are developed in the Technical and Environmental Department and discussed politically in the Technical and Environmental Committee, and approved by the City Council. The plan and policy have furthermore been informed by a workshop with participants from the department and different stakeholders, and the plan has been through and internal hearing process in relevant departments and sections of the municipality and with selected stakeholders from the municipality's business and citizen organisations.

Relation to water company

The water utility is now a private entity which has been separated out from the municipal government. The water company is involved in the managing waste water and in the development of actions to adapt to future flooding. Networks are developed between the water company and the Technical and

Environmental Department, due especially to personal relations with former municipal employees that are now working at the water company. Moreover, the water company provides advisory services and assists in developing the local adaptation approach (interview municipal planner).

4.3.2 Climate change impacts and adaptation activities

Climate adaptation activities – levels of responses, types of action

The local government has in 2013 adopted an overall climate strategy, in accordance with national requirements. This strategy states the basic principles for climate adaptation policies as: to base the municipal climate adaptation initiatives on a flexible approach in which there is room for new knowledge and changed scale and timing of impacts; to take precautionary action in the form of preventing adverse effects of climate changes rather than repair after e.g. severe flooding; to base policy actions on collaborations with private actors which includes citizens and businesses.

The climate plan and the section on climate planning in the municipal strategy and plan focus on water issues. Due to the coastal location of the municipality, this consists firstly of increased rains and cloudbursts and secondly of rising sea levels and risks of very high sea levels under specific weather conditions. The policies plan to adapt to the increased rains through improved grey infrastructure – especially increased volumes of waste water pipes – and retention of surface water through green and grey infrastructure, including in particular SuDS solutions. This also means that adaptation is closely linked to the coming, revised waste water plan 2013-20124. To mitigate the extensive coastline and the risk or sea flooding, the municipality has furthermore made a mapping of the locations most at risk for storm surge, which for example include the central harbour areas to be developed in the near future and which comprise both residential and trade areas, for the use of private constructions as well as the municipal land use planning. This mapping is public and accessible online.

To prepare the main town and other towns for the increased risk of flooding and storm surges, the municipality plans to tighten building regulations in high risk zones (interview municipal planner). In addition, to promote autonomous action and prepare private homeowners and developers for future flooding, detailed mappings of modelled risks of flooding under extreme weather events (storm surges; heavy rains and cloud bursts) are posted on a public home page, anticipating that home owners and developers autonomously seek the information and take precautionary action in the form of protecting buildings (interview municipal planner).

The municipality maintains dikes which are planned to be reinforced in areas that are particularly prone to especially storm surges.

Nature conservation, including protection of coastal wetlands, streams and habitats and protection of breeding birds, is planned, though to some extent dependent on data availability.

A green water retention area around the stream running through the main town was obstructed by strong local interests who saw their town gardens disappear. The green water retention area is now planned to be in a different place which is less at risk and which is closer to social housing areas.

Stage of development of the climate adaptation Plan

The adaptation plan consists of a risk mapping, which specifically includes blue areas like wetlands, streams and coastal areas.

The Municipal Climate Adaptation Plan is expected to be published late 2013 and, in concurrence with the climate mitigation and energy policy for the municipality, added as an appendix to the Municipal Plan 2013-2023.

The Climate Plan was finalised in 2013 and went through the public hearing phase in early 2014.

Involvement of actors and allocation of responsibilities

During the development of the Climate Plan, the working group at the Technical and Environmental Department has consulted relevant planners in other departments and sections of the local governance administration. This has however not been formalised. Moreover, a central employee of the local water company has been included in the development of the adaptation plan as a consultant. Being a former employee of the municipality, the municipal planners interviewed reported that they were experiencing a shared understanding as well as that the collaboration was very useful, promoting the collaboration and tightening informal networks (interview municipal planner).

The political level has debated and approved the Climate Plan 2012 in which adaptation is included, however not on a detailed level. Once the administrative level had finished the draft of the Municipal Climate Adaptation Plan, it was discussed by the Municipal Council.

Knowledge

The municipality has generally had access to mapping tools and knowledge that allowed for the risk mapping. In particular, data and models provided by GEUS, DMI and the national climate adaptation and energy portals have provided knowledge for the municipal mapping of risks and flooding / storm surges. At the time of conducting the case study, the municipality did not quantify the social and / or economic consequences of climate changes.

4.3.3 Analysis of climate adaptation policy and institutional setup

Organisational setup

The climate adaptation planning is organised along two dimensions. Development of the local adaptation policy and plan is placed in the Technical and Environmental Department and politically debated and outlined in the Technical and Environmental Committee. Here, it has since the Municipal Climate Plan 2008 been treated as an additional issue in the local climate policy which has mainly focussed on climate mitigation. This is also reflected in the Municipal Climate Plan 2012.

The state mandated climate adaptation plan has however singled out adaptation and the responding climate adaptation plan was included in the Municipal Plan 2013-20123, when the draft Adaptation Plan was politically mandated by the local council.

At the municipality, the adaptation policy approach links via climate mitigation actions to regional networks of municipalities. Also international networks were included in the development of the approach and provided ex-

perience, best practice and legitimacy. Moreover, to be a Climate Municipalities are mentioned in connection with the climate policy and strategy but does not take up a significant position in the adaptation plan (Municipal Plan).

Approach to management of climate adaptation

To this point, the state mandated climate change adaptation plan has set the agenda for adaptation activities. These are however merged with the municipal climate and energy policy, as a specific dimension of the climate change policy. In this sense, the approach continues the tracks laid out in the climate and energy policy of 2008. Due to the compulsory local adaptation plan, adaptation issues receives more attention; as expressed by the interviewed planners, the state mandated plan has pushed adaptation up on the climate policy agenda.

It is furthermore a general theme in the municipal approach that due to limited though improving knowledge on specific impacts of climate changes and due to the innovative potential in the area of climate adaptation, policy and planning for adapting to the impacts of climate changes must be flexible and adjusted along the way. The Climate Policy announces annual evaluation of actions relative to meeting the objectives. While this evaluation is mainly directed to achieving climate mitigation objective, it emphasises the dynamic ambitions of the approach to climate policy and planning.

Moreover, the approach is based on collaborations with citizens and private local business, especially in the form that these private actors take autonomous action (interview municipal planner). Engagement of the private sector is however stated in very vague and general terms and lacks substantial actions and initiatives (Municipal Plan).

Use of knowledge

So far the risk mapping and associated activities have drawn mostly on technical knowledge, and in addition the costs of some actions have been assessed and included in the municipal budget.

Due to the extensive coastline and the rapid increase in risks of storm surges, mapping of these risks at a local and detailed level is of special importance for climate proofing the municipality which the municipal acknowledge. It has thus produced a public available mapping which is expected to promote autonomous and private adaptive initiatives, for example in connection with construction and regeneration of housing.

The key planners however also stated a need for guidance on how to design appropriate initiatives, rank these according to priority, balance interests among and with local actors, and make use of participation.

Engagement with private actors represents additional inclusion of knowledge in the adaptation planning. This comprises private investments in indicated public-private partnerships for investments in green businesses as well as the autonomous adaptive actions which were anticipated to follow from increased risk knowledge. The public-private partnerships were however indicated as possible option rather than supported by concrete actions, e.g. the business coalition of the municipality does not address climate adaptation technologies or investments, and climate adaptation was not mentioned in the strategy for economic growth.

Climate Policy Integration – inclusion of climate adaptation policy issues in other policy areas

Climate adaptation policy has not been prominent on the political agenda. Adaptation was included in a climate action plan that was drafted in 2012 and was linked to the waste water planning.

Climate adaptation does not take up a prominent position in the municipal strategy or vision. The interviews indicated that the keeping the issue in the Technical and Environmental Department on the one hand was a natural and obvious choice due to the professional training and expertise of the staff, while it at the same time had the drawback that many parts of the municipal organisation considered the 'environmentalists' or the 'technical nerds' of the this department to obscure and / or exaggerate the risks and significance of the adaptation issues.

Hence, climate policy issues were mostly integrated within the areas of the Technical and Environmental Department, in particular planning, i.e. land use planning, waste water management, nature management and protection, building regulations and to lesser extent transport.

Often mentioned in conjunction with climate mitigation, the two dimensions of climate change policy were often treated as interwoven, or as adaptation being a sub-issue to climate mitigation. Compared to the 2008 policy, this has however become less distinct and with the compulsory Municipal Climate Adaptation Plan, where adaptation had to be individually targeted.

Institutional barriers

The analysis of climate adaptation policy in local governing in Case no 3's municipality shows institutional barriers as well as potential solutions at several levels of decision-making. Firstly, the integration of climate adaptation issues in relevant policy areas do not appear to be widespread and appeared more on a rhetoric than substantial level. This may be related to the allocation of resources to the development of the adaptation plan, which in the experience of key planners is inadequate. In busy daily routines where many environmental issues cross the work desk of the planners, the planners did not feel they could devote the needed attention to challenging adaptation issues. The lack of resources thus potentially concerns available man-hours as well as specialised climate adaptation competencies. In interviews, planners expressed that good working relations prevail among the environmental and technical planners since the merger of the former three municipalities in 2007.

Secondly, some of the main issues that slow down climate policy integration and impeded the specification of the municipality's adaptation strategy were connected to the administrative organisation of climate adaptation policy. Clearly defined as an environmental issue in a local government organisation which in addition focusses on other aspects of local development, climate adaptation was not positioned high on the local agenda and was perceived to be confined to be among the interests of the environmental people. The physical location of the Technical and Environmental Department at a distance from other departments of the local governance organisation amplify the somewhat detached status of environmental issues and thus of climate adaptation policy.

Solutions or potential solutions developed by the municipality

The municipal planners identified the lack of knowledge on initiatives and processes to be a barrier, to some extent rooted in the limited resources and expertise within climate adaptation issues of a small municipality. They were positive concerning visits of the national task force for guidance on local climate adaptation plans to provide the needed input (interview municipal planner).

Informally, the planners in addition addressed the very sectorial organisation of the municipality and the outsider status of many environmental issues. It is however not an issue which received broad attention across the municipal organisation.

4.4 Summary – findings of the case studies

The three case studies each show different significant dimensions of local governance in Denmark. Significantly, integration of climate adaptation issues in policy areas beyond environmental policy areas and especially in the overall strategy / vision of the municipalities has shown to be moving very slowly. Planners who were engaged with developing the local adaptation plans and with adaptation issues in general however recognized quickly and informally the need and benefits of such mainstreaming of climate adaptation policy across the municipal administration and policy areas. However, when leadership existed things moved quicker, as was the case for the large and the medium-sized municipality, while the lack of leadership and internal tensions appeared to slow down the process in the small municipality. Leadership that managed to combine adaptation actions and plans with other priority issues, such as business development and green development of urban and suburban green spaces pushed the climate adaptation policy process and added further impetus for action for local government. This was evident in the case study of the large municipality, and to some extent in the medium-sized municipality.

Furthermore, the small, rural municipality experienced inadequate resources, including lacking detailed and dedicated expertise and very crowded local agendas. The administration of the medium sized municipality had been more pro-active in countering this challenge while the necessary political attention, engagement and leadership were still sparse. Likewise, there was a perceived lack of national leadership beyond setting objectives.

Moreover, mapping of risks of future flooding were adopted by all case municipalities and made available to the public, and in general the involved planners experienced that the knowledge was available and used widely. Additional knowledge on how to design adaptive actions and how to engage private actors was less developed. Different strategies were followed to address this lack. Aarhus for example, created a network of municipalities in the proximity who shared types of flooding challenges, and the municipalities made joint efforts to produce the needed knowledge. In this respect, Aarhus served both as initiator and facilitator and moreover took lead in pushed adaptation issues higher on local governance agendas.

5 Survey of institutional barriers in local level adaptation policies

Based on the literature review and on preliminary findings of the case studies, we conducted in December 2012 a survey among the 98 Danish municipalities. The survey was addressed to section leaders or named employees in the municipal administrative offices identified through websites as responsible for climate adaptation coordination. Following two reminders, a total of 60 municipalities filled in the questionnaire, for a response rate of 61 per cent. Non-participants tend to be smaller municipalities. The questionnaire is presented in Appendix B and the survey report in Appendix C (both in Danish since the municipalities' working language is Danish). This chapter presents and discusses the findings of the survey. The analysis of the survey data has focused on key issues that also structure the chapter. These are:

- Actual experiences with and anticipations of impacts of climate changes
- Content and extent of local climate adaptation actions
- The organisation of municipal climate adaptation actions
- Collaborations and networks sustain adaptation actions
- Position and role of knowledge

The analysis is briefly summarized at the end of the chapter and is further discussed when Chapter 6 synthesises the study and draws conclusions.

5.1 Data collection

The questionnaire was sent via email to named persons in the municipal administrations. The recipients were identified via municipal websites as the head of the unit or, if possible, the individual civil servant responsible for climate adaptation. All 98 municipalities were asked to participate; 60 did after two follow-up invitations, resulting in a response rate of 61 pct. Analysis of the data showed that non-participating municipalities were smaller than the national average, averaging 45.900 inhabitants as compared with the national average of 57.060 (calculated using figures from Statistics Denmark 2010). As the qualitative analysis indicates that larger municipalities are more likely to have the institutional capacity to attack climate adaptation and to do so in an integrated manner, the results in this quantitative analysis may give a more advanced picture of climate adaptation efforts than is the case for the municipalities in general. Importantly, however, the rates of participation among coastal and inland municipalities do not differ significantly.

5.2 Experience and expectations of climate changes and their impacts at local level

Until now, climate changes have appeared mainly in the form of increased precipitation and heavier storms. As many as 84 per cent of the participating municipalities have experienced extreme rains while 33 per cent have had more heavy snow and intensified storms. Some municipalities have experienced changes in ground water level and / or sea level rise (see figure 1).

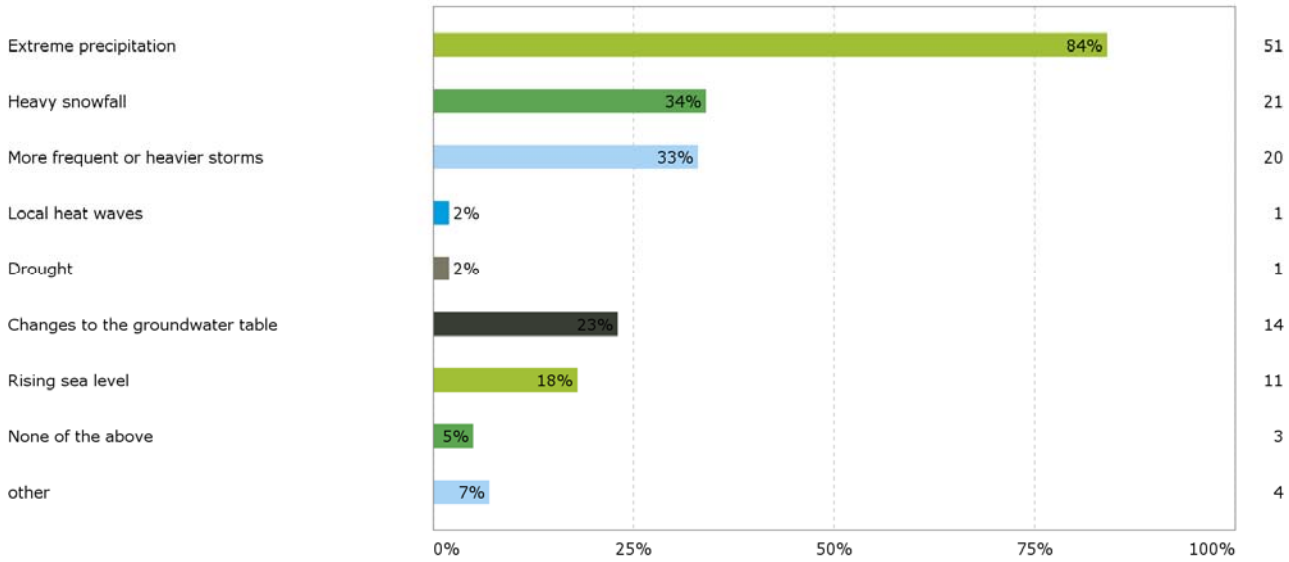


Figure 1 During the past five years, which climate impacts has your municipality encountered?

These experiences are reflected in the reported expectations of municipalities concerning future climate related problems in the municipality. The increased rains and rising levels of water constitute the majority here (see figure 2), with half of the responding municipalities expecting future flooding due to increased rains or rising sea / ground water levels and with another 39 per cent expecting these climate events to some extent. Flooding from the sea is anticipated by 58 per cent of the municipalities. Other direct impacts, such as storm damages, are also expected by more than half of the municipalities and another 13 per cent have high expectations of storm damages.

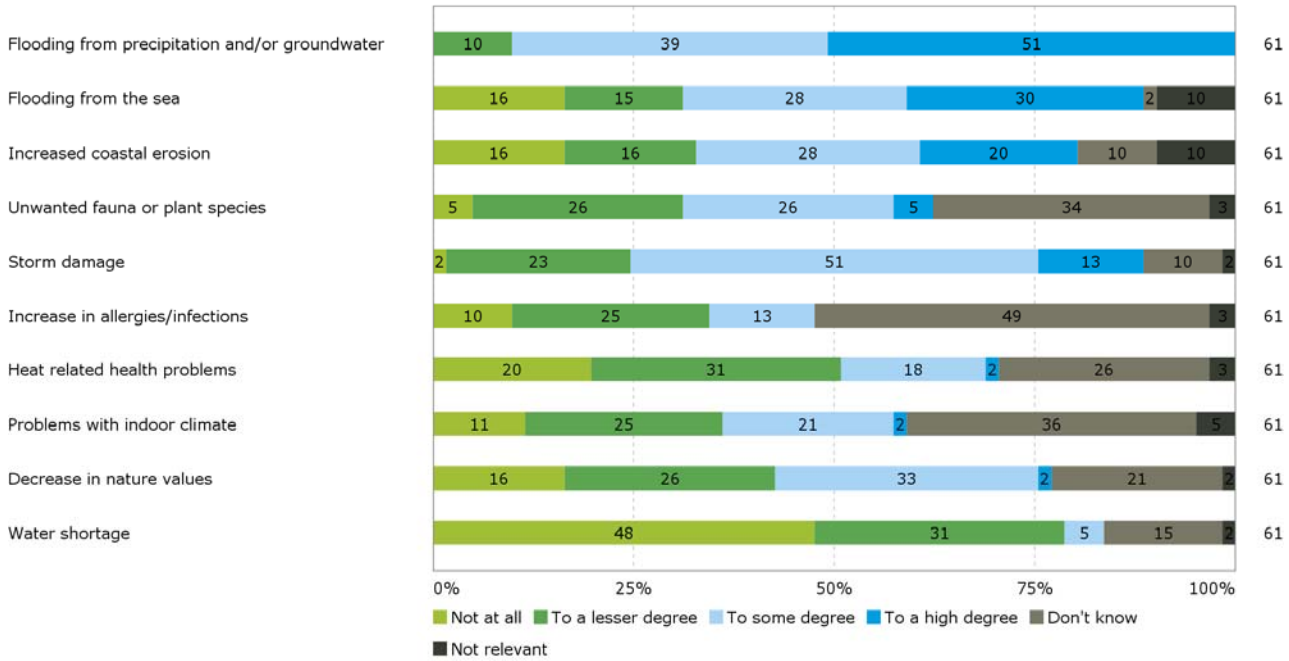


Figure 2 To what extent do you anticipate the following impacts of climate changes to affect your municipality?

Fewer municipalities expect impacts on nature and health while there is, however, relatively large uncertainty concerning these issues. For example, 49 per cent of the municipalities respond 'do not know' to the question whether they expect increased allergies and / or infections, and 39 per cent do not know whether they expect an increase in non-desirable plants and animal species.

Between 50 and 70 per cent of municipalities have already experienced an increase in contacts from concerned citizens, water supply companies and other offices in the municipal organisation, while a smaller number of municipalities have experienced an increase in contacts made by businesses (Appendix C, Figure 3).

5.3 The extent and content of climate adaptation plans

In general, the municipalities are in the process of formulating and developing their municipal climate adaptation plans. By late 2012, nine out of ten municipalities had started the geographical mandatory mapping of risks, and for 70 per cent of the municipalities, the mapping is accompanied by a mapping of adaptive actions needed to secure transport, waste water and knowledge infrastructure. Furthermore, more than half of the respondents have made financial investments in extended and enhanced waste water infrastructures and in green infrastructures (see Figure 3).

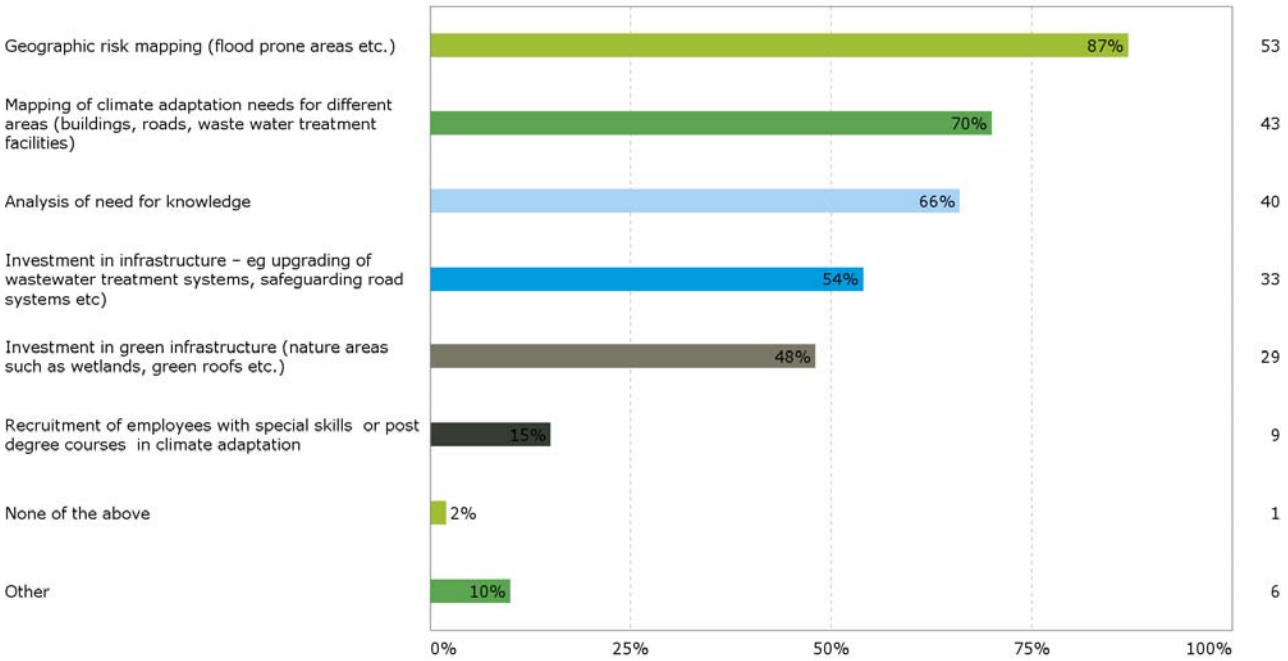


Figure 3 Which concrete initiatives have been launched as part of developing the Climate Adaptation Plan?

A main focus of this study is whether municipalities perceive climate adaptation to be a cross cutting area of local policy and planning. The survey responses indicate that the majority of municipalities do indeed perceive climate adaptation as a crosscutting issue, but for most municipalities this is limited to issues related to land use planning. This is reflected in the finding that more than three-quarters of the municipalities expect land use planning, parks and green spaces to be included in the climate adaption plan, followed to a lesser degree by urban regeneration / renewal, building regulations and development of former port areas. A much smaller share of municipalities perceive innovation and sport and recreation relevant for inclusion the climate plan.

The types of other municipal plans that include climate adaptation (see Figure A6 in Appendix C) mirror a similar tendency. Again, it is plans that address physical infrastructure such as waste water plans, local plans and the municipal plan that include climate adaptation issues. For municipal plans the picture is, however, less clear as this is the overall plan which ties together the individual policy areas at municipal level. The share of munici-

palities that integrate climate adaptation in plans of the natural environment and water plans is smaller, approximately 40 per cent. Compared to the attention to climate adaptation issues within these areas, the responding municipalities only to a very limited extent report that climate adaptation is included in transport plans or agricultural plans, and none report climate adaptation to be included in public health plans. These findings are not surprising, considering that municipalities primarily expect climate change to cause flooding and other water related impacts (see Figure 2).

5.4 Organisation of climate policy

Not surprisingly, the climate policy and tasks linked to climate adaptation are located in the technical and environmental departments of the municipalities. Inclusion of other administrative departments is still very limited. In the technical and environmental department, 87 per cent of the municipalities respond that the waste water sections is involved with climate adaptation policy to a high degree (see Figure A7, appendix C), reflecting the overwhelming focus on water in local governance adaptation policies. Moreover, planning sections, natural environment sections are included to a high degree in climate policy in more than half of the responding municipalities. Building permits and housing administrative sections and traffic sections are also included in climate adaptation policy, but less intensively, as 71 per cent of the municipalities include building and housing sections to some or to a lesser degree.

Even though the municipalities report to expect to have to make large investments in preventing damage from climate change impacts, it is still only less than one in five municipalities that involve the economic departments of the municipal administration in the work with adaption.

Coordination of the adaptation policy work has high attention in the municipalities where 83 per cent of the respondents have appointed a coordinator for municipal adaptation. The free text responses provided reflect that these coordinators mainly are found among the staff in the technical and environmental departments. Coordinators from the staff of the emergency services are the second highest number while a single municipality has used an employee from the tourism section.

As demonstrated in figures 4, 5 and 6 the coordination units are established mainly within the technical and environmental departments. In 74 per cent of the municipalities, the water companies have been included as participants in these units, while other departments of the municipality are only included in just over a quarter of the municipalities. The survey shows that inclusion of other departments is more common in larger municipalities than in small municipalities while this pattern is not strong enough to be statistically significant.

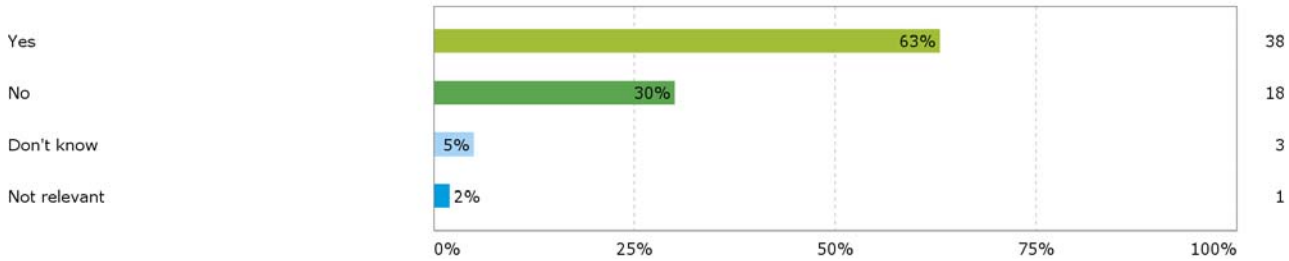


Figure 4 Has a coordination forum for developing climate adaptation been established within the Technical and Environmental Department?

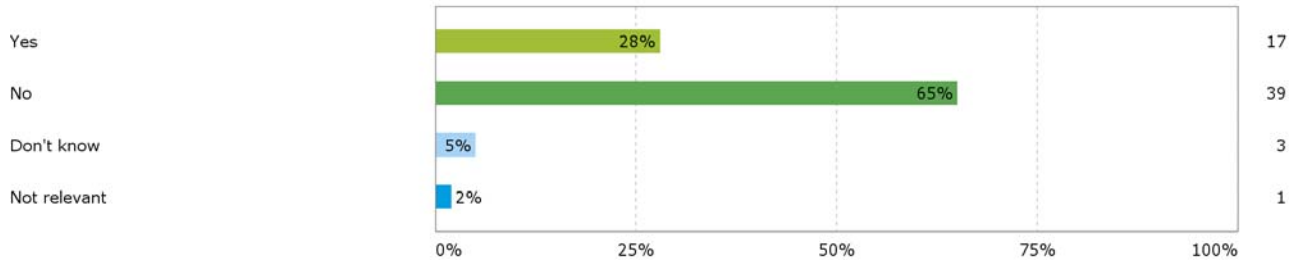


Figure 5 Has a coordination forum for developing climate adaptation been established with participation of civil servants from other municipal departments?

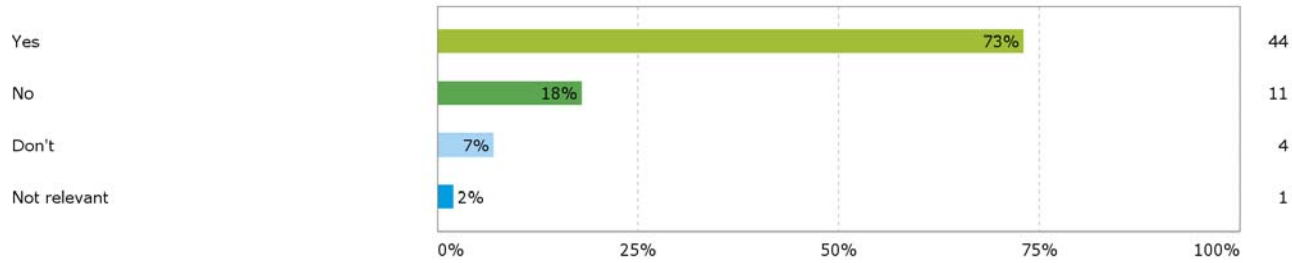


Figure 6 Has a coordination forum with participation of the water utility been established?

5.5 Attention and priority on the policy agendas

Adaption to the impacts of climate change is on the policy agenda in many municipalities although this is not always followed by funding. Approximately 2/3 of the respondents agree or agree to a high degree that climate adaptation is high on the policy agenda in their own section as well as in the management of the Technical and Environmental Departments (see Figure 7). Almost half the municipalities share the perception that climate adaptation is also high on the agenda of the local politicians, while a smaller share finds that the municipalities allocate the necessary funding to adaptive measures and policies. Here only 31 per cent of the respondents express that the municipal politicians allocate the necessary time and financial resources while 33 per cent find that this is not the case. The survey results further shows no statistical differences in the allocation of resources for adaptation based on coastal location or size of municipality.

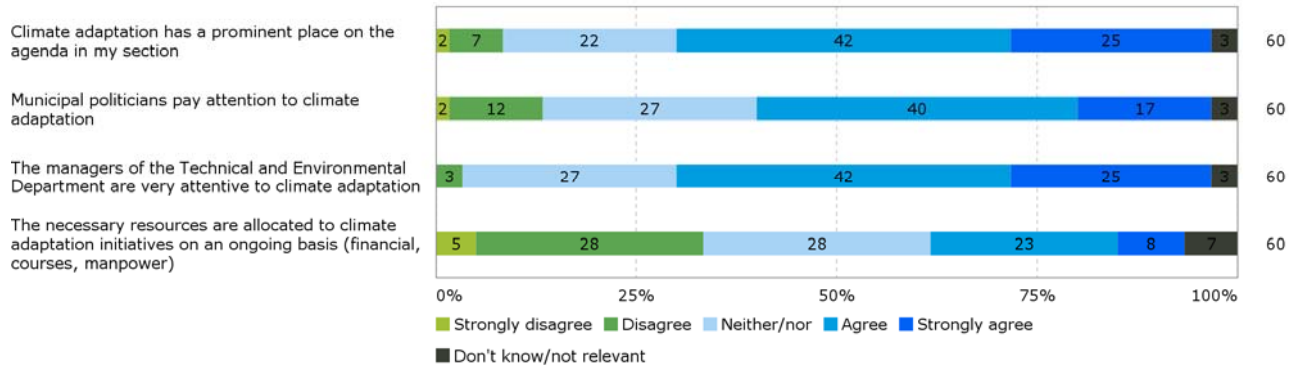


Figure 7 In your experience, to what extent is priority given to climate adaptation?

Approximately half of the respondents find that climate adaptation is of key importance for the general wellbeing of the municipality (see Figure 8). Moreover, half of the respondents agree that there is widespread recognition in their municipalities that taking climate adaptation initiatives now is less costly and better than future adaptation. Meanwhile, almost three-quarters of the respondents find that the need for adaptation must be documented in order for such initiatives to take off, i.e. that the impacts of climate change impacts are real and hazardous, and that adaptive actions are efficient. The costly character of most adaptive actions may be one potential reason for this. 44 per cent of the respondents reply that adaptation requires large expenditures and will be costly for the municipality.

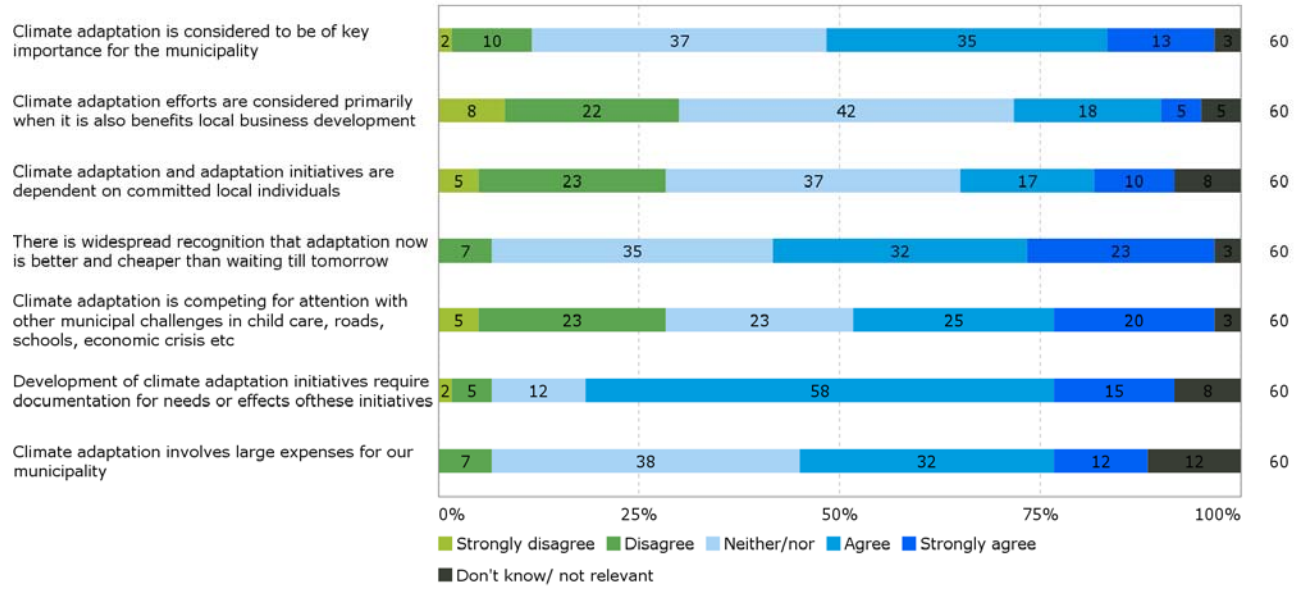


Figure 8 How is the climate adaptation strategy/plan experienced to be a challenge in the municipality?

Thus, even though attention is high among the technical and environmental departments, our survey does not indicate that climate adaptation is high and hot on the general policy agendas of local governments. This is confirmed when the respondents are asked about cross departmental collaboration on climate adaptation (Figure 9). About half of the respondents find that the issue attracts great attention among relevant departments and sectors. About a quarter of the respondents agree with the statement that 'there is a widespread sense that climate adaptation isn't urgent' while one third disagree. In other words, one third indicates that climate adaptation is considered a pressing issue widely across the municipality.

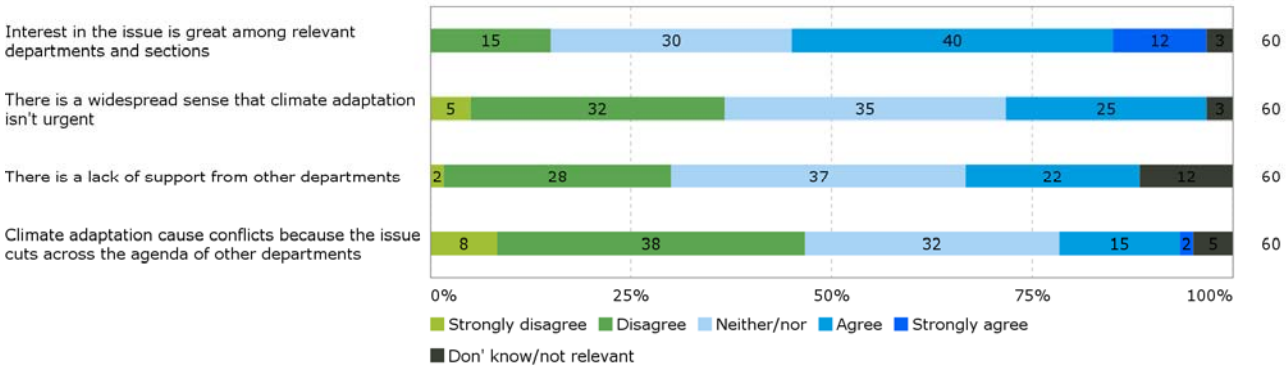


Figure 9 How do you experience collaboration on climate adaptation across the municipal organisation?

The survey does not show actual resistance to climate adaptation policy and planning (Figure 9). Only 22 per cent of the respondents state a lack support from other departments and only 17 per cent respond that conflicts arise due to that adaptive measures and policies cuts across other policy areas while 46 per cent disagree with this. At the same time, as shown in Figure 8 above, less than half of the respondents, 45 per cent, find that climate adaptation must compete for attention with other municipal policy issues, while a similar share of the respondents disagree with these statements.

5.6 External collaboration

Municipalities only collaborate to a moderate extent with external partners on climate adaptation issues.

One in three of the municipalities are active in engaging the citizens in concrete participatory activities on climate adaptation (see Figure A15, Appendix C). However, almost half of the municipal respondents state that they do not believe their citizens are familiar with the municipal climate adaptation strategy or plan, while less than a quarter believe that their citizens are not interested in the issue.

There appears to be even less focus on collaboration with businesses. In fact, nearly three quarters of the respondents do not know about collaboration with businesses about climate adaptation (Figure 10), while 13 pct. answer that they cooperate with businesses about adaptation technologies and a similar share of municipalities cooperate with business networks on climate adaptation at a strategic level. Only 8 per cent of the municipalities report that they have businesses represented in working groups developing climate adaptation strategies, and the same number state that businesses are involved in developing specific adaptation initiatives. These low numbers fit with figure 8 which showed that only 23 per cent of the respondents integrate adaptation policy and business development policy.

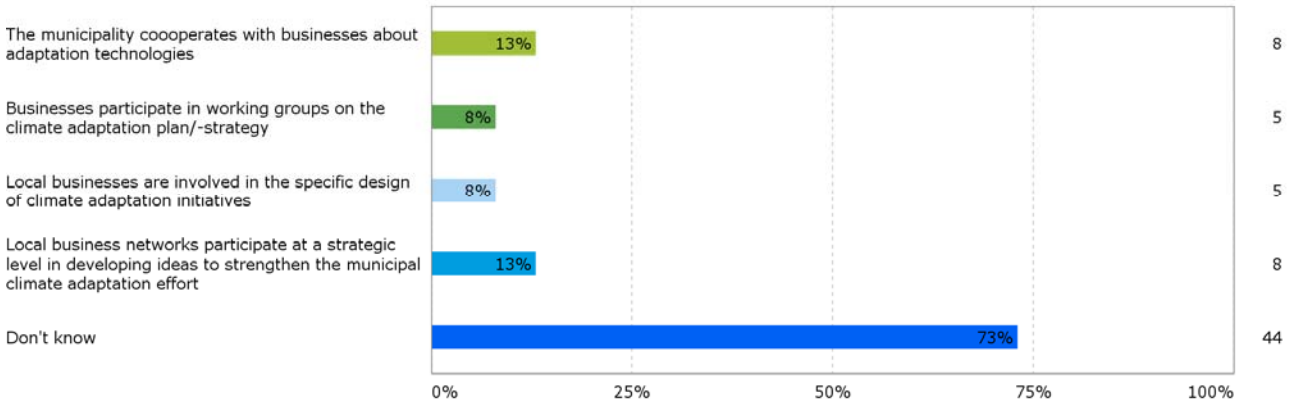


Figure 10 How is collaboration with private business on climate adaptation organised?

When it comes to collaboration with other municipalities almost half of the respondents report that they have no collaborations concerning climate adaptation with neighbouring municipalities (see Figure A17 appendix C). Among the other half this collaboration takes different forms. 52 per cent of the municipalities exchange experiences and ideas for mutual inspiration. Moreover, 22 per cent have entered formalised cooperation projects on climate change, while 27 per cent of the municipalities state that collaborations take place as division of work.

The state adaptation policy framework did not appear to set the agenda in a significant manner in 2012 when data were collected. The national adaptation policy framework is not experienced as blocking local policies. Only 18 per cent of the respondents report the national frameworks to be a barrier for municipal adaptation policy actions (see Figure 11) while 48 per cent of the municipalities disagree with the statement that municipalities do not have the necessary action space for making adaptation plans and policies at local scale. However there is still 36 per cent of the respondents who experience the national set of rules and regulations within this areas to lack transparency, while a larger share here respond 'neither'.

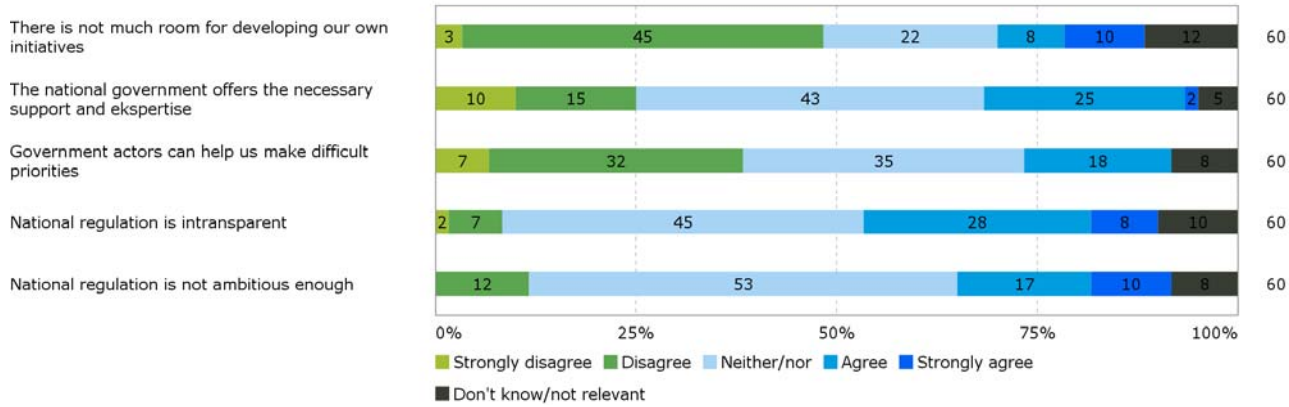


Figure 11 Which role does the national policy framework for climate adaptation play for climate adaptation in the municipality?

Moreover, the national government is not experienced as a strong partner for collaboration. Only a little more than a quarter of the respondents find that the state offers the necessary support and expertise and less than one in five of the municipalities find that the state can assist when difficult priorities have to be made. On top of this, more than 60 per cent respond 'nether' or 'do not know' when asked about the national level of ambition within

climate adaptation policy framework while 27 per cent find that it is not ambitious enough.

State actors do however provide useful knowledge and data, see Figure 13 in the section on knowledge below.

5.7 Knowledge

The majority of municipalities have access to information about climate changes and possible courses of action at least to some degree. Asked about access to the necessary knowledge for developing adaptation policies, 57 per cent and 20 per cent, respectively, respond that the necessary knowledge to some degree or to a high degree is available. In parallel with this, 55 per cent and 13 per cent of the municipalities report that the needed knowledge on local governance actions to some degree or to a high degree, respectively, is available (see Figure 12).

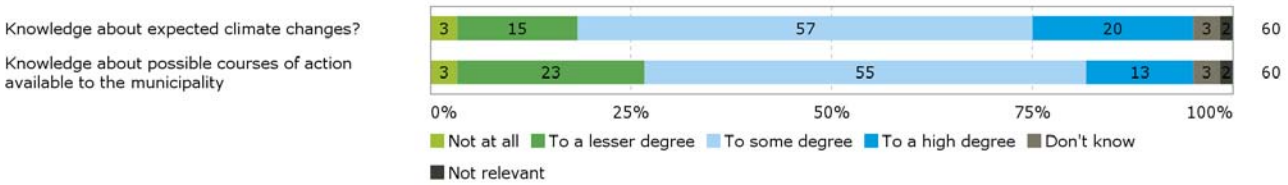


Figure 12 Does the municipality have access to necessary knowledge?

Web sites from national authorities as well as private consultancies represent significant sources of information (see Figure 13). Thus, 70 per cent of the municipalities find the websites from national authorities to be especially useful. Almost as many municipalities assess consultancy firms to be a significant source of knowledge. Almost half of the municipalities evaluate their own and state experts to be suppliers of specifically useful knowledge.

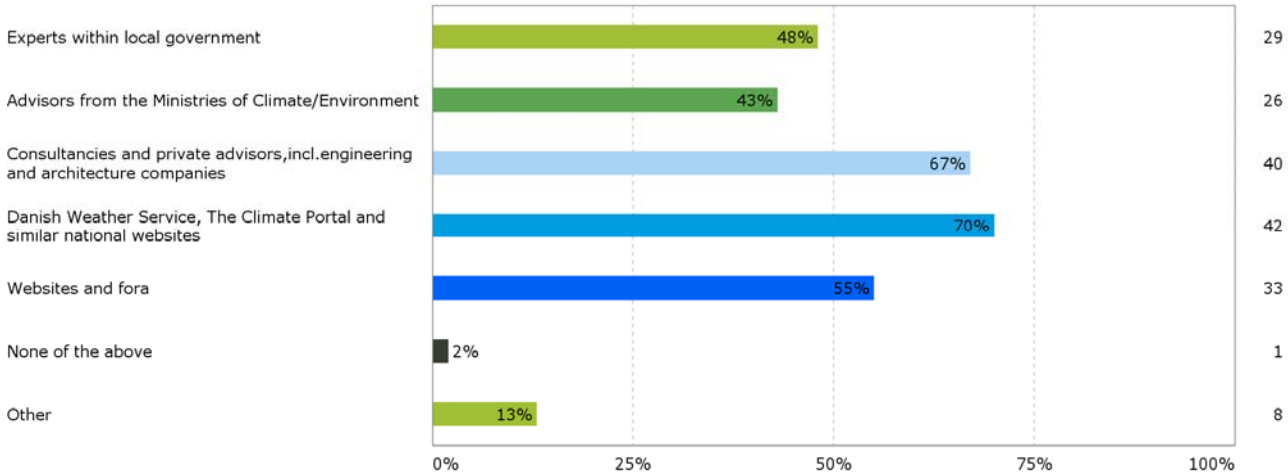


Figure 13 Which sources of knowledge on future climate changes and impacts for the geography of the municipality do you at your department find particularly useful?

5.8 Summary – findings of the survey

The survey uncovers how the Danish municipalities conducted and organised the development of climate adaptation policy activities until the end of 2012, with specific attention to the potential integration and coordination of adaptation policy issues across policy areas. Moreover, potential factors that promote or impede their ability to develop such policy measures have been addressed.

The survey demonstrates that almost all of the respondents are in process with developing municipal adaptation plans while the coordination and integration of climate adaptation policy issues across the municipal administration and its policy areas is limited. In most cases, adaptation is perceived to consist of water related issues, particularly minimizing the hazards associated with extreme rains and rising ground water and sea levels. This focus is reflected in the measures aimed at adapting water infrastructure and in the location of adaptation policy in the technical and environmental departments. Also collaborative networks and projects reflect the water focus where collaborations most often involve partners internally in the technical and environmental department and water utilities, which are public companies.

This prominent water focus of the adaptation policies in the municipalities indicates that the organisation and cognitive perceptions of climate adaptation policy constitute a main barrier for mainstreaming of climate adaptation policy; the location in the organisation defines the ways that climate adaptation is perceived and defines the policy actions. Meanwhile, this may also reflect that the municipal work with climate adaptation at the time of data collection was in its initial phases where a limited policy focus is normal, and the character and extent of mainstreaming may change as the policy development progress.

Another barrier may be found in the priority and position on local policy agendas where adaptation receives limited attention and resources and where the professional staff within adaptation issues expresses a concern for lack of resources.

Furthermore, it is significant that only a limited share of the municipalities have integrated citizens and businesses in the work with climate adaptation policies. Collaboration in the form of exchange of experience and inspiring initiatives, and to a limited extend on concrete projects exists with other municipalities while the state is mostly seen as source of knowledge and data.

6 Conclusion

In this study, we were interested in *which institutional barriers and enablers of local governance that condition the capacity for climate adaptive policy actions*. We have investigated the institutional barriers and enablers for climate change adaptation through *examining and identifying the capacity of local governance to manage the experienced and anticipated impacts of climate changes*. Specifically, we have addressed the research questions outlined in Chapter 1 through conducting a literature review, three case studies and a survey issued to all Danish municipalities. The questions are:

- Which barriers and enablers impact on the ability of local governance to develop solid and apposite policy responses to meet the challenges of climate change;
- How local governance institutions manage the challenge of climate policy integration; and
- How governance institutions condition adaptive policy making

Below, we draw together the findings and present conclusions on why some institutions of local governance are more successful than others in developing policy responses. The chapter is structured according to the research questions.

6.1 Impacts on the (potential) ability of local government to develop solid and apposite policy responses to meet the challenges of climate change.

The literature study identified a range of institutional factors that impact on the ability of local government to manage the policy challenges that flow from the impacts of climate change. This served to structure the case studies and the survey, and in this section we discuss the findings that are based on this.

Literature on local governance ability to manage adaptation stresses leadership and agenda setting as central elements. Leadership and placing adaptation on local governance agendas are crucial for ensuring that adaptation and adaptation policy receive attention and priority in local governance. Moreover, leadership is crucial for keeping attention alive after the initial introduction of climate change as a local policy issue. The survey showed that overall, climate adaptation policy has climbed up on the agendas of local governance, while priority of and attention to climate adaptation policy issues were more or less restricted to the Technical and Environmental Departments and in some cases subunits thereof. The situation mirrors the timing of the challenging task presenting the state mandated climate adaptation plan. The scale and long-term perspectives of climate impacts imply that it remains an open question whether the relatively high attention of the environmental departments will last. With the *National Action Plan* (see chapter 1), climate adaptation was addressed in the annual Financial Agreement for Municipalities (Aftale om Kommunernes Økonomi) between the Government and Local Government Denmark (Kommunernes Landsforening). The long term inclusion of adaptation issues in this agreement is however still an open question. Until adaptation policy and adaptive planning becomes a recurrent issue in the annual Financial Agreements, and until knowledge about and experience with various adaptation measures and approaches are

developed, adaptation issues may struggle for local policy attention beyond complying with legal requirements of developing municipal adaptation plans.

The need for political attention and leadership to get climate adaptation off the ground as an issue both within and beyond the planning and water offices was also demonstrated in the three case studies. In our case studies of a small municipality, and a to a limited also in the case study of a medium sized municipality, a lack of central priority with local political and administrative leaders, and conflicts between concrete measures and other local interests meant that adaptation stayed off the agenda for a long time. Outside the environmental section of the local administration adaptation issues were perceived to be marginal, compared to employment and agricultural issues especially. In our study of the city, leadership that served to push climate policy integration recognized the costs of not adapting and therefore prioritized climate issues despite other pressing policy issues. The survey showed that most municipalities recognized climate policy integration to be a central issue, while assessing the appropriate level of adaptation that would follow from avoiding the costs of not adapting were only included at a very general level; i.e. future costs as something which should be avoided. In addition, the survey results suggest that climate adaptation policy integration was mainly recognized within the environmental departments but not visible in other parts.

Thus, even when climate events have placed the political spotlight closer to adaptation issues, adaptation issues must compete for attention with a range of other pressing issues on local policy agendas, which especially applies for issues not yet experienced in the municipality. For climate adaptation, the timeframe of realizing benefits from a local perspective is perceived as distant compared with these other policy issues. Impact scenarios, scale and precise location/timing of impacts are furthermore based on data and knowledge which is uncertain and has for decades been contested in public and political debates, which potentially blurs the urgency of action. Compared to present issues of business development, employment or schools and elderly citizens, climate adaptation may thus seem less urgent, pushing adaptation issues down on the agenda. At the local level, local interests such as a strong agricultural lobby may push climate adaptation lower.

As part of the national climate adaptation strategy embedded in the action plan, the national planning act was amended. The amendment enables municipalities to develop legally binding local scale Climate Plans for areas of the municipalities with specific relevance for implementing adaptive measures or actions against risks. This was widely acknowledged to be beneficial and welcomed by the municipalities, and thus support Næss et al.'s findings that sufficiently flexible national legal frameworks, i.e. flexible in the sense that the outline overall rather than detailed actions thus permitting that the national frameworks can be implemented to fit local conditions, potentially promote adaptation policies while too tight national requirements can block efficient adaptation (Næss et al., 2005).

Moreover, it was striking how significant prior experience with climate events was for pushing adaptation issues upwards on the agenda, specifically demonstrated in the case studies. Aarhus, for instance, following two flooding events in 2012, placed special emphasis on developing local actions to retain water in situations with heavy rains.

6.2 How local governance institutions manage the challenge of climate policy integration

Environmental problems cross administrative boundaries, and this indeed is also the case for impacts of climate changes that interact with other policy issues at the local level such as urban development, nature protection and biodiversity, water management, transport infrastructure, agriculture, built environment and business innovation. Integration of climate policy concerns and coordination across sectorial divides are in this context seen as ways to manage the complexity related to climate change adaptation. The position of climate adaptation policy on local agendas discussed above is a marker of this whereas the study demonstrates that policy integration happens in multiple ways.

Significantly, across the survey and the case studies, strong policy integration is generally lacking and adaptation is seen as a water issue far more than a cross-cutting, complex local policy issue. There are, however, policy areas where climate adaptation issues are present.

The extent and form of the integration of climate adaptation policy within other policy areas happens mainly in the form of firstly, green spaces and green infrastructure designed to provide water retention and in a longer timespan to undermine the heat island effect, although the latter are mostly a concern in larger cities. Green spaces are often designed to serve multiple functions such as water retention areas also offering recreational areas or wetlands providing a pleasant 'urban feel' when the rains are not extreme. In connection with a greening of the built environment, adaptation issues may thus be included when municipalities launch actions to make towns and cities more liveable and pleasant. From the opposite angle, a study of suburban green spaces indicates that the present greening of many city strategies gain momentum when the strategies link to climate adaptation and in particular to local water treatment solutions (SuDS, Sustainable Drainage System - SuDS) (Petersen et al., forthcoming). In this perspective, the trend of greening urban areas and opening these up to dwellings and encounters, as was the case for the study of a small town in our study, may thus indicate the integration of climate adaptation policy.

In the case studies, climate adaptation actions were at a very general level linked to a green business development potential, which includes technological innovation, at local scale implying locally adapted solutions to specific adaptation challenges. The linkage to business and green growth means that specific climate adaptation actions have a multi-functional potential, and that municipal adaptation policy gains more legitimacy across the administration and among key policy actors.

A key challenge is the sectorial or compartmentalized organization of environmental policy issues in many local governance institutions, including for climate change issues (Jensen et al., 2013). To develop adaptive measures to manage the impacts of climate change may also push for more collaboration across policy sectors while the effect of this is often conditioned by networks among local policy makers and leadership. For climate adaptation issues to appear relevant and be prioritized as policy issues across different sectors, the municipalities must perceive climate adaptation to be a cross cutting area of significance for local policy and planning. The survey shows that the majority of municipalities share this perception while this for most municipalities is limited to issues related to land use planning. Three out of four in-

tegrate and coordinate, or expect to do so, climate adaptation in land use planning, management and development of parks and green spaces and include these in the climate adaption plan. Fewer but still a significant number of municipalities moreover indicated an integration of adaptation issues in urban regeneration/renewal, building regulations and development of former port areas. When it comes to support for innovation and sport and recreation, the share of municipalities which find these areas relevant for climate adaptation integration is far smaller. As urban development and regeneration becomes a policy issue for integration of climate adaptation concerns, the issue moves beyond the environmental policy area which potentially represents a qualitative change and can promote a stronger coordination and integration across the policy institution. The lack of inclusion of local/regional business development in policy actions suggests slower policy integration while this equally may be due to the stage of maturity of local climate adaptation policy actions and/or the local business climate. Our study does not offer solid findings on these latter topics.

As demonstrated by the survey and case studies, the coordination units concerned with adaptation policy and planning are mainly established within the technical and environmental departments, and for three out of four municipalities this also include representatives from water management companies. Other departments of the municipal organisation are in general not represented. Only a quarter of the municipalities sees representation by other departments to promote the development of the plan while in the case studies such collaborative forums have been stressed as arenas for reaching common perceptions and understandings of the challenges related to climate adaptation. The survey shows that inclusion of other departments is more common in larger municipalities than in small municipalities while this pattern is not strong enough to be statistically significant. However, also the case studies show that the larger municipality, Aarhus, had more attention reaching beyond the environmental area than the two smaller ones which supports the indication of size of municipality as a positive factor for climate policy integration. Moreover, these findings indicate that there is a tendency to overcome sectorial barriers when additional measures such as establishment of steering groups and project groups across policy sectors are included among climate adaptation actions.

Cross sector adaptation policies are not only a matter of recognizing climate adaptation as a pressing and relevant issue, but also and in particular of operationalization and pooling of knowledge and capacities. In the case municipalities, granting priority and importance to climate adaptation beyond the environmental department of local governance was a key issue which not only involved changed procedures but also leadership. This moreover revealed the importance of not only the key planners recognizing the need for coordinated action, but equally that the remainder of the municipal administration and other political areas accepted the invitation to think in terms of climate adaptation and develop and promote actions.

In addition, some adaptation measures, such as allocation of green spaces to water retention, involved conflicts over land use stretching far into other policy areas and where these sensitive areas were not addressed, it blocked to some extent development of adaptation actions. Studies of other Danish cities, in particular Copenhagen, have shown that these conflicts may be reduced through clear lines of competencies and a framework for conflict resolution, promoted when climate adaptation is mainstreamed and developing

under clearly set policy goals and objectives, which are e.g. also pushed by the Financial Department (Zandersen et al., 2014; Jensen et al., 2013).

Overall, the findings indicate that integration of climate adaptation policy and granting adaptation issues priority is also a matter of changing the mentality across the organisation. This implies breaking habits and challenging taken-for-granted perceptions of climate adaptation issues as limited environmental issues. As is the case with local low carbon development, to alter the ways that adaptation issues are positioned and addressed within local policy institutions is like changing the direction of a super-tanker – It takes time and much energy but when the change is implemented, it may have great momentum and serve as impetus for other developments in the municipality.

Networks among and between policy actors who were directly or indirectly engaged with adaptation showed to be a second theme influencing the ways in which local governance institutions manage the complexity related to adaptation. Policy networks with positive influence include especially networks with the water company and networks with other central planners in the local governance institution. The former fosters development on technical issues and potentially prevent tensions on issues where competencies are unclear, as for example is the case when the adaptation plan includes actions that aim to separate surface water (mainly rain water) from water underground that is channelled via the sewage system. Establishment and utilization of good relations with the water companies, in particular when it comes to innovation projects are significant.

Policy networks that mainly include policy makers in government are conditioned by, but also conditioning, the position of the environmental department in the municipal administration, and may build on existing networks or emerge as climate adaptation actions develop and take shape. This links closely to the issues of climate policy integration discussed above.

Moreover, complex problems require specialised and situated knowledge, and in a regional perspective, as indicated by the case study of Aarhus as well as existing networks such as 'Vand i Byer' ('Water in Cities'), networks comprising several municipalities with similar challenges offer arenas for pooling of resources. In regional networks such as the one facilitated by Aarhus, common knowledge gaps may be addressed in cost-efficient ways and provide an arena for social learning and development of novel approaches tailored to specific local or regional conditions. In addition to these three forms of networks, networks that involve social actions such as local business and civil society associations are stated to offer potential for innovation and autonomous actions by some municipalities. The case studies indicate that policy networks supporting the capacity of local governance for making apt adaptive policies and planning are often based on personal relations as well as institutionalized relations such as those between water companies and municipal departments. Thus, there is a tendency for local governance to use networks – geographical or issue based – to build competencies at the local level which otherwise represent a deficit and could function as a barrier for adaptation.

The level of competencies that is available at local level is often experienced as inadequate which stresses the need for supervision and detailed expertise and support from the national institutions, as well as for local / regional net-

works. Other, locally based actions are suggested as equally important. The case studies indicate that building expertise based on prior knowledge and experience with for example water management, as in Aarhus, or with collaborative processes on technical issues rather than from scratch is of key significance for developing the adaptive capacity of local government. This comprises for example redefinition or redirection of existing measures and policies, as well as recruiting staff with relevant experience. Moreover, the case studies suggest that it is important to have others to reflect and share knowledge with, and build joint expertise when resources are scarce as is the case for many smaller municipalities. Also, the tight time schedule for completing the mandatory local adaptation plans exerts pressure on knowledge accumulation and development and on building expertise.

6.3 How do governance institutions condition adaptive capacity

The study suggests that the size of the municipality affects the ability to implement a proactive climate adaption policy at the local level. The larger municipalities had built and could maintain expertise that they perceived to be necessary to handle the complexity associated with adapting to climate change. This expertise for example included developing policy responses within areas anticipated to be future challenges just as much as keep on addressing areas where climate events had shown it necessary to implement actions. Furthermore, the larger municipalities could invest the resources necessary for developing and implementing a long term strategy to adapt the area and minimize the risks and costs associate with present and future climate changes. In addition, the larger municipalities could facilitate and take advantage of networks with other governance institutions, business, public associations, etc. within challenging areas of adaptation.

Leadership that take action on climate adaptation issues and maintain a strong attention to adaptation issues moreover holds a potential for overcoming the barriers immanent in the policy institution that impede adaptation policy. This was for example the case in Aarhus where heads of section and key representatives of the Financial Department were involved in drafting the climate adaptation plan. This is further illustrated by Copenhagen where adaptation has been high on the agenda in the municipal strategy and plan, and thus was enforced by the Financial Department, as well as spearheaded by comprehensive initiatives in the Technical and Environmental Department (Zandersen et al., 2014).

Size stands out as to some extent significant both in the case studies and in the survey. Integration across sectors and integration of business and citizens, where especially the larger municipalities take advantage of business innovation and business capacity, as well as the option to concentrate knowledge and expertise.

To integrate climate adaptation in the overall strategy of the municipality and thus grant adaptation significance in the strategic approach of local government is not widespread and thus holds a potential for further policy integration and for moving adaptation to the forefront, highlighting the medium and long term costs of non-adaptation and the opportunities offered by adaptation. This would for example stress integration of flooding risk in housing development and prioritization of innovative adaptation technologies in business development support. Such a comprehensive integration is however premised on a capacity of the municipal organisation to integrate learning

and to challenge taken-for-granted perceptions of climate adaptation as merely a technical and / or environmental local issue. In this perspective, focus is slowly shifting towards a local policy discourse on mitigation at institutional level (Jensen et al., 2013; Yohe & Oppenheimer, 2011). This potentially can pave the way for integration of climate adaptation policy issues, considering that in most municipalities no strict divide has separated climate mitigation and climate adaptation – illustrated by the historic blend of adaptation and energy efficiency and reduced CO_2 emissions in local climate strategies. The mix of climate mitigation and climate adaptation issues is challenged with the state mandated local adaptation plans, and this may serve to single out adaptation in the same overall framing of strategic green development. Decoupling adaptation and mitigation may also serve to remove a general attention at the level of local municipal organisations, when the adaptation plan is finalised or until the next major extreme weather event, in particular in those municipalities where adaptation to a large extent is perceived to be an environmental issue. Decoupling mitigation and adaptation as policy issues may also change the perception of temporal and spatial frames of climate change and the urgency of policy responses as climate change impacts present themselves as already present.

Hence, size and ability to change institutional processes and perceptions influence the capacity of municipalities to be proactive for future events and fill gaps in knowledge and competencies and cumulate these. In this perspective, integration of climate adaptation policy concerns and coordination across the municipal organisation potentially promote adaptive capacity of local governance institution, as well as adaptive capacity is conditioned by a responsiveness to the climate adaptation agenda and thus climate adaptation integration.

References

Adelle, C. & Russel, D., 2013: Climate Policy Integration: a Case of Déjà Vu? Environmental Policy and Governance 23: 1–12.

Adger, W. & Vincent, K., 2005: Uncertainty in adaptive capacity. Comptes Rendus Geosciences 337(4), 399–410.

Adger, W.N., Arnell N.W. & Tomkins E.L., 2005: Successful adaptation to climate change across scales. Global Environmental Change 15: 77-86.

Agrawal, A., 2008: The Role of Local Institutions in Adaptation to Climate Change. Paper prepared for the Social Dimensions of Climate Change, Social Development Department, The World Bank, Washington DC, March 5-6, 2008, pp. 1-65.

Alasuutari, P., 2009: The rise and relevance of qualitative research. International Journal of Social Research Methodology 13(2), 139-155.

Andersen, N.Å., 1995: Selvskabt forvaltning, Frederiksberg: Nyt Fra Samfundsvidenskaberne.

Berman, R., Quinn, C. & Paavola, J., 2012: The role of institutions in the transformation of coping capacity to sustainable adaptive capacity. Environmental Development 2(0), 86-100.

Bowen, G.A. 2009: Document Analysis as a Qualitative Research Method. Qualitative research journal 9(2), 27-40.

Burch, S., 2010: Transforming barriers into enablers of action on climate change: Insights from three municipal case studies in British Columbia, Canada. Global Environmental Change 20(2), 287-97.

Bulkeley, H., 2013: Cities and Climate Change. Abingdon: Routledge.

Bækgaard, M., 2008: ”Politisk og administrativ organisering i danske kommuner: Strukturreformens betydning”, Politica 40: 349-368.

Danish Government, 2008: Danish National Strategy for Adaptation to Climate Changes [Strategi for tilpasning til klimaændringer i Danmark]. Copenhagen: Energy Agency.

Danish Government, 2012: How We Manage Cloudbursts and Rains. Action Plan for Climate Proofing in Denmark [Sådan håndterer vi skybrud og regnvand. Handlingsplan for klimasikring af Danmark]. Copenhagen: Agency of the Environment.

Danish Government and Local Government, Denmark, 2012: The Annual Financial Agreement 2013. Available at: http://www.fm.dk/nyheder/pressemeddelelser/2012/06/aftale-om-kommunernes-oekonomi-for-2013_groen-omstilling-og-udvikling-af-velfaerd/~/media/Files/Nyheder/Pressemeddelelser/2012/06/KL%20afta

le/aftale_kommunernes%20økonomi%20for%202013.ashx (accessed June, 2013).

Danish Society for Nature Conservation [Danmarks Naturfredningsforening] 2009: Climate Adaptation Policy [Klimatilpasningspolitik]. Copenhagen: Danish Society for Nature Conservation.

Denzin, N.K. & Lincoln, Y.S., 1998: Handbook of Qualitative Research. London: Sage Publishers.

Dixit, A., McGray, H., Gonzales, J. & Desmond, M., 2012: Ready or Not – Assessing National Institutional Capacity for Climate Change Adaptation. Washington DC: World Resources Institute.

Dodman, D. & Satterthwaite, D., 2008: Institutional Capacity, Climate Change Adaptation and the Urban Poor. IDS Bulletin 39(4): 67-74.

Fereday, J. & Muir-Cochrane, E., 2006: Demonstrating rigor using thematic analysis: A hybrid approach of inductive and deductive coding and theme development. International Journal of Qualitative Methods 5(1), 80–92.

Flyvbjerg, B., 2001: Making Social Science Matter. Cambridge: Cambridge University Press.

Gupta, J., 2010. Mainstreaming climate change: a theoretical exploration. In Mainstreaming Climate Change in Development Cooperation, Gupta J, Van Der Grijp N (eds). Cambridge University Press: Cambridge, pp. 67–96.

Hall, P.A. & Taylor, R.C.R., 1996: Political science and the three new institutionalisms. Political Studies 44 (5), 936–957.

Hellesen, T., Lund, D.H., Nellemann, V. & Sehested, K., 2010: Climate Policy in Danish Municipalities – an overview [Klimatilpasning i de danske kommuner – et overblik]. Working Paper [Arbejdsrapport] no. 121, Skov & Landskab, Frederiksberg: University of Copenhagen.

Hertin J. & Berkhout F., 2003: Analysing institutional strategies for environmental policy integration. Journal of Environmental Policy and Planning 5, (1), 39–56.

IDA, 2012: Climate Proofing of Denmark – IDA's Climate Adaptation Strategy (Klimatilpasning af Danmark – IDAs klimatilpasningsstategi]. Copenhagen: Ingeniørforeningen, IDA. Available at:
http://ipaper.ipapercms.dk/IDA/Politik/Klimatilpasning/?Page=3
(accessed March 2013).

Ivey, J., Smithers, J.S., de Loë, R.C. & Kreutzwiser, R.D., 2004: Community capacity for adaptation to climate-induced water shortages: linking institutional complexity and local actors. Environmental Management 33(1), 36-47.

Jensen, A., Bommel, S., Pedersen, A.B., Nielsen, H.Ø. & Kuindersma, W. 2013: Framing Climate Change: New directions in Dutch and Danish planning strategies, Planning Theory and Practice 14(2), 233-247.

Jordan, A. & Lenschow, A., 2010: Policy paper. Environmental policy integration: a state of the art review. Environmental Policy and Governance 20:147–158.

Kelly, P.M. & Adger, W.N., 2000: Theory and Practice in Assessing Vulnerability to Climate Change and Facilitating Adaptation. Climatic Change 47(4), 325-352.

Kern, K. & Bulkeley, H., 2009: Cities, Europeanization and Multi-level Governance: Governing Climate Change through Transnational Municipal Networks. Journal of Common Market Studies 47(2), 309-332.

Klimatilpasning.dk, 2013: Municipal Climate adaptation plans. Available at http://www.klimatilpasning.dk/kommuner/klimatilpasningsplaner.aspx (accessed March, 2013).

Klimatilpasning.dk, 2014: Status of the Climate Adaptation Plans. Available at http://www.klimatilpasning.dk/kommuner/ (accessed January, 2014).

Knox, S. & Burkard, A.W., 2009: Qualitative research interviews. Psychotherapy Research 19(4-5), 566-575.

Kok, M.T.J. & de Coninck, H.C., 2007: Widening the scope of policies to address climate change: directions for mainstreaming. Environmental Science & Policy 10(7–8), 587-599.

Kvale, S. & Brinkmann, S., 2008: InterViews: Learning The Craft Of Qualitative Research Interviewing. London: Sage.

Lafferty, W.M. & Hovden, E. 2003: Environmental policy integration: towards an analytical framework. Environmental Politics 12(3), 1–22.

Measham T.G., Preston B.L., Smith T.F., Brooke C., Gorddard R. Withycombe G. & Morrison C., 2011: Adapting to climate change through local municipal planning: barriers and challenges. Mitigation and Adaptation Strategies for Global Change 16(8), 889-909.

Mickwitz, P. & Kivimaa P., 2007: Evaluating Policy Integration: The Case of Policies for Environmentally Friendlier Technological Innovations. Evaluation 13(1), 68-86.

Mickwitz, P., Aix, F., Beck, S., Carss, D., Ferrand, N., Görg, C., Jensen, A., Kivimaa, P., Kuhlicke, C., Kuindersma, W., Manez, M., Melanen, M., Monni, S., Pedersen, A.B., Reinert, H. & van Bommel, S., 2009: Climate Policy Integration, Coherence and Governance. PEER Report No. 2, Helsinki: Partnership for European Environmental Research.

Næss, L.O., Bang, G., Eriksen, S. & Vevatne, J., 2005: Institutional adaptation to climate change: Flood responses at the municipal level in Norway. Global Environmental Change, 15 (2), 125-138.

Nilsson, M. & Persson, A., 2003: Framework for analysing environmental policy integration. Journal of Environmental Policy & Planning 5(4), 333-359.

North, D.C., 1990: Institutions, institutional change and economic performance. Cambridge: Cambridge University Press.

Næss, L.O., Bang, G., Eriksen, S. & Vevatne, J., 2005: Institutional adaptation to climate change: Flood responses at the municipal level in Norway. Global Environmental Change 15: 125-138.

Packer, J., 2010: What is an Archive?: An Apparatus Model for Communications and Media History. The Communication Review 13(1): 88-104.

Pelling, M., High, C., Dearing, J. & Smith, D., 2008: Shadow spaces for social learning: a relational understanding of adaptive capacity to climate change within organisations. Environment and Planning 40(4), 867-884.

Petersen, L.K., Ejrnæs, R., Jensen, A., Levin, G., Zandersen, M. & Brunbjerg, A.K., 2014: Parcelhushaven - en del af byens natur. Aarhus Universitet, DCE – Nationalt Center for Miljø og Energi, 86 s. - Videnskabelig rapport fra DCE - Nationalt Center for Miljø og Energi nr. 90.

Seidman, I. (2013). Interviewing as qualitative research: a guide for researchers in education and the social sciences, 4th ed. New York: New York, Teachers College Press.

Sharp, L. & Richardson, T., 2001: Reflections on Foucauldian discourse analysis in planning and environmental policy research. Journal of Environmental Policy and Planning 3(3), 193-209.

Smit, B. & Wandel, K., 2006: Adaptation, adaptive capacity and vulnerability. Global Environmental Change 16:282–292.

Storbjörk, S. & Hedrén, J., 2011: Institutional capacity-building for targeting sea-level rise in the climate adaptation of Swedish coastal zone management: lessons from Coastby. Ocean and Coastal Management 54: 265–273.

Statistical Agency Denmark, Data on Municipalities. Available at: http://www.dst.dk/da/Statistik/emner/kommuner-paa-landkortet.aspx, (accessed March, 2013).

Swart, R. & Raes, F., 2007: Making integration of adaptation and mitigation work: mainstreaming into sustainable development policies? Climate Policy 7: 288–303.

Söderberg, C., 2011: Institutional conditions for multisector environmental policy integration in Swedish Bioenergy Policy. Environmental Politics 20:4, 528-546.

Tompkins, E.L. & Adger, W.N. 2005: Defining response capacity to enhance climate change policy. Environmental Science and Policy 8(6), 562-571.

Yin, R., 2000: Case Study Research: Design and Methods. Beverly Hills, CA: Sage.

Yohe, G. & Oppenheimer, M. 2011: Evaluation, characterization, and communication of uncertainty by the intergovernmental panel on climate change - an introductory essay. Climate Change 108(4), 629-639.

Young, O., 1998. Institutional dimensions of global environmental change, science plan. IHDP Report No. 9. http://www.ihdp.uni-bonn.de/html/publications/reports/report09/ (Accessed April 2004)

Zandersen, M., Jensen, A., Termansen, M., Buchholtz, G., Munter, B. Blemmer, M., Bruun, H.G. & Andersen, A.H., 2014: *Ecosystem Based Approaches to Climate Adaptation – Urban Prospects and Barriers.* Research report no. 83, DCE – Danish Centre for Environment and Energy, Aarhus University, Department of Environmental Science.

Aarhus Municipality, 2007: A Vision of 'recreation for Aarhus Aa From the Brabrand Lake to Aarhus Port [Rekreativ vision for Aarhus Å – Fra Barbrand Sø til Aarhus Havn], Aarhus: Technical and Environmental Department, Aarhus Muncipality.

Aarhus Municipality, 2010: Statistical 10 year review 2001-2010. Available at: http://www.aarhus.dk/da/aarhus/Aarhus-i-tal/Statistisk-tiaarsoversigt-2001-2010.aspx accessed February 2013

Aarhus Municipality, 2011: A Society Based on Intelligent Energy. Climate Plan 2012-2015 [Det intelligente Energisamfund. Klimaplan 2012-2015]. Aarhus: Technical and Environmental Department, Aarhus Muncipality.

Aarhus Municipality, 2013: Agreement on Governing, Structure and Collaborative Culture, [Aftale om styring, struktur og samarbejdskultur], Aarhus: Municipality of Aarhus.

Appendix A. Interview guide for interviews in the case municipalities

The objective of the interviews is thus to inform our case studies on institutional drivers and barriers for climate change adaptation at the level of local governance. In combination with document analysis, the interviews serve as main method for data production for the empirical study. The interviews are open-ended, face-to-face, semi-structured and in-depth, aimed at constructing the meaning relations behind the issues of the study, as well as acquiring specific knowledge. The interviews will be recorded, and selected passages transcribed for the analysis.

In particular, we investigate how climate adaptation policy is integrated in local policy making (EPI, compartmentalised local government), how the landscape of key actors enables or blocks local government's capacity for climate adaptation policy actions (network governance), how which types of information and of prior experience with climate change impacts move climate adaptation policy actions forward and / or lack (information, priority).

This suggests that the interviews focus on

- drivers / barriers connected to the organisation of climate adaptation policy action, e.g. sectoral planning, networks , new forms of collaboration
- how climate adaptation issues are integrated in the specific agendas of local government
- which prior experiences with and perceptions of climate change impact the local government organisation collectively build their climate adaptation policy actions on
- which role other levels of climate adaptation policy have for the capacity to manage and the approach adopted to manage impacts of climate change
- how are costs and benefits of climate adaptation policy actions, quantifiable as well as non-quantifiable, perceived, including in relation to specific actor groups, included, avoided, exploited and managed
- Local capacity to manage impacts of climate change

The interviews hence covered the following themes and for each interview, these were structured as a proper interview guide and adjusted to the interviewee / the case municipality.

Interview guide – themes to address

<u>Experience with climate change impacts</u>

- Experienced impacts of climate change
- Which events
- Which impacts are experienced as risks, hazards that need to be managed

<u>Approach to climate adaptation policy</u>

- What does adaptation mean for involved actors
  - How is climate adaptation policy specified (and in sectoral terms)
  - How is it operationalized

- Which adaptation issues are specified within a sectoral approach, which are conceptualized within
- International collaborations – new forms, or…
- Mix of mitigation and adaptation
- What type of challenge does climate adaptation policy pose? i.e. technical, social, etc.
  - Municipals want this area quantified to act – how far is it possible to quantify and at what other cost?
  - Who pays the non-financial costs???
- Granted a position in the strategic development of the municipality

Position of climate adaptation policy in local governance

- Which priority
- Integrated in local development strategies?
- Municipalities focus on MULTIFUNCTIONALITY in adaptation strategies – how is this done locally
- In the local policy organisation, to what extent is climate change accepted as an issue of planning? And the planning of which department?
- Who have taken initiatives, been in the lead and active, etc.
- Range of stakeholder interests
  - Who wins and who loses
- Which interests have to be balanced – between actors, between human-nature

Organisation of local climate adaptation governance

- Who are considered as relevant actors to manage impacts of climate change
- Roles
- Responsibilities

Local governance network – partnerships?

- Where is climate adaptation policy formally located in the organisation of local governance
- Insurance?

Role of higher levels of governance

- Perception of adequacy of climate adaptation policy actions at national and international level
- Crowded local governance agendas – the diversity and full demands faced by local government
- Local government merely implementing agents for state climate change regulation?
- Which incentives are presented for acting
- Is there legal and/or experienced room for action or is the local level more acting out the regulations and directions of national level climate adaptation policy

Managing the impacts of climate change

- To what extent are technical solutions favoured or seen as optimal
- What initiatives are launched

- Which efforts are taken to develop the mandatory climate adaptation plan?
- What has worked and why?
- What do the key actors see as ideal actions to manage local impacts of climate change – and what is the current one?

Knowledge

- Uncertainty
- Are the types of knowledge needed and appropriate level of detail available?
- Which are important to you?

Change

- What is approached or managed differently than before the risks of climate change entered?
  - Articulations of risks, local governance issues, roles, etc., priorities.
  - Procedures, allocation of resources.

Final issue

- What could be done differently to make climate adaptation policy actions better, more solid, quicker, etc.?

Appendix B. Guide of analysis for climate adaptation policy documents

- Which impacts and experience with impacts are included?
- Which actions are specified, e.g.:
  - Specific measure outline, including temporal horizon and scale
  - Strategic importance
  - Approach: Is it a 'hard' measure (new or higher dams or other water barriers, new sewage channels, etc.); reflexive (including feedback loops, testing novel technologies, monitoring and warning systems, participation, etc.); or structural changes (using ESS, green infrastructure, new planning principles
  - Does the approach represent and / or imply a change of local governance?
- Which (other) sectors are involved – to what extent does the measure and approach cross-sectoral / comprehensive climate policy integration?
- Which forms of intervention do the adaptive measures include?
  - How to establish an effect, e.g. change of behaviour.
- Who are appointed agency?
  - Leaders, officials from the technical and / or environmental departments / offices / centres
  - Municipal actors from other policy areas
  - Private developers, residents, consultants, etc.
  - National support
- How is knowledge represented?
  - Lack / need of more detailed / new forms of knowledge
  - Which forms of knowledge are included
  - Which forms legitimize the approach and actions
- How is the action(s) presented to induce costs or new options for the municipality?
- Which barriers for adaptation are included?

Appendix C. Survey questionnaire on Climate Adaptation for Danish Municipalities

Appendix C documents the results of the survey carried out among Danish municipalities. Due to the Danish speaking respondents in the municipalities, the survey questionnaire was conducted in Danish. Thus, the questions and the preliminary survey results were conducted in Danish, whereby this appendix is written in Danish, unlike the other parts of the present report.

Spørgeskema til danske kommuner om Klimatilpasning

Dette spørgeskema er et led i en undersøgelse af de institutionelle barrierer, som kommuner oplever i deres arbejde med tilpasning til klimaforandringer, både i forbindelse med udarbejdelse af klimatilpasningsplanen og mere generelt. Undersøgelsen er uafhængig og foretages af forskere ved Aarhus Universitet.

Både i ind- og udland får tilpasning til klimaforandringer på lokalt niveau stigende opmærksomhed, især som det viser sig at usikkerhed om faktiske og lokale ændringer og udfordringernes kompleksitet er betragtelige. Dette forskningsprojekt fokuserer på at afdække hvordan kommunerne håndterer disse udfordringer. Ud over spørgeskemaundersøgelsen indgår også case studier og litteratur review i undersøgelsens data indsamling.

Alle besvarelser er anonyme og behandles fortroligt. Undersøgelsens resultater bliver generaliseret og offentliggjort.

Vi værdsætter meget, at du tager dig tid til at besvare spørgsmålene og dele din viden og erfaringer med os. Spørgeskemaet tager ca. 15 min at udfylde.

Vær opmærksom på, at der er forskellige typer svarmuligheder og for nogen spørgsmål kan du give flere svar.

Klimaforandringer: erfaringer og forventninger

1. I hvilken grad forventer I, at klimaændringer vil medføre følgende udfordringer i jeres kommune?
   SKALA: I høj grad, I nogen grad, I mindre grad, Slet ikke, Ved ikke, Ikke relevant.
   a. Oversvømmelser fra nedbør / grundvand
   b. Oversvømmelser fra havet
   c. Øget kysterosion
   d. Uønskede dyre / plantearter
   e. Stormskader
   f. Vækst i allergier / infektioner
   g. Sundhedsproblemer pga. hedebølger
   h. Indeklimaproblemer
   i. Færre naturværdier
   j. Vandmangel

2. I hvilken grad har I i kommunen inden for de seneste fem år oplevet følgende klimarelaterede problemer?
   SKALA: I høj grad, I nogen grad, I mindre grad, Slet ikke, Ved ikke, Ikke relevant.
   a. Ekstrem nedbør
   b. Voldsomt snefald
   c. Hyppigere / kraftigere storme
   d. Lokale hedebølger
   e. Tørke
   f. Ændringer i grundvandsspejl
   g. Havspejlsstigning
   h. Andet

3. Oplever I en stigning i henvendelser til kommunen om klimarelaterede hændelser?
   Svarkategorier: Ja – en del, Ja - lidt, Nej, Ved ikke.
   a. Fra borgere
   b. Fra erhvervsliv
   c. Fra andre dele af den offentlige forvaltning
   d. Fra forsyningsselskaber
   e. Fra andre aktører

Udformning af indsatsen for klimatilpasning

4. Hvilke konkrete initiativer er sat i gang i forbindelse med udarbejdelse af klimatilpasningsplan?
   Svarkategorier: Ja, i høj grad; ja, i nogen grad; nej, men planlægger at gøre det inden for 1 år; nej. Ved ikke, ved at tilpasser eksisterende initiativer.
   a. Kortlægning af risici (oversvømmelsestruede områder mv)
   b. Kortlægning af behov for klimatilpasninger for forskellige områder (bygninger, veje, spildevandsanlæg mv.)
   c. Udredning af vidensbehov
   d. Investeringer i ny infrastruktur – fx- regnvandsbassiner, opgradering af spildevandssystemer mv.
   e. Nyansatte med speciel kompetence i eller efteruddannelse af medarbejdere i klimatilpasningstiltag (herunder teknologiske)
   f. Andet:_____

5. Hvilket stadie er arbejdet med at udarbejde en klimatilpasningsplan / -strategi?
   Sæt gerne kryds ved flere
   a. Arbejdsgruppe nedsat
   b. Oversigt over indsatsområder
   c. Handlingsplan
   d. Klimatilpasningsplanen forventes færdig inden for 6 måneder
   e. Andet:_____

6. Hvilke aktiviteter / områder forventes at indgå i klimatilpasningsplanen
   SKALA: I høj grad, I nogen grad, I mindre grad, Slet ikke, Ved ikke, Ikke relevant.
   a. Arealplanlægning
   b. Byfornyelse, bygningsreglement
   c. Erhvervsudvikling
   d. Sport og fritid
   e. Børne- ungeområdet

f. Innovationsstøtte
g. Parker og grønne områder
h. Udvikling af havneområder
i. Rådgivning af bygherre
j. Rådgivning af landmænd
k. Andet:_____

7. I hvilken grad indgår klimatilpasning i kommunens andre strategier og planer?
   SKALA: I høj grad, I nogen grad, I mindre grad, Slet ikke, Ved ikke, Ikke relevant.
   a. Spildevandsplaner
   b. Lokalplaner
   c. Kommuneplanens hovedstruktur
   d. Bydudviklingsstrategi
   e. Naturstrategi
   f. Naturplaner
   g. Vandstrategi
   h. Vandforsyningsplaner
   i. Friarealstrategi
   j. Trafikstrategi
   k. Skovrejsningsplaner
   l. Jordbrugsstrategi
   m. Sundhedsstrategi
   n. Andet: _____

Organisering af klimaindsatsen

8. I hvilken grad er medarbejdere fra andre dele af den kommunale forvaltning involveret i udformning af klimatilpasningsplanen
   SKALA: I høj grad, I nogen grad, I mindre grad, Slet ikke, Ved ikke, Ikke relevant.
   a. Spildevandskontor / afdeling
   b. Planlægningsafdelingen, herunder byfornyelse
   c. Byggesagsbehandling
   d. Naturforvaltning
   e. Trafikforvaltning
   f. Fritid
   g. Økonomiforvaltningen
   h. Sundhed
   i. Andre enheder, angiv venligst hvilke:_____

9. Hvordan er arbejdet med klimatilpasningsindsatsen organiseret?
   a. Er der udpeget en koordinator eller ansvarlig for klimatilpasningsindsatsen?
      Ja, Nej, Ikke relevant, Ved ikke
      Hvis ja, hvilken afdeling er koordinator så tilknyttet:_____
   b. Er der oprettet et koordinationsforum arbejdet med klimatilpasningsplanen internt i Teknik- og Miljøforvaltningen?
      Ja, Nej, Ikke relevant, Ved ikke
      Er der oprettet et koordinationsforum for arbejdet med klimatilpasningsplanen med deltagelse af embedsmænd fra andre kommunale forvaltninger?
      Ja, Nej, Ikke relevant, Ved ikke
      Hvis ja, hvilke afdelinger er så repræsenteret:_____

c. Er der koordinationsfora, hvor vandselskabet deltager?
Ja, Nej, Ikke relevant, Ved ikke
Hvis ja, så hvilke(t):_____

10. Hvordan opleves klimatilpasningsindsatsen som en udfordring i kommunen?
Angiv venligst hvor enig du er i hvert af nedenstående udsagn
Skala: Meget enig, Enig, Hverken/eller, Uenig, Meget uenig, Ved ikke/ikke relevant
a. Klimatilpasning anses for at have stor betydning for kommunens ve og vel
b. Klimatilpasning inddrages centralt i kommunens strategier
c. Klimatilpasning inddrages kun når den samtidig gavner kommunens erhvervsindsats
d. Hensyn til klimatilpasning og tilpasningsinitiativer er afhængig af lokale ildsjæle
e. Der er en bred erkendelse af at tilpasning nu er bedre og billiger end tilpasning i morgen
f. Klimatilpasning kæmper om opmærksomhed med kommunens udfordringer inden for veje, børn og unge, skoler, det sociale område, et kriseramt erhvervsliv, mv.
g. Udvikling af initiativer for klimatilpasning er betinget af dokumentation af behov og/eller virkning af initiativer
h. Klimatilpasning er afhængig af ressourcer som kommunen måske ikke råder over
i. Klimatilpasning kræver store omkostninger
j. Andet:_____

11. Hvordan oplever du prioriteringen af klimatilpasning?
Angiv venligst hvor enig du er i følgende udsagn.
Skala: Meget enig, Enig, Hverken/eller, Uenig, Meget uenig, Ved ikke/ikke relevant
a. Klimatilpasning står højt på dagsordenen i min afdeling
b. Klimatilpasning står højt på dagsordenen i kommunen
c. Klimatilpasning har de kommunale politikeres bevågenhed
d. Klimatilpasning har stor bevågenhed fra den administrative ledelse i Teknik- og Miljøforvaltningen
e. Klimatilpasning har stor bevågenhed fra kommunens generelle administrative ledelse
f. Der er bevågenhed omkring behovet for klimatilpasning bredt blandt kommunens ansatte
g. Der afsættes løbende de nødvendige ressourcer (økonomisk, efteruddannelse, mandemåneder)
h. Ved ny-ansættelser indgår kompetencer der er relevante for klimatilpasning

Samarbejde om klimatilpasning indsatsen

12. Hvordan oplever du samarbejdet om klimatilpasning internt i kommunen.
Angiv venligst, hvor enig du er i følgende udsagn.
Skala: meget uenig, uenig, hverken/eller, enig, meget enig. Ved ikke/ikke relevant.
a. Der er stor interesse blandt berørte forvaltninger og kontorer
b. Der er en udbredt opfattelse af at tilpasning ikke er presserende
c. Der mangler opbakning fra andre forvaltninger

d. Klimatilpasning skaber konflikter, fordi det skærer ind over andre forvaltningers arbejdsfelter

13. Hvordan foregår samarbejdet omkring klimatilpasning med nabokommuner
    Sæt kryds ved det eller de svar der passer bedst
    a. Formaliseret i fælles projekter
    b. Formaliseret i fælles og vedtagne aftaler om byrdedeling
    c. På ad hoc basis
    d. Gensidig inspiration
    e. Vi deler opgaverne mellem os hvor relevant
    f. Der er ikke noget samarbejde

14. Borgerinddragelse
Sæt kryds ved det eller de svar der passer bedst
    a. Kommunen prioriterer at involvere potentielt berørte borgere i klimatilpasningsindsatsen
    b. Kommunen gennemfører konkrete aktiviteter for at involvere borgerne i klimatilpasningsindsatsen
    c. Flertallet af borgerne kender ikke til kommunens klimatilpasningstiltag
    d. Flertallet af borgerne interesserer sig ikke for klimaforandringer

15. Virksomhedssamarbejde
    Sæt kryds ved det eller de svar der passer bedst
    a. Kommunen samarbejder med virksomheder om tilpasningsteknologier
    b. Virksomheder indgår i arbejdsgrupper som arbejder med klimatilpasningsplanen/-strategien
    c. Lokale virksomheder involveres i den konkrete udformning af tilpasningstiltag
    d. Erhvervsnetværk i kommunen indgår på et strategisk niveau i idéudvikling der skal styrke kommunens klimatilpasningsindsats

16. Hvilken rolle spiller den statslige ramme for kommunen.
    Angiv venligst hvor enig du er i følgende udsagn.
    Skala: Meget enig, Enig, Hverken/eller, Uenig, Meget uenig, Ved ikke/ikke relevant
    a. Der er ikke meget manøvrerum til at lave vores egen indsats
    b. Staten giver den nødvendige sparring og tilbyder specialiseret ekspertise
    c. Statslige aktører kan være behjælpelige med svære prioriteringer
    d. Det statslige regelsæt er uigennemskueligt
    e. Det statslige regelsæt er for uambitiøst

Viden – både om fremtidens klimaforandringer og om brugbare handlemuligheder

17. Hvordan er adgangen til viden i/for kommunen?
    SKALA: I høj grad, I nogen grad, I mindre grad, Slet ikke, Ved ikke, Ikke relevant.
    a. Oplever I at den nødvendige viden om de forventede ændringer i klimaet er tilgængelig?
    b. – på tilstrækkelig detaljeret niveau?
    c. Oplever I at den nødvendige viden om kommunens handlemuligheder er tilgængelig, fx om konkrete tiltag?

18. Hvilke kilder til viden om fremtidens ændrede vejr og betydning for kommunens geografi finder i særligt brugbare?
    SKALA: I høj grad, I nogen grad, I mindre grad, Slet ikke, Ved ikke, Ikke relevant.
    a. Kommunens egne eksperter
    b. Rådgivere fra Klimaministeriet / Miljøministeriet
    c. Konsulentvirksomheder og private rådgivere, inkl. Ingeniørvirksomheder og arkitektfirmaer
    d. DMI
    e. Klimaportalen eller andre statslige sider
    f. Sider og fora på internettet

Åbne spørgsmål

19. Hvad har i kommunen vist sig som svært i forhold til at udarbejde en tilpasningsplan / -strategi?

    _____

20. Hvilke særlige forhold i kommunen (både internt i kommunen og ude i kommunen) fremmer eller hæmmer jeres indsats for klimatilpasning?

    _____

Appendix D. Survey of institutional barriers for climate adaptation in Danish municipalities

Introduktion: formål og baggrund

Denne rapport analyserer resultaterne af en spørgeskemaundersøgelse om danske kommuners klimatilpasningsindsats. Spørgeskemaundersøgelsen indgår i en undersøgelse af institutionelle barrierer og muligheder for en tværgående klimatilpasningsindsats. Klimatilpasning har i høj grad handlet om indretningen af den fysiske infrastruktur. Men en vigtig dimension af samfundets tilpasningsevne til klimaforandringer er at sikre, at klimaforandringer bliver tænkt ind i andre politikområder, ligesom klimatilpasningspolitikken ikke må modarbejde politikker på andre områder. En sådan integration af klimatilpasningspolitikken med andre relevante politikområder kræver, at den offentlige forvaltning evner at 'tænke på tværs' og indretter procedurer, strukturer og kompetencer dertil. Da en stor del af klimatilpasningsindsatsen foregår i kommunerne, er det særlig interessant at undersøge, hvordan kommunerne håndterer udfordringen med at koordinere klimatilpasningen med planer og tiltag på andre politikområder. Kommuner skal udarbejde en handlingsplan for klimatilpasning, jf. aftalen om kommunernes økonomi for 2013 mellem KL og regeringen (klimatilpasning.dk 22.03.2013). Projektets konkrete formål er derfor at afdække institutionelle barrierer for en integreret klimatilpasning på kommunalt plan samt at pege på redskaber til at overvinde disse barrierer.

Spørgeskemaundersøgelsen skal således give et overblik over, hvordan kommunerne opfatter og planlægger opgaven klimatilpasning, hvordan klimatilpasningsindsatsen konkret er organiseret, samt i hvilket omfang tiltag og planer er integreret med andre politikområder. Foruden spørgeskemaundersøgelsen er der gennemført case studier af tre kommuner baseret på dokumenter og interviews.

Metode

Spørgeskemaet er udsendt elektronisk til navngivne personer i de kommunale forvaltninger. Personerne er identificeret via kommunernes hjemmesider som den person eller lederen af den organisatoriske enhed, der har ansvar for klimatilpasningen. Skemaet er udsendt til samtlige 98 kommuner i første halvdel af december 2012. Efter to rykkerrunder er der kommet svar fra 60 kommuner, dvs. en svarprocent på 61 procent.

En analyse af frafaldet viser, at de kommuner, der ikke har deltaget, i gennemsnit er lidt mindre end gennemsnittet af danske kommuner med et indbyggertal på 45.900 mod landsgennemsnittet på 57.060 (beregnet efter DST, 2010). Om end der er flere små kommuner blandt de ikke deltagende kommuner, fordeler frafaldet sig jævnt på kommunestørrelser. Deltagelsesgraden er nogenlunde lige stor blandt kommuner med kyst som blandt kommuner uden kyst. Til gengæld er frafaldet skævt fordelt mellem regionerne. Således har kun 40 pct. af kommunerne i region Syddanmark udfyldt skemaet, mens det i region Nordjylland er 80 pct. af kommunerne der har deltaget.

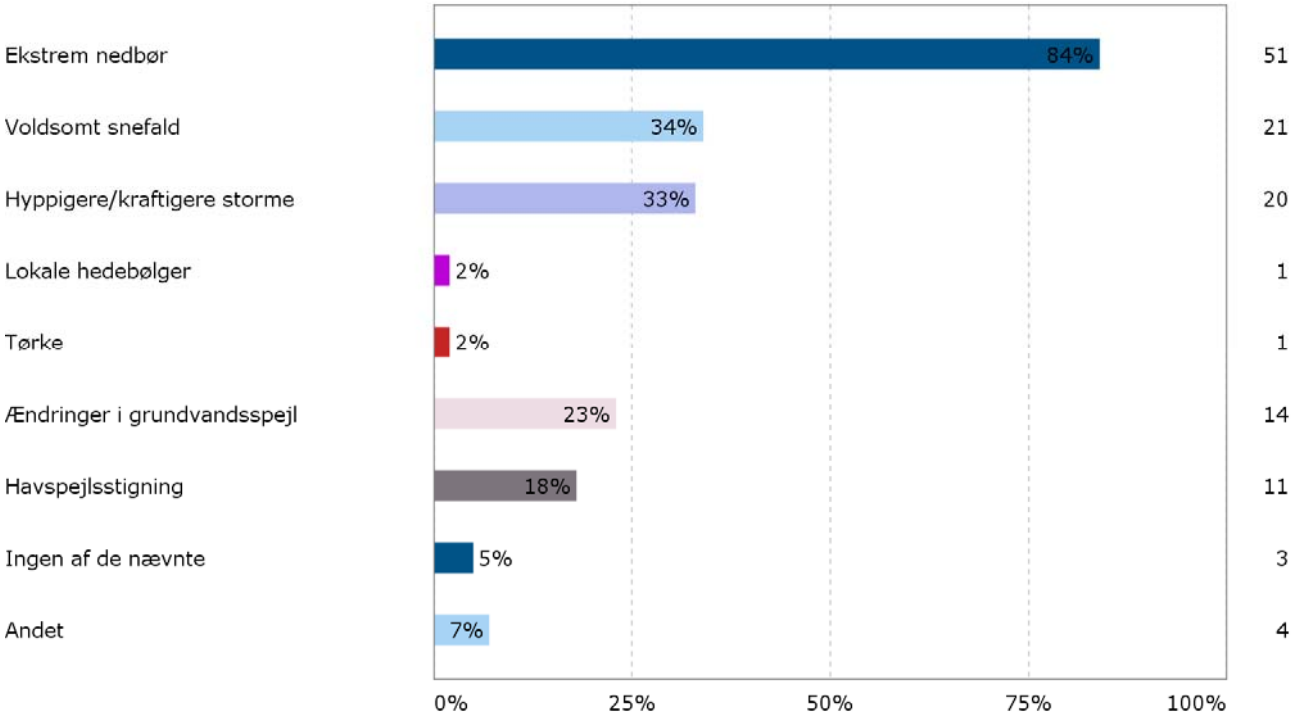
Klimatilpasningsindsatsen – undersøgelsens resultater

Analysen er inddelt efter følgende overordnede emner:

1. Konkrete erfaringer med og forventninger til klimaforandringer,
2. Klimatilpasningsindsatsens omfang og indhold
3. Organisering af arbejdet med klimatilpasning,
4. Eksternt samarbejde og
5. Viden

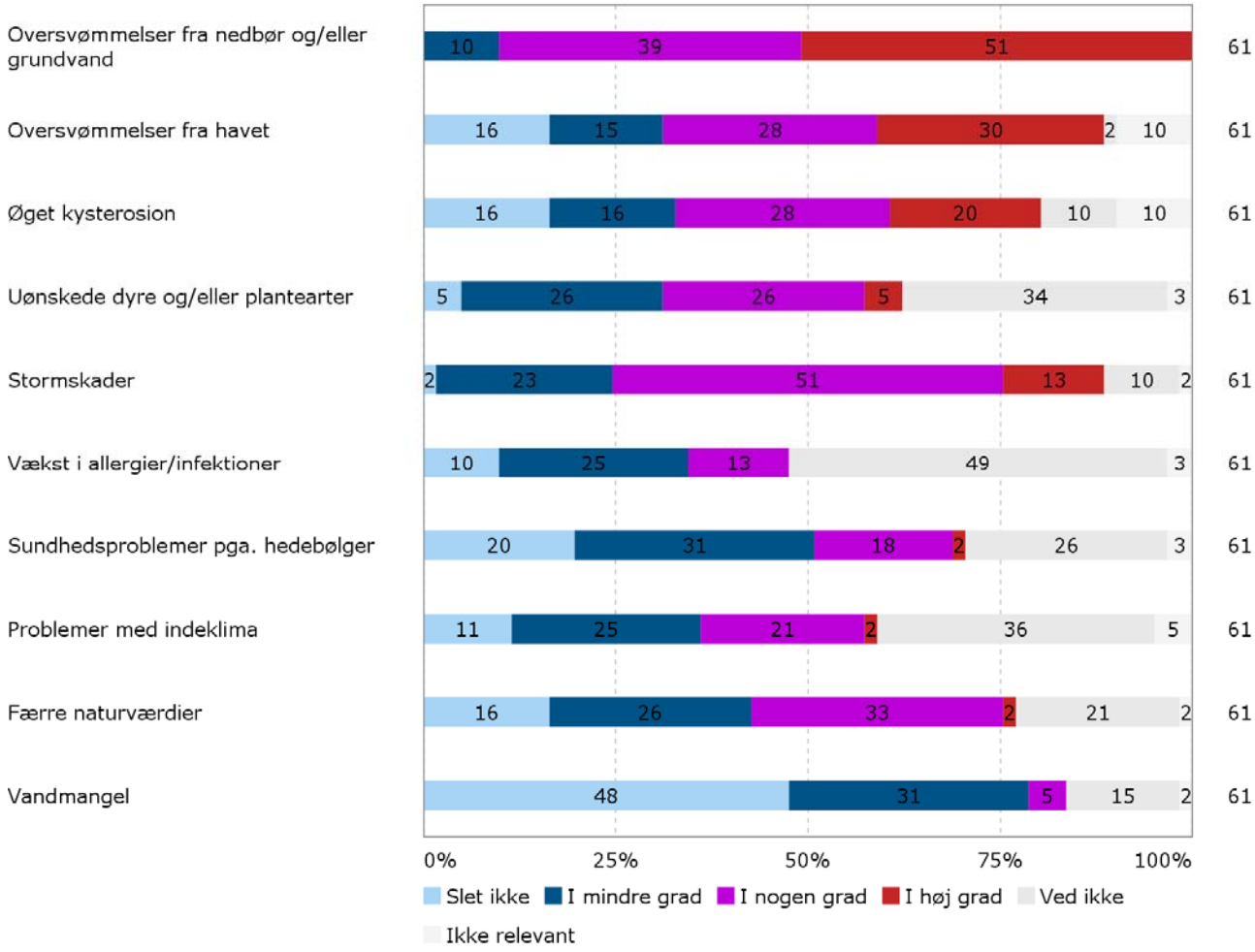
Klimaforandringer: erfaringer og forventninger

Indtil videre har klimaforandringerne først og fremmest vist sig i form af nedbør og kraftigere storme. Hele 84 procent af de deltagende kommuner har oplevet ekstrem nedbør, mens 1/3 har oplevet voldsomme snefald og hyppigere storme. Hertil kommer ændringer i grundvandsspejl og havspejlsstigninger (Figur A.1).



Figur A.1 Hvilke klimarelaterede problemer har I oplevet i kommunen inden for de seneste fem år?

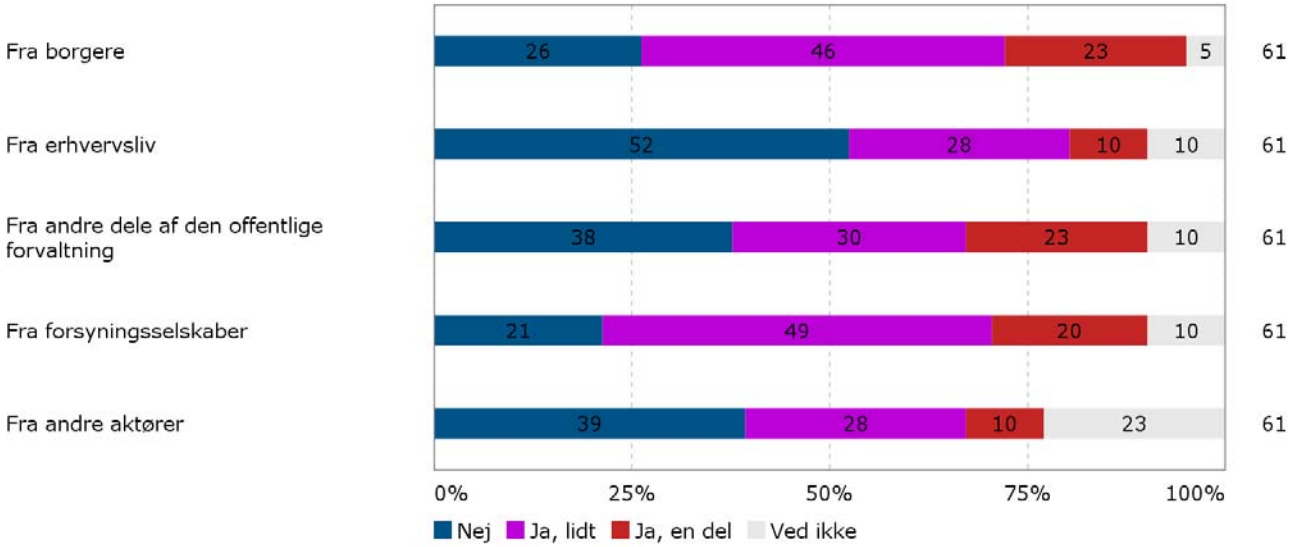
Erfaringerne afspejler sig også i forventningen til fremtidige klimarelaterede problemer, hvor der især er fokus på problemer forårsaget af stigende vandmængder (Figur A.2). Halvdelen af kommunerne forventer i høj grad oversvømmelser fra nedbør eller stigende grundvand, og yderligere 39 % forventer i nogen grad sådanne oversvømmelser. Oversvømmelser fra havet forventes også i nogen eller i høj grad i mere end halvdelen af kommunerne, 58 %. Også andre direkte udfordringer som stormskader forventes af en høj andel af kommuner, idet godt halvdelen forventer stormskader i nogen grad, mens yderligere 13 procent forventer stormskader i høj grad.



Figur A.2 I hvilken grad forventer I, at klimaændringer vil medføre følgende udfordringer i jeres kommune?

Undersøgelsen viser, at der er i mindre grad forventes effekter på natur og på sundhed, men også at der er forholdsvis stor usikkerhed omkring udfordringerne på disse områder. Eksempelvis svarer hele 49 procent 'ved ikke' på spørgsmålet, om kommunen forventer vækst i allergier og infektioner, mens 39 procent svarer 'ved ikke' på forventninger om flere uønskede dyre eller plantearter.

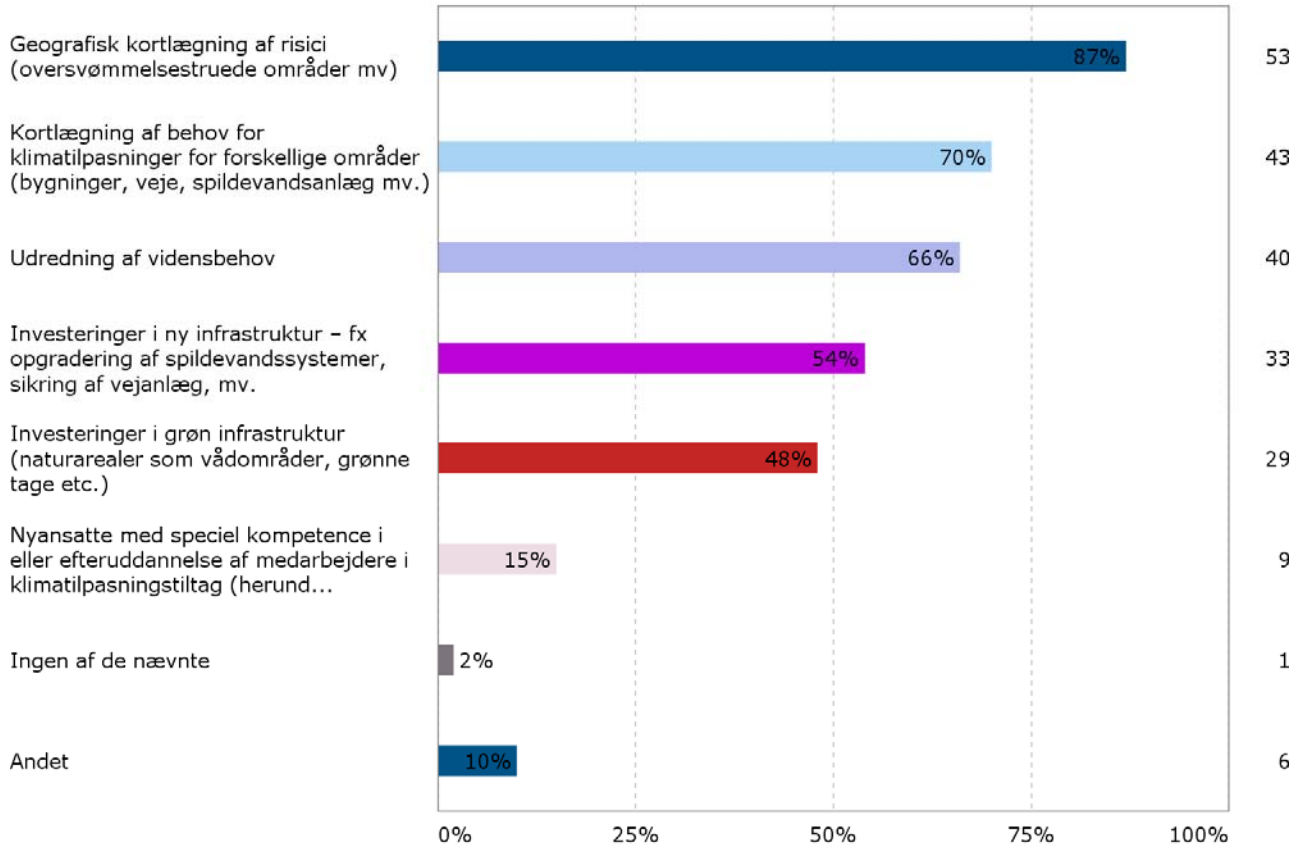
I en del kommuner har klimaændringerne har allerede manifesteret sig i en stigning i henvendelser til kommunen. Det gælder især henvendelser fra borgere, forsyningsselskaber og andre dele af den offentlige forvaltning, mens lidt færre kommuner har set en stigning i antallet af henvendelser fra erhvervslivet.



Figur A.3 Oplever I en stigning i henvendelser til kommunen om klimarelaterede hændelser?

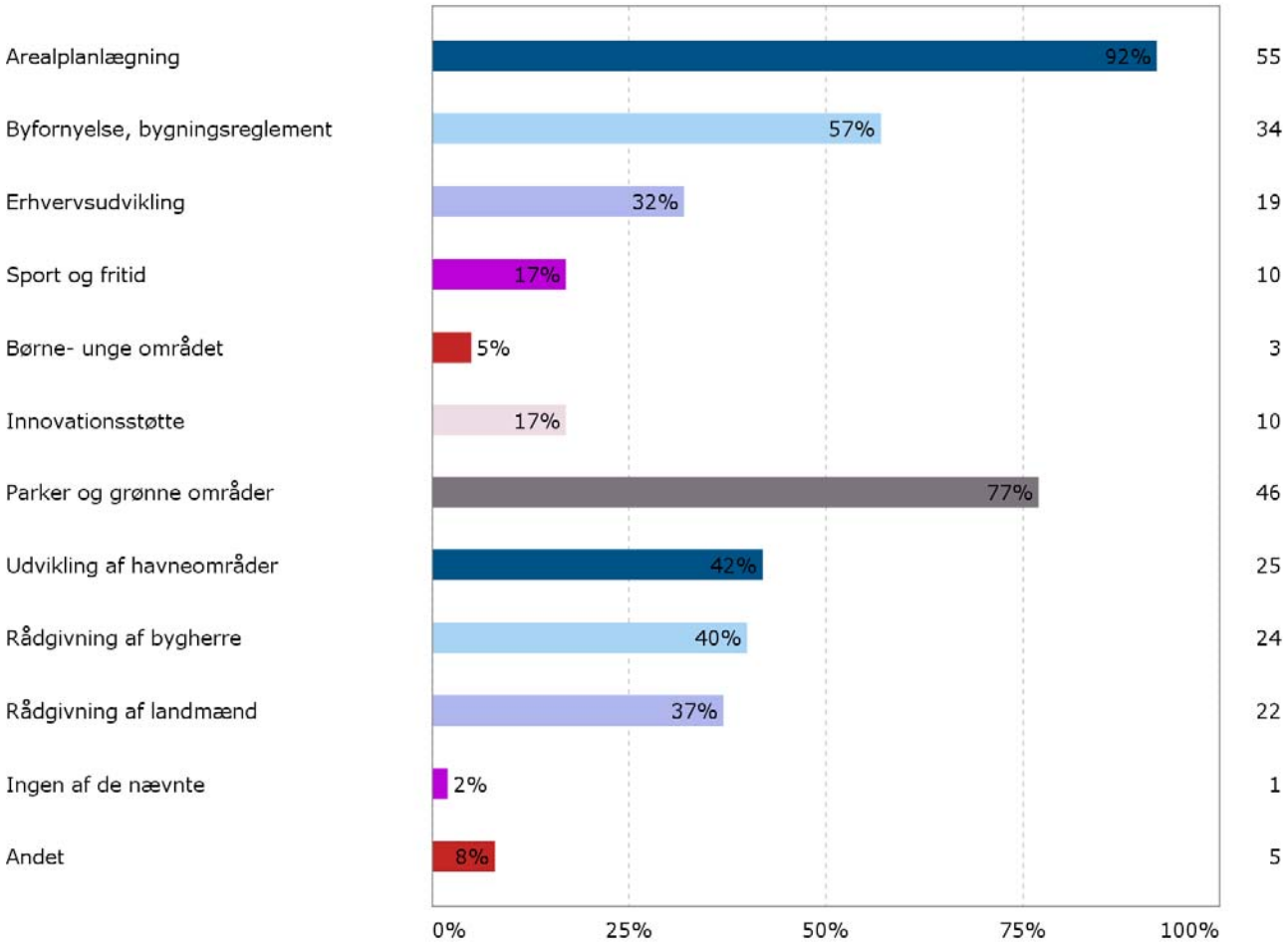
Klimatilpasningsplaner – omfang og indhold

Kommunerne er godt i gang med at kortlægge behovet for klimatilpasningsindsatsen. Næsten 9 ud af 10 kommuner har således i gangsat en geografisk kortlægning af risici, og den følges i 70 procent af kommunerne op af en kortlægning af behovet for tilpasning til klimaforandringer af infrastruktur som spildevandsanlæg og veje samt af viden. Men der er også foretaget investeringer; mere end halvdelen af de deltagende kommuner har således foretaget investeringer i infrastruktur som spildevandsanlæg men også i grøn infrastruktur såsom våde enge (Figur A.4).



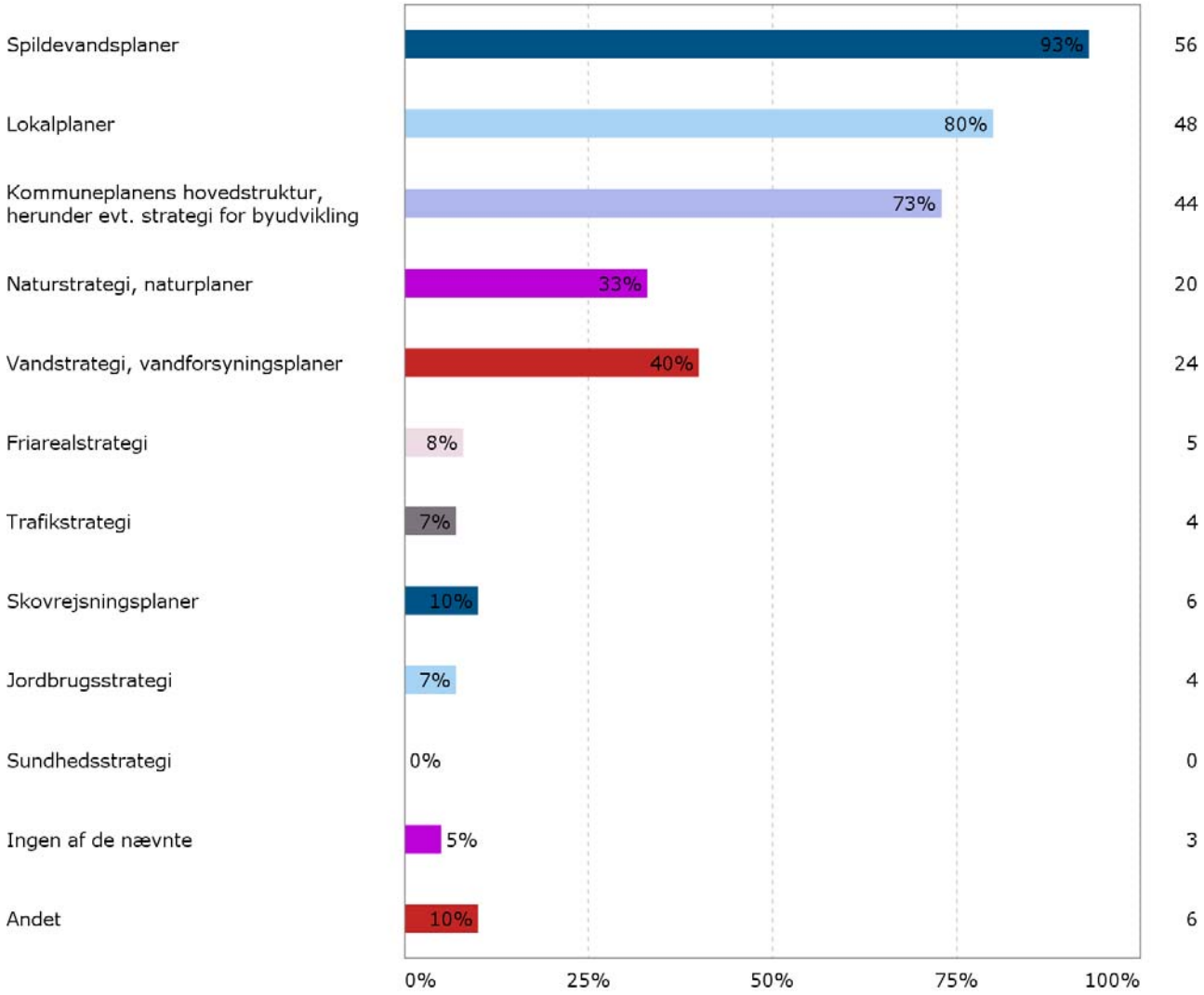
Figur A.4 Hvilke konkrete initiativer er sat i gang i forbindelse med udarbejdelse af klimatilpasningsplan?

Et af undersøgelsens nøglespørgsmål er, om kommunerne tænker klimatilpasning som et tværgående indsatsområde. Her er det korte svar, at det gør mange kommuner, men dog alligevel tværgående i relativt snæver forstand i form af emner, der relaterer sig til den fysiske planlægning. De områder, der forventes at indgå i klimatilpasningsplanen er i langt flest kommuner arealplanlægning og parker og grønne områder, som indgår i omkring ¾ af de deltagende kommuner og dernæst i noget mindre grad i byfornyelsesindsatsen og bygningsreglement og udvikling af havneområder. Omvendt er det relativt få kommuner, der tænker klimatilpasning ind i forhold til fx innovationsstøtte eller i sport og fritidsaktiviteter.



Figur A.5 Hvilke aktiviteter/områder forventes at indgå i klimatilpasningsplanen?

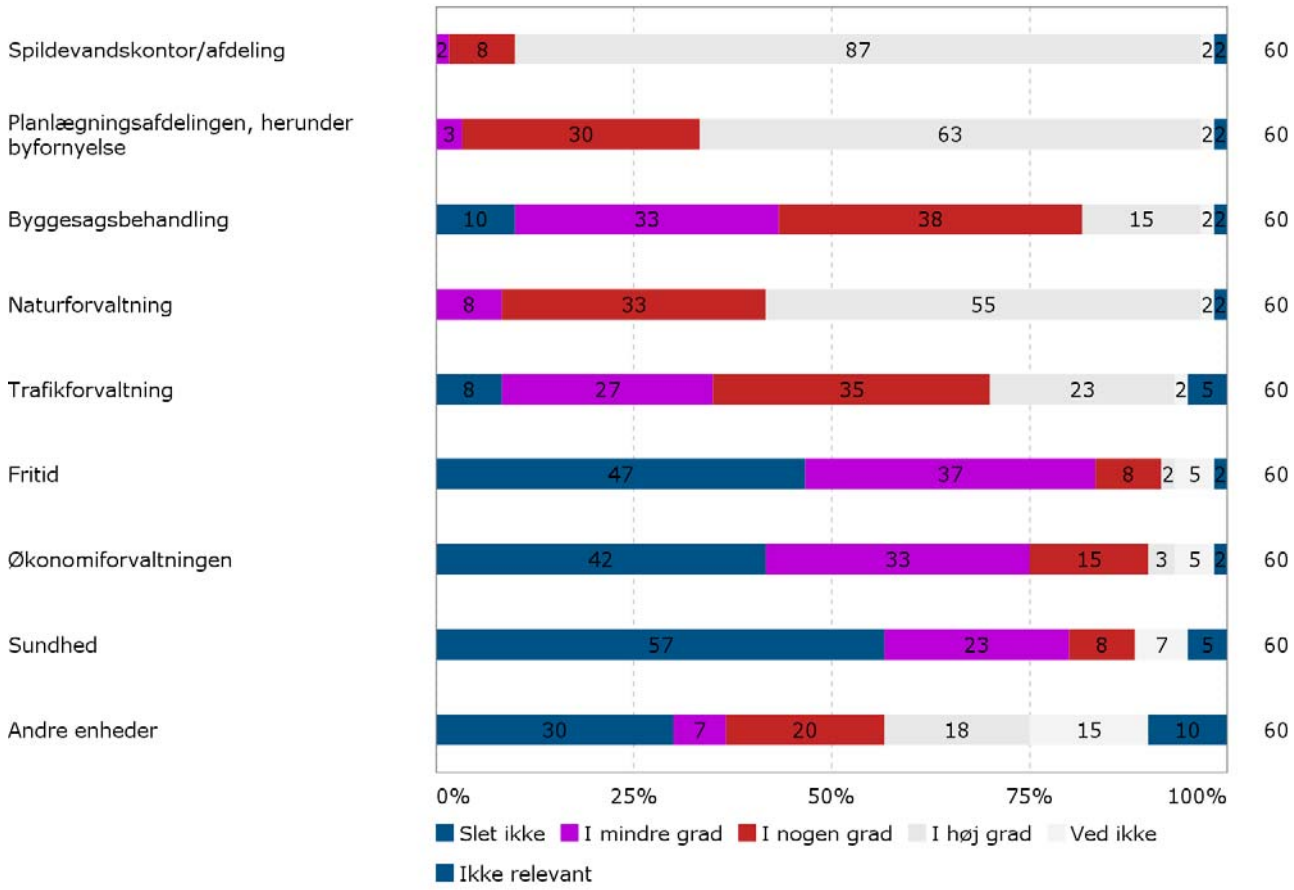
Det samme mønster viser sig i forhold til, hvilke kommunale strategier og planer, der inddrager klimatilpasning (Figur A.6). Også her er det især planer vedrørende den fysiske infrastruktur som spildevandsplaner, lokalplaner og kommuneplanen, der også omhandler klimatilpasning. Lidt færre kommuner, men dog omkring 40 procent, inddrager også klimatilpasning i naturplaner og vandforsyningsplaner. Derimod har næsten ingen kommuner indarbejdet klimatilpasning i hverken transport- eller jordbrugsstrategier og slet ingen i sundhedsstrategier. Disse mønstre afspejler ikke overraskende de forventninger, der er til hvilke effekter kommunen vil opleve af klimaændringer, jf. Figur A.2.



Figur A.6 I hvilke af kommunens andre strategier og planer indgår klimatilpasning?

Organisering af klimatilpasning – hvem er med?

Organiseringen af klimatilpasningsindsatsen er ikke overraskende forankret i teknik- og miljøforvaltningerne, og inddragelsen af andre forvaltninger forekommer indtil videre at være ret begrænset. I teknik- og miljøforvaltningerne afspejler organiseringen igen, at kommunerne har fokus på vand problematikker, idet 87 pct. af kommunerne angiver, at spildevandskontoret i høj grad er involveret i arbejdet (Figur A.7). Men også planafdelinger og naturforvaltninger er inddraget i høj grad i mere end halvdelen af de deltagende kommuner. Byggesagsbehandling og trafikforvaltningen inddrages også i mange kommuner, men knapt så intensivt. Således er det 71 pct. af kommunerne, der inddrager byggesagsbehandlingen i nogen eller i mindre grad.

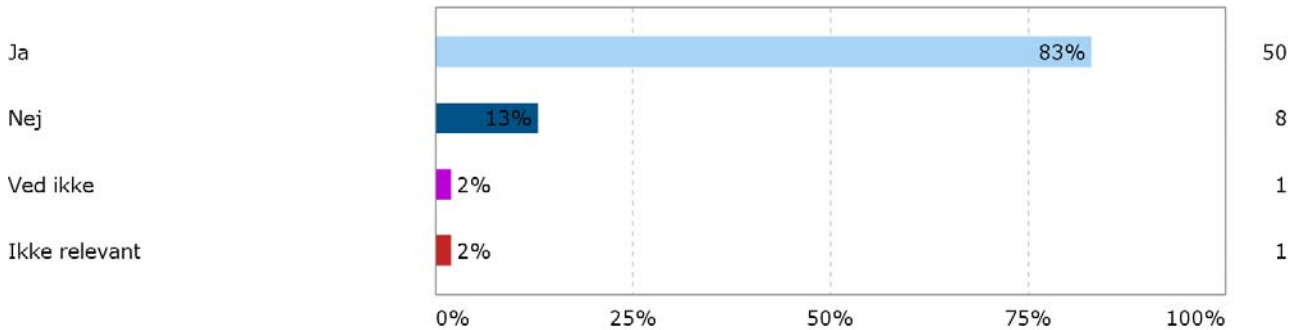


Figur A.7 I hvilken grad er medarbejdere fra andre dele af den kommunale forvaltning involveret i udformning af klimatilpasning.

På trods af de formodede store investeringer, der kan blive behov for til klimatilpasning, er der kun knapt hver femte kommune der i høj eller i nogen grad inddrager økonomiforvaltningerne i arbejdet.

Koordinationsfora har også teknik- og miljøforvaltningerne sit primære omdrejningspunkt. Hele 83 pct. at de deltagende kommuner har udpeget en koordinator for klimatilpasning. De åbne svar viser, at disse langt overvejende kommer fra miljø- og plan eller miljø- og naturafdelinger.

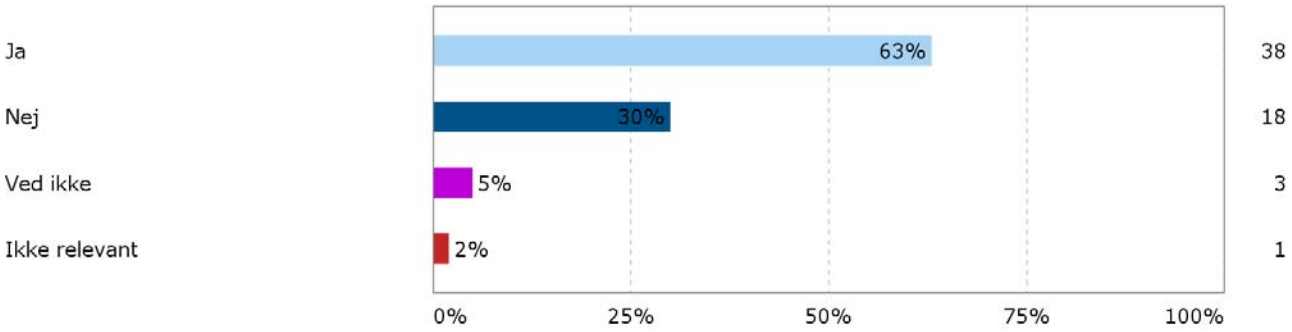
Blandt de kommuner, der nævner andre forvaltningsenheder, er det primært beredskabsmyndigheder der indgår, om end en enkelt kommune også inddrager den enhed, der har ansvar for turisme.



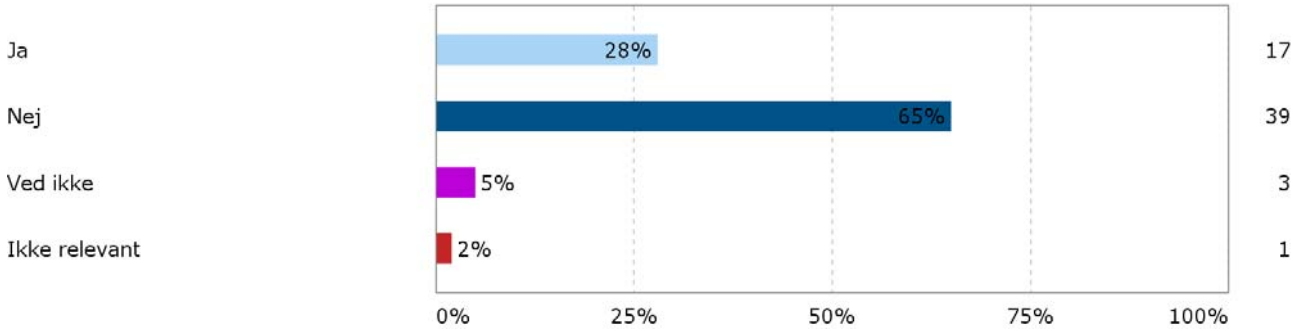
Figur A.8 Er der udpeget en koordinator eller ansvarlig for klimatilpasningsindsatsen?

Som det fremgår af figurerne A.9, A.10 og A.11 er der typisk oprettet koordinationsfora internt i teknik- og miljøafdelingerne og i hele 74 pct. at kom-

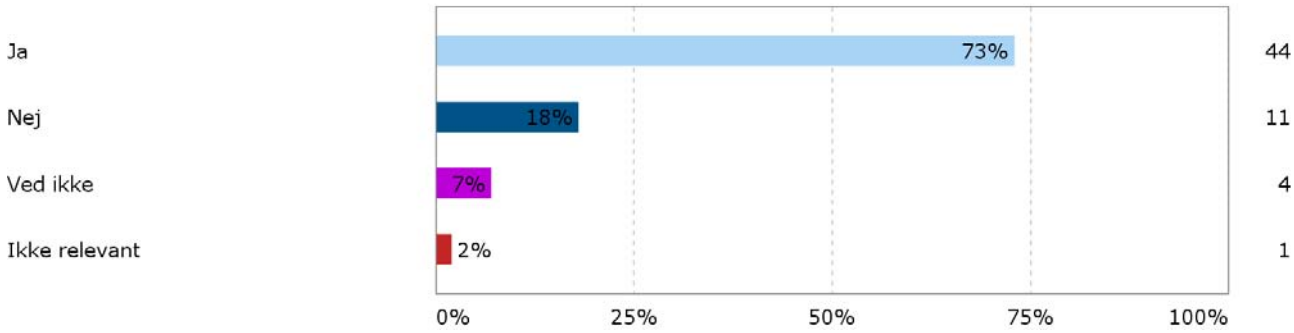
munerne deltager vandselskabet i et koordinationsforum. Derimod er det kun godt en fjerdedel af kommunerne, hvor andre kommunale forvaltninger deltager i sådanne institutionelle enheder. Analysen viser, at større kommuner er mere tilbøjelige til at involvere flere kommunale forvaltninger end små kommuner, men mønstret er ikke markant nok til at være statistisk signifikant.



Figur A.9 Er der oprettet et koordinationsforum, for arbejdet med klimatilpasning, internt i Teknik- og Miljøforvaltningen?



Figur A.10 Er der oprettet et koordinationsforum, for arbejdet med klimatilpasning, med deltagelse af embedsmænd fra andre kommunale forvaltninger?

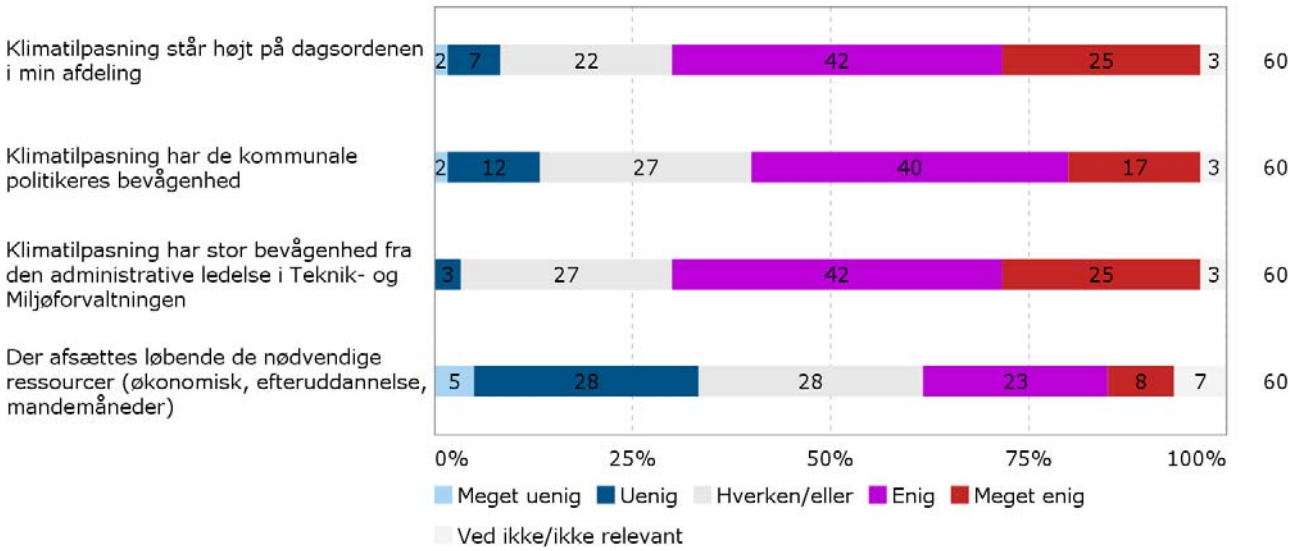


Figur A.11 Er der koordinationsfora, hvor vandselskabet deltager?

Bevågenhed og prioritering

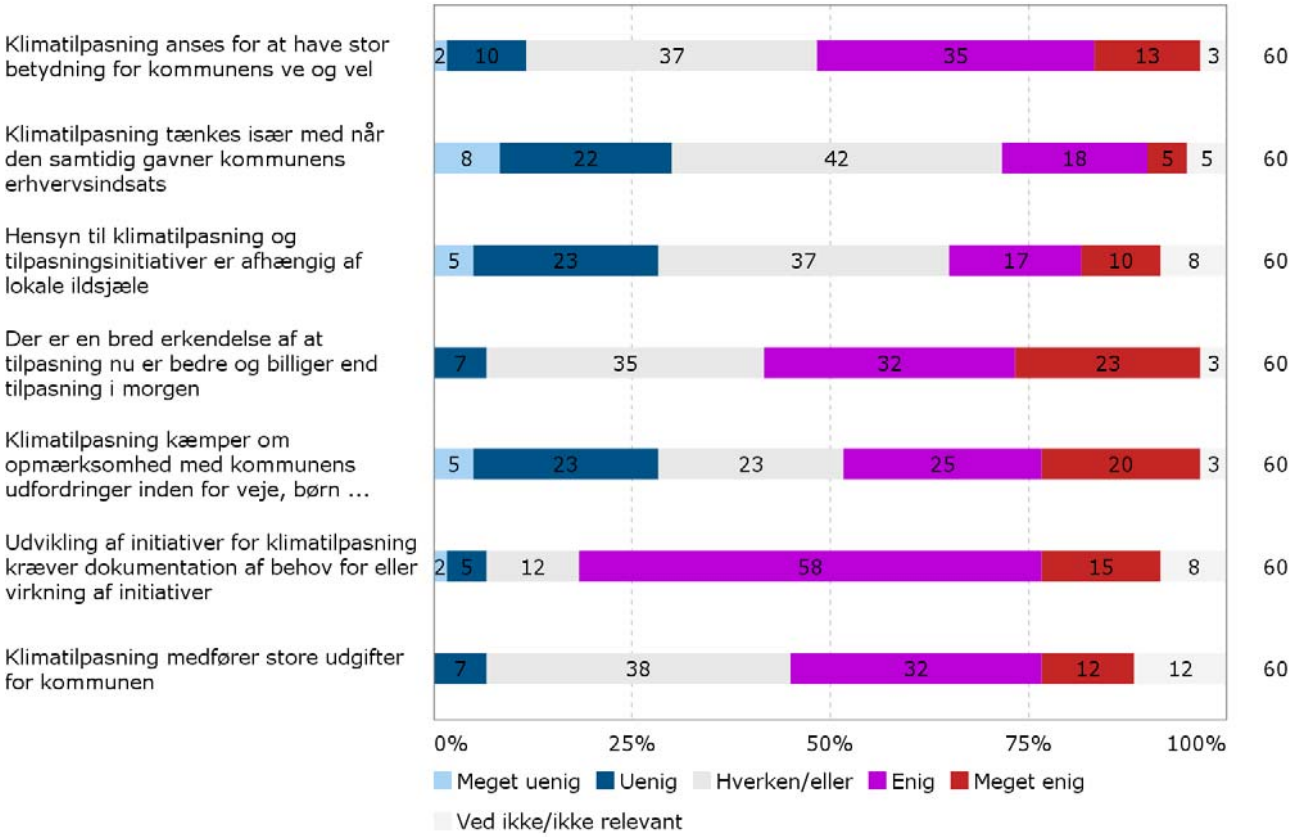
Klimatilpasning er på dagsordenen i mange kommuner, men pengene følger ikke nødvendigvis opmærksomheden. I ca. 2/3 af kommunerne er respondenterne enige eller meget enige i, at klimatilpasning står højt på dagsordenen både i egen afdeling og i Teknik- og miljøforvaltningens administrative ledelse (figur 12). I lidt færre kommuner, knapt halvdelen, er det opfattelsen, at klimatilpasning også har de kommunale politikeres bevågenhed. Færre er dog enige i, at kommunerne også afsætter de nødvendige ressourcer til at dække klimatilpasningsindsatsen. Kun 31 pct. af respondenterne svarer, at deres kommune tildeler tilstrækkeligt med tidsmæssige og økonomiske ressourcer til at dække indsatsen, mens 33 pct. finder, at der ikke afsættes de

nødvendige ressourcer. Yderligere analyser viser, at der ikke er statistiske forskelle mellem kommunernes ressourcetildeling baseret på størrelse eller placering ved kyster.



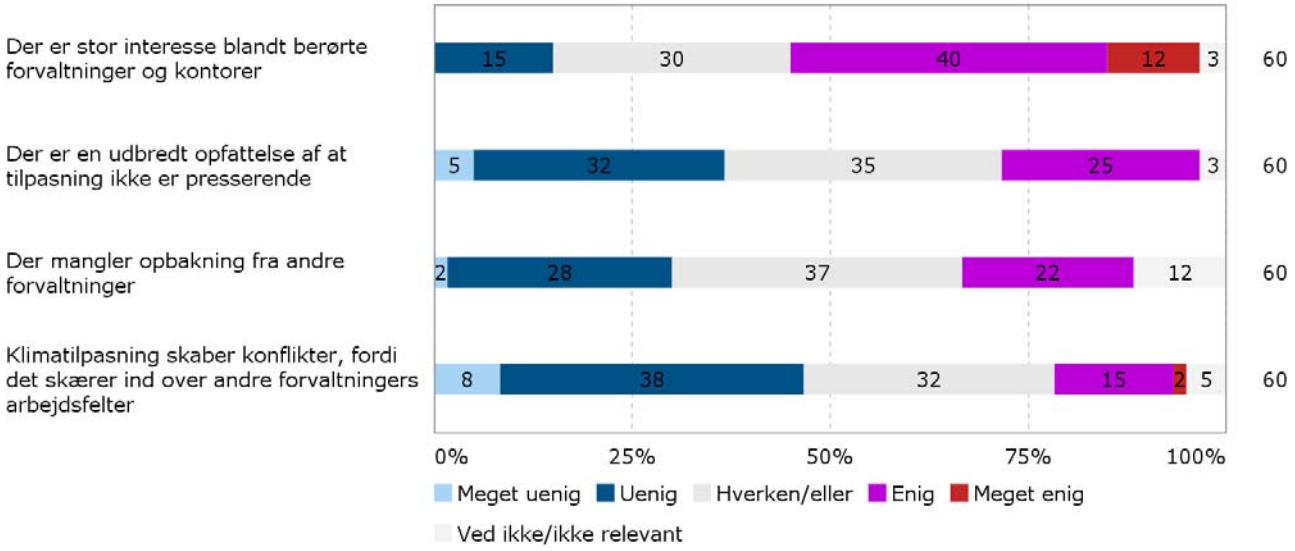
Figur A.12 Hvordan oplever du prioriteringen af klimatilpasning?

Det er også kun i cirka halvdelen af kommunerne, at klimatilpasning anses for at have stor betydning for kommunens ve og vel (figur 13). Og ligeledes er der i halvdelen af kommunerne en erkendelse af, at tilpasning nu er bedre og billigere end i fremtiden (korrelation). Samtidig er det dog en klar opfattelse, at der skal være dokumentation for, at der er et behov for en indsats, og at indsatsen vil virke; det gælder for næsten ¾ af undersøgelsens kommuner. Det kan skyldes, om end langt fra i alle tilfælde, at klimatilpasningsindsatsen er dyr. I 44 pct. af de deltagende kommuner vurderes det, at klimatilpasningen vil medføre store udgifter i kommunen.



Figur A.13 Hvordan opleves klimatilpasningsstrategien som en udfordring i kommunen?

Om end der altså i teknik- og miljøforvaltningen generelt er stor opmærksomhed på klimatilpasning, tyder undersøgelsen ikke på, at klimatilpasning generelt er et brændende emne i de kommunale forvaltninger. Således er det kun 50 procent af respondenterne, der oplever stor interesse for klimatilpasning blandt *berørte* forvaltninger og kontorer (figur 14). Omkring en tredjedel er *uenige* i, at der er en opfattelse af 'tilpasning *ikke* er presserende', hvilket med nogen rimelighed kan tolkes sådan at ca. 1/3 af respondenterne oplever at der er en udbredt opfattelse af at klimatilpasning *er* et presserende emne. Ligeså mange svarer hverken/eller til dette. Der er dog heller ikke tegn på egentlig modstand mod indsatsen. Kun 22 pct. indikerer, at der er manglende opbakning fra andre forvaltninger, og kun 17 pct. svarer, at der opstår konflikter, fordi arbejdet med klimatilpasning skærer ind over andre forvaltningers arbejde, mens 46 pct. er direkte uenige i dette. Samtidig viste figur 13, at under halvdelen af respondenterne – 45 pct. -- finder, at klimatilpasning kæmper om opmærksomhed med andre kommunale områder.

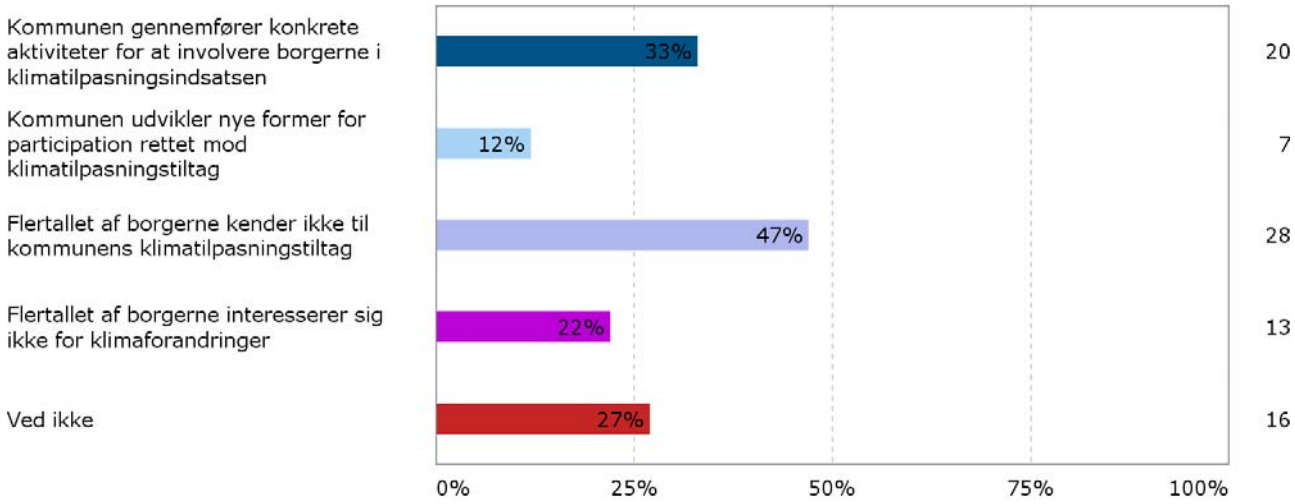


Figur A.14 Hvordan oplever du samarbejdet om klimatilpasning internt i kommunen?

Eksternt samarbejde

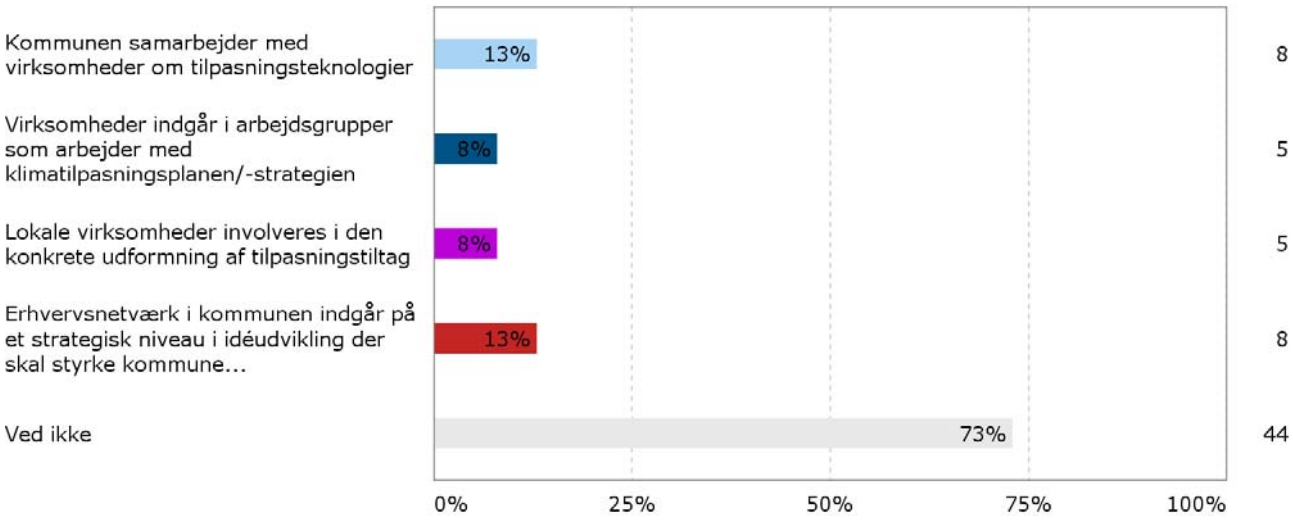
Det eksterne samarbejde omkring klimatilpasning er moderat.

Borgerne søges aktivt inddraget i 1/3 af kommunerne, der har gennemført konkrete aktiviteter for at involvere borgerne i indsatsen (figur 15). Nogle få, 12 pct., udvikler nye deltagelsesformer specifikt rettet mod klimatilpasning. Til gengæld er det opfattelsen i 47 pct. af kommunerne, at borgerne ikke kender til kommunens klimatilpasningstiltag.



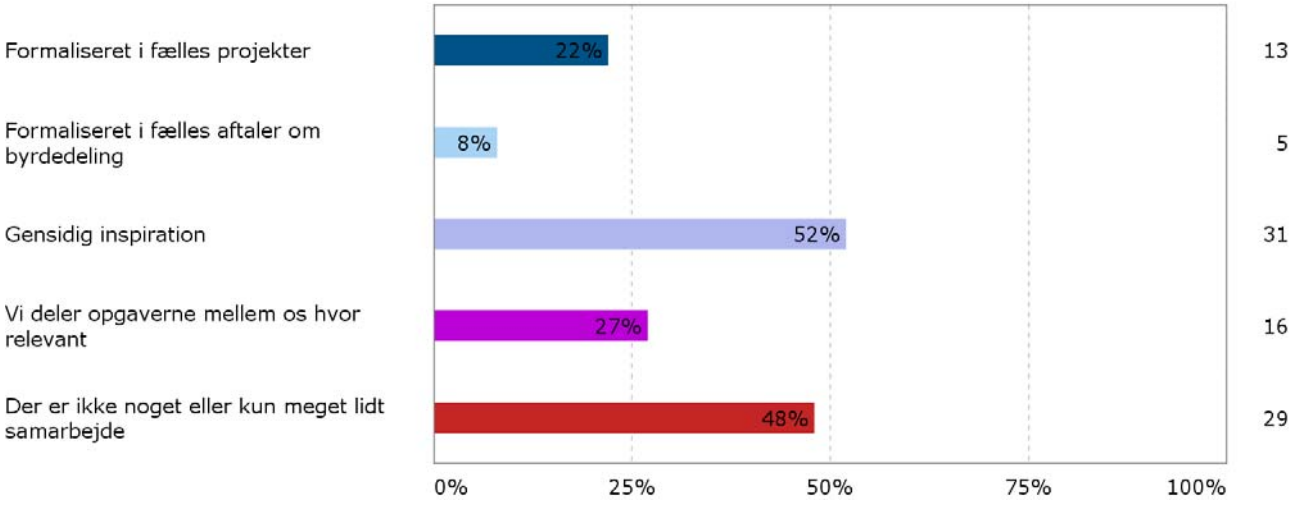
Figur A.15 Hvordan foregår samarbejdet omkring klimatilpasning med borgerinddragelse?

Samarbejde med virksomhederne er i endnu mindre grad i fokus. Her er det kun i 8 pct. af kommunerne at virksomheder indgår i arbejdsgrupper omkring klimatilpasningsplanen og i samme omfang, at virksomheder involveres i udformningen af klimatilpasningstiltag (figur 16). Lidt flere kommuner, 13 pct., inddrager erhvervsnetværk i strategisk ideudvikling omkring klimatilpasning. Samme andel samarbejder med virksomheder om egentlige tilpasningsteknologier. Billedet passer godt med, at kun 23 pct. af kommunerne tænker klimatilpasning sammen med kommunens erhvervsindsats (jf. figur 13).



Figur A.16 Hvordan foregår samarbejdet omkring klimatilpasning med virksomhedssamarbejde?

For så vidt angår samarbejde med andre kommuner angiver knapt halvdelen af kommunerne, at de ikke samarbejder med nabokommunerne om klimatilpasning (Figur A.17). Blandt den halvdel af kommuner, der samarbejder med andre kommuner, antager samarbejdet flere former, men det sker først og fremmest gennem gensidig inspiration. 22 pct. af kommunerne har dog formaliseret samarbejdet i fælles projekter, mens 27 pct. af kommunerne angiver, at samarbejdet består i arbejdsdeling.



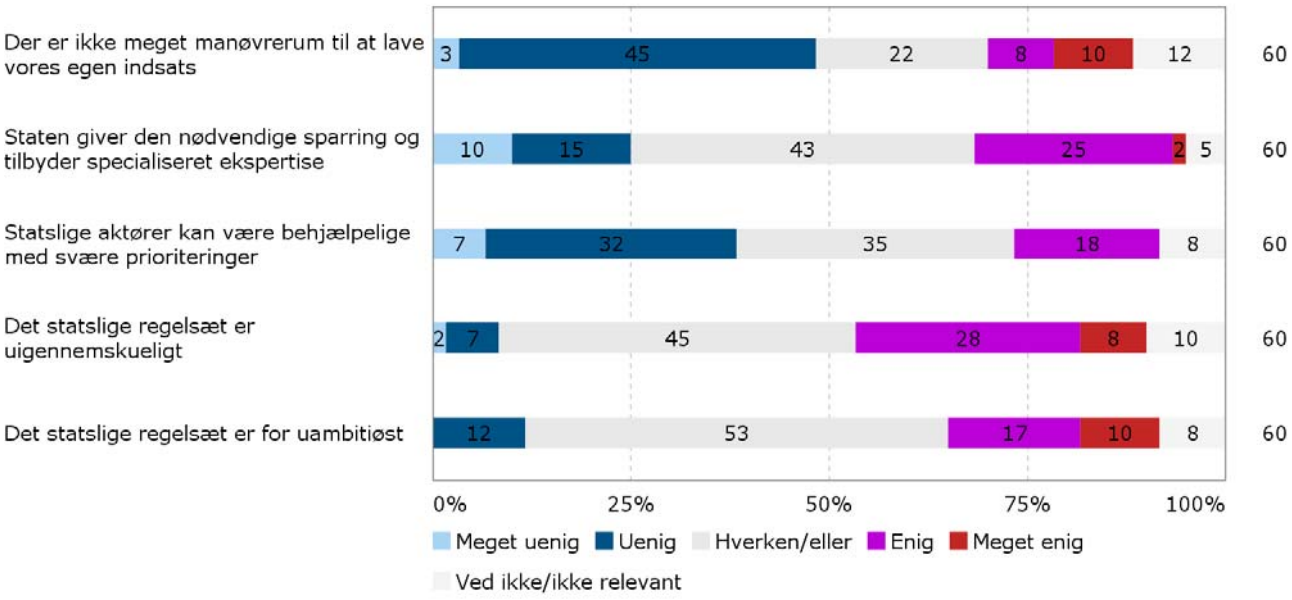
Figur A.17 Hvordan foregår samarbejdet omkring klimatilpasning med nabokommuner?

Det statslige niveau spiller tilsyneladende heller ikke nogen fremtrædende rolle for kommunernes arbejde med klimatilpasning. På den ene side udgør de statslige rammer ikke nogen hæmsko. Kun et mindretal på 18 pct. af kommunerne oplever de statslige rammer som begrænsende (figur 18), mens 48 pct. erklærer sig direkte uenige i, at kommunen ikke skulle have det nødvendige manøvrerum. Dobbelt så mange kommuner, 36 pct., finder dog, at det statslige regelsæt på området er uigennemskueligt, men en større andel svarer neutralt på dette spørgsmål.

På den anden side opleves staten heller ikke som nogen stærk samarbejdspartner for kommunerne. Kun godt hver fjerde kommune finder, at staten giver den nødvendige sparring og ekspertise, og kun knapt hver femte kommune svarer, at statslige aktører kan være behjælpelige med svære prio-

riteringer. Dertil kommer, at godt 60 pct. svarer neutralt eller 'ved ikke' på spørgsmålet om det statslige regelsæts ambitionsniveau, mens 27 pct. finder det statslige regelsæt for uambitiøst.

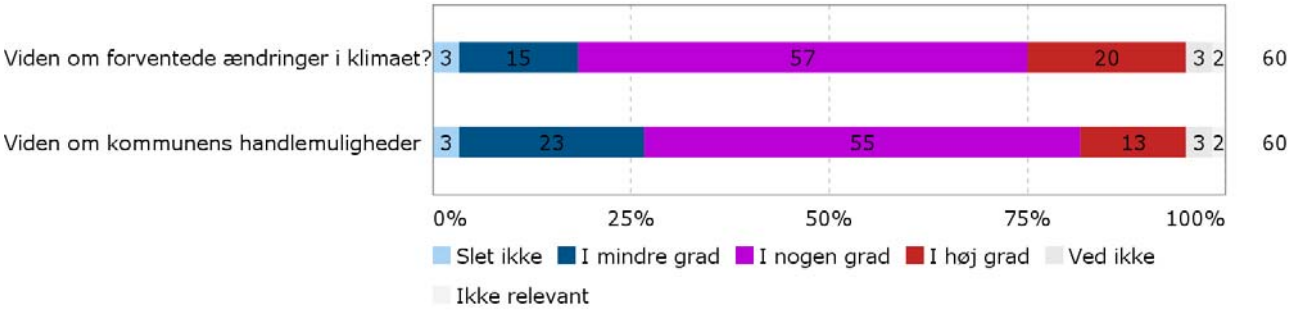
Statslige aktører betragtes dog som en brugbar kilde til viden, jf. Figur A.20 neden for.



Figur A.18 Hvilken rolle spiller den statslige ramme for kommunen.

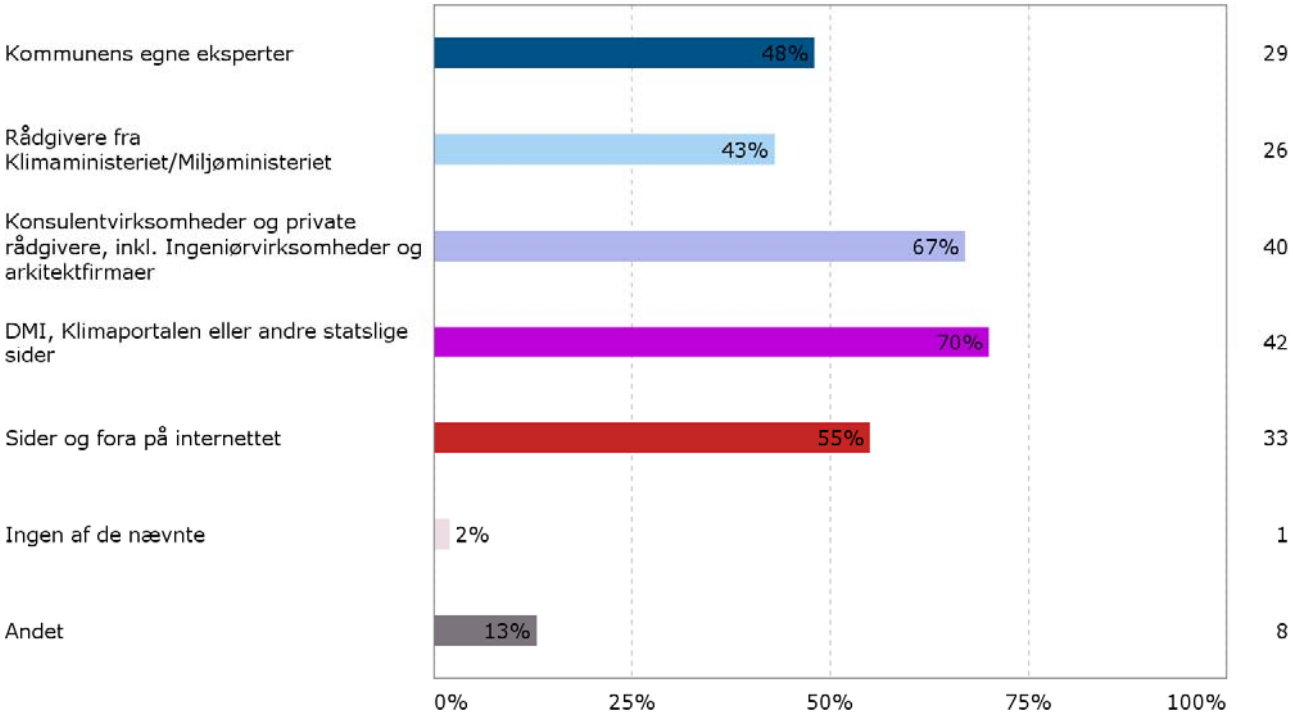
Viden

For det store flertal af kommuner udgør adgang til viden ikke nogen stærk barriere i klimatilpasningsarbejdet. 57 pct. af kommunerne svarer, at den nødvendige viden om de forventede ændringer i klimaet *i nogen grad* er tilgængelig, og yderligere 20 pct. finder, at denne viden *i høj grad* er tilgængelig (Figur A.19). Tilsvarende er det 55 pct. og 13 pct. af de deltagende kommuner, der svarer, at den nødvendige viden om kommunens handlemuligheder i nogen grad / i høj grad er tilgængelig.



Figur A.19 Hvordan er adgangen til viden i/for kommunen? Er den nødvendige viden tilgængelig?

Internetsider er en væsentlig kilde til viden. Statslige hjemmesider med viden angives som særligt brugbare af hele 70 pct., mens andre sider og fora på nettet betragtes som gode videnskilder af 55 pct. af kommunerne i undersøgelsen (Figur A.20). Konsulentvirksomheder udgør en væsentlig kilde til viden for næsten ligeså mange kommuner som de statslige hjemmesider. Færre, men dog stadig en betragtelig andel på knapt halvdelen af kommunerne angiver kommunens egne og ministeriernes eksperter som leverandører af særligt brugbar viden.



Figur A.20 Hvilke kilder til viden om fremtidens ændrede vejr og betydning for kommunens geografi finder I særligt brugbare?

Konklusion

Spørgeskemaundersøgelsen har fokuseret på, hvordan kommunerne har organiseret arbejdet med klimatilpasning og især hvordan og i hvilken grad arbejdet integrerer og koordinerer på tværs af policy områder.

Undersøgelsen viser, at kommunerne er i gang med at udarbejde klimatilpasningsplaner og i mange tilfælde har udpeget en koordinator. Men den viser samtidig, at den tværgående tænkning på nuværende tidspunkt er begrænset. Klimaforandringer opfattes først og fremmest som en vandrelateret problematik, således at indsatsen skal skabe tilpasning ift. ekstreme nedbørshændelser og stigninger i grundvandsspejl og havniveau. Indsatsen handler først og fremmest om at tilpasse infrastrukturen til sådanne vandstigninger. Tilpasningsplanlægningen er således forankret i kommunernes teknik- og miljøforvaltninger, ofte i spildevandskontoret. Og samarbejdsrelationer er også primært afgrænset til teknik- og miljøforvaltningen, især den fysiske planlægning samt i nogle tilfælde naturafdeling/kontor samt til vandselskaber, der ofte tidligere var en del af de kommunale natur- og teknikforvaltninger. Det ser derfor ud til, at en væsentlig barriere for en tværgående indsats er organisatorisk og kognitiv: det organisatoriske udgangspunkt definerer forståelsen og indsatsen. Det betyder dog ikke nødvendigvis, at kommunerne ikke med tiden kommer til at arbejde tværgående i en bredere forstand. Klimatilpasningsplanlægningen er mange steder i en opstartsfase, og det er almindelig praksis at starte med en mere afgrænset problemstilling.

En anden mulig barriere er, at kommunalpolitikerne endnu kun til en vis grad prioriterer klimatilpasning, hvilket bl.a. kommer til udtryk ved, at kun en tredjedel af respondenterne mener, der er afsat tilstrækkelige ressourcer til klimatilpasningsindsatsen. Omvendt er det ikke usædvanligt, at fagprofessionelle, som er sat til at løse en opgave, finder, der ikke er afsat tilstrækkelige ressourcer.

I forhold til eksterne samarbejder, har kommunerne kun i begrænset omfang inddraget borgere og virksomheder. Andre kommuner bruges primært til gensidig inspiration, mens staten udgør en kilde til viden men ikke i væsentlig grad opfattes som en vigtig sparringspartner.

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CLIMATE ADAPTATION IN LOCAL GOVERNANCE:
INSTITUTIONAL BARRIERS IN DANISH MUNICIPALITIES

Climate change and climate adaptation constitutes a key challenge for contemporary planning and politics.
In Denmark, climate adaptation policy is formulated nationally, but implemented primarily at the municipal level. This study therefore examines the ability of climate adaptation capacity of local governments, aiming to uncover institutional barriers for adaptation to climate change.
Methodologically, the study combines literature review, in-depth case studies of three municipalities and a survey among all Danish municipalities. We find that political and executive leadership are crucial for ensuring sustained attention to climate adaptation in local policy making. Furthermore, experience with climate change events such as flooding also to tend to place adaptation higher on local decision-making. Finally, the study shows that larger municipalities are better equipped in the form of expertise and financial resources to take a proactive and long-term approach to climate adaptation.

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