Local climate adaptation

Identifying opportunities and challenges for using climate knowledge in municipal decision making

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Forord

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Abstract

The usability of climate knowledge for decision makers has proved problematic. The often discussed usability gap occurs because of a discrepancy of what climate scientist perceive to be useful information and what decision makers view as usable (Lemos, Kirchhoff, and Ramprasad 2012). This thesis investigates the role of knowledge in local decision making on climate adaptation. It identifies opportunities and challenges for using knowledge for decision making in Bergen municipality. A case study of how Bergen municipality works on this issue, provides insight on how administrative employees and politicians in a large municipality acquire and employ knowledge for climate adaptation work. Through an integrated theoretical framework, based on approaches of wicked issue, knowledge regimes and co-production, opportunities and challenges for employing knowledge for this purpose will be discussed. It is argued that a qualitative case study based on interview data provides valuable insight on incentives and behaviors of individuals, within the context where knowledge utilization and decision making behavior occurs. The results show that a lack of invested interests in the issue is not a viable explanation for knowledge going unused, it seems that challenges of time, quantities of information and uncertainty may be more feasible explanations. Moreover, levels of political conflict are identified. In addition, the study finds that much knowledge is located *within* the municipality as well, giving them the opportunity to not merely be users of knowledge, but act as providers of information to other actors.

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1 Investigating climate adaptation in the Norwegian context

1.1 Introduction

The effort of this thesis is to identify *opportunities and challenges for using knowledge for decision making on climate adaptation* at the municipal level. According to The Intergovernmental Panel on Climate Change, the climate is changing worldwide affecting both natural and human systems, and adaptation processes has been initiated in all regions of the world (IPCC 2014). Climate change is a global as well as a local problem (Aal, Groven, and Lindseth 2007). It is widely accepted that adaptations are needed in meeting the challenges of a changing climate. Moreover, adaptation requires large amounts of knowledge; "Climate-change-related risks pose serious threats to the management of a wide range of social, economic and ecological systems. Managing these risks requires knowledge-intensive adaptive management and policy-making actively informed by scientific knowledge, especially climate science" (Lemos, Kirchhoff, and Ramprasad 2012). Knowledge is thus instrumental in working on these issues. This thesis analyses the role of knowledge in climate adaptation work on the municipal level in Norway. The Nordic region is described to be among the most knowledge-intensive societies in the world (J. Christensen, Gornitzka, and Holst 2017, 253). Climate adaptation has also been put on the agenda on the national as well as regional and local level. This makes the Norwegian context interesting for investigating the role of knowledge for local decision making on this issue.

Norway is described as a decentralized welfare state. Decentralization in this respect highlights the role of local government in the political system. Central to the Nordic model is the system of co-operative governance which refers to the "political interaction between levels of government" in these countries, the amount of tasks delegated to the local level and the trustful relationship between the local governments and the central state (Baldersheim, Rose, and Sandberg 2017, 193). Local governments are not merely self-governing institutions, but seen as partners of the central government (Baldersheim, Rose, and Sandberg 2017, 198).

In Norway, climate adaptation is largely a local responsibility, however implemented in a multi-level governance setting (Neby 2019). *Statlige planretningslinjer for klima og energiplanlegging og klimatilpasning,* or the central government's planning directions, state that climate adaptation contributes to society being more prepared to face climate change, by ensuring that municipalities and county authorities avoid or limit risk, vulnerability and disadvantages, and make use of potential advantages of climate change (Kommunal- og moderniseringsdepartementet 2018). Stortingsmelding 33 (a Norwegian white paper), states that a fundamental principle for climate adaptation should be that the responsibility for climate adaptation lies with the actor that is responsible for the services or functions that are affected by climate change (Miljøverndepartementet 2012-2013). The white paper goes on to clarify the role of the municipalities, expressing that municipalities should found their planning and exercise of authority on relevant knowledge about the climate and future climate change. Furthermore, it is stated that climate change is of upmost importance regarding how municipal services and infrastructure should be developed in a long-term perspective (Miljøverndepartementet 2012-2013). The municipalities can thus be seen as central actors in adapting to climate change.

Norwegian municipalities have been described as welfare pioneers; welfare services were historically but also quite recently established at the local level before the central government took on the same functions at the national level (T. Christensen et al. 2014, 144; Grønlie 2004). Historical examples include municipal healthcare, pension funds and an extension of education services. A more modern example is the local initiatives that inspired the establishment of the state funded cash-for-care benefits (Grønlie 2004). Aal, Groven, and Lindseth (2007) find that some Norwegian municipalities were able to push the agenda for national climate policy and go beyond the boundaries of existing national policy on GHG emissions. Building on this, a highly potent question is; could Norwegian municipalities also be pioneers when it comes to climate adaptation? *Where they forced national change in the welfare politics, could municipalities be found in the same driving position when it comes to political change on climate adaptation?*

1.2 Previous empirical findings

Local climate adaptation in the Norwegian context is an emerging field. Dannevig, Rauken, and Hovelsrud (2012) describe climate adaptation still being in its infancy in Norway. They examine the implementation of climate adaptation measures in eight Norwegian

municipalities. They find that in addition to participating in research projects, efforts of individuals, network participation, access to resources, external expertise and experiences with extreme weather events affect implementation of measures. The *first movers* in the study do not merely follow the central government regulations, but initiate work with climate adaptation measures themselves. Næss, Solli, and Sørensen (2011) investigate how local government employees acquire knowledge of climate change, the challenges of appropriating this knowledge and putting it to use. They pose a timely question: is climate science usable? They point to a lack of domesticating climate knowledge, and that resources and cognitive challenges are not a sufficient explanation. They find a need for more standards and regulations to increase the authority and relevance of climate science. Hanssen, Hofstad, and Hisdal (2015) argue that increasing central government control might not be enough, and point to the municipal responsibilities being more clarified in recent years. They find that multi-level networks are effective in mitigating challenges related to translation of natural science into usable information for municipalities.

Kolstad et al. (2019) discuss their experiences with coproduction of climate services in the Hordaklim project, a co-production project in which the objective was downscaling and customizing quantitative climate knowledge for municipalities in Hordaland county. This pilot project posed challenges for researchers as well as municipal actors, where it seemed that coproduction proved hard to achieve in practice. Neby (2019) investigates local climate adaptation in relation to wickedness and governance capacity, with a focus of Western Norway. He points to the wickedness of the issue that stems from social dynamics when actors work together trying to solve the issue. This might make adaptation and preparedness more difficult, and challenges governance capacity. The extent of the challenges are however influenced by how actors attempt to solve them (Neby 2019). Climate adaptation has thus been on the research agenda in recent years. Studies have aimed to find reasons for implementation of measures, whether climate knowledge is used, what makes it more usable and how to embark on co-producing knowledge.

1.3 A case study of Bergen municipality

Bergen is located on the western coast of Norway, in Vestland county. It is the second largest city in Norway, with over 280 000 inhabitants (Statistisk sentralbyrå 2018). The city's topography is distinct with it's hilly landscape and only minor areas of continuous lowland (Thorsnæs 2020). Bergen's main source of income is oil and gas production, however

renewable energy production, marine and maritime industries, tourism, finance, media and the culture industry are also central (Bergen kommune 2019b). Bergen has been led by Mayor Marte Mjøs Pedersen from the Labor Party, since the election in 2019. The current City Government is a coalition between the Labor Party, the Green Party, the Liberal Party and the Christian Democrats. The opposition thus consists of The Conservative Party, Folkeaksjonen Nei til mer bompenger, the Socialist Left Party, The Centre Party, The Progress party, The Pensioners' Party and The Red Party (Bergen kommune 2019c, 2019a).

The 2014[1] vulnerability assessment for Bergen clearly states that the climate in Bergen is expected to become warmer and wetter, with more extreme weather events related to wind and precipitation. Floods, storm water, avalanches and landslides are highlighted as likely incidents with serious consequences (ROS 2014). The 14th of September 2005, Bergen experienced a landslide at Hatlestad that caused the death of three people, injured 10 and had 225 evacuate. The cause of the landslide was said to be heavy precipitation, large quantities of storm water, the placing of deposits over the landslide area and perhaps additional water from broken water pipes (Lango 2014). This, in combination with severe flooding of the Nesttun-river is said to be the trigger for climate adaptation work in Bergen (Groven 2017). Climate adaptation has thus been on the agenda for quite some time.

Bergen municipality has since 2000 had a parliamentary model of governing (T. Christensen et al. 2014, 154). This makes Bergen one of two municipalities in Norway with parliamentarism, along with Oslo. The alderman model remains used throughout the rest of the country. The purpose of municipal parliamentarism is the increased possibility of holding the political majority accountable. In a parliamentary model the City Government, the executive branch of the municipality, is chosen by a majority in the city council. In the chairmanship model, the executive branch is chosen according to the PR-principle. In the parliamentary model, members of the City Government need not be chosen from the City Council. The administration is led by politically elected Commissioners, as opposed to having an administrative leader in the chairmanship model. The City Government can be removed from office with a vote of no confidence from the City Council, whereas the executive committee in a alderman model is elected for a 4 year period (T. Christensen et al. 2014, 154).

[1] A new VA will be available in 2020.

The premises of the parliamentary model turned out to be central in explaining aspects of communication and cooperation, for the thesis' analysis.

For the purpose of this thesis Bergen was chosen as a case based on the following criteria: *size, focusing event, frontrunner* and *proximity to knowledge*. In Norway, large municipalities are generally further along with climate adaptation work, which might be due to economic resources and capacity (Klemetsen and Dahl 2019; Dannevig, Rauken, and Hovelsrud 2012).

A focusing event is a rare and harmful event that catch the attention of the mass public and politicians, has potential to push topics on to the agenda and trigger policy change (Dannevig, Hovelsrud, and Husabø 2013). It is argued that the extreme events of 2005 are focusing events, because they pushed vulnerability to the consequences of climate change higher up on the local agenda. The incidents lead to the municipality carrying out several vulnerability assessments of infrastructure and residential areas (Dannevig, Hovelsrud, and Husabø 2013). The Hatlestad landslide has even been named a "political landslide" because of its political consequences and agenda setting (Groven 2017). The events of 2005 even inspired another large city, Stavanger, by creating public concern and awareness, to produce risk maps, indirectly serving as a focusing event here as well (Dannevig, Hovelsrud, and Husabø 2013).

Bergen municipality was rated number 13 among the 15 most climate adapted municipalities in Norway (Klemetsen and Dahl 2019). Therefore, it could be argued that the municipality is relatively far along in their work on climate adaptation. Selecting a municipality that is far along provides more material to investigate, as opposed to municipalities where adaptation work is not dealt with extensively.

Bergen is a university city and hosts a number of research institutions like NORCE, the Bjerknes Centre, the Meteorological Institute and others who do climate research. There is thus a proximity to knowledge in Bergen, and an opportunity for administration and politicians to access these resources.

1.3.1 Central documents

The municipality has several plans and strategies concerned with climate adaptation, some of which are included in the empirical analysis of this thesis. Two climate and energy action plans, the political platform for the City Government, the Risk and Vulnerability Assessment

and the land-use element of the Municipal Masterplan are referred to in the empirical part of the thesis. These are all central documents on how the municipality works with climate adaptation both administratively and politically. “Grønn strategi”, the Climate and energy action plan for Bergen was decided by the City Council in 2016[2], and inspired by the social element of the municipal master plan (Grønn strategi 2016). It was a follow up from the previous Climate and energy action plan from 2010. “Grønn strategi” is largely a plan for reducing emissions, aiming for the city to be fossil free in 2030. However, it includes a chapter on climate adaptation. The goal expressed in the chapter is that Bergen be ahead of the development and equipped to minimize the negative consequences of climate change. Further, the chapter clarifies the municipalities responsibilities and the strategies used to fill them. The chapter presents the challenges associated with climate adaptation in Bergen, the municipal strategy on climate adaptation and measures taken. It also has a section dedicated to the use of knowledge (Grønn strategi 2016). The previous Climate and energy action plan from 2010 is also referred to in the empirical part of the thesis, as it includes central knowledge projects relevant for climate adaptation work (Klima og energihandlingsplan 2010). This action plan included a chapter on climate adaptation as well.

The land-use element of the municipal master plan from 2018 was passed by the City Council in 2019 (KPA 2018). The objections of the plan is to provide a framework for area use and what new measures can be implemented. It also states necessary considerations for area use, and includes maps, current provisions and a thorough plan description. One of the chapters are dedicated to climate adaptation, risks and vulnerability. Norwegian municipalities are requested to carry out risk and vulnerability assessments. The Risk and Vulnerability Assessment from 2014, was the first holistic risk and vulnerability assessment developed for Bergen (ROS 2014). It incorporates both the administrative and geographical responsibilities of the municipality. The report is described as a process and a tool for identifying, assessing and handling risks. The report develops matrixes for a comprehensive set of unwanted events, calculating their probability, estimating consequences and listing measures taken in relation to reduce or prevent consequences. Many of the themes in the report are directly connected to climate change, such as extreme weather events, precipitation, wind, floods, storm water, landslides and avalanches. The two documents described in this paragraph, provide valuable information on how Bergen municipality works on these issues administratively.

[2] There is a Norwegian and an English version of the document, both have been used in the thesis.

The political platform for the current City Government, is in action from 2019 to 2023 (Byrådsplattform 2019-2023). The City Government consists of the Labor Party, the Green Party, the Liberal Party and the Christian Democrats. The political platform clarifies the political ambition of the City Government. One chapter is dedicated to climate, environment and nature, with a section on climate adaptation. This document is a central source of information on how the municipality works politically on climate adaptation.

1.4 Contribution

Because of the relevance and precarity of the climate change issue and the policy area of climate change having been on the agenda in Bergen for about 15 years, it is of interest to see how a large municipality, with its level of resources and capacity, works on climate adaptation and how they use knowledge in this respect. The role of knowledge in local climate adaptation work has been the subject of several academic articles. However, this intensive case study with its theoretical framework represents a new way of investigating knowledge and adaptation in Norway. Where Næss, Solli, and Sørensen (2011) chose to study municipal employees only, because they are expected to provide knowledge for decision making, I have chosen to include local politicians as well. Orderud and Winsvold (2012) studied the role of learning and knowledge in relation to climate adaptation in Oslo, using different theories of learning and knowledge, investigating how municipal officers acquire and build competence. This thesis elaborates on how administrative employees and politicians in Bergen municipality acquire and use knowledge in their work on climate adaptation. It aims to identify possibilities and challenges for employing knowledge for this purpose. Using theoretical approaches of wicked issue, knowledge regimes and co-production, I seek an understanding of the issue, the context in which knowledge exists and cooperation as a way of making climate knowledge more usable. The research question is therefore: *What are the opportunities and challenges for using knowledge for decision making on climate adaptation in Bergen municipality?*

1.5 Concepts

I will investigate the research question using the concepts of *climate adaptation* and *knowledge.* The concepts will be used throughout the analysis, and the inclusive approach in relation to the concepts needs to be specified. In order to operationalize the research question I will now clarify these concepts. Conceptualization is a complicated endeavor and should be

approached with caution. When Sartori (1970) develops his theory of the ladder of abstraction, he states that general concepts can still consist of specifics. Conceptual stretching first occurs when the concept can no longer be underpinned by specifics. Extensive concepts are thus well suited for generalizations, because although the concept is extensive, it still has a set of identifiable specifics that allow for empirical testing (Sartori 1970). Bearing this is mind, there is nothing wrong with general concepts as long as they are built on specifics that are empirically testable. The conceptualization will be carried out on this recommendation.

Climate adaptation could be defined and conceptualized in different ways. The IPCC defines adaptation as "The process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities" (IPCC 2014). The action plan for climate and energy in Bergen from 2016 "Grønn Strategi", also bases its understanding of climate adaptation on IPCCs definition[3]. The Norwegian Environment Agency on their webpages take climate adaptation to entail an understanding of the consequences of climate change and implementing measures to hinder or reduce damage, or on the other hand make use of the benefits that climate change could entail (Miljødirektoratet). In "Statlige planretningslinjer for klima og energiplanlegging og klimatilpasning", the central government's planning directions, it is stated that climate adaptation and emission reduction should be viewed in conjunction where relevant, to find solutions that reduce emissions and reduce risks and vulnerability related to climate change (2018). Drawing on these understandings climate adaptation can be said to incorporate a process where one adjusts to actual or expected climate change, there should be an understanding of climate change consequences, the goal of adaptation is to reduce or hinder damage and possibly benefit from opportunities caused by climate change. Lastly adaptation could be viewed in conjunction with emission reduction.

For this thesis I will be flexible in my understanding of the concept, but depart from the following criteria that also resonates with how the informants perceive the concept:

- Climate adaptation is concerned with working with measures/planning and account for current or future effects of climate change.
- Based on an understanding/knowledge of the consequences of climate change.
- With the aim of reducing, preventing damage and/or take advantage of benefits.

[3] The cited definition is from the IPCC, but from 2007 with minor revision.

- Could be linked to emission reduction.

Going into this research project, I did not want to approach the concept with a narrow definition. Instead, I wanted to see how my informants viewed the concept of climate adaptation. The very first questions asked to all informants was: how do you understand the concept of climate adaptation? I wanted to uncover if they had a technical and narrow understanding of the term, or if they took a more broad approach, perhaps linking adaptation and emission reduction.

One of the administrative employees understanding of the concept was "that we should adapt the city or the surroundings to be able to withstand the climate that we have prognosis for. That we plan according to the best knowledge about the future climate (…) and then there is trying to make the best out of climate adaptation, using it to… in society to add value or create competitive advantage, I know that there is a dual definition, I do not remember exactly, but those are the two things that go into it." Another informant from the administration said "it means that we should make arrangements for the city and the city's inhabitants to be safe, when it comes to the effects of climate change and climate related unwanted events." One of the politicians took it to be "taking seriously the fact that we have a considerable change in the climate situation and that there is a need for different adaptations to face the challenges to come. It being stormwater management, it is temperature (…)." Another politician said that it was "activities that are accommodated to not increase the temperature, average temperature. Because climate is a very comprehensive term. And adaptation – it is really a very abstract term. Yes. It is almost a buzzword. Climate adaptation (…) because it is not very concrete." There are thus different views of the concept in the data, but they all fall under the wide approach to the concept described in the first paragraph of this section. The informants problem perception will be thoroughly discussed in chapter 4.

Knowledge is somewhat more challenging to conceptualize in this context. As will be apparent in chapters 4 and 5, knowledge in this thesis takes the form of scientific knowledge, knowledge stemming from other institutions and more experience based knowledge within the administration. Here too, I have opted for a broad approach to the concept. Knowledge plays a central role in the Norwegian political system. Nordic countries have been described as knowledge democracies, referring amongst other things to the increasing role of expert knowledge and policy making based on this knowledge, as well as an egalitarian distribution

of knowledge in these societies (J. Christensen, Gornitzka, and Holst 2017, 239). Knowledge as a concept is therefore of high relevance in the context of investigating decision making in Norway. The central government has also been explicit in the need for basing climate adaptation on the best knowledge available, both of expected climate change and the following consequences (Kommunal- og moderniseringsdepartementet 2018; Miljøverndepartementet 2012-2013).

One of the ways to approach the concept is looking at the purpose of knowledge. Knowledge can be used instrumentally as a means to solve concrete problems, strategically to achieve goals where conflict is present and symbolically to give an impression of rationality and efficiency (Naustdalslid and Reitan 1994). Boswell (2008) suggests a legitimizing function, where using expert knowledge enhances legitimacy of decisions, and a substantiating function, where expert knowledge give authority to some policy positions where cases are politically contested. These two resonate with the symbolic and strategic use of knowledge.

Another aspect within the concept is that of different types of knowledge. The informants were for instance asked to evaluate the use and usefulness of social science- and natural science research. According to Naustdalslid and Reitan (1994), natural sciences formed the ideal for use and usefulness of research in the context of governing. This has implications for social science research, as it is too expected to contribute to social technologies that can solve issues in politics, public administration and the business sector. Ideally, research will make decision makers find solutions to problems they would not otherwise have found (1994, 13). Knowledge as a concept will in this thesis be an extensive one. It applies to research knowledge directly accessed from researchers and research institutions, more indirectly provided by government institutions, and the knowledge existing within the bureaucracy. The common denominator for all these understanding is that they all need to be used or intended for making decisions on climate adaptation.

The research question has now been elaborated on and the ground is prepared for presenting the theoretical lenses when investigating the problem at hand.

1.6 Structure

First, however, outlining the structure of the thesis is in order. Chapter 2 presents the theoretical framework. Theoretical approaches of wicked issue, knowledge regimes and co-

production are discussed in relation to the research topic, pointing to the analysis with some productive angles. Chapter 3 presents and discusses the method, methodological approach and research design. Methodological considerations are included. In chapter 4, I present and analyze the empirical data, before moving on to applying the theoretical framework for analysis in chapter 5. Chapter 4 describes how the municipality works on climate adaptation, the informants perception of the concept and its relevance, as well as identifying possible opportunities and challenges in climate adaptation work generally and related to the use of knowledge. Chapter 5 aims to explain some of these findings using the three theoretical approaches. The wickedness of the issue, invested interests, channels for transmitting knowledge, the municipality as a knowledge provider and signs of co-production are some of the issues presented. Chapter 6 discusses central findings and provides some concluding remarks. The concluding chapter also discusses the municipality as a policy actor.

2 Theoretical framework

2.1 Introduction

In the following chapter I will develop the theoretical framework for the thesis, building on theories and perspectives of wicked issue, knowledge regimes and co-production. The wicked issue approach will help describe the issue and its implications, the knowledge regime approach points to the frame within which knowledge exists and the co-production approach offers solutions for making knowledge more usable. The theoretical framework will form the foundation of the analysis. It will motivate the variables discussed at the end of this chapter. The variables will then be revisited in chapter 3, where empirically driven categories will operationalize each variable. Some questions derived from each theoretical approach will be presented an motivate the analytical discussion of chapter 5.

2.2 Wicked issue

The first approach that makes up the theoretical framework is that of *wicked issues*. This approach is useful for understanding the problem at hand and illuminating some of the implications climate change has in this context. Wicked issues are characterized as cutting across established administrative levels and sectoral boundaries (Fimreite, Lægreid, and Rykkja 2014, 22). Christopher Pollitt (2016) even describes climate change as the ultimate wicked issue, seeing as

> "It will directly affect a vast range of government functions, from building regulations to flood defenses; from agricultural policy to public health; from border controls to emergency services, and from energy policy through transport policy to the insurance industry and international diplomacy" (Pollitt 2016).

Attention has been put on how to better coordinate and integrate the public sector in order to deal with these issues (Fimreite, Lægreid, and Rykkja 2014, 22). In other words, wicked issues seem to be able to change some of the structure of the political system. Pollitt (2016) too argues that the wicked issue of climate change requires policy-making to be more "joined-up across sectors and levels of government". Drawing on this it will be worthwhile

identifying aspects of wickedness and investigating if increased cooperation has been a consequence of climate change in Bergen municipality's work on climate adaptation.

Pollitt (2016) elaborates on what is needed to deal with the wicked issue of climate change. An important point is that climate change calls for a shift towards more long-term policy making. Moreover, governments will need the support of the business community and civil society to meet these challenges (Pollitt 2016).

Wicked issues are identified as cutting across sectors and levels of administration. The connections between knowledge and wicked issues are apparent when J. Christensen and Velarde (2019) argue that cross-cutting issues require a great amount of knowledge, because the issues go beyond the capabilities of the specialized and fragmented sectors. In their study of innovation policy, because there is a need for knowledge on cross-cutting issues they expect the space to be open for external actors to analyze and define the issue. The authors state that for some cross-cutting issues, there might be a lack of invested interests by political and administrative actors. This might be a hindrance for decision makers to adopt expert advice (J. Christensen and Velarde 2019). *Is the invested interest assumption valid for climate change and adaptation as well?* This remains to be seen.

Although wickedness stems from physical factors such as increased precipitation causing floods, another case of wickedness might stem from societal factors, according to Neby (2019). This has to do with how actors attempt to handle climate adaptation. Co-production, which will be elaborated on later, might increase the wickedness of the issue according to Neby. By co-producing knowledge for decision-making on climate adaptation, the involved actors increase their 'analytical capacity', but could also contribute to wickedness by involving a complex and fragmented set of actors (Neby 2019). It would therefore be of interest to see if there are signs of wickedness stemming from cooperation on climate adaptation in the data generated for this thesis. *Are there signs of wickedness in the data when it comes to cooperation between a larger set of actors both within and beyond the municipality? Or can wickedness be reduced as a consequence of cooperation?*

2.3 Knowledge regimes

It has been apparent that wicked issues require large amounts of knowledge. *Governing through knowledge* is a characteristic of Nordic countries (J. Christensen, Gornitzka, and Holst 2017, 253). A fundamental question is: how is knowledge production organized and governed? The theory of knowledge regimes could provide fruitful insight on the premises of knowledge within the Norwegian political system. Central questions when investigating knowledge regimes are: what type of expert knowledge exists within the government bureaucracy and what mechanisms are available to communicate research to decision makers (J. Christensen, Gornitzka, and Holst 2017, 239). Campbell and Pedersen understand knowledge regimes as "the organizational and institutional machinery that generates data, research, policy recommendations, and other ideas that influence public debate and policymaking" (2014, 3). Central to studying a knowledge regime is "identifying the organizations and institutions that produce and process knowledge and understanding how these operate and are governed" (J. Christensen, Gornitzka, and Holst 2017, 241).

Knowledge regimes can be categorized along four dimensions *public or private, location, government control* and if knowledge distribution is *democratized* (J. Christensen, Gornitzka, and Holst 2017, 242). The public or private dimension asks what kind of institutions the regime is dominated by. Location has to do with where the knowledge production is situated: is knowledge produced inside or outside the government? Government control is about the extent to which the government can control the different policy advises. The fourth dimension investigates how democratized the knowledge distribution is within the regime (J. Christensen, Gornitzka, and Holst 2017, 242). Two of these dimensions will be used to shed light on aspects of the knowledge regime that can be found in the informants responses. *Is knowledge production situated within or outside the municipality? And to what extent is knowledge distributed democratically, in other words is knowledge equally available to all decision makers?*

The Norwegian knowledge regime can be characterized as one with extensive public funding of higher education, traditionally with professionalized bureaucracies, but where professional knowledge in agencies and ministries has become more independent in recent decades. The regime is constructed in part for educating professionals to the public service of the expanding welfare state, a share of research and development is undertaken by government institutes, and where expenditure of research and development to a lesser degree is occupied by

businesses (J. Christensen, Gornitzka, and Holst 2017). Thus there are strong ties between government and knowledge institutions in Norway, as in other Nordic countries, but some of the dynamics of the regime are changing. One illustration of this phenomenon is the regional social science institutes established by the state in the 1980s. The purpose of these institutes was to provide regional and local governments with expertise and ensure regional development. Several of the institutes have gone from being governed by the state to become more independent or merged with universities or university colleges. The result of this changed dynamic is a more competitive market for providing policy-relevant research (J. Christensen, Gornitzka, and Holst 2017, 246-247).

Reitan (2004) highlights another shift, namely that of going from a 'politics of expertise' to a process of 'politicization'. Focusing on the case of nature conservation, Reitan observes a shift from the field being dominated by the professional expertise of natural scientists to conservation policy being more ambitious with higher levels of political conflict. *Are there traces of a politicization process on climate adaptation in Bergen?*

Part of investigating a knowledge regime is identifying what channels are available for transmitting research to decision-makers (J. Christensen, Gornitzka, and Holst 2017, 239). Building on this it would be of interest to investigate *what channels of communication are highlighted by the informants*.

The theoretical approach of knowledge regimes will be used to seek out traces of the Norwegian knowledge regime when investigating *how knowledge is accessed and produced in Bergen municipality*. Elements such as what type of knowledge exists within the municipal bureaucracy, what stems from the central government, which external knowledge providers are central, the degree of democratization of knowledge and if there is an observable process of politicization on this issue will all be discussed in the analysis.

2.4 Co-production

The two theoretical approaches presented above informs two central elements for this thesis. Using knowledge to govern is thus a central part of the Norwegian model of governing. Knowledge is also essential in order to effectively deal with the wickedness of climate change. A third essential element when investigating opportunities and challenges for using knowledge for decision making is whether knowledge is usable for decision makers. Lemos,

Kirchhoff, and Ramprasad (2012) emphasize the role of scientific knowledge, in managing the risks of climate change, and its importance for policy making. Commonly stated in the literature is the question of the usability of climate knowledge and the so-called usability gap (see for instance Lemos, Kirchhoff, and Ramprasad 2012; Kolstad et al. 2019 ; Næss, Solli, and Sørensen 2011; Vaughan and Dessai 2014). The usability gap occurs because of discrepancies between what scientists view as useful information and what users perceive as relevant for decision making. From the provider side, researchers may produce knowledge that they think is relevant, but not understanding the context and decision making process fully, results in the knowledge going unused. From the user side, there might be unrealistic expectations to what knowledge could be produced and there is a risk of ignoring useful information (Lemos, Kirchhoff, and Ramprasad 2012).

A solution for making climate science more usable is co-production or iterative interaction in producing knowledge (Lemos, Kirchhoff, and Ramprasad 2012; Lemos and Morehouse 2005; Vaughan and Dessai 2014). Co-production was first used by Ostrom and collogues, and is defined as a process where inputs used to produce goods and services are contributed by individuals who are not in the same organization (Ostrom 1996; Bremer and Meisch 2017). Røiseland and Lo (2019) distinguish between co-production and co-creation. They take co-production to be a narrow concept where professionals and users cooperate. Co-creation, on the other hand, is more radical and involves equal cooperation between the public sector, citizens and organizations (Røiseland and Lo 2019).

I will not opt for a strict divide between these two definitions, but use them to describe the same phenomenon under investigation as more or less of a process of cooperation in producing knowledge for decision making on climate adaptation. Co-production is highly relevant in the Norwegian context, it has even been called the DNA of Norwegian municipalities (Røiseland and Lo 2019). Torfing, Sørensen and Røiseland (2016) state that there is a desire from the municipal sector to have external actors contribute more to the community. Co-production of climate information has also been tested in the Norwegian municipal sector (Kolstad et al. 2019 ; Sofienlund 2018). It has proved a difficult goal to achieve, as a consequence of resources, expectations, role specifications, allowing for the maturing of the co-production project and a common understanding of what is useful information (Kolstad et al. 2019 ; Sofienlund 2018).

There are different ways of approaching co-production. One way is to apply an institutional approach where the central question is: How can we build adaptive capacity in governance institutions (Bremer and Meisch 2017)? Here co-production is part of the process where institutions learn to adapt to change. There is a collaboration where one draws on different sources and types of knowledge to address and define the problem. This can happen within institutions to enable learning, or between institutions to facilitate cooperation horizontally between institutions working in the same sector, or vertically between scales. Successful co-production contributes to adaptive capacity in institutions (Bremer and Meisch 2017). *Do informants report co-production as something that has strengthened the municipality's capacity to adapt to climate change? Are there signs of co-production within the institution as well as external horizontal or vertical cooperation? What did informants learn from participating in these activities?*

Another approach is iterative interaction, which is focused on how consultative interaction between users and providers of knowledge can be promoted in order to lead to more useful information (Bremer and Meisch 2017). Here interactions between users and providers influence how scientists pursue science and how users understand the possibilities and limits of science. Co-production in this manner can lead to mitigating the usability gap. It is not about reconstructing the system of research and science, but there is a focus on tailoring scientific knowledge to the context of the decision makers. Regular consultation is a key word here (Bremer and Meisch 2017). *Do informants from Bergen municipality report this sort of consultation? And if so, are there apparent opportunities and challenges in the process of iterative interaction described by the informants?*

Lemos, Kirchhoff, and Ramprasad (2012) identify some barriers and opportunities for usability of climate information based on interaction between users and producers. Barriers include non-legitimate interaction, one-way communication, infrequent interaction and an end-user relationship. Opportunities include legitimate interaction, two-way communication, trust, iterative interaction, co-production and a long-term relationship. "How users obtain, receive and participate in the production of climate information affects decision-makers' willingness to use that information" (Lemos, Kirchhoff, and Ramprasad 2012). *Are any of these barriers or opportunities mentioned by the informants? And how do they perceive interaction with producers of knowledge?*

2.5 Summing up the theoretical framework

My theoretical framework thus combines three different approaches, the intention is that they will shed light on different aspects of using knowledge for decision making on climate adaptation in Bergen municipality. Derived from the theoretical framework I will elaborate on six variables; *problem perception, knowledge, communication, politics, cooperation* and *problem solution*. The variables will guide the empirical investigation into Bergen municipality's climate adaptation.

Problem perception. The variable is linked to the theory of wicked issue by way of investigating how informants perceive new challenges posed by climate change, how they conceptualize climate adaptation, what the greatest challenges in climate adaptation work is an so on. Here some of the wickedness of the climate change issue could be apparent. For this variable, the theoretical framework can be "tested" to see if the issue goes beyond administrative levels and sectoral boundaries. Fimreite and colleagues state that because of wicked issues, the public sector has become more integrated in order to deal with these issues (2014, 22). Could there also be signs of this in the data? There is also in the theoretical framework a link between cross-cutting issues and the need for knowledge. Is there something in the data that illustrates this need, do informants say something about the need for knowledge on this issue?

Knowledge

As has been apparent, knowledge is needed in order to deal with the wickedness of climate change. Do the informants link the need for knowledge to some sort of wickedness? The knowledge regime approach is operationalized here when identifying knowledge sources and investigating how knowledge is accessed and produced in the municipality. Here, it is worthwhile finding out if universities and research institutions play a central role, whether knowledge stems from the central bureaucracy and what knowledge exists within the municipal administration.

Communication. Communication can in itself be seen as central to iterative interaction described in the co-production part theoretical framework. Lemos, Kirchhoff, and Ramprasad (2012) suggest trust and two-way communication as opportunities that affect climate information usability. How is trust perceived by different informants, both in regards to the relationship between politicians and administration and in the relationship to academics?

What signs of two way communication are present? And how are needs for knowledge communicated to researchers in order to make information more useful? Challenges in communication is also an important part to. The structure of the political system is essential to bear in mind, as it could both facilitate and complicate communication. Parliamentarism is central here as it has implications for the relationship between politicians and administration.

Cooperation. This variable is closely linked to the communication variable, as communication is an important part of cooperating. Even though the cooperation variable reflects the co-production approach, co-production is just one of the categories that make up the variable. This variable is more comprehensive in that it describes who is involved, the process of cooperation, the output of cooperation, as well as looking for concrete indications of actual co-production of knowledge. What do informants say about interacting with other levels of government such as the regional and central government? How do they report working with other units within the municipality? And do they view any research institutions as central partners? Increased understanding between users and providers of knowledge can be uncovered in the output category. This relates back to what Bremer and Meisch (2017) saw as one of the products of iterative interaction. Another output could be that of increased adaptive capacity of the municipal institution. Another way to view cooperation is in the light of the wicked issue approach. As Neby (2019) cautioned against, co-production can increase the analytical capacity of the actors involved, but complexity arises when a number of different actors work together, which could result in an increasing effect of wickedness. Are there signs of wickedness in the data when it comes to cooperation between a larger set of actors both within and beyond the municipality?

Problem solution. Working with solutions is the goal of climate adaptation work. Here I was interested to find the outcome of knowledge, what did the knowledge received result in as reported by the informants. The theoretical framework is visible here too. Pollitt (2016) states that there will be a need for high quality research as well as response monitoring and evaluation of all sorts of the novel policies and programs needed for tackling this issue, and mitigate or adapt to climate change. Another essential point made is that climate change calls a shift towards more long-term policy making. Could there be signs of wickedness in how informants report working on solutions, for instance when it comes to time perspectives on policy related to adaptation? What about their perception of the effect of the measures taken?

Here it is not the characteristics of the wicked issue that is under examination, but the consequences of it.

Politics

Although not directly inspired by theory, this variable is essential to uncover how the municipality works on these issues politically. It may also affect the other variables, especially with regards to the level of political conflict associated with the issue. The level of conflict is central to what might be a process of politicization, as described by Reitan (2004).

Figure 1 on page 22, presents several factors from each theoretical approach that can contribute to opportunities and/or challenges for decision makers in using knowledge for climate adaptation work. Each theory inspired relevant variables presented above, that will guide the empirical analysis.

Factors derived from the wicked issue approach are; complexity of the issue, the complex of actors involved, and the extent to which invested interests are present. Opportunities associated with these factors are cooperation as a means of reducing wickedness, thereby mitigating some of the complexity of the issue that cuts across sectors and administrative levels. This opportunity might however also be a challenge, because it increases the number of actors involved, contributing to increased wickedness. These actors may have different backgrounds, purposes and responsibilities. Lacking invested interests could also be a challenge, a factor associated with the wicked issue approach, because decision makers not having invested interests might result in knowledge going unused. On the other hand, a challenge could be that invested interests in the issue results in conflict. Invested interests might therefore be a source of disagreement.

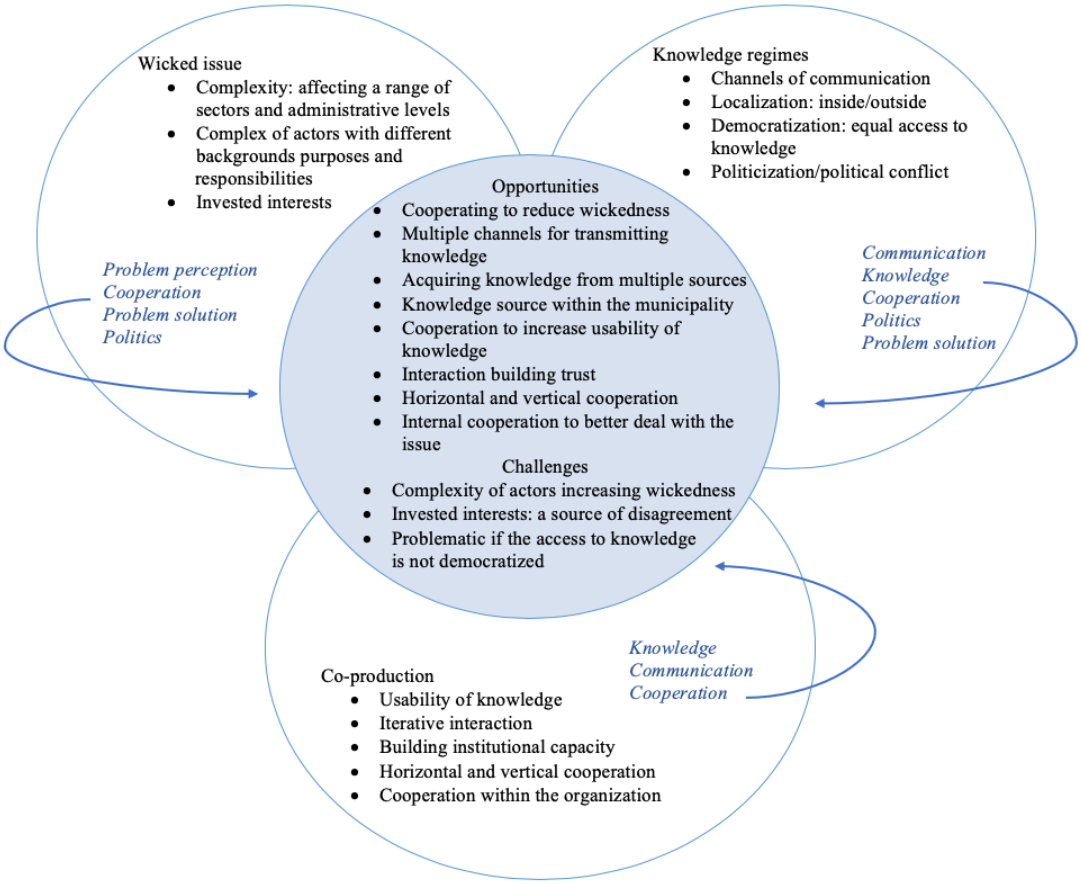
Factors related to the knowledge regime approach are channels of communication, localization, democratization and politicization/political conflict. Opportunities associated with this approach are; having multiple channels for communicating research to decisionmakers and decisionmakers being able to acquire knowledge from multiple sources. Localization of knowledge within the municipality can provide opportunities as well. One challenge associated with the approach is if decision makers do not have equal access to knowledge. Politicization of the issue, that is moving from relying on expertise to the issue being more politicized, could be viewed as a challenge if there is political conflict in the

decision making process. This is related to invested interests described by the wicked issue approach.

Factors derived from the co-production approach are usability of knowledge, iterative interaction, building institutional capacity, horizontal and vertical cooperation, and cooperation within the organization. Opportunities associated with the approach are; cooperating and co-producing knowledge as a way of increasing usability, interaction between users and producers as a way of building a trustful relationship. Co-production might also result in building institutional capacity. Iterative interaction can happen horizontally and vertically and might also be a way of mitigating some of the wickedness of the issue. Cooperation within the municipality through iterative interaction might also create opportunities for using knowledge on these matters. The main challenge associated with this approach is the usability gap.

Figure 1 illustrates how the three theoretical approaches are combined in order to identify opportunities and challenges for using knowledge for decision making, through the theoretically motivated variables.

Figure 1: Visual representation of the theoretical framework



Summing up this chapter the three theoretical approaches are intended to shed light on specific opportunities and challenges for using knowledge for climate adaptation. The theoretical framework is well suited for providing descriptions, which will be the main goal of the analysis. Explanations could thus only be discussed and not provided by my theoretical approach. Some central questions were formulated based on the theoretical approaches. The wicked issue approach helped identify the questions *Is the invested interest assumption valid for climate change and adaptation as well? Are there signs of wickedness in the data when it comes to cooperation between a larger set of actors both within and beyond the municipality? Or can wickedness be reduced as a consequence of cooperation?* The knowledge regime approach inspired the questions *how is knowledge accessed and produced in Bergen municipality? Is knowledge production situated within or outside the municipality? To what extent is knowledge distributed democratically, in other words is knowledge equally available to all decision makers? What channels of communication are highlighted by the informants? And are there traces of a politicization process on climate adaptation in Bergen?* The co-production approach motivated the questions *do informants report co-production as*

something that has strengthened the municipality's capacity to adapt to climate change? Are there signs of co-production within the institution as well as external horizontal or vertical cooperation? What did informants learn from participating in these activities? Do informants from Bergen municipality report regular consultation with external acotrs? And if so, are there apparent opportunities and challenges in the process of iterative interaction described by the informants? Are any of barriers or opportunities associated with interaction between users and providers mentioned? And how do they perceive interaction with producers of knowledge? These questions will inspire the analytical discussion provided in chapter 5.

3 Method and methodology

3.1 Introduction

The thesis aims to identify how decision makers on the local level acquire and use knowledge about climate change and adaptation and the opportunities and challenges for doing so. Following the theoretical framework which is suited largely for descriptions as well as the explorative nature of the research question, a qualitative method has been chosen. In this chapter I present my methodological decisions, the qualitative method used, the purpose of the interview guide, how informants were selected, a description of the analytical procedure and a discussion of the methodological considerations of my design. The method used for collecting data for this thesis was semi-structured interviews with 7 informants. In order to get an in-depth understanding of the experiences of decision-makers at the local level, I have interviewed both politicians and administrative employees. The interviews were recorded, transcribed and then subject to categorization done with a cross-sectional approach to use the same analytical treatment on all units. The method is thus suitable when providing a detailed empirical description, carried out in chapter 4, which again prepares the ground for the analytical discussion in chapter 5.

A qualitative method allows for exploring phenomena from the inside, where experiences and perspectives provided by research participants form the starting point of research (Ormston et al. 2014). Qualitative research could be distinguished from quantitative research by its usefulness for generating hypotheses from the analysis, rather than testing already stated hypotheses. The qualitative method allows for generating detailed data, a more complex analysis and a detailed description of the phenomena under investigation (Ormston et al. 2014). Ritchie and Ormston (2014) state that qualitative research "is needed to provide greater understanding of the nature of an issue or problem, but where measurement of its extent is not at that time of interest". This is applicable for new and developing social phenomena, when there is a need for refining previous understandings of them phenomena, or when previous knowledge does not fully explain the issues at hand (Ritchie and Ormston 2014). As the field of using knowledge for climate adaptation on the local level in Norway is relatively new, a qualitative approach to better understand this phenomenon is in order.

3.2 Epistemology and ontology

According to Miles and Huberman, referenced by Ryen, the researcher should clarify their ontological and epistemological approach in order to make the analysis more available to the reader (Ryen 2002, 155). Miles and Huberman are themselves realists. The realist epistemology looks at social phenomena as existing in the objective world, not just in people's perceptions, and that there are present some stable relations between these social phenomena. The realist epistemology looks for causal explanation, not as the traditional stimuli-response variant, but by way of exploring how each unit or action is part of the explanation. Therefore, one should not just explain, but describe each causal relationship. This makes the realist method describing and inductive, according to Ryen (2002, 155-156). This is the epistemic position I will place myself in when continuing the writing of this thesis. However, a realist approach starts already with data collection, finding a selection of informants with a format that allows for comparison (Ryen 2002, 156). I believe that my format allows for contrasting the experiences of politicians and administrative employees. Asking largely the same questions to both groups facilitates contrasting.

I will approach my data in what Spencer et al. (2014) call a substantive way of treating data. Here the researcher focuses on what the text *says*, aiming to understand and interpret the meaning of the data. This is contrasted by the structuralist approach that focuses on language and what the text *does*, aiming to see how accounts of the world are constructed (Spencer et al. 2014). Consequently, I will take what my informants say during the interview as a representation of the real world. This could also be seen as a naturalist approach, where the ontological standpoint is that the subjects interpretations represent the truth or their reality (Ryen 2002, 72). One should however be aware of the element of hindsight, when interviewing people about their experiences. The hindsight bias is when people overestimate the degree to which they expected certain events to occur, after the event took place (Leary 1982). The relevance of the bias in this context is more generally that interviewing people about past experiences might lead them to overestimate the reasons for events occurring or why they made certain choices.

3.3 The dimension of time in qualitative designs

Ryen emphasizes that doing qualitative research is not following a chain of separate links, but rather a process of 'subsequent loops', where the researcher moves back and forth between fieldwork, analysis and interpretation (2002, 145). The analytical process is a messy, non-

linear, creative process aiming for structure and order of the collected data (Ryen 2002, 145). Both data collection and analysis is stretched out in time, one can therefore make adjustments as one goes along, gaining understanding, and more knowledge of the context allows for making adjustments in new interviews. By doing so, one allows for what Miles and Huberman call an interim analysis during the data collection process (Ryen 2002, 158). After conducting the first interviews I learned that not all questions of my topic guide were necessary to ask, some of them were repetitive, others were less relevant in some contexts. One example are the questions formulated about the relationship between the administration and politicians, that were not entirely relevant when interviewing politicians from the opposition, since they have very little direct contact with the administration. This is due to the parliamentary model of governing in Bergen municipality. The divide between political position and opposition is greater in a parliamentary model, where the municipal administration is led by politically elected commissioners (T. Christensen et al. 2014, 154). Another important aspect of the time dimension in qualitative interviews is that accounts are based on the informants recollection. Retrospective interviewing pose difficulties with for instance recall and post-event rationalization (Lewis and Nichols 2014), and hindsight as mentioned earlier.

3.4 Induction and deduction

Miles and Huberman, as referenced by Ryen, advocate for a mix of inductive and deductive approaches to analyzing data. First, one inductively defines a theme, then one moves on to deductively confirm this finding. It is equally legitimate and useful, according to Miles and Huberman, to start off with analytical categories derived deductively or to gradually develop such categories inductively. An inductive approach is recommended when dealing with new or complex fields (Ryen 2002, 157). I will employ a mix of induction and deduction in my design. This will be apparent when discussing the analytical process, where variables are derived from theory, as explained in section 2.5, and categories are empirically driven, as will be apparent in section 3.7.

Essential for inductive analysis is moving from description to explanation, and from the concrete to the abstract (Ryen 2002, 157). I will adopt this approach by careful description of my data before embarking on discussing causal relationships. Therefore, chapter 4 will be concerned with a thorough description of the variables *problem perception, knowledge, politics, communication, problem solution* and *cooperation*, all of which were identified in the

theoretical framework. Thereafter, chapter 5 will use the findings on each variable in combination with the theoretical framework in order to identify and explain possibilities and challenges for employing knowledge in climate adaptation work.

3.5 Formulating the interview guide

Two separate interview guides were formulated. One for administrative employees and one for politicians (included in appendix). The themes of the interview guides were kept the same. As an introduction, informants were asked how they understood the concept of climate adaptation and if it was central to their work. The question of how the informants interpret the concept would be used to uncover signs of wickedness. Then we moved on to the main topics. *Climate adaptation work in general;* where informants answered questions of whether it was an important issue for the municipality (and for politicians if climate change and adaptation was central to their party program), what the priority areas for the municipality was (and for politicians; the City Council and party) as well as what plans and strategies were associated with the work. This in combination with the opening questions would provide important background information as well as saying something about the saliency of the issue.

What challenges climate change poses; here informants were asked what challenges faced local politicians or the municipality/administrative employees and what the greatest challenges in climate adaptation were. These challenges could uncover some of the wickedness that lies in the issue. *The relationship between administration and politicians*; here informants were asked about the relationship when it comes to climate adaptation work, communicating knowledge, initiative and cooperation. *Knowledge from multiple levels*; where questions were asked about acquiring knowledge from regional and central government bodies. Here too, signs of wicked issues could be apparent, if the issue is said to be cutting across these different administrative levels. It would also uncover traces of the knowledge regime, identifying sources of knowledge. *Cooperation in networks and with other institutions*; here questions were asked about cooperation within the municipal apparatus, participating in networks on this issue, for politicians if knowledge comes from the party, what external institutions are cooperated with, and what institutions are most central in acquiring knowledge for climate adaptation. These questions can uncover sources of knowledge and their location in relation to the knowledge regime approach, as well as elements of cooperation from the co-production approach. Questions were also asked to reveal possible co-production of knowledge, like “When the municipality/local politicians

receive knowledge about climate change from external actors, are you active in communicating what type of knowledge you need?" and "Is there a common understanding between the municipality and these actors on what type of knowledge the municipality requires for the climate adaptation work?". Informants were asked if there was cooperation with other actors in the form of workshops and dialogue with consultants. They were asked how satisfied they were with the knowledge they got from external actors, to what extent it is used in the climate adaptation work and the challenges and benefits for actual measures/decisions. *Natural and social science research*; here informants were asked to what extent and what use they had of these two broad types of research. This could also be related to knowledge regimes, identifying what types of knowledge exists within the municipal bureaucracy. *Actions taken*; here informants were asked to exemplify climate adaptation measures. This could also be a fruitful indication of how knowledge is used for actual measures. And lastly, *wishes for the role of research/researchers*; where informants could state what knowledge they wished was available for climate adaptation work, how their relationship to researchers were and how they wished it could be. This might also relate back to the *democratization* aspect of the knowledge regime, as it sheds light on who has access to relationships with researchers.

The topic guide was piloted before the fieldwork began, on a person that previously held a central position within the City Government. It was essential to test the topic guide on someone who knew the context well. Valuable feedback was given during the piloting that was used to revise some of the formulations, as well as preparing me for the interview situation and context.

3.6 Selecting informants

Informants were selected from a broad range of the municipality's sectors and from different parties in the City Council. Because of the inductive approach to this relatively little explored field, I wanted to investigate how knowledge is used in different areas of the municipal activities. A different approach would be to choose one agency for instance, and select multiple informants from the same agency. This would provide a more in depth understanding of how the agency uses knowledge in its work, but with a narrower focus. In selecting informants from a wide range of the municipality's activities, I would be able to give a more general overview that could be used to further conduct more in depth research. Selecting

informants both from the administrative and political side also allows for a more comparative approach.

Table 1: Overview, informants

Group	Where	Level/position
Administrative	Agency of Water and Sewage Works	Level 2
Administrative	Agency for Planning and Building Services	Level 2
Administrative	The Climate Section	Level 1
Administrative	Section for Civil Protection and Emergency Planning	Level 1
Politician	City Council	Governing party
Politician	City Council	Opposition
Politician	City Council	Opposition

Administrative employees were chosen in order to represent a broad range of the administration. Bergen municipality has been organized according to the "two level model" since 2004 (Kristiansen et al. 2014). The model was introduced in order to achieve a flatter organizational structure, as well as stimulating more accountability and clarify the exercise of authority. Sections on level one are subject to the instructions of the Commissioner directly through the municipal executive. Units such as agencies are organized at level two where they execute their tasks in accordance with expert assessment, laws and regulations (Kristiansen et al. 2014). Therefore, representants were chosen from both levels; two representants of agencies belonging to level 2 and two representants for sections belonging to level 1[4].

Politicians were chosen from the City Council on the connection they have to climate adaptation work. It was important that the politicians had been involved in decision making on climate adaptation. All informants were therefore selected from the Standing Committee on Environmental and Urban Development. Informants were selected both from one governing party and from two opposition parties. I was not successful in my attempts on getting an interview with the Commissioner for Climate, Environment and Urban Development in the City Government. After several invitations to participate in the project, the Commissioner had to decline due to reasons of time.

[4] Level 1 is the Commissioner's secretariat and provide the Commissioner with professional advice. Level 1 is responsible for overseeing the work of the agencies at level 2. Agencies on level 2 are responsible for the municipality's services towards the citizens. https://www.bergen.kommune.no/omkommunen/avdelinger/byradsavdeling-for-klima-miljo-og-byutvikling/om-oss

A snowball selection technique was employed for selecting informants. From someone who had worked within the municipal apparatus I got tips on who could be relevant informants to contact. Some of the administrative employees I addressed, did not participate themselves, but referred me to other people. One of the informants was selected at the recommendation of another informant during an interview.

Once selected, all informants were given an information sheet with a written consent statement modeled after the template offered by the Norwegian Center for Research Data (NSD). The information sheet is included in the appendix.

3.7 Cross-sectional qualitative analysis

Spencer et al. (2014) outline a way for formal analysis in their chapter of the book *Qualitative Research Practice – A guide for social science students & researchers*. Using the same labels on the dataset as a whole, in order to obtain a systematic overview of the data is what constitutes the cross-sectional method. Here, the researcher uses a common system for the entire dataset, in contrast to non-cross-sectional methods where particular cases within the sample are given special categories to understand the distinctiveness of each case (Spencer et al. 2014). I will largely use a cross-sectional approach when analyzing the data, as Spencer et al. (2014) put it, to compare and contrast the views of the participants across the whole data set, and use non-cross-sectional approaches if specific evidence in the interviews requires so. The variables, each consisting of respective categories, have been kept the same and used to categorize the transcriptions of all the interviews. Where a category cannot be retrieved in the transcription of one interview the rubric in the data matrix has been left blank, but this also provides important information as one can try to make sense of why this was not relevant for this particular interview. Overall, most categories have been relevant for all interviews one way or the other. The exception is the politics variable, where politicians naturally elaborated more. The matrix for administrative employees therefore contains a lot of empty rubrics for this variable.

3.8 Analytical procedure

Different phases of the analytical process are described by Spencer et al. (2014). At the beginning of the process, although the design of the study was theoretically informed, the developed themes are grounded in the data. When the researcher then moves on to develop

some higher order concepts, and tries to explain their linkages to the data, there is a return to theory or existing knowledge. As already mentioned, the variables used in the analysis were theoretically motivated. I started the process after transcribing the interviews by categorizing the variables in the dataset and making data matrixes for each of them. I kept the politicians and administrative employees in separate documents to easily keep an overview. The variables were formulated prior to transcribing all interviews based on theory, the topic guide and my recollection of what had been discussed during the interviews. After transcription, categories for each variable was developed. Where the variables were inspired by theory in the way explained in section 2.5, which also informed the interview guide, the categories were empirically driven. The chosen categories will now be elaborated on.

For cross-sectional qualitative analyses ideas and concepts should be grounded in the data. "To achieve this, the method needs to allow emergent ideas, concepts and patterns to be captured and revisited. Where a priori concepts are utilised, a careful check is made to ensure that the data support their adoption" (Spencer et al. 2014). The variables were theoretically informed and thus formulated a priori. Then, a set of categories was formulated for each variable. They were formulated in two different ways, some from conducting the interviews I knew would be apparent as well as central to answer the research question, and some as I started reading through the transcriptions of the interviews. Although some categories were developed somewhat a priori, that is before reading through the entire set of transcriptions, it was apparent when going through the transcriptions that they were highly relevant. For some variables I added categories on the way of going through the transcriptions, because important points made in the interviews needed an additional category in order to be categorized. I have tried to formulate general categories in order to take a step back from the dataset and using labels that would cover many interviews, as to avoid formulating new categories for each new interview I examined. It is also important to note that I categorized one variable at the time, that is I went through all interviews on the one variable, before moving on to the next.

By having a reflexive approach to theoretical intakes, variables and empirics in the way described, I largely ensured that each interview was given the same analytical treatment, another point highlighted by Spencer et al. (2014). However, it is not impossible that categories were added after some of the interviews already had been examined. In this case, the category might not have been relevant for previous interviews, or when coming back to an empty box in the matrix for different categories, the interviews could be revisited on a later

point to check if the category was relevant for this interview. In some cases, when writing chapter 4, I had to revisit the transcriptions when I found an empty box in the data matrix.

Table 2 is an overview of the variables with respective categories that were initially used to categorize the entire data material.

Table 2: Variables and categories

Variable	*Problem perception*	*Knowledge*	*Politics*	*Communication*	*Problem solution*	*Cooperation*
Categories	Conceptual understanding	Challenges	Party politics	Channel	Concrete measures	Who?[5]
	Relevance	Benefits	The City Council	Initiative	Perceived effect	Process
	New challenges	Types	The City Government	Challenges	Plans and strategies	Internal
	Types of climate change	Source	Other views/attitudes	Positive experiences	Other views	External
		Internal knowledge		Structure of the political system	Considerations	Co-production
		Knowledge going out		Trust	Challenges[6]	Output
		View of knowledge		Communicating needs for knowledge		Possible improvements
		Lack of knowledge		Relationship to researchers		

3.8.1 Operationalizing the variables

A short operationalization of the variables, presented in section 2.5, through the categories is in place. As already mentioned the categories for each variable are driven by the empirical data. The problem perception variable is comprised by the categories *conceptual understanding, relevance, new challenges,* and *types of climate change.* The categories

[5] This category was only used on one interview, because it became apparent that it overlapped too much with the internal/external category.
[6] This category was only used on one interview, but it has been called attention to in the empirical analysis

identify how the informants perceive the concept of climate adaptation, the relevance of these issues for their work and in the municipality, new challenges posed by climate change and what types of climate change and consequences are mentioned by the informants.

The knowledge variable consists of the categories *challenges, benefits, types, source, internal knowledge, knowledge going out, view of knowledge* and *lack of knowledge.* The categories identify where knowledge comes from (mainly external actors), what types are being used in climate adaptation work, the benefits and challenges of using it, knowledge existing within the municipality as well as knowledge being communicated outwards, informants view of knowledge and what knowledge they wish was available.

The politics variable is built up by the following categories; *party politics, the City Council, the City Government* and *other views/attitudes.* The categories identify what are important priority areas for the parties of the informants, as well as for the City Council, and if there is congruence among them, what is said in relation to the City Government and other views brought forward by informants related to politics.

The communication variable received the categories *channel, initiative, challenges, positive experiences, structure of the political system, trust* and *communicating needs for knowledge.* The categories identify what channels are used for communicating knowledge both internally and externally, who initiates communication (mainly administration or politicians in relation to each other), challenges for communicating, positive experiences from communicating, the structure of the political systems implications for communicating, and if the informants are active in communicating what knowledge they need. The category *relationship to researchers* was also categorized here, but this was moved to the cooperation variable when writing chapter 4, because it made more sense to see this relationship in the light of cooperation, rather than communication.

For the problem solution variable the categories are *concrete measures, perceived effect, plans and strategies, other views, considerations* and *challenges*. It identifies specific climate adaptation measures carried out in the municipality, the perceived effect of measures taken, plans and strategies mentioned by informants associated with climate adaptation, considerations one needs to make in climate adaptation work and challenges related to solutions. “Other views” was made as a catch all category for other relevant responses.

Finally, the cooperation variable has the categories *who, process, internal, external, co-production, output* and *possible improvements*. The category *relationship with researchers* was, as mentioned, moved to this variable from the communication variable, before writing the empirical analysis. The categories identify the actors involved in cooperating both from within and outside the municipal organization, characteristics of the cooperation process, what the informants report getting out of cooperating, what could be done better and the relationship the informants have with researchers.

3.9 Reflecting on the analytical procedure

The previous section presented the procedure used for going through and sorting all of the data from the interviews. All the different data matrixes produced, two for each variable (one for administration and one for politicians), where then gone through systematically and formed the basis of the empirical analysis. Not all categories proved relevant to include in the empirical analysis, some of them were merely too much a collection of quotes that would not add up to form a sensible point or fit the narrative.

One of the greatest challenges when categorizing the data along these variables were that many of the variables were hard to distinguish from each other. This was particularly true when categorizing different types of challenges. Trying to keep challenges of climate change separate from challenges of communication or challenges for using knowledge. Interpreting challenges was also difficult; did the informant experience this as a challenge or have I interpreted this as a challenge? This was especially true for responses to questions not directly asking the informants to list challenges. Distinguishing source of knowledge from cooperation was also difficult. Separating cooperation and communication also posed challenges. Was there actual cooperation involved, or just a one way line of information? I tried to keep them separate, but true for many if not all variables were that the same quotes were put into different variable matrixes. Ryen (2002) identifies this challenge by stating that the same data can belong to different categories. This will broaden the range of possible hypotheses that the data can generate and one should therefore handle the data with flexibility (Ryen 2002, 145-146).

Spencer et al. (2014) underline the importance of staying close to the original data early in the process and encourages the researcher to “follow a systematic path and build a structure of

evidence within which the building blocks of the analysis can be seen" (Spencer et al. 2014). I have chosen to dedicate one chapter to describing the empirical foundations of the analysis, before moving on to the more theoretical-analytical discussion chapter. The purpose of this procedure is transparency, so that the reader can follow the analytical line of reasoning.

3.9.1 Translation

All interviews were done in Norwegian. It was therefore necessary to translate the material when writing the thesis. The transcription was done in Norwegian along with the categorization of the data. Categories were first translated when writing them into the thesis. Any quotes from the informants used in the thesis were translated before writing them in. To help translation of Norwegian terms from the municipal sector, I used online glossary lists from the Norwegian government and Bergen municipality[7]. I also used the English version of Bergen municipality's web page[8].

3.10 Ethical considerations

According to data protection regulations political attitudes are viewed as sensitive personal information. This was the reason for all measures taken when collecting and storing the data for this thesis. However, all respondents were interviewed in their public capacity. Therefore, the views presented should be the views of the party or agency/section. The possibility of some views or attitudes being personal can however not be eliminated, so instructions on how to collect and store data on sensitive personal information from the Norwegian Centre for Research Data (NSD), the University of Bergen's data protection officer, were followed.

All informants provided written consent to partaking in the interviews and for their data to be stored in line with instructions provided by the NSD. Another important aspect underlined in the consent form was that of anonymity. All informants consented to the following: "that information about me may be published so that I can be recognized as a consequence of indirect identifiable personal information. Complete anonymity cannot be guaranteed for, seeing that the sample is relatively small. The thesis might contain phrases like 'an administrative employee in (relevant)department/agency' or 'a representant from (relevant)

[7] Regjeringen.no. Termlist – The Planning and Building Act. https://www.regjeringen.no/no/tema/plan-bygg-og-eiendom/plan--og-bygningsloven/plan/veiledning-om-planlegging/Bokmal-nynorsk-ordliste/ordliste-norsk-engelsk--plan--og-bygning/id462717/
Bergen.kommune.no. Norsk-engelsk ordliste pr April 2010.
https://www.bergen.kommune.no/bk/multimedia/archive/00097/Norwegian-English_no_97304a.pdf
[8] Bergen municipality webpage, English version. https://www.bergen.kommune.no/english

standing committee' combined with gender" (my translation). All caution taken by informing the informants about this, I have still kept the respondents as anonymous as possible in the analysis.

3.11 Methodological considerations

Choosing a qualitative method for this thesis could of course be debated. What is gained and what is lost using the method and tools selected? In the words of George and Bennett (2005) "case studies are generally strong precisely where statistical methods and formal models are weak", referring to conceptual validity, deriving new hypothesis and exploring causal mechanisms. What is lost with the case study method is the ability to make generalizations applying to broad populations, estimating average causal effect and the ability to include frequency and representativeness (George and Bennett 2005). According to Yin (1981) case studies are especially relevant for assessing knowledge utilization, because the phenomenon cannot be separated from its context. Reasons for choosing the case study when investigating knowledge utilization, as well as decision making behavior, is that a series of decisions are often spread out in time (with no clear beginning and end), and situations are unique in terms of agency, timing etc. Although surveys could be used to establish frequency, in order to answer "how" or "why" questions a case study is an appropriate strategy (Yin 1981). What is lost with the methodological choices I have made is the ability to answer questions of "how much" and uncovering correlation. Mosely (2013) states that interviews are both important and sometimes essential in making sense of political phenomena. Interviews are suited to uncover beliefs, incentives and behaviors of individuals, directly assessing actions and attitudes in an in-depth manner. They have the potential to uncover causal mechanisms. "Interviews allow scholars to interact directly with the individuals, or some of the individuals, who populate our theoretical models" (Mosely 2013). A case study with in-depth interviews is what from the start seemed more suitable for the research objective, which was uncovering opportunities and challenges for using knowledge for decision making on climate adaptation.

The methodology chosen for the thesis is not without consequence. The epistemological stand taken could be problematic. Miles and Huberman's method of critical realism analyze the informant's responses independently of what questions are asked, and therefore does not offer much consideration of the context of which these answers are provided (Ryen 2002, 162). I have also adopted a substantial approach of handling my data, focusing on what the text tells me, not how language is used to articulate responses. My approach has thus been to take the

informants responses at face value and extract responses independently of what questions were asked. I have not adopted this strategy too strictly however. I have often commented within the data matrix what questions were asked to make the quotations easier to retrieve in the transcriptions later on, to understand the quotation if it seems difficult to understand in itself, as well as to be able to compare answers to specific questions across the entire dataset. Therefore, some context has been included, but the point is that what the informants have stated has been taken at face value. The problem with the approach is that context is not thoroughly considered. Informants may be motivated to respond in a particular way because of their political orientation or occupational status. Another aspect to be discussed here is if I have indeed followed the approach of Miles and Huberman strictly enough. The approach is concerned with building categories through a bottom-up approach. Ryen calls attention to a common issue in qualitative research, namely starting out with already formulated categories and searching for data to confirm them. This is not in line with the realist method (2002, 162). Some of my categories have been a priori formulated, such as the co-production category. After transcribing the interviews I took a step back when formulating most of the categories in order to make them not too idiosyncratic for each interview. Thus many of them were formulated between transcribing and categorizing, and informed by what I saw to be logical categories to investigate under each variable. They were moreover highly grounded in my recollection of what had been put forward in the interviews and the transcriptions of them.

One weakness could be the relatively small sample of informants. Due to the time perspective of the master project, constraints were set on how many informants were reasonable to interview, especially with regards to what size of data material could be examined properly within the time frame. The analysis could however had brought on different results if a larger number of informants were included, say from more political parties as well as the City Government, multiple informants from the same agencies and sections or from agencies and sections not represented in the sample. Informants from different municipalities would also have been productive to answer the research question, and could provide an opportunity for generalization. A larger number of informants might have provided different findings or more extensive empirical knowledge on different aspects. The findings might not be representative for all administrative employees and politicians in the municipality, most likely they are not. The qualitative orientation of the thesis sets some limitations. It does not provide for generalizing the results. Whether the results are generalizable to other large municipalities in Norway, cannot be claimed. A quantitative approach, including questionnaires for reporting

different challenges and possibilities perceived by a large number of respondents could allow for statistical generalization. A larger number of informants in a qualitative design could also have been fruitful, perhaps including informants from a number of municipalities. The latter was considered for this master's project, but the approach was assessed too time consuming for the purpose of the thesis.

Another weakness to be discussed is that of translating my material. The interviews were, as previously mentioned, carried out in Norwegian. Translations in the thesis are my own[9], therefore there could be translations that people might find misleading. I have however tried to stay as close to the Norwegian meaning of the data as possible, when translating it to English. The dataset in its entirety has been kept untranslated and the analysis has been carried out on the data still in its original form. The categories have been translated in order to put them into the thesis, and quotes used have also been translated before writing them into the thesis.

A source of error could be dedicated to myself in the role of the interviewer. MacLean states that "by *illuminating* the power dynamics and biases involved in the process of conducting interview research, rather than assuming they do not exist, or trying to somehow eliminate them, political science scholarship can become more rigorous, not less" (2013, 68). She discusses amongst other things the power of authorship and the power of the researcher's position in the field. On the latter part, my position as a masters student may have given specific impressions to the informants. Many of them had previous experience with being interviewed by master students. When it comes to authorship as well as my position in the field and other biases, I hope to offer transparency throughout the analysis.

The validity and reliability of the thesis should also be discussed. Validity in this respect refers to whether the interviews measure what they are supposed to; did I manage to ask the right questions in the right way, and did the participants provide truthful answers (Mosely 2013)? Early interviews are important for the researcher to get an understanding of how to best ask the questions she wants answered, according to Mosely (2013). The first couple of interviews made me get a feeling of how to ask the questions, and further along in the interviewing process I saw how some questions were unnecessary to ask. However, this does

[9] I did confer with my supervisor and another researcher at the University about some translations.

not eliminate the possibility that I may have excluded questions based on previous experience that actually could have provided fruitful insight if they were asked to other informants. For one interview I discovered that I had not asked some questions that would be of importance. Luckily the informant was generous enough to answer these questions at a later date. For some interviews, to keep within the one hour timeframe, some questions had to be dropped.

Turning to whether or not informants answered questions truthfully, I cannot say anything but this being my impression. Informants were also quick to ask questions in return if there was something unclear in the way I posed my questions. The possibility of a bias related to hindsight, or altering ones perceptions after the fact might of course be present. However, I have chosen to take what informants say at face value.

Reliability in this context points to the extent to which the information collected in the interviews is accurate, and if the same information would be generated had the interviews been repeated (Mosely 2013). All interviews were recorded and transcribed as soon as possible after the interview. However, transcribing was a lot more time consuming than expected. Reliability can also be related to translation. All interviews were done in Norwegian and although I have kept as close to the Norwegian formulations when translating the data in the text, some of the translations might have slightly distorted the message. Some of the points made in the analysis as well as the categorization work done beforehand is also influenced by my own interpretations of what the informants are saying. What may look like a challenge in an informants response, might not be intended explicitly as challenge by the informant. Another example is how some responses have been categorized in multiple categories, and thus used to describe different arguments. In sum, there are clearly challenges of validity and reliability present and these cannot be eliminated. However, as long as one is aware of these challenges and they have been presented to the reader, the study can be assessed in the light of this information.

Summing up the chapter, a qualitative method is considered appropriate in accordance with the explorative research question and the descriptive nature of the theoretical framework. A case study with interviews is expected to provide fruitful insight on incentives and behaviors of individuals, within the context where knowledge utilization and decision making behavior occurs. A description of the analytical procedure, selection of informants and formulation of

the topic guide was offered. Methodological weaknesses and necessary considerations have been elaborated on. The ground is now prepared for conducting the empirical analysis.

4 Empirical analysis

4.1 Introduction

In the introduction of this thesis Bergen was described as a large municipality, quite far along in climate adaptation work, hosting a number of research institutions. In this respect it is an interesting case to study in terms of using knowledge for adaptation work. The municipality would be expected to have capacity and resources to use for this purpose, linked to their size. The fact that they are quite far along in climate adaptation work provides more processes and measures to study, as well as the proximity to knowledge may facilitate communication or cooperation with research institutions. The municipality's climate strategy "Grønn strategi" clearly states that Bergen should be a frontrunner when it comes to the environment, sustainable development and adaptation to climate change (Grønn strategi 2016, 9). How then does the municipality work with climate adaptation? This chapter will elaborate on how the municipality works with this issue, where and how they acquire knowledge and how they cooperate and communicate. Interview data form the main basis of the empirical analyses, however, the documents presented in section 1.3.1 will provide useful context.

The theoretical framework has been used to derive the variables employed for analyzing the data. In this chapter, I will carefully describe the findings on each variable as they appear in the data material. The chapter is structured using the six variables as main themes. A more specific discussion of the findings in relation to the three theoretical approaches will be conducted in chapter 5. The reason for this procedure is that the variables need to be investigated properly before explanation and causation can be introduced. Some of the categories have been included as separate subheadings. However, many of the categories have been merged in order to create a coherent narrative. Some categories also proved less relevant to include in the empirical analysis. I will keep the responses of administrative employees and politicians separate, because they respond from different sides of the municipal organization. This allows for comparison between administrative employees and politicians, however, comparison within the two groups is also of interest.

4.2 Problem perception

The municipality's responsibilities when it comes to climate adaptation is safeguarding the lives, health and security of its inhabitants, prevent damage, with the duty to ensure

emergency response and preparedness (Green Strategy 2016, 76). This responsibility is taken care of through integrating climate adaptation in urban planning and development, as well as in the municipal work on risk and vulnerability and other municipal plans (Green Strategy 2016, 76). The climate and energy action plan from 2010, clearly stated the importance of climate adaptation being dealt with locally, and the municipality's opportunity to be vigorous through their work on urban planning (Klima og energihandlingsplan 2010).

4.2.1 Conceptual understanding

A central task is to uncover how the informants understand the concept of climate adaptation. The chapter on climate adaptation in the current Climate and Energy Action Plan states that the future climate is hard to predict, but depends amongst other things on how much greenhouse gasses are emitted in the time to come (Grønn strategi 2016, 72). Here, adaptation and emissions are linked. The risk and vulnerability assessment includes the risks that fall under the municipal administration's responsibility, as well as the risk associated with the municipality as a geographical unit (ROS 2014, 4). This is an indication of the risks included in the report going beyond the traditional municipal responsibilities.

Administrative employees generally have a professional and technical understanding of the concept, such as developing the city to be robust enough to handle future climate change and making arrangements for the city and its inhabitants to be safe from climate change consequences and climate related unwanted events (Administrative employees 2 and 4). When talking about handling future climate change, uncertainty is expressed; not knowing exactly what the challenges will be (Administrative employee 2). An example of the technical approach to the concept comes from administrative employee 1, who understands climate adaptation in this way:

> "that we should adapt the city or the surroundings to be able to withstand the climate that we have prognosis for. That we plan according to the best knowledge about the future climate. (…) Generally, we are thinking a hundred years ahead. That is on climate adaptation, and then there is trying to make the best out of climate adaptation, (…) using it to… in society to add value or create competitive advantage …" (Administrative Employee 1).

There is however one administrative employee that views the concept more inclusively saying "it is not just about physical change. But it is also about economics, and actually about

people's mental health, it is about diseases, it is about food supply – there are a lot of aspects tied to the climate" (Administrative employee 3). The informant describes climate adaptation as a concept that "covers a lot".

The main difference in problem perception between administrative employees and politicians is the level of generality attributed to the concept. It is difficult to draw a clear distinction between the two groups because all informants perceive the concept somewhat differently. The politicians tend to use phrases like; rethinking urban development and considering sustainability (Politician 2) and taking seriously the fact that the climate is changing considerably and the need for adaptation to face the challenges to come (Politician 1). Politician 3 views climate adaptation as a an abstract term, a buzzword, and understood it as activities directed towards not increasing the acreage temperature. The distinction between the two groups is tendentious, and as we have seen, one of the administrative employees also has a wide approach when describing the concept.

4.2.2 Relevance

Is climate adaptation a central issue for the municipality and visible on the municipal agenda? The land-use element of the municipal masterplan from 2018 includes climate as a novel theme, with an article 19 on climate adaptation, risk and vulnerability (KPA 2018). The same document also states that a climate perspective is central to all land-use planning. This says something about the relevance of the issue for municipal planning. Moreover, the municipality has a Climate Section that coordinates climate work across agencies and an internal climate adaptation group where members from all agencies are present. Bergen was the first in Norway to get guidelines for storm water management, and climate adaptation is central throughout the risk and vulnerability assessment (Administrative employee 2, 3, 1 and 4). A good illustration of the saliency of the issue comes from one of the politicians stating:

> "My understanding is that one to a larger extent do climate adaptation measures in cases, and now the new thing is that the influence of climate change should in a way be mentioned in all cases where it is relevant. (…) before it was possible to forget this perspective, now the politicians have in a way forced themselves to remember, in the way that one ask cases to be presented" (Politician 2).

Nearly all administrative employees viewed climate adaptation as central to the municipality. The fourth states that it is hard to compare this issue to other issues the municipality deals

with, but that a lot of attention has been awarded to climate change and climate issues (Administrative employee 4). All administrative employees respond in one way or another that they perceive the politicians to be concerned with these issues as well. One of the politicians, in turn, respond that the administration takes these issues very seriously (Politician 1). The politicians generally view climate adaptation to be central, however one replies that the municipality likes to say that it is a central issue. But later, when talking about municipal plans, goes on to say that there is great attention awarded to the issue (Politician 3).

Administrative employees view climate adaptation as central to their work[10]. One said he hoped it would become even more central (Administrative employee 3). Politicians also view it as central to their political work, although one makes the reservation: to the extent to which we can influence issues related to average temperature and stop emissions (Politician 3).

4.2.3 New challenges

Getting a grasp of the problem of climate change requires and understanding of what challenges it poses for the municipality. A warmer, wetter and wilder climate will lead to more unwanted events, like landslides and floods. The municipality states that there will be an increased need for knowledge about this development, in order to make sure new developed areas are safe (Klima og energihandlingsplan 2010). Informants were asked what new challenges come with climate change for the municipal administration or local politicians. Climate change requires more cooperation and coordination of the different resources in the municipality, one informant says (Administrative employee 4). Further, another highlights uncertainty, both in regards to planning towards an unknown future and knowing when one has to implement measures (Administrative employee 3).

Funding and knowledge was also discussed as challenges by the administrative employees. There seems to be different opinions on whether funding is an issue for climate adaptation. Some view funding as an issue, or points to the uncertainty of an unknown economic situation (Administrative employee 1 and 3). Others say that although measures are expensive funding is not really an issue, or that there is a willingness to fund these activities both in private and public sector (Administrative employee 2 and 4). Knowledge is also described as challenging in that there is a need for more, the availability of expert knowledge and being knowledgeable

[10] One of them (Administrative employee 4) was not asked this question, but stated in the start of the interview that considering and evaluating climate related questions, cover all the responsibilities of his department.

of a wide range of challenges (Administrative employee 4, 1 and 2). As one informant puts it "we do not know enough. We do not lack knowledge, we have a lot of expertise within the municipality, (…) But more knowledge is probably needed" (Administrative employee 4).

Politicians differ in their view of what climate change requires of them. Thinking about local measures to reach global goals and being more concrete in measures taken, is mentioned (Politician 1 and 2). Politician 3 is of a different opinion; the climate in itself does not require anything, but it is about what local politicians can do in relation to sea level rise and extreme weather events. Here ideological differences might be what affects the answers. One of the politicians use the formulation "for us who take it seriously", which might be an indication of ideological differences present for these issues. Keeping track of the knowledge part of this large policy area is perceived as challenging and time consuming (Politician 1). Proving effects is also mentioned as a challenge (Politician 2). Uncertainty is also highlighted, in relation to the consequences of sea level rise (Politician 3).

4.2.4 Types of climate change

What are the manifestations of climate change that already are and will be central in Bergen? The risk and vulnerability assessment reports extreme weather events to be highly likely with serious consequences for the environment and economical values. Incidents with floods and storm water are rated as likely, and could have serious consequences for the environment and economical values. The consequences for life, health and reputation is rated as serious. Landslides and avalanches are rated likely with serious consequences for life, health, environment and economical values (ROS 2014). One informant summarized it nicely when talking about the priority areas for the municipality on climate adaptation, by stating that "a lot has to do with water. So, everything that has to do with water, that is managing quantities of water" (Administrative employee 4). Water in different forms and the consequences of it, seems to be Bergen's number one challenge.

Types of climate change mentioned by both administration and politicians were increased precipitation and extreme weather events. Two administrative employees also mention wind. Two politicians add temperature and one adds variable weather conditions. These can be said to be typical first order effects, namely climate dynamics and variability (Neby 2019). Second order effects are the consequences influenced by the climate dynamics (Neby 2019). Second

order effects mentioned by both groups are sea level rise, flooding, landslides and storm water management. Administrative employees also mention avalanches and storm surges.

To summarize, problem perception in Bergen thus bear evidence of a somewhat varying conceptual understanding where some view it technically and others take a more general approach. This divide exists between the two groups where administrative employees generally represent the former, while politicians represent the latter. Climate adaptation is a relevant issue and absolutely on the municipality's agenda. It is also a large policy area that requires large amounts of knowledge and financial resources, as well as an issue that introduces a lot of uncertainty.

4.3 Problem solution

One of the ways Bergen municipality works on solutions for climate adaptation is mapping landslide risks, wind, flooding, precipitation and sea level rise that is used in the processing of building applications (Grønn strategi 2016; Green Strategy 2016). As a consequence of the Hatlestad landslide, a wake-up call for politicians, the municipality made a lot of investigations on precipitation, sea level rise, winds and floods. The Agency of Water and Sewage Works work actively on flood management and all built-up areas in the municipality have been examined by a geologist in relation to landslides (Administrative employee 3). There are strict practices on not allowing building projects where sea level rise is an issue and all developers are required to investigate issues of landslide and avalanches in detail (Administrative employee 2).

In the land-use element of the municipal master plan there are a lot of goals related to emissions as well. These are reducing traffic, concentrate building development, optimizing the use of infrastructure, roads and public transport and preserve the city's green areas. For larger building projects there is a demand for carbon budgeting (Administrative employee 2).

The risk and vulnerability assessment is also a central document in this respect. It maps out the risks of all types of unwanted events, but they have a special focus on climate change and the unwanted events they might lead to (Administrative employee 4). There is also a risk and vulnerability assessment related to the land-use element of the municipal master plan, which forms the foundation for being strict in terms of building development (Administrative employee 4).

The municipality also uses knowledge projects actively for concrete measures. The MARE project contributed to finding solutions for sea level rise at Bryggen where there has been carried out adaptations in the sewerage system, and for a canal between Lille Lungegårdsvann and Store Lungegårdsvann that has been put into the municipal regulation plan. The BEGIN project contributed to finding the solution for a canal at Mindemyren (Administrative employee 1). I would like to draw attention to what one of the politicians said, that related knowledge to solutions. When asked if there are elements of knowledge that can be challenging, he says "it can be challenging to find solutions within the frame that knowledge provides. It is a small work of art, both administratively and politically" (Politician 1).

4.3.1 Perceiving effects

One thing is planning and implementing measures, another issue is whether measures are perceived as effective. The politicians present different angles to perceiving effects. One says that every small action has an impact on the main goal (Politician 1). Another says that one has visions and use big words, but being specific and proving effect could be challenging (Politician 2). Yet another says that they (in the City Council) do not agree on measures are effective, and what are merely symbolical (Politician 3).

Summing up, there are plans and concrete measures being implemented in the municipality. Some of which are inspired by research projects, others a consequence of the focusing event of the Hatlestad landslide. There seems to be levels of disagreement on the political side of what measures are effective.

4.4 Politics

It has been apparent that climate adaptation is dealt with administratively, but how does the municipality work on these issues politically? The City Council of Bergen has declared climate crisis (Byrådsplattform 2019-2023, 8). The City Government was not interviewed for this thesis, but how they work on climate adaptation is described in their political platform. The political platform says they will continue to upgrade the city's water and sewerage system and opening up rivers and streams that were previously in pipes. This way the city is better equipped to handle large amounts of precipitation. The City Government also finds it necessary to implement measures to secure Bryggen and other buildings worthy of preservation against sea level rise and storm surges (Byrådsplattform 2019-2023, 8). When

asked if climate adaptation is central to their political work, the politician representing one of the parties in the City Government reported that the Sustainable Development Goals are a leading part of the political platform and that "everything that we do locally builds on these goals". Administrative employees perceive the Commissioners of recent City Governments as wanting them to work actively with climate adaptation and that past Commissioners have been very committed to climate questions (Administrative employee 1 and 2). Administrative employee 1 also perceives a political will and understanding towards working to secure the city for a harsher climate. Moreover, "Grønn Strategi" clearly states that climate adaptation should be a part of the municipality's activities (Administrative employee 3).

When it comes to the centrality of climate change and adaptation for the parties interviewed, politicians differ in their responses. Two of the politicians report that *climate change* is central to the party both on the local and national level (Politician 1 and 2). A third says climate change is central to the party program in relation to reducing pollution (Politician 3). Two of the politicians were asked if *climate adaptation* was central to their party programs, whereby one said yes, but that they have a way to go, and one said that it was not a recurrent theme, but that it is something that everyone bears in mind (Politician 1 and 3).

For two of the politicians there was congruence in what they perceived as priority areas for the City Council and if this was also important to their party. One brings up infrastructure for public transport as the most important issue, but also mention replacement of water pipes, reopening water streams and other forms of water management. She also reports these issues as important to the party (Politician 2). Another says reducing transportation needs is important to the City Council, herein also cruise ships and freight transport. This is reported as important to the party as well (Politician 1).

The third informant draws attention to the political conflict by highlighting that this issue is a source of disagreement in the City Council, as mentioned in the previous section; "we do not agree on what measures are effective" (Politician 3). The political conflict will be discussed further in chapter 5.

In essence, climate adaptation is clearly an issue being worked on politically in Bergen. There are however differences present in how the different political parties report working on adaptation.

4.5 Knowledge

Previous sections of this chapter has shown how Bergen municipality works with the issue of climate adaptation politically and administratively as well as how the issue is perceived. The central question for this thesis is how they acquire and use knowledge for this purpose. The municipal strategy on climate adaptation clearly defines the municipality's responsibilities in relation to knowledge. To meet their responsibilities of securing inhabitants, prevent damage, emergency response and preparedness, the municipality will acquire the best available knowledge on climate change and effects and use this knowledge to change or prepare the local community to adapt (Grønn strategi 2016). Knowledge development has been on the agenda for many years, the Climate and energy action plan from 2010, listed a number of ongoing knowledge projects where the municipality was involved (Klima og energihandlingsplan 2010).

Knowledge is acquired from a range of external sources. EU projects are mentioned by several administrative informants (Administrative employee 1, 2 and 3). Responses include Interreg projects, MARE (Managing Adaptive Responses to changing flood risk in the North Sea Region), BINGO (Bringing Innovation to Ongoing Water Management), BEGIN (Bluegreen Infrastructure through Social Innovation) and CAMINO (Climate Adaptation Mainstreaming Through Innovation).

Knowledge stemming from national sources are also emphasized by administrative employees. Responses include the Norwegian Environment Agency, the Norwegian Directorate for Civil Protection and the Norwegian Water Resources and Energy Directorate. Respondents report participating in networks coordinated by the Norwegian Environment Agency, such as the I-Front network (Administrative employee 3) and The Norwegian Association of Local and Regional Authorities, known as KS (Administrative employee 4). Informants also report using the internet to access information from government institutions such as the Norwegian Environment Agency and the Norwegian Water Resources and Energy Directorate (Administrative Employee 3 and 4). One however, says "today with computers and everything, it is not hard to get information if only one knows where to look (…) But sometimes it is rather that the information flow gets so big that you have to be selective" (Administrative employee 2).

In addition to EU research projects, the administrative informants report cooperating and receiving knowledge from a range of national research institutions, some of which also partake in the EU projects. Two institutions are mentioned by all four administrative employees; NORCE and the Bjerknes Center. Other institutions mentioned are Norwegian University of Science and Technology/SINTEF, University of Bergen, the Institute of Marine Research, The Nansen Centre, Western University of Applied Sciences, The Meteorological Institute, Western Norway Research Institute, Norwegian University of Life Sciences and CICERO. One informant states that the research community is *the most* central source of knowledge. She also says her unit mostly uses the research community in Bergen, because it is easily accessible and that it is an opportunity to contribute to the development of the research community (Administrative employee 4).

The politicians in turn, report receiving knowledge from the administration, as is normal procedure (Politician 1 and 2). All of the politicians report published research and research institutions as a source of knowledge. All report reading reports or written material stemming from research institutions. Two mainly report receiving knowledge from local research institutions, while the third also mentions universities abroad. All politicians also report being invited to lectures and seminars organized by research institutions. However, they mention time constraints as an obstacle to participate in these events (Politician 1 and 3). “If I was to go to all these events (..) I would not have been much in the office” one says (Politician 1). An important aspect brought forward by politician 2, is that these things are very much up to the initiative of the individual politician, and that receiving knowledge from research institutions does not happen automatically.

The politicians also mention knowledge sources on different levels. One says that there is a lot of information coming from the central government. He also includes as the most central actors when acquiring knowledge; the UN and the central government’s ministries (Politician 3). When asked about the County Council two of the politicians do not perceive them to be very central, other than in the context of hearings (Politician 1 and 3). The third also mentions hearings, but view them as a way of gaining knowledge about how the County Council work on these issues (Politician 1). Administrative employees also discuss the role of the County Council. It is viewed as a partner on these issues, but as will be apparent later, the knowledge going from the municipality to the County Council is also central.

Other sources of knowledge mentioned by politicians are newspapers, the industrial sector such as oil companies, NGOs, interest organizations such as Miljøvernforbundet (Green Warriors of Norway) and Naturvernforbundet (Friends of the Earth Norway), and private companies. Other sources of knowledge mentioned by administrative employees are special interest organizations, the labor union Tekna, consultancy firms and city to city learning.

4.5.1 Types

There was an apparent difference in how informants viewed natural science research and social science research. Generally, it seems that natural science is more widely used than social science. Using social science is for instance described as being in an early phase, but that it is absolutely on the agenda (Administrative employee 1). One says that they make use of social science research too, but that there has not been much concrete to go on up until now. “I search for social science research that I can make use of with a fine-tooth comb” one says (Administrative employee 4). Another states “in some ways I think we should at least increase our efforts on that field”, and exemplifies this with both law and social economics (Administrative employee 2).

One of the politicians says they to a lesser extent use social science research, and that she cannot remember if social science research has been attached to the cases they have had (Politician 2). Another replies that there could have been more of it and it could have been higher on the agenda (Politician 3). However, a third states that there has been a development here, and that this perspective is more and more apparent in the cases they receive (Politician 1). This is also symptomatic of some of the replies from the administration, there *is* social science research being used in climate adaptation work. But it does not seem to be used to the same extent as natural science research.

4.5.2 Knowledge located within the municipality

The municipality is not only a passive user of knowledge produced by external actors. They also work internally with knowledge and communicate knowledge outwards. Bergen has an internal network for climate adaptation on the administrative side, called *Klimatilpasning Bergen* (Climate Adaptation Bergen), which is used for communication and informing participants about new projects (Administrative employee 3). Administrative employees also describe the municipality to have a large amount of knowledge or being competent on these issues (Administrative employee 4 and 2). As described above, the politicians use the

administration as a knowledge source. This too is part of the knowledge *within* the municipality. They also get knowledge from the party organization. All politicians report internal training from their parties, which takes the form of seminars and written information.

Moreover, what became apparent in the first interviews conducted and something I had not given enough thought before starting my fieldwork; the municipality contributes a lot with their knowledge to other actors. This was however only discussed by the administrative employees, not the politicians, which is quite natural considering the administration's role as a knowledge provider[11]. One of the ways in which the municipality contributes with knowledge to external actors is giving talks in different settings. Three administrative employees report having given talks on how Bergen municipality works with climate adaptation, in settings such as regional gatherings and networks (Administrative employee 1, 3 and 4). An annual conference where climate and environmental issues have been on the agenda, was also described as an arena where a message and profile is expressed (Administrative employee 2).

Another way of contributing knowledge is related to educational institutions. One informant says that his department has been involved in trying to get educational institutions in the city to better cooperate on educating qualified candidates for the department to recruit. He reports that this covers a range of disciplines, from social sciences to more technical disciplines. This dialogue has also been a source of learning, the informant says, because the other parties contribute with something in return and you have a process where you can come up with something new and develop both practice and the knowledge behind it (Administrative employee 2). Another reports having contact with teaching staff and contributing with talks based on the agency's practice to students. In addition to contributing in lectures, he reports that students are given the opportunity to write about cases the department is working on (Administrative employee 1).

The municipality also supplies knowledge to the regional government. When asked if the municipality receives knowledge on climate adaptation from the County Council, one says "we are perhaps as much of a knowledge source for the County Council, as opposed to the other way around" (Administrative employee 1). He reports that they do communicate with

[11] There might of course be opportunities for politicians to communicate knowledge outwards, but this was not apparent in the data I collected.

the regional government, but that the municipality has a broader approach on climate adaptation than the regional government. And that they have considerably more competence on climate adaptation in practice, than both the regional government and the County Governor's office. Another informant states that

"I think the County Council wants a close cooperation with Bergen municipality, because Bergen municipality is so large that we have the opportunity to acquire knowledge about this – knowledge that smaller municipalities perhaps do not have the opportunity and resources to acquire" (Administrative employee 3).

He goes on to say that the regional government values cooperation with Bergen, because they can use this common knowledge also with smaller municipalities (Administrative employee 3).

4.5.3 View of knowledge

Administrative employees and politicians differ in how they view knowledge in relation to climate change and adaptation. Administrative employee 1 expresses that it is essential to always be searching for knowledge, and being humble to the fact that one does not have all the answers, and that what one thought to be correct might not always be right when you get more experience. Another states that what his unit does is very interdisciplinary and that they need to collect knowledge everywhere that they can, and that with climate adaptation and climate related issues nearly no disciplines are irrelevant (Administrative employee 2). Administrative employees are generally satisfied with the knowledge they receive from external actors. One says with a laugh: "you will never be satisfied, that is the whole point!", but that she thinks that what they get works very well for them (Administrative employee 4). Another however, points to large quantities of information that can make it hard to find what is more important (Administrative employee 3).

Factual knowledge is viewed as beneficial by politicians. However, politicians discuss quality assurance as an issue (Politician 1 and 3). One reports that on this issue, as all other political issues, there is information provided that is focused on achieving something. He follows up by stating that they do thankfully not experience this a lot, but that it has happened. In total however, he perceives actors to provide serious, quality information (Politician 1). Another highlights quality assurance in the way that you need to know where reports are coming from,

read them critically and knowing if there is an agenda behind them. The informant also states that for science to have any value it has to be trusted by everyone, and that there needs to be a consensus of the validity (Politician 3). It seems that politicians to a larger extent have some concerns about the quality of knowledge. This could be a result of the level of political conflict related to the issue of climate change, but the data I have is not enough to make this more than a speculation.

4.5.4 Benefits and challenges

What benefits do the informants have of knowledge discussed in the interviews for concrete decisions, and to what extent is the knowledge used for actual adaptation work? Furthermore, what are the challenges for employing knowledge for climate adaptation?

The ways in which knowledge entails benefits is clear in many interviews. When asked if the knowledge is used in actual adaptation work, one informant lists several EU projects and specifically what this knowledge has contributed to in terms adaptation work. He describes the output of the EU projects as contributing both to actual solutions and to internal cooperation. For instance, the MARE project resulted in a canal being incorporated in the zoning plan, and in terms of sea level rise adaptations were made on the sewerage system at Bryggen, that made them able to tackle a storm surge. The informant also highlights the positive effects on internal cooperation in the municipality (Administrative employee 1). This will be discussed further under the cooperation variable. Another sees the output they have of participating in research and development in the way that they get something back, in the form of enhancing competence (Administrative employee 2). He then goes on to describe an aspect also mentioned by other informants; being more certain of making the right decisions (Administrative employee 2 and 4, Politician 2). Central in this aspect is being more certain of what to communicate outwards (Administrative employee 4) and being more certain of propositions, understanding scope and further developing policies (Politician 2).

“very few politicians are professionals within their political field. So there is (…) always a need for more knowledge, and it makes you more certain of the propositions you have. (…) It can provide certainty for decisions and that one knows that they are correct” (Politician 2).

“that we are more certain on what we are communicating in terms of demands and knowledge to the outside world” (Administrative employee 4).

"it leads to being more certain in processing things in the right way and arriving at the right decisions" (Administrative employee 2).

Two of the politicians approach the question of what benefits local politicians have of knowledge in concrete decisions, quite generally. Saying that basing policy on knowledge is only beneficial or that you will always benefit from knowledge, no matter the theme or area of concern (Politician 1 and 3). When describing the role of knowledge in the process of working on some concrete measures, one says that "I do not think (…) that many local politicians (..) would have thought the necessary thoughts without the knowledge based information that we got" (Politician 1). An administrative employee also talks about new ideas saying knowledge broadens the horizon and describes it as a snowball-effect where one gets ideas that one can take to other networks, gathering knowledge and working further with it. He also describes the value of networks where several units are gathered; you get to view things from different perspectives and in a larger context (Administrative employee 3).

The main difference in the data material is perhaps not so much the difference between politicians and administrative employees, but the difference between two administrative employees in how they perceive benefits from participating in projects. When asked to what extent the knowledge discussed in the interviews is used for actual climate adaptation measures, one lists several EU-projects and how they contributed to finding solutions (Administrative employee 1). The other says the effect of participating in projects cannot be measured, and takes a more general approach, talking about enhancing competence (Administrative employee 2).

I have tried to keep challenges related to knowledge and the use of it separate from what are in other categories challenges related to climate adaptation, cooperation and communication. Here great care must be taken because responses that might be interpreted as challenges might not be what the informants themselves perceives as challenges.

The administrative employees tend to talk about a wide spectrum of competence, seeing the big picture and making sure you have *enough* competence and knowledge as challenging (Administrative employee 1, 2 and 4).

“One cannot be an expert in everything, but one has to get the totality (…) one has to know the challenges of the whole spectrum. That is a challenge” (Administrative employee 2).

“One of the challenges is that we do not know enough. We do not lack knowledge, we have a lot of professional knowledge in the municipality (…) But there would have been a need for more knowledge (…) to know what we might expect” (Administrative employee 4).

A recurrent theme is the large amounts of knowledge that exists on this issue. One administrative informant illustrated this well when saying there is so much information that it can be challenging to select the most important information, “you really need to keep at it to be up to date” (Administrative employee 3). One of the politicians experiences climate adaptation as a very large policy area with a lot of information, and states that “you need to spend a lot of time (…) to be on top of that type of information” (Politician 1). Another politician, when talking about research based reports, points to the large amount as well as that things may be contradictory and thus finding it hard to know how to weigh the information (Politician 3).

Another politician presents a different approach, when asked of the greatest challenges for employing knowledge for actual measures, she says that there might be a lot of knowledge that they are unaware of, that could be of significance to political decisions. She says they have to trust the administration to catch the most essential information, but that this might be a little random and that it might affect the focus, which is based on the knowledge they receive (Politician 2).

For politicians, time was also an issue. One politician describes the information that they get from research institutions, and says that it can be challenging for a local politician to have time to sort all the information. He also mentioned time as an issue when being invited to events organized by the research community (Politician 1). Another politician, although not stating this as a challenge explicitly, points to the issue of time when saying that they are invited to an awful lot things, but have their political work to attend to (Politician 3).

4.5.5 Lack of knowledge (want list)

Now that we have seen apparent benefits and challenges of knowledge, it is interesting to see what the informants identified as areas where more knowledge is needed. All informants were

asked the question "what knowledge do you wish was available for climate adaptation work"? Table 3 is a list of the informants responses to the question:

Table 3: List of wishes for available knowledge

What knowledge do you wish was available for climate adaptation work	
Administrative employees	*Politicians*[12]
• More knowledge on operating and maintenance of open storm water solutions • More knowledge on risks and the handling of them, prevention • Global climate effects, and how these changes will effect public administration in Norway • How societal structures are affected, and how the municipal responsibilities as well as the urban society is affected. • Social effects of climate change	• The consequences of not reaching the two-degree target • The reasons for increased precipitation in Bergen • How contesting political views affect climate issues, and whether political triumph matter the most. • How the decisions made by politicians affect individuals, groups and the business community. • If the oil industry is shut down, what will be the consequences for the society and for the climate? • Emission policies in relation to the Paris agreement.

Outside this question, one administrative informant also expresses that there could be done research on how to handle the fear that these changes might cause people. A politician also points to the communication and conflict between the different camps on these issues, and that there could be done more research here.

In brief, administration and politicians require knowledge from a range of external actors on multiple levels of government, even the supranational level in EU projects. Knowledge is accessed from a range of national research institutions. Knowledge is located within the municipality as well, and the administration also provide external actors with their knowledge. Politicians seem more concerned with quality assurance, than do administrative employees. The informants report benefits, such as being more certain on decisions and finding specific solutions, and challenges, such as quantity and time.

[12] The responses here were contributed by Politician 1 and 3.

4.6 Communication

Here, the evidence uncovered by the communication variable will be presented. What channels are used for communicating knowledge, what premises for communication is set by the political system? Trust and the extent to which the informants communicate what knowledge they need to work on these issues is also included here.

4.6.1 Channels

A number of channels for communicating knowledge can be identified in the informants responses. Some of which are used to communicate information internally within the municipality, some are used to receive information from external actors, and some are used to communicate knowledge outwards.

One of the channels is the internal administrative network Klimatilpasning Bergen. This will be elaborated on further under the cooperation variable. Another channel for internal communication, namely between administration and politicians will be discussed under section 4.6.2 *structure of the political system.*

Networks could also be seen as channels of communication. The administrative employees mention networks with the Environmental Agency, the Norwegian Association of Local and Regional Authorities (KS) and networks in relation to EU-projects.

One administrative employee also highlights workshops with different actors such as researchers, the County Council, the County Governor and insurance companies (Administrative employee 4). One administrative informant says his unit organizes an annual conference on urban development (Administrative employee 2). Another administrative employee says that Tekna, a labor union, organizes conferences and that they contribute to the organizing of these conferences (Administrative employee 1). Both networks and conferences could be said to be channels where information flows both ways.

Three out of four administrative employees report using the internet to access information. This channel is more passive as it is not really about dialogue, only acquiring knowledge.

A recurrent theme is what is being communicated outwards from them municipal administration. Three out of four administrative employees report having given talks on

climate adaptation in different settings (Administrative employee 1, 3 and 4). The fourth reports that his agency has information meetings towards the industry associated with his department as well as citizens (Administrative employee 2).

The politicians all mention being invited to events organized by research institutions. Events mentioned are seminars, meetings and lectures. They also report receiving written material from research institutions such as reports and newsletters. One politician, however, says that "on my part it has been that I have been to seminars and lectures, not dialogue based" (Politician 2020). This says something about the direction of communication. In this informant's case it seems that there is more of a one way communication. All politicians report receiving knowledge from the party organization in the form of internal schooling. The politicians also report communication with other levels of government, such as the County Council and County Governor, mainly through hearings.

4.6.2 Structure of the political system

When discussing communication and cooperation between administration and politicians, it became apparent that the structure of the parliamentary model, along with other structural issues, set some premises for communication and cooperation. The administrative employees report little direct contact and that communication happens primarily through written plans/accounts and cases brought forward for political processing. One says "I think several agencies want more contact with the politicians" but that this interplay is difficult (Administrative employee 3). One says that he offers to give talks (to the politicians), but that this opportunity is seldom taken (Administrative employee 1).

The communication is however perceived positively. One says that he thinks what they communicate is understood and respected by the politicians (Administrative employee 2). Another informant, who works for a section on level 1, reports that for them the communication works very well, because they are close to the political side (Administrative employee 3). A third says that on the whole they communicate with their commissioner. He perceives this contact positively, but states that in some instances, where issues are complex, they should to a larger extent have been presented and shed light on to the City Council and the committee (Administrative employee 1).

The two politicians from opposition parties make largely the same point; that there is very little contact between the City Council and the administration. One says that they only see representants from the administration when they have committee meetings, and if they ask questions in advance, they are get an answer. “The City Council and the City Government, it is two different worlds” (Politician 3). Another also reports little contact, they respond to the cases that they get from the commissioner, and these cases are based on preparations by the administration. This informant also says that what they receive from the administration are mostly written documents and that there is little dialogue or seminars and so on. “On the political side in a parliamentary system, there will not be a communication between administration and politicians, because communication is only between us and the City Government” (Politician 2).

The representant for a party holding political position, similarly to one administrative employee also states that communicating knowledge happens from case to case. When working with plans, he says they make sure the administration and the City Government hold briefings for the politicians in the City Council. The informant also points to the parliamentary organization of the municipality and that the members of the City Council only know their commissioner and do not have much direct contact with the administration. These issues could require open seminars in order to ask the right questions before politically processing plans, here there is room for improvement, the informant says (Politician 1).

One administrative informant expresses that in some concrete cases he wishes there would be closer communication with the broad political spectrum. He also reports having given talks on climate adaptation for politicians in regional settings, and on how Bergen works with EU projects to another big Norwegian city, but that this does not happen to the same extent in Bergen. Here he sees a potential for improvement for closer communication internally. When asked who initiates communication, administration or politicians, he says that they try to initiate communication and offer to report, but that they have not been able to do so in a way that is interesting enough to be accepted (Administrative employee 1).

4.6.3 Trust

All politicians talk about trust in one form or the other. Trust is discussed in relation to research results, as presented under 4.5.3 the *view of knowledge* category as well. One says that if science is to have any value it needs to be trusted by everyone (Politician 3). Another

states that they do experience receiving information that is focused on one single issue where someone wants to achieve something, but that this does not happen a lot (Politician 1). A third politician talks about trust in relation to the information they receive from the administration. She says that there are high levels of trust in what they are presented with. She also says that they have to trust the administration to catch the essential information, and that this in some cases might lead to the focus being on just the knowledge you received, whilst there might have been something else worthy of that focus. Talking about to what extent knowledge is used for actual climate adaptation work, she says that politicians are laymen and that they need to trust that the knowledge base is correct, which can be challenging for these complicated issues (Politician 2).

Two of the administrative employees also mention issues related to trust. One says that politicians need to trust in your professional expertise in what you are suggesting (Administrative employee 1). Another says that what they communicate to the politicians is understood and respected and that a competent professional body makes it worthwhile listening to (Administrative employee 2).

4.6.4 Communicating needs for knowledge

All informants were asked whether they are active in communicating what knowledge they need from external actors. A central point brought forward by two administrative employees is that knowledge is required in order to ask the right questions (Administrative employee 2 and 3). One says asking the right questions is always challenging (Administrative employee 3). The other administrative employees respond that they try to be and give examples of how they work to achieve this. One talks about presenting the issues they have to researchers in an application process (Administrative employee 1). Another mentions workshops with different actors where the use of research results have been discussed as well as what they need more knowledge on (Administrative employee 4). More on these last two informants experiences will be apparent in under 4.7.3, the *co-production* category.

One of the politicians point to the external actors as setting the premises for the information flow, and that local politicians could be better at setting the terms for what information they need (Politician 1). Another does not think they are active in communicating what knowledge they need from external actors (Politician 2).

Politicians do not seem to perceive a common understanding on what knowledge is needed in the climate adaptation work. One says that there is no system for evaluating or weighing the information. He also points to the fact that many of the international reports not really relates to the municipal operations (Politician 3). Another politician says it is difficult to know what knowledge is needed (Politician 2). A third politician also says there is no common understanding and points to the different attitudes towards the issue from local politicians (Politician 1). Administrative employees are different in this respect, with generally positive responses. One perceives there to be a constructive dialogue on these matters and that there is a common understanding (Administrative employee 1). Another says that state actors do a good job in asking what the municipality needs, but it is hard to say if this is good enough (Administrative employee 3). A third says that because of cooperation in workshops, a common understanding is emerging (Administrative employee 4).

In summary, channels of communicating knowledge are used actively, especially by administrative employees. The politicians use channels more passively. The structure of the political system seems to be somewhat of an impediment for effective communication between administration and politicians. Trust is discussed mainly by politicians in relation to what knowledge they are presented with. There is a difference between the two groups in how they perceive a common understanding between external actors and the municipality on what knowledge is needed for climate adaptation work.

4.7 Cooperation

The municipal strategy on climate adaptation mentions the role of cooperation quite clearly. An important connection between knowledge and cooperation is made, when stating the municipality is seeking knowledge in order to adapt to changes through cooperation with other societal actors. Further, it is written that it will always be necessary to acquire knowledge and experience through participating in national and international cooperation projects (Grønn strategi 2016, 75). The informants report cooperating with a number of different partners.

4.7.1 External cooperation

One form of cooperation is participating in networks. Whether it being with other large cities in the country, EU networks or networks organized by KS or the Environmental Agency. This

is however mostly on the administrative side, although one politician also mentions KS and the Environmental Agency.

One of the informants says that his unit participate continuously in projects with a research component (Administrative employee 1). The municipality works with a range of research institutions on issues related to climate change and adaptation. Table 4 lists the research institutions that the informants report working with. An important point here is that politicians *receive* information and there might not be much cooperating involved. The administrative employees to a larger extent seem to talk about cooperating with different research institutions. This might be due to the role of the administration as a knowledge provider.

Table 4: Research institutions as partners

Research institutions reported as cooperating partners	
Administrative employees	*Politicians*
• Norwegian university of Science and Technology/SINTEF • Norwegian University of Life Sciences • The Meteorological Institute • Western Norway Research Institute • CICERO • The Bjerknes Centre for Climate Research • NORCE • The University of Bergen • Western Norway University of Applies Sciences • Institute of Marine Research • Nansen Environmental and Remote Sensing Center	• The University of Bergen • Norwegian School of Economics • The Bjerknes Centre for Climate Research • Universities abroad (unspecified)

One of the politicians mentions a Nordic cooperation of sister towns, with Århus, Åbo and Gothenburg. He reports that the last time they met, climate adaptation was the main focus (Politician 1).

When it comes to cooperation with other levels of government such as the County Council and the County Governor, the replies are somewhat ambiguous. In relation to the County Council or County Governor, the politicians mainly focus on hearings. One of the administrative employees state that the County Governor and the County Council are important partners (Administrative employee 2). Another reports a positive cooperation with the County Council, but says that the County Governor has not been as involved in these issues (Administrative employee 3). Yet another, says that for her unit the County Council is not very central, other than that they see them in networks and at gatherings (Administrative employee 4).

4.7.2 Internal cooperation

The municipality not only cooperates with external actors on climate adaptation, there is internal cooperation reported as well. Here, I would like to draw attention to the cross sectoral work within the municipal administration reported by administrative employees. All administrative informants report forms of cross sectoral work. One says that the Climate Section tries to coordinate a common effort across the municipal units and that the section play a central role in "that we acquire the knowledge we need" (Administrative employee 2). The representant from the Climate Section says he works with getting the municipality to work across sectors towards climate adaptation. He also talks about Klimatilpasning Bergen. This group started because of the EU project MARE, where they needed to cooperate across agencies. When the project ended they continued the group because they saw the importance of cross-sectoral work. Since then they have expanded, and the agencies involved are: the Cultural Heritage Management Office, the City Architect, the Agency for Water and Sewage Works, the Urban Environment Agency, the Agency for Planning and Building Services, the Section for Civil Protection and Emergency Planning and the Climate Section. He says they use this group as a network for information sharing and occasionally organize meetings (Administrative employee 3). Another administrative employee also talks about how participating in EU projects have provided arenas where people from different professional environments of the municipality can discuss the same issues. This results in a broad enhancement of competence as well as creating a common understanding. He says that this makes knowledge development faster and breaks down barriers and objections to working across sectors (Administrative employee 1).

4.7.3 Co-production

One aspect when talking about external cooperation is if there is actual cooperation present. In the case of the politicians, it was apparent that they receive information from different sources. It seemed as though the administrative side to a larger extent reported cooperation. This category will however reveal if there are signs of co-production present. Two of the administrative employees give accounts that can be associated with co-production.

One of the informants talk about being part of a (project) application lead by a university. Here he says "we try to present the problems that we see and that we do not have a good solution for" (Administrative employee 1). When asked how a cooperation process with external actors works, the informant says that it often happens in the phase of developing a project:

"where you discuss how to direct an application, how to organize a project. What will be the key points you wish to be answered and how will you work to receive those answers. (…) and then when the project is completed you have a better understanding of how well we did (..) And it happens very often that a research project culminates (…) in that you need more research on this and that, right?" (Administrative employee 1).

When asked to describe a typical cooperation process, the informant uses an EU project as an example. He says they decide on what they want out of the project, and then define so-called demonstration projects, that is what will be their case within the larger project. This is the procedure for the cities and partners, and then representants of research institutions suggest a method for working on these problems. He describes what is called city to city learning where workshops are held for partners with similar problems:

"Then there is a mix of recounting how we work on the problem defined, what do you have that corresponds, and do you have experiences from something you have done earlier or now or have planned to do – that can be useful for us to include in the project. (…) and then you sit down with people from universities or research institutions that contribute to and facilitate communication" (Administrative employee 1).

The other informant describes workshops they have had where several actors have been present, not just researchers, but other municipalities, the County Governor's office, the County Council and insurance companies. "There we have discussed the specific use of the

research results they can contribute with, and what we do not know, and what we need more of (..) we have had many working days together" (Administrative employee 4). When asked to describe the process of exchanging knowledge in these workshops the informant says:

"a lot of it has been that they invite several researchers from their research environment that present their research, it being a masters student (…) or a PhD student that present their research questions and results. (…) this is general information, and then we have to select what is relevant for our purposes. And then we have contributed with how we think we can use this in our work and what we perhaps need more on. So I think it has been very useful, the workshops that we have had" (Administrative employee 4).

When asked if she perceives there to be a common understanding between the municipality and these actors she says that it is starting to get there due to this form of cooperation.

4.7.4 Output

What do the informants report getting out of cooperating on these issues? Many of the informants express what can be interpreted as outputs in one way or the other. Outputs have already been apparent in previous sections, but here these are more explicitly related to cooperation. One is knowledge as a result of cooperation making them feel more certain of decisions, assessments and what to communicate outwards (Administrative employee 2 and 4). Another is how participating in EU projects have given them networks with researchers and universities as well as cities in Europe (Administrative employee 1). Participating in EU research projects has strengthened internal cooperation in the municipality as well, as mentioned under internal cooperation. The informant says that participating in EU projects has made it easier to cooperate in smaller projects. These projects have "made important contributions to cooperating on climate adaptation" (Administrative employee 1).

4.7.5 Possible improvements

I would like to draw special attention to how one of the administrative informants described cooperation between the municipality and research institutions. The reason for putting the argument in this category is because the informant says he wishes they did better on this and that they have a job to do on this issue.

Cooperating with researchers is a challenge and raises the following question; is the municipality and research community rigged for such a cooperation? He substantiates this by stating that the municipality and researchers have different target groups and different purposes (Administrative employee 3).

"One thing is to have this cooperation, and we can do that. We can start projects together (…) but then the researchers expect us to do things, right? But we might not be able to do these things because it is a little off what we are set to do. And it is the same with what we will demand from the researchers (..) we will ask questions: when do we have to do this? And how much? (…) And the researchers might not be ready to answer this either. Because the answers do not exist, but science is a way of closing up on a form of conclusion. And science is not always exact. So obviously the meeting place between research and public administration is very important, very interesting, but I feel we are not yet rigged to get the maximum out of it" (Administrative employee 3).

4.7.6 Relation to researchers

The last informants remark about cooperation and if they are rigged for it takes us further to the relationship between researchers and the municipality. All informants were asked about the relationship between the municipal administration/politicians and researchers.

The politicians answer the question of such a relationship quite differently. One says there exists such a relationship and that he makes use of it when working cases. He mentions City Labs as an arena for this, and that it is important that politicians partake. He says that the relationship works well. When asked how it could be improved he says that workshops can often be an ice breaker to create contacts and that numerous opportunities can come out of it (Politician 1). The two other politicians report that they do not have any relationship at all with researchers on these issues. When they are asked if they wish for a relationship, one says yes, as long as it is legitimate (Politician 3). The other says the goal should be that all politicians have the opportunity to get the same knowledge base, and that the idea of everyone knowing "their researcher" is a little odd in this respect (Politician 2).

One of the administrative employees says that he would want a strategy for this relationship in the municipality, because now it is up to the individual departments. He says that although the relationship as of today is not optimal, there is fast development (Administrative employee 3). Another has observed a development of "thinking together" and that through

research projects like Hordaklim, Hordaplan and Hordaflom it is easier to communicate. “We do not speak the same language, but we speak an understandable common language” (Administrative employee 4). Administrative employees view the relationship positively (Administrative employee 1 and 2). It is important that there is a communication so that researchers have the ability to see what is of importance for the municipality in relation to what could be an interesting research topic, according to one (Administrative employee 1).

To summarize this section on cooperation, some key issues can be found in the relationship between researchers and the municipality. Are the parties rigged for this cooperation? The politicians seem to differ in their relationships to researchers. The municipality cooperates with a range of research institutions and other actors providing knowledge, at least on the administrative side. The administration also cooperates internally on climate adaptation. Co-production with external actors is also found in some cases.

4.8 Opportunities and challenges when working with climate adaptation in Bergen municipality

Connecting all key empirical findings from this chapter, ends up as a short presentation derived from the interview material, of how Bergen works with climate adaptation and the opportunities and challenges for doing so. These empirical findings are essential to grasp before moving on to the next chapter of discussing the findings within the theoretical framework. Climate adaptation is a central issue in Bergen, being worked on administratively and politically.

As was expected, there was different perceptions and experiences reported by politicians and administrative employees. The administrative employees tend to use a more technical and close-to-their-work description of the concept. This could be explained by the administrations role as a professional body comprised of experts. There are some very expected divides, such as the administrative employees to a larger extent engaging in cooperation projects, actively seeking new knowledge, while the politicians are more provided with the knowledge they need. This reflects back on the different roles of the two groups. The administrative employees seem to be more active in communicating what knowledge they need from external actors, than the politicians. The administrative employees also perceive a common understanding between the external actors and the municipality more positively than do the

politicians. Generally, the administrative employees report more of a relationship with researchers which they view positively. One administrative employee here asks for more of a formalized strategy for the relationship between the municipality and research community.

The politicians to a larger extent than the administrative employees tend to have a more general perception of the concept of climate adaptation, referring to larger themes such as sustainability and emission reduction. This might be due to the politicians role of seeing the big picture as well as appealing to voters. The politicians report no relationship with researchers, except for one that reports making use of it. They do also not agree on how this relationship should work.

There are many factors that facilitate the work on climate adaptation in Bergen. Firstly, cooperating creates common understanding. One example is EU projects that have led to both concrete solutions and has benefited cooperation. Secondly, cooperation can also help build down barriers of working together. Moreover, internal cooperation and communication are also factors that can facilitate the work on climate adaptation. Thirdly, the knowledge situated within the municipality gives them the opportunity to share their knowledge with external actors as well. And lastly, a benefit of knowledge central to many of the informants was that it creates certainty of propositions and decisions.

There are also challenges present for the work on climate adaptation. One is the large amount of information that exists from different sources that can make it challenging to sort through. Politicians more so than administrative employees mention time constraints as an issue. It is described as a large policy area. They are invited to a lot of events, but mention not having time to attend everything. Uncertainty is also mentioned by several informants, in relation to prognosis, how the future will be and what the costs will be for the municipality in the future. We have also seen that the structures of the political system set some premises for communication and cooperation between administration and politicians, and that the administration seems to want closer communication on these issues. A politician also identified this need. Then there is the question of whether the municipality and the research community is rigged for the cooperation they are undertaking in relation to climate change and adaptation. It is hard to say what can be done to rig them in a way that maximizes the outputs of cooperation. However, for this thesis the theory of co-production might provide some answers.

The integrated theoretical framework presented on page 27, identified factors from the three theoretical approaches that could create opportunities and challenges. Further identifying opportunities and challenges will be done in chapter 5, in light of the theoretical framework. An important aspect here is to provide a dialogue between empirical findings and theoretical framework, thus ending up as an analytical discussion.

5 Analytical discussion

5.1 Introduction

In chapter 1, some expectations were laid out for Bergen municipality in terms of climate adaptation work. The municipality was said to be relatively far along in working on this issue, with capacity and resources, as well as a proximity to knowledge. Following the empirical analysis of the previous chapter, climate adaptation could be viewed as a central policy issue in Bergen. Informants report acquiring and cooperating with a range of different research institutions. Working on this issue, administration and politicians have different perceptions of the concept. Where politicians take a general stand, the administration take a more technical one. The administration is active in seeking knowledge on the issue and described as competent. There are indications of political conflict present for the issue. This chapter aims to provide some theoretical explanations of the descriptions in the previous chapter.

The theoretical approaches presented in chapter 2, shed light on how to view the issue of climate change, under which premises knowledge exists within the Norwegian political system, and closing the usability gap through co-production or interaction. The integrated theoretical framework identifies factors derived from the theoretical approaches that contribute to opportunities and challenges for employing knowledge for decision making on climate adaptation. Throughout chapter 2, questions related to each theoretical approach were presented. These questions will once again be brought forth in this chapter, as part of the analytical discussion.

The previous chapter presented the findings identified by six different variables. This chapter will analyze the empirical findings from the previous chapter based on the theoretical framework, comprised by approaches of wicked issue, knowledge regimes and co-production. Page 27-28 summarizes the key elements of the integrated framework and the central questions derived from each theoretical approach that form the basis for this chapter.

5.2 Wicked issue

Wicked issues, as discussed in the theoretical framework, would be expected to pose challenges for decision makers. But there might lie opportunities here as well. The municipality is responsible for avoiding or limiting risks, vulnerability and disadvantages, as stated in the central governments planning directions (Kommunal- og moderniseringsdepartementet 2018). However, climate change and its effects are not limited to one sector or level of government. In this section, elements of wickedness will be discussed in relation to the variables problem perception, problem solution and cooperation. I will attempt to identify opportunities and challenges in the data related to the wicked issue approach. The questions derived from this approach in chapter 2 were; *is the invested interest assumption valid for climate change and adaptation? Are there signs of wickedness in the data when it comes to cooperation between a larger set of actors both within and beyond the municipality? Or can wickedness be reduced as a consequence of cooperation?*

An essential first step is to clarify whether or not signs of wickedness are present in the informants perception of the problem. As stated in chapter 2, wicked issues are characterized as cutting across administrative levels and sectoral boundaries (Fimreite, Lægreid, and Rykkja 2014, 22). Some indications are apparent in one of the administrative employees responses when stating that "it is not just about physical change. But it is also about economics, and actually about people's mental health, it is about diseases, it is about food supply – there are a lot of aspects tied to the climate" (Administrative employee 3). Here a range of sectors are mentioned from economics to health care and food security. The effects mentioned here can be categorized as third order effects, because they are societal consequences of the physical climate changes (Neby 2019). Another administrative employee emphasizes that there is a need for cooperation and coordination of the different resources of the municipality, this might be a sign of the issue cutting across the different municipal sectors. Communicating, cooperating and receiving information from the regional- and central government, as well as supranational bodies like the EU, illustrates the issue cutting across administrative levels. An implication of the wickedness of climate change is that it requires more long term policy making (Pollitt 2016). One of the administrative employees says that his unit generally thinks a hundred years ahead, an indication that a long term perspective is present. The examples of this paragraph thus indicate traces of wickedness.

One expectation from the theoretical framework was that for some cross-cutting issues there could be a lack of invested interests by politicians and administrative actors, hindering them to adopt expert advice in decision making (J. Christensen and Velarde 2019). In chapter 2, one of the questions raised was *is the invested interest assumption valid for climate change and adaptation as well?* If this expectation holds for the investigation of knowledge used for decision making on climate adaptation in Bergen, could be questioned. Politicians have contesting political views on the issue, indicating invested political interests. There are also specific examples of knowledge from research projects being used to find solutions, such as the sewerage system at Bryggen and the canal between Lille and Store Lungegårdsvann. It seems to be the case that the theoretical expectation of lacking invested interest is not present for the issue of climate adaptation, and knowledge *is* used in specific measures. There might however be other reasons for not adopting knowledge for decision making, but the lack of invested interest does not seem to be one of them. One of the politicians, for instance experiences finding solutions within the frame that the knowledge provides to be challenging.

The theoretical framework introduces the possibility that co-production might increase wickedness. Neby (2019) states that the wickedness here stems from involving a complex set of actors. Relevant questions are *whether there are signs of wickedness when it comes to cooperation between a larger set of actors both within and beyond the municipality? Or can wickedness be reduced as a consequence of cooperation?* All administrative informants report forms of cross sectoral work within the municipality. The internal group, Klimatilpasning Bergen, coordinated by the Climate Section is one example. The fact that this group was continued after the MARE project ended, because they saw the importance of working across sectors, indicates a positive view of involving more actors on these issues. One of the administrative employees described the output of different municipal sectors working together in EU projects as breaking down barriers and objections to working across sectors. He also said that knowledge development is faster this way, thus increasing what Neby (2019) refers to as analytical capacity. This is an example of how co-producing knowledge with external actors in EU projects and with different units of the municipal administration led to strengthened internal cooperation. If involving more actors to solve the issue contributes to wickedness in these cases, cannot be answered directly. However, there are positive views on cooperation and outputs in the data. Cooperation is considered a benefit, in many cases. On the other hand, one of the informants raises the question: is the municipality and research community rigged for cooperation? Here, the informant describes a dissonance that stems

from cooperating, namely that researchers expect the municipality to act on the information produced, and the municipal actors ask questions the researchers are not able to answer, such as when and how much they need to do. Involving actors from different sectors, such as the municipal bureaucracy and the research community, could here be interpreted as a challenge. More data would be required in order to answer the question of whether involving more actors increases wickedness, but two different intakes on the question have been presented here.

5.2.1 Uncertainty

Not very apparent in the theoretical framework, but lying implicitly in the wicked issue approach, is the element of uncertainty. Uncertainty can take many forms, scientific uncertainty as well as uncertainty regarding the effects of policy measures (Neby 2019). The informants mention uncertainty related to several aspects of the issue. One administrative employee highlights this in his perception of the issue, where *not knowing* what the new challenges will be is mentioned. Uncertainty is also related to the challenges of climate change in regards to planning towards an unknown future as well as not knowing when measures need to be implemented. The economic situation is also described as unknown, asking what the future costs will be for the municipality. Uncertainty is also mentioned in relation to projections. This illustrates some of the complexity of this issue. Not only does it seem to cut across sectors and administrative levels, it is also followed by a lot of uncertainty, making it even more complex.

Thus, the wicked issue approach provides insight into some characteristics of the issue in the empirical data. Indications of wickedness *are* apparent in the informants responses. Is seems that the empirical findings do not support the assumption that a lack of invested interests might lead to knowledge going unused. Therefore, other factors might explain why knowledge might go unused. Involving more actors in solving the problem seems to entail both *opportunities* and *challenges*. Whether it increases wickedness or not, the data does not suffice to say in this case. Levels of uncertainty are present, making the issue more complex.

5.3 Knowledge regimes

Theories of knowledge regimes shed light on some of the premises of knowledge within the political system. Identifying factors such as channels for communicating research to decision

makers, the localization of knowledge and the extent to which knowledge is democratized, can point to possibilities and challenges. These theoretically derived factors will be discussed in relation to the following variables: communication, knowledge and cooperation. The questions inspired by this approach were; *how is knowledge accessed and produced in Bergen municipality? What channels of communication are highlighted by the informants*? *Is knowledge production situated within or outside the municipality? And to what extent is knowledge distributed democratically, in other words is knowledge equally available to all decision makers? Can traces of a politicization process on climate adaptation be identified in Bergen?*

5.3.1 Communication

Investigating what channels are available for transmitting research/knowledge to decision-makers is part of uncovering characteristics of a knowledge regime (J. Christensen, Gornitzka, and Holst 2017, 239). This section addresses the first two questions; identifying ways of accessing knowledge and through what channels. Networks are central and involve different levels; there is the internal group Klimatilpasning Bergen, networks like the Ifront-network coordinated by the Envirnomental Agency, The Norwegian Association of Local and Regional Authorities' climate adaptation networks, and networks in relation to EU projects. Using the internet to access information is also common among the administrative employees. One also mentions workshops with researchers and actors from other levels of government. Conferences are mentioned, where administrative departments organize or participate in organizing conferences on these issues. For politicians, being invited to events, such as seminars, meetings and lectures, organized by research institutions is central. So is receiving written material from research institutions. Receiving knowledge from the party organization is reported by all politicians. Other channels of communication reported by politicians are newspapers, meetings and written material from environmental organizations and the industrial sector, and participating in networks. Hearings are also mentioned by the politicians as a way of communicating with the other levels of government on this issue. Drawing on these examples, there seems to be multiple opportunities for transmitting knowledge to decision makers.

One aspect not very apparent in the theoretical framework, but found in the empirical data was the structure of the political system in relation to communication. This was discussed in the interviews, referring to the parliamentary model where administration and politicians do

not have close communication. Communication between the administration and politicians in the City Council largely happens through the City Government and written documents, from case to case. Both from the administrative and political side, it is stated that these issues could require more communication between the two. One could pose the question of whether this organizational premise for communication could be an impediment for effective communication between administration and politicians. Members of the administration seem to want more direct contact with the broader political spectrum.

5.3.2 Knowledge within the bureaucratic apparatus

One of the dimensions of analyzing a knowledge regime is *location*, where one seeks to uncover whether knowledge is produced inside or outside the government (J. Christensen, Gornitzka, and Holst 2017). In this case the government is the municipality. The municipality is described by several informants as being competent and having large amounts of knowledge on these issues. A good illustration of this is when one of the administrative employees is asked if they receive knowledge from the regional government on these issues; "we are perhaps as much of a knowledge source for the County Council, as opposed to the other way around" (Administrative employee 1). Another informant's response builds further on this by stating that he thinks the County Council wants close cooperation with Bergen. Because of their size they have an opportunity for acquiring knowledge (Administrative employee 3). Informants also report giving talks on how Bergen works with climate adaptation in settings such as regional gatherings and networks. This emphasizes the location of knowledge that is not just acquired from external actors, but also exists within the municipality. Another example is the internal network Klimatilpasning Bergen. However, it is important to emphasize that the municipality itself does not do research. When research is undertaken it is in cooperation with external actors.

Therefore, answering the question of whether knowledge production is situated within or outside the municipality; knowledge is accessed from a number of external actors, however, the municipality should not only be viewed merely a user, but also as a provider of knowledge. Knowledge is situated within the municipal bureaucracy, but also communicated outwards. This provides the municipality with opportunities to engage in knowledge sharing activities and be a knowledge resource for other actors.

5.3.4 A process of politicization?

Are there observable indications of a process of politicization of the climate adaptation issue, as described by Reitan (2004)? Indications of what might be a process of politicization can be found in the problem perception variable, under the category perceived effects. Here the politicians have quite different approaches, which illustrates the contention of the issue. One states that all small actions have an impact on the main purpose, another that visions and big words are used, but proving effect is challenging. A third says that the City Council does not agree on what are effective measures and what are symbolical. One of the politicians used the formulation *for us who take this seriously*, during the interview. This too could be evidence of the presence of political conflict. A common understanding of what knowledge is needed does not exist due to ideological reasons, according to one politician. In addressing the question of whether traces of a politicization process on climate adaptation could be identified in the data, some nuances are present. If there is indeed a process of politicization, where one is moving from relying on expert knowledge to higher levels of political conflict, is hard to say with the limited data collected for this thesis. However, there is a level of political conflict which is quite apparent for this issue.

5.3.5 Relation to researchers, a democratic approach?

Another dimension of analyzing a knowledge regime is investigating the extent to which knowledge is democratized (J. Christensen, Gornitzka, and Holst 2017, 242). I interpret this dimension to encompass the aspect of whether knowledge is equally available to all decision makers, thereby addressing the question of the democratization of knowledge from the introduction of this section. Results from the cooperation variable, specifically the relation to researchers category, shed light on an interesting discussion in this respect. Here the politicians differ drastically in their responses. One reports that he makes use of this relationship in his political work, the two others report not having a relationship to researchers. These two politicians highlight an important aspect of the democratization of the knowledge regime; one that the relationship needs to be legitimate, the other that all politicians should have access to the same knowledge base. Not having equal access to researchers could be seen as a challenge both for the individual politicians, but also for the democratization aspect of the knowledge regime itself. It is important to emphasize that having a relationship to researchers is only one way of acquiring knowledge. Politicians report several other sources for acquiring information. Nevertheless, this link to researchers sheds light on an interesting challenge for the knowledge regime. The politicians that report

not having a relationship to researchers do not point to this as a challenge, but rather discuss the premises for such a relationship. One of the administrative employees asks for a strategy for this relationship, and says that now it is up to the individual departments (Administrative employee 3). This could be a possible solution to mitigate the unequal access.

The theory of knowledge regimes thus provides a lens in which the premises of knowledge are uncovered. It points to the possibilities of communicating knowledge to decision makers, as well as uncovering the opportunities stemming from the location of knowledge within the municipality. A possible challenge is that the issue seems to be subject to political conflict. Another challenging aspect is the relationship between researchers and decision makers, where equal access seems not to be achieved.

5.4 Co-production

The usability of knowledge is a central debate when it comes to climate research. There are however opportunities to overcome the usability gap through co-producing knowledge; iterative interaction, internal as well as vertical and horizontal cooperation and building institutional capacity are all factors that might entail both opportunities and challenges. These theoretical factors will be linked to the cooperation and communication variable to investigate possible opportunities or challenges found in the data. A number of questions were inspired by this approach. *Do informants report co-production as something that has strengthened the municipality's capacity to adapt to climate change? Are there signs of co-production within the institution as well as external horizontal or vertical cooperation? What did informants learn from participating in these activities? Do informants from Bergen municipality report regular consultation? And if so, are there apparent opportunities and challenges in the process of iterative interaction described by the informants? Are any of barriers or opportunities associated with interaction between users and providers mentioned by the informants? And how do they perceive interaction with producers of knowledge?* Not all of these questions can be addressed directly within this relatively short analysis, but they point us in the right direction.

5.4.1 Indications of co-production?

As illustrated in chapter 4, two informants account for processes where aspects can be associated with co-production theory. Both informants report communicating what type of

knowledge they need, they also report a cooperation processes where dialogue is central. Could these factors facilitate the possibility of making knowledge more usable? One says they discuss the specific use of research results, and both of them describe participating in workshops in relation to projects. City to city learning as described by one informant, has clear signs of co-production. Here, people who are not in the same organization produce knowledge in collaboration. The process as described by the informant is interesting because it does not depict the traditional divide of them as users and the researchers as providers. It is more an account of knowledge sharing amongst the cities and then the researchers *contribute to* and *facilitate* communication. A strict divide between users and providers has been identified as an obstacle for achieving co-production, as it sets some expectations in relation to these roles (Kolstad et al. 2019 ; Sofienlund 2018).

Bremer and Meisch (2017) describe the outcome of co-production with an institutional approach as *building institutional capacity*. The question of adaptive capacity from the introduction of this section, will in short be addressed here. One of the informants accounts of participating in workshops could relate to building institutional capacity. She mentions research projects such as Hordaklim, Hordaplan and Hordaflom, and that these projects contribute to having more knowledge when communicating with politicians and citizens. She says this makes them more confident in what they are communicating outwards. Another example is the output of EU research projects that have resulted in the municipality being more coordinated in their work on climate adaptation. These could both be signs of cooperation in knowledge projects leading to increased institutional capacity.

Iterative interaction is also a way of narrowing the usability gap. Interaction and consultation between users and providers influence how users understand the possibilities and limits of science and how scientists pursue their research (Bremer and Meisch 2017). This paragraph thus relates to the questions of regular consultation and iterative interaction, posed in the introduction of this section. Identifying iterative interaction in the data is not straight forward. Could there however be signs of outcomes of iterative interaction? One of the informants accounts about a common understanding emerging because of the co-production projects Hordaklim, Hordaplan and Hordaflom, might point to a positive outcome of working together. *We do not speak the same language, but we speak an understandable common language*, is the phrase used by the informant. She says the researchers now have an understanding of the municipality's challenges, when it comes to their everyday work

(Administrative employee 4). This account serves as an illustration of positive outcomes of iterative interaction, which might function as an opportunity for the usability of knowledge.

Generally, many elements of cooperation in the data cannot strictly be categorized as co-production. Therefore, cooperation seems to be central, but not always in the form of co-producing knowledge. Whether it is co-production or cooperation, there are signs of opportunities for building institutional capacity and make knowledge more usable.

5.4.2 Communication as part of cooperation

Addressing the last two questions posed for this section, about barriers and opportunities for interaction and how it is perceived, the communication variable provides some insight. Lemos, Kirchhoff, and Ramprasad (2012) list trust between users and producers to be an opportunity to increase usability. They state that two-way communication and an ongoing relationship builds trust between parties. Trust, in turn, influences users' perceptions of the salience, credibility and legitimacy of information (Lemos, Kirchhoff, and Ramprasad 2012). Trust is discussed in two different ways by the informants. I must emphasize that trust is not discussed in relation to co-producing knowledge. Nevertheless, trust as discussed by the informants might provide insight to a *willingness* to use information. Two of the politicians discuss trust in relation to the validity of research. One of the politicians expressed that if science is to have any value it needs to be trusted by everyone. Another says that they do sometimes experience information where the provider wants to achieve something, but that it does not happen a lot.

A politician and two administrative employees talk about trust between politicians and administration. The politician describes high levels of trust towards the administration, and that they have to trust that the knowledge base they receive is correct. This can however be challenging for these complicated issues. One of the administrative employees says trust in their professional expertise is decisive for getting support for what you are suggesting. Another says that what they communicate is respected and related this to their levels of competence.

These examples suggests an awareness of trust, when it comes to interaction between users and producers. In this case, *interaction* is under investigation, not necessarily co-production.

This section suggests that trust is an important ingredient for making knowledge and information usable for decision making.

Two-way communication was also listed by Lemos, Kirchhoff, and Ramprasad (2012) as an opportunity for interaction between users and producers to increase usability. The administrative informants differ in their answers on being active in communicating needs for knowledge. Two of them give examples of how they communicate what they need, as highlighted when discussing co-production. “We know what we need, at least we think we know what we need”, another says (Administrative employee 2). Knowledge is required to ask the right questions, according to some administrative informants. Politicians did not seem active in communicating their needs for knowledge, and one said they could be better at setting some premises for what knowledge they need. Two-way communication as an important ingredient for usability is therefore not a straight forward endeavor, even though some informants may seem to participate in such activities.

The co-production approach thus contributes to identifying opportunities such as aspects of institutional capacity building and outcomes of iterative interaction. An awareness of trust and some apparent differences in two-way communication was also uncovered by this approach.

To summarize this chapter, the three theoretical approaches and their derived factors from chapter 2 all provide insight on opportunities and challenges in using knowledge for climate adaptation purposes in Bergen. Opportunities include; outputs of cooperation strengthening internal cooperation, multiple channels for communicating knowledge to decision makers, the municipality as a knowledge provider, cooperation building institutional capacity and a common understanding as a result of cooperation. Challenges in this respect must be approached more carefully, because some of them are subject to interpretation by the author. However, challenges might include; uncertainty related to several aspects of this complex issue, the presence of political conflict and unequal access to researchers. It is however important to emphasize that especially the last two were not stated by informants as explicit challenges. They are inspired and interpreted by the theoretical framework and identified as aspects that might pose challenges. Other points made were that the parliamentary model might not allow for optimal communication between administration and politicians on this issue. There is also an awareness of trust in relation to these issues, and a divide between

those who actively participate in two-way communications (often administrative employees) and those who do not (the politicians). Some of the expectations of the theoretical framework either did not seem to hold or lacked sufficient data to confirm. The former was apparent when discussing invested interests. The latter became clear when discussing whether co-production or involving more actors increased wickedness. The next chapter will provide some conclusive remarks in relation to the findings of chapter 4 and 5. Chapter 6 will also summarize key findings and more explicitly answer the research question.

6 Conclusion

6.1 Introduction

The story of climate adaptation in Bergen is a story of a city adapting to a changing climate, where managing quantities of water and its consequences are essential. Knowing what to expect and how to adapt requires large amounts of knowledge, which in many cases have an element of uncertainty. The municipality works actively with acquiring the knowledge needed to find solutions and implement adaptive measures. The objective of this thesis was to study climate adaptation and knowledge at the local level, posing the question *what are opportunities and challenges for using knowledge for decision making on climate adaptation in Bergen municipality.* The motivation behind the question was a desire to find out how a large municipality, with preconditions such as large capacity, resources and a proximity to knowledge, work on adapting the city to a changing climate. In this last chapter, I will present and discuss the key findings of the analysis. I will also relate back to a question posed in the introduction chapter: *could municipalities be found in the same driving position when it comes to political change on climate adaptation, as was the case for welfare policies?* Thereafter, I will present my contribution and the limitations of the study. And lastly, some recommendations for future research.

6.2 Key findings

The key findings of the thesis will shed light on the research question, which asked for opportunities and challenges of using knowledge for decision making on climate adaptation. Several factors seem to facilitate the work on climate adaptation. Drawing on the empirical analysis in chapter 4, opportunities and challenges are apparent. One opportunity is the positive effects of cooperation in knowledge projects that leads to a common understanding of the issue and each other's challenges, and break down barriers for cooperation. Internal cooperation and communication might also be a facilitator. The competence that exists within the municipal bureaucracy gives them the opportunity to share their knowledge with other actors. More knowledge on these issues help decision makers feel more certain of propositions and decisions. Challenges include large amounts of information and time constraints. Uncertainty in relation to prognosis, costs and knowing what the future might look like is also a challenging aspect of climate change and adaptation. The parliamentary model seems to reduce the opportunities for direct communication and cooperation between

administration and politicians in the City Council. There could be a need for closer cooperation and communication on these issues. Another challenge identified is the extent to which the municipal administration and the research community is rigged for cooperation.

Compiling the evidence from chapter 5 prepares the ground for making some connections between key findings and assessing the explanatory value of the theoretical framework's different components. The findings are also linked to the different questions derived from the three theoretical approaches, as they appear again in chapter 5. The perceptions of climate adaptation seem to include signs of wickedness. It is clearly an issue that goes beyond the responsibility and capacity of only one sector or level of government. A lack of invested interests does not seem to be present for the policy area of climate adaptation in Bergen. For this issue, a lack of invested interest does not explain why knowledge might not be used. Evidence from chapter 4, such as lack of time and large amounts of knowledge might have more explanatory value. The analysis provides no clear answer to the question of whether involving more actors to solve the problem contributes to wickedness. Cooperation is generally viewed as beneficial, but challenges are present when it comes to whether the public administration and science is rigged for cooperating. What does seem to entail challenges are the levels of uncertainty associated with the issue.

The knowledge regime approach identified how knowledge is not just located outside the municipal organization. In relation to climate adaptation, the municipality has the opportunity to act as a knowledge provider. The approach also identifies multiple opportunities for communicating knowledge to decision makers. The theoretical approach also posed the question of whether a politicization process was apparent for the issue. Politicization might be an implicit challenge in relation to problem solution for climate adaptation. Adding perceptions of trust and the question of equal access to researchers, the factors could be expected to pose a challenge for employing knowledge for decision making. However, more data is needed to test this hypothesis. From a more normative stance, a process of politicization should not be viewed exclusively as something negative. By involving politically elected officials in the issue, this becomes more than just an expert domain. The approach also gave an important contribution in identifying how knowledge is localized within the municipality, not just outside. Thus, answering the question of whether knowledge is located within or outside the bureaucratic apparatus.

It is important to emphasize that this thesis is not a study of co-production processes in Bergen municipality. However indications of co-production are present, which contribute to opportunities for the use of knowledge. Questions motivated by this approach included if co-production had strengthened the municipality's adaptive capacity, if and challenges or opportunities are present for iterative interaction. The approach brought forward evidence of instructional capacity building, as a result of what could be defined as co-production projects (such as Hordaklim, Hordaplan and EU research projects). Iterative interaction seemed to provide opportunities for a common understanding of the issue and its challenges, and thus the usability of knowledge. Trust and two-way communication was identified as central ingredients, although there might be challenges related to both of them. These two factors did reveal some ambiguity in the data, but seem important to several informants.

Thus, some expectations from the theoretical framework were apparent, whereas some did not seem to hold. Among the latter was that a lack of invested interests might lead to expert advice not being put into policymaking. "If political and administrative actors do not have a direct stake in the issue, they are unlikely to adopt and act upon expert advice on the issue. In other words, cross- cutting issues may facilitate the involvement of experts but hinder political adoption of their advice" (J. Christensen and Velarde 2019). The contesting views on the issue by politicians prove invested political interests. Administrative employees also seem highly invested in the issue, in addition to climate adaptation being central in several municipal plans and strategies. The lack of invested interest does likely not explain challenges for using knowledge for decision making. Other factors such as the quantity of knowledge, time restrictions and uncertainty might have more explanatory value and point to the challenges of using knowledge for decision making.

The data collected for this thesis does not suffice to conclude whether or not the involvement of more actors working to find solutions increases wickedness. The wicked issue approach is thus productive for describing central aspects of the issue, but using it to explain this sort of implication the data would have had to be more extensive.

Evidence from chapter 5 thus provides possible opportunities and challenges. Opportunities include multiple channels for communicating knowledge to decision makers, location of knowledge within the municipality making them a knowledge provider, co-production building institutional capacity and iterative interaction creating a common understanding.

Challenges include political conflict and the premises of cooperation between public administration and the research community. An awareness of trust and unequal access to researchers might also pose challenges.

I will therefore argue that a general understanding of how knowledge is acquired and the opportunities and challenges for using knowledge for decision making on climate adaptation in Bergen has been provided in this thesis. The wicked issue approach is productive for describing the issue, and the co-production approach provides some insight on how to overcome the usability gap. The theory of knowledge regimes perhaps produced the most central finding for this thesis. Both highlighting the political conflict present for the issue, and the opportunity the municipality has for being a knowledge provider, not merely a knowledge user.

6.3 Reflections

Some reflections on the theoretical framework and findings are in order. Why are these findings obtained? Some key findings were based on the empirical analysis of chapter 4, therefore largely empirically produced. However, some of the most central findings, that were not merely descriptive, were obtained in chapter 5, thus largely affected by the three theoretical approaches. The three approaches have contributed to gaining insight from different angels, regarding the problem at hand, the premises of knowledge and ways of making knowledge more usable. Other theoretical intakes might have produced a very different focus; using an implementation approach or more closely studying the decision making process is one example. Other findings could have been produced using the three theoretical approaches if another focus had been chosen from the theories. One example from the knowledge regime approach is studying the public vs private dimension, aiming to find out if knowledge production is undertaken by public or private actors (J. Christensen, Gornitzka, and Holst 2017, 242). I could also have opted for a more close investigation of the co-production processes.

The findings in chapter 5 are obtained as a result of my interpretation of the three theoretical approaches. The thesis is also not concerned with theory testing, but uses the theoretical approaches to identify, describe and sometimes aims to explain different aspects of local climate adaptation in Bergen and the role of knowledge for this purpose.

6.4 The municipality as a policy actor

Although not the main focus of this thesis, a relevant question posed in the introduction was whether municipalities could be found in a driving position on the issue of climate adaptation, acting as policy pioneers. This question can also be discussed in relation to one of the main findings of the thesis.

Norwegian municipalities have been pioneers of novel policies both historically and in more recent years. This is especially true for welfare policies. Mentioned in chapter 1, municipal healthcare, pension funds and education services are historical examples of sectors where municipalities acted as pioneers. The state's cash-for-care is a more modern example, which was inspired by local initiatives (Grønlie 2004). A potent question is thus whether municipalities could be found in a driving position on the issue of climate adaptation, acting as policy pioneers.

Aal, Groven, and Lindseth (2007) state that local commitment on its most ambitious is where municipalities go beyond the central government's defined minimum standard and thus work as policy actors. Dannevig, Rauken, and Hovelsrud (2012) studied the so-called *first movers*, municipalities that implemented climate adaptation measures even when the central government did not have any clear instructions in place. They found the ability to move beyond central regulations is closely linked to size and capacity in the form of human and financial resources. What determined implementation of adaptation policy were factors such as participation in research projects, efforts of individuals, use of external expertise, access to resources and extreme weather event experiences. Bergen was one of the cases in the study, given high scores on implementing adaptation measures by the authors. Bergen can thus be described as a *first mover* on climate adaptation.

Bergen has clear ambitions on this issue. The municipality's climate and energy strategy states that Bergen should be a frontrunner on environment, sustainable development and climate adaptation (Grønn strategi 2016, 9). The thesis has shown the relevance of the issue for the municipality and how knowledge is actively used for finding solutions. Drawing on previous empirical findings and the findings of this thesis, Bergen might be said to be both far along in climate adaptation work and a frontrunner in this respect. Moreover, Bergen might not just be a first mover or policy pioneer on this policy area - the municipality is also a

knowledge resource on this field, and is already acting as a *knowledge provider* in different settings.

6.5 Contribution and limitations

The thesis provides a description of how a large Norwegian municipality works with climate adaptation and how they use knowledge for this purpose. It points to some challenges for using climate knowledge as well as opportunities in this respect. It is not restricted to the decision making process, but looks at the municipal operations as a whole. The analysis draws on semi-structured interviews, where politicians and administrative employees report their experiences and perceptions. The most central finding of the thesis, I argue, is the opportunity Bergen has to be a knowledge provider on this issue for other actors, not merely a user of knowledge.

Although a co-production approach proved fruitful for identifying some opportunities, this is not a study of co-production processes in Bergen municipality. The thesis does not provide a comprehensive explanation of a process of politicization, but suggests that indications of such a process might be apparent. The thesis is also not able to identify whether involving more actors in finding solutions for the issue of climate change is in fact increasing wickedness.

The necessary methodological weaknesses have been elaborated on in chapter 3. Some of the greatest limitations might stem from the relatively small sample of informants. This study is therefore not suited for generalizations, but provides insight to the case and the context of which knowledge exists for adaptation purposes.

6.6 Recommendations for future research

Further research on some of the indications and expectations posed by the thesis is recommended. A mix of qualitative and quantitative methods would provide fruitful insight on further opportunities and challenges for using knowledge for decision making on climate adaptation at the local level. Næss, Solli, and Sørensen (2011) used a method of combining in-depth interviews and telephone interviews, the latter representing something in between an interview and a survey. Surveys might also be productive in gaining an understanding of how a wider range of municipal actors use knowledge sources, and what their main concerns and reported opportunities are in relation to employing knowledge for decision making.

Further investigating the opportunities for the municipality to be a knowledge provider could be an interesting topic for future research. More in-depth knowledge on how the municipality fills this role is of interest. Reports from external actors that have received knowledge from Bergen would also be relevant.

Studying a process of politicization on this issue might also prove highly relevant. The political conflict from the perspective of all the different political parties in the City Council, would provide fruitful insight. Investigating in more detail if there is a process of moving from expert knowledge being at the base of decision making to higher levels of political conflict and the consequences or implications related to this process would be highly relevant.

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Appendix

Information sheet and written consent form

Vil du delta i forskningsprosjektet

"Kunnskapens rolle i lokal beslutningstagning på klimatilpasning/The role of knowledge in local decision making on climate adaptation"?

Dette er et spørsmål til deg om å delta i et forskningsprosjekt hvor formålet er å undersøke hvordan beslutningstakere bruker klimakunnskap i beslutningstagning på kommunenivå. I dette skrivet gir vi deg informasjon om målene for prosjektet og hva deltakelse vil innebære for deg.

Formål
I dette prosjektet ønsker jeg å undersøke klimakunnskapens rolle i kommunenes arbeid med klimatilpasning. Jeg vil undersøke hvor beslutningstakere får kunnskapen fra, hvordan denne kunnskapen blir brukt, hvilke utfordringer som oppstår for effektiv bruk av kunnskapen og eventuelt hvordan disse utfordringene kan løses. Forskningsspørsmålet som vil bli analysert er «hva er mulighetene og utfordringene ved å ta i bruk kunnskap i beslutningstagning på klimatilpasning i Bergen kommune? (*What are the possibilities and challenges of employing knowledge for decision making on climate adaptation in the municipalitiy of Bergen?)*. Prosjektet er en masteroppgave ved Institutt for sammenliknende politikk, Universitetet i Bergen. Den ferdige masteroppgaven blir skrevet på engelsk, men intervjuene gjennomføres på norsk.

Det kan bli aktuelt å presentere masteroppgaven utenfor universitetet, for eksempel hos KS Vest-Norge. Det kan også bli aktuelt å skrive et sammendrag av masteroppgaven i artikkelformat som leveres til KS eller publiseres et annet sted. Oppgaven vil også bli presentert på Senter for Klima og Energiomstilling (CET) ved Universitetet i Bergen.

Hvem er ansvarlig for forskningsprosjektet?
Universitetet i Bergen er ansvarlig for prosjektet.

Hvorfor får du spørsmål om å delta?
Du mottar denne henvendelsen fordi du enten er administrativt ansatt eller politiker i Bergen kommune. Kommunen er valgt fordi det er en stor kommune som har kommet godt i gang med klimatilpasningsarbeidet. Kommunen er også en universitetsby, dette sier noe om nærheten til forskningsbasert kunnskap. Omtrent fem til åtte personer vil bli intervjuet i kommunen.

Hva innebærer det for deg å delta?
Hvis du velger å delta i prosjektet, innebærer det at du deltar på ett dybdeintervju som vil vare ca. en time. Dybdeintervjuet vil være semi-strukturert, noe som gir deg muligheten til å fortelle relativt fritt fra ditt ståsted og om dine erfaringer. Intervjuet vil inneholde spørsmål om hvor kommunen innhenter kunnskap om klimaendringer og klimatilpasning, hvordan

denne kunnskapen blir brukt i konkrete tiltak, samarbeid om kunnskap i nettverk og med andre institusjoner, samhandling om kunnskapsproduksjon, bruk av naturvitenskapelig forskning og samfunnsfaglig forskning, samhandling med regionalt og statlig nivå, og samhandling om kunnskap mellom administrasjon og politikere. Det vil bli gjort lydopptak av intervjuet og tatt notater underveis.

Det er frivillig å delta
Det er frivillig å delta i prosjektet. Hvis du velger å delta, kan du når som helst trekke samtykke tilbake uten å oppgi noen grunn. Alle opplysninger om deg vil da bli anonymisert. Det vil ikke ha noen negative konsekvenser for deg hvis du ikke vil delta eller senere velger å trekke deg.

Ditt personvern – hvordan vi oppbevarer og bruker dine opplysninger
Vi vil bare bruke opplysningene om deg til formålene vi har fortalt om i dette skrivet. Vi behandler opplysningene konfidensielt og i samsvar med personvernregelverket.

- I tillegg til meg som masterstudent vil veileder ved Institutt for sammenliknende politikk ha tilgang til dine opplysninger.
- Navnet og kontaktopplysningene dine vil bli erstattet med en kode som lagres separat fra øvrige data. Datamaterialet vil bli lagret på universitetets sikre skrivebordsløsning SAFE. Lydopptak tas på diktafon tilhørende universitetet og lastes så snart som mulig opp i SAFE, før det slettes fra diktafonen. Lydopptak, transkribering og analysert materiale oppbevares i SAFE.

Masteroppgaven vil bli tilgjengelig gjennom Universitetet i Bergens åpne digitale forskningsarkiv (BORA). Fullstendig anonymitet kan ikke garanteres ettersom utvalget er relativt lite. Oppgaven vil kunne inneholde formuleringer som «en administrativt ansatt i (aktuell)avdeling/etat ved Bergen kommune», «en representant i bystyret/kommunestyret/byrådet i Bergen», «en representant for (aktuelt)politisk utvalg», gjerne kombinert med kjønn.

Hva skjer med opplysningene dine når vi avslutter forskningsprosjektet?
Prosjektet skal etter planen avsluttes 02.06.2020. Personopplysninger, lydopptak og transkriberinger vil bli slettet senest etter ett år, 02.06.2021. Opplysningene lagres etter prosjektslutt dersom sensor skulle be om innsyn eller om det skulle bli aktuelt å skrive en artikkel som sammendrag av masteroppgaven.

Dine rettigheter
Så lenge du kan identifiseres i datamaterialet, har du rett til:

- innsyn i hvilke personopplysninger som er registrert om deg,
- å få rettet personopplysninger om deg,
- få slettet personopplysninger om deg,
- få utlevert en kopi av dine personopplysninger (dataportabilitet), og
- å sende klage til personvernombudet eller Datatilsynet om behandlingen av dine personopplysninger.

Hva gir oss rett til å behandle personopplysninger om deg?
Vi behandler opplysninger om deg basert på ditt samtykke.

På oppdrag fra Universitetet i Bergen har NSD – Norsk senter for forskningsdata AS vurdert at behandlingen av personopplysninger i dette prosjektet er i samsvar med personvernregelverket.

Hvor kan jeg finne ut mer?
Hvis du har spørsmål til studien, eller ønsker å benytte deg av dine rettigheter, ta kontakt med:

- Student: Institutt for sammenliknende politikk, Universitetet i Bergen ved Mina Halle, på epost (...)
- Veileder: Institutt for sammenliknende politikk, Universitetet i Bergen ved Anne Lise Fimreite, på epost (...)
- Vårt personvernombud: Janecke Helene Veim.
- NSD – Norsk senter for forskningsdata AS, på epost (personverntjenester@nsd.no) eller telefon: 55 58 21 17.

Med vennlig hilsen

Anne Lise Fimreite
(Veileder)

Mina Måsvær Halle

Samtykkeerklæring

Jeg har mottatt og forstått informasjon om prosjektet **Kunnskapens rolle i lokal beslutningstagning på klimatilpasning/The role of knowledge in local decision making on climate adaptation**, og har fått anledning til å stille spørsmål. Jeg samtykker til:

- ☐ å delta i dybdeintervju
- ☐ at opplysninger om meg publiseres slik at jeg kan gjenkjennes, som følge av indirekte identifiserbare personopplysninger. Fullstendig anonymitet kan ikke garanteres ettersom utvalget er relativt lite. Oppgaven vil kunne inneholde formuleringer som «en administrativt ansatt i (aktuell)avdeling/etat ved Bergen kommune», «en representant i bystyret/kommunestyret/byrådet i Bergen», «en representant for (aktuelt)politisk utvalg», gjerne kombinert med kjønn.
- ☐ at mine personopplysninger lagres etter prosjektslutt, frem til ett år etter innlevering av oppgaven, altså 02.06.2021.

Jeg samtykker til at mine opplysninger behandles frem til prosjektet er avsluttet, ca. 02.06.2021.

(Signert av prosjektdeltaker, dato)

Interview guide, administrative employees

Intervjuguide (kommuneadministrasjonen)

Innledende spørsmål

1. Hva legger du i begrepet klimatilpasning?
2. Ser du på arbeid med klimatilpasning som en sentral del av dine arbeidsoppgaver?

Klimatilpasningsarbeidet generelt

3. Står arbeidet med klimatilpasning sentralt i kommunen? Hvordan?
4. A) Har kommunen en konkret handlingsplan eller andre delplaner med tanke på klimatilpasning? Grønn strategi, kommuneplanens arealdel
   B) Er denne vedtatt i bystyret?
   C) Hvem tok initiativ til å få på plass handlingsplanen?
5. Hva er viktige satsingsområder for kommunen i klimatilpasningsarbeidet?

Klimaendringer: hvilke krav stiller denne utfordringen?

6. Stiller klimaendringene nye krav til kommunen/kommuneadministrasjonen? Er klimatilpasning en del av dette?
7. Hva er de største utfordringene, sett fra ditt ståsted, i arbeidet med klimatilpasning i kommunen?

Forholdet mellom administrasjon og politikere

8. Hvordan forholder kommuneadministrasjonen seg til politikerne når det kommer til arbeid med klimatilpasning?
   B) Hvem tar initiativ til arbeidet (politikere eller administrasjon)?
9. A) På hvilken måte blir kunnskap om klimaendringer og eventuell tilpasning formidlet mellom administrasjon og politikere?
   B) Fra ditt ståsted, hvordan fungerer denne kommunikasjonen?
   C) Hvem tar initiativ til denne kommunikasjonen (politikere eller administrasjon)?
10. Kan du ta meg gjennom hvordan en slik samarbeidsprosess foregår, altså mellom politikere og administrasjon på klimatilpasning.

Kunnskap fra flere nivåer: samhandling med det regionale nivået og staten

11. I hvilken grad får kommunen kunnskap om klimatilpasning fra fylkeskommunen?

12. I hvilken grad får kommunen kunnskap om klimatilpasning fra fylkesmannen?
13. I hvilken grad får kommunen kunnskap om klimatilpasning fra statlige organer?

Samarbeid: i nettverk og med andre institusjoner

14. Hvilke etater innad i kommunen samarbeider om klimatilpasningsarbeidet?
15. Deltar kommunen i nettverk der klimatilpasning er en sentral del (nettverk med andre norske kommuner, EU)? Hvilke?
16. Hvilke institusjoner utenfra samarbeider kommunen med om klimatilpasningsarbeidet? (NVE, Miljødirektoratet, Statens vegvesen, Fylkesmannen, Fylkeskommunen, universiteter eller andre forskningsinstitusjoner).
17. A) Fra hvor henter kommunen kunnskap om klimaendringer?
    B) Kommer kunnskapen fra nettverk eller andre institusjoner som nevnt i de to foregående spørsmålene?
    C) Henter kommunen kunnskap om klimaendringer fra forskningsinstitusjoner? Hvilke?
    D) Hvilke institusjoner er mest sentrale når kommunen skal skaffe seg kunnskap om klimaendringer?

18. A) Når kommunen får kunnskap om klimaendringer fra eksterne aktører, er dere aktive i å formidle hvilken kunnskap dere trenger?
    B) Finnes det en felles forståelse mellom kommunen og disse aktørene om hvilken kunnskap kommunen trenger i klimatilpasningsarbeidet?
    C)Foregår det et samarbeid om kunnskap med eksterne aktører i form av workshops, dialog med konsulenter, i denne sammenhengen?
    D) Kan du ta meg gjennom hvordan en slik samarbeidsprosess foregår?

19. A) I hvilken grad blir denne kunnskapen brukt i det faktiske klimatilpasningsarbeidet?
    B) Hvilke utfordringer kan oppstå når kunnskapen skal tas i bruk for faktiske tiltak?
    C) Hvilke fordeler har kommunen av denne kunnskapen når det skal fattes konkrete beslutninger?
20. Hvor fornøyd er du med den kunnskapen dere får fra eksterne aktører?

Naturvitenskapelig og samfunnsvitenskapelig forskning

21. A) I hvilken grad tar kommunen i bruk naturvitenskapelig forskning i arbeidet med klimatilpasning? Eksempler på dette kan være: klimafremskrivninger/projeksjoner, flom/nedbørskart, klimaprofilene (på fylkesnivå) osv.
    B) Hvor stor nytte har kunnskap basert på naturvitenskapelig forskning i arbeidet med klimatilpasning sett fra ditt ståsted?
22. A) I hvilken grad tar kommunen i bruk samfunnsvitenskapelig forskning i arbeidet med klimatilpasning? Eksempler på dette kan være: forskning på holdninger til klima, samfunnssikkerhet, organisering etc.
    B) Hvor stor nytte har kunnskap basert på samfunnsvitenskapelig forskning i arbeidet med klimatilpasning sett fra ditt ståsted?

Faktiske tiltak

23. Kan du gi noen eksempler på konkrete klimatilpasningstiltak som er gjennomført i kommunen eller som skal gjennomføres i nærmeste fremtid?
24. Kan du ta meg gjennom hovedtrekkene i prosessen det var å få på plass dette tiltaket?
25. Hvilken rolle spilte kunnskap og forskning i denne prosessen?

Ønsker om forskningens rolle

26. Hvilken kunnskap skulle du ønske var tilgjengelig for klimatilpasningsarbeidet?
27. A) Finnes det en relasjon mellom forskere som forsker på klima og kommuneadministrasjonen?
    B) Hvordan fungerer den?
    C) Hvordan skulle du ønske den hadde fungert?

Interview guide, politicians

Intervjuguide (politikere)

Innledende spørsmål

1. Hva legger du i begrepet klimatilpasning?
2. Ser du på arbeid med klimatilpasning som en sentral del av ditt politiske arbeid?

Klimatilpasningsarbeidet generelt

3. Står arbeidet med klimatilpasning sentralt i kommunen? Hvordan?
4. A) Har kommunen en konkret handlingsplan eller andre delplaner med tanke på klimatilpasning? Grønn strategi, kommuneplanens arealdel,
   B) Er denne vedtatt i kommunestyret (evt bystyret)?
   C) Hvem tok initiativ til å få på plass handlingsplanen?
5. Står klimaendringene sentralt i partiprogrammet? Hvordan?
6. Står arbeid med klimatilpasning sentralt i partiprogrammet? Hvordan?
7. A) Hva er viktige satsingsområder for bystyret i klimatilpasningsarbeidet?
   B) Er dette også viktige satsningsområder for partiet?

Klimaendringer: hvilke krav stiller denne utfordringen?

8. Hvilke krav opplever du at klimaendringer og klimatilpasning som sak stiller til lokalpolitikere?
9. Hva er de største utfordringene, sett fra ditt ståsted, i arbeidet med klimatilpasning i kommunen?

Forholdet mellom administrasjon og politikere

10. A) Hvordan forholder politikerne seg til kommuneadministrasjonen når det kommer til arbeid med klimatilpasning?
    B) Hvem tar initiativ til dette arbeidet (politikere eller administrasjon)?
11. A) På hvilken måte blir kunnskap om klimaendringer og eventuell tilpasning formidlet mellom administrasjon og politikere?
    B) Fra ditt ståsted, hvordan fungerer denne kommunikasjonen?
    C) Hvem tar initiativ til denne kommunikasjonen (politikere eller administrasjon)?
12. Kan du ta meg gjennom hvordan en slik samarbeidsprosess foregår, altså mellom politikere og administrasjon på klimatilpasning?

Kunnskap fra flere nivåer: samhandling med det regionale nivået og staten

13. I hvilken grad får lokalpolitikerne kunnskap om klimatilpasning fra fylkeskommunen?
14. I hvilken grad får lokalpolitikerne kunnskap om klimatilpasning fra statlige organer og Fylkesmannen?

Samarbeid: i nettverk og med andre institusjoner

15. A) Fra hvor henter politikere kunnskap om klimaendringer?
    B) I hvilken grad kommer kunnskapen fra partiet? Hvordan foregår det?
    B) Hvilke forskningsinstitusjoner får politikerne kunnskap om klimaendringer fra?
    C) Hvilke institusjoner eller aktører er mest sentrale når lokalpolitikerne skal skaffe seg kunnskap om klimaendringer?
16. Deltar kommunen i nettverk der klimatilpasning er en sentral del (nettverk med andre norske kommuner, EU)? Hvilke?

17. A) Når lokalpolitikere får kunnskap om klimaendringer fra eksterne aktører, er dere aktive i å formidle hvilken kunnskap dere trenger?
    B) Finnes det en felles forståelse mellom kommunen og disse aktørene om hvilken kunnskap kommunen trenger i klimatilpasningsarbeidet?
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    D) Hvilke fordeler har lokalpolitikerne av denne kunnskapen når det skal fattes konkrete beslutninger?

Naturvitenskapelig og samfunnsvitenskapelig forskning

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B) Hvor stor nytte har kunnskap basert på naturvitenskapelig forskning i arbeidet med klimatilpasning fra ditt ståsted?

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    B) Hvor stor nytte har kunnskap basert på samfunnsvitenskapelig forskning i arbeidet med klimatilpasning fra ditt ståsted?

Faktiske tiltak

22. Kan du gi noen eksempler på konkrete klimatilpasningstiltak som er gjennomført i kommunen eller som skal gjennomføres i nærmeste fremtid?
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    B) Hvordan fungerer den?
    C) Hvordan skulle du ønske den hadde fungert?