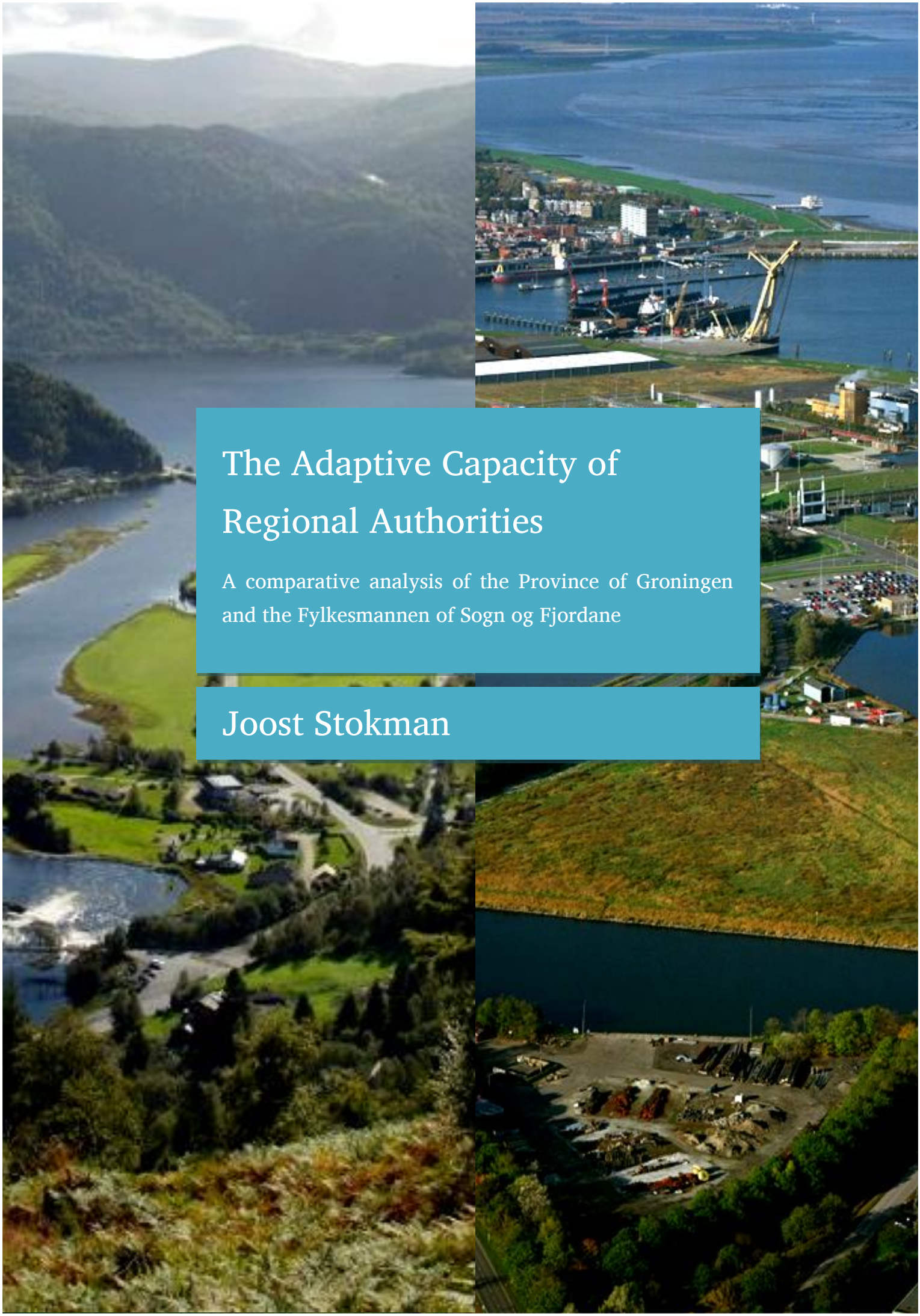

The Adaptive Capacity of Regional Authorities

A comparative analysis of the Province of Groningen and the Fylkesmannen of Sogn og Fjordane

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II. Abstract

Despite the efforts of society to mitigate climate change it has become clear that even in the most optimistic scenarios climate change will occur. The issue of climate change is considered to be a 'wicked' issue due to the interconnected nature of climate change with other aspects of society, the uncertainties surrounding the distribution and consequences of the impacts, and the unclear and diffused responsibilities. The impacts of climate change are felt at multiple spatial levels and regional governmental authorities are in an unique position which allows for a more flexible approach than national government while closely coordinating and cooperating with the local level (Grecksch, 2013). Moreover some impacts of climate change transcend the borders of local territory and are better addressed at a regional scale by a regional authority. Adaptation to climate change is a challenging policy field. Even though the costs to adapt now are much lower than adapting in the future, the policy field competes with the short-term interests of other policy issues. Furthermore, it is a relatively new policy field in which actors have to deal with high level of uncertainties.

This research has assessed the level of adaptive capacity that is present at the selected regional authorities, compared the regional authorities in order to distinguish universal patterns and has analyzed the extent to which the adaptive capacity contributes to securing climate change adaptation action. By conducting a cross-national comparative case-study analysis of two regional authorities active in climate change, the Province of Groningen and the Fylkesmannen of Sogn og Fjordane, the level of adaptive capacity is determined. Both regional authorities are active integrating climate change adaptation and can be considered front-runners. The Province of Groningen has created a regional climate change adaptation program through which projects have been created to address climate change adaptation in policy areas such as water management and heat-stress. The Fylkesmannen of Sogn og Fjordane have focused on integrating climate change adaptation into existing policy making processes in the fields of spatial and emergency planning. To enable the analysis of the adaptive capacity a framework was developed which consisted of the following six dimensions: 'variety', 'learning capacity', 'leadership', 'resources', 'fair governance' and 'willingness and perceived ability to adapt'. The data collection took place through a combination of content analysis of key formal policy documents and legislation and by conducting interviews with key policy makers and actors which operate in the field of climate change adaptation.

The overall conclusion is that the adaptive capacity of the Province of Groningen has a moderately positive effect and the adaptive capacity of the Fylkesmannen of Sogn og Fjordane has a overall neutral effect on the ability of actors to adapt to climate change. Both the approach of the Province of Groningen and the Fylkesmannen of Sogn og Fjordane feature specific strengths and weaknesses. The flexible governance approach of the Province of Groningen has positively influenced the dimension 'variety' as the inclusion of actors from multiple levels and sectors and utilizing and developing new solutions is at the centre of policy making. The key strength of the top-down approach of the Fylkesmannen is the clearly established authority, accountability which in turn stimulate the learning capacity. Opportunities in terms of improvement lie mainly in the development of a information infrastructure, strengthening the program management and stimulating double-loop learning for the Province of Groningen and employing a larger variety of solutions to reduce the risk of path dependency and strengthen the establishment of strong links between adaptation and other important societal governance themes through the organization, and foster cooperation on climate change adaptation with the Fylkeskommune.

Keywords: climate change adaptation, adaptive capacity, regional authority.

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Chapter 1. Introduction

1.1 Introduction

The increasing threat of climate change taxes human aspirations toward a sustainable planet. The sheer magnitude of the problem and the potential to challenge existing paradigms make it one of the most complex and far reaching issues humans have ever encountered (Engle, 2010). Through international institutions, such as the Intergovernmental Panel on Climate Change (IPCC), scenarios have been created to outline the consequences of climate change. Even in the most optimistic scenarios climate change shows negative climate impacts. Current data indicates that emissions of greenhouse gasses continue to rise globally and that the world is on track for over two degrees of climate change (IPPC, 2013). The increasing global mean temperature will lead to a multitude of effects impacting all dimensions of society. Effects such as enhanced volatility and an increased frequency of extreme precipitation, sea level rise ,decrease in intensity and amount of cold days and increase in intensity of amount of warm days are likely to occur in early 21st century (IPCC, 2013). These effects will negatively impact society in areas such as the availability of water resources, crop yields, frequency and intensity of floods and droughts, prevalence of diseases (diarrheal or cardio-respiratory) and resilience of ecosystems (IPCC, 2007). Moreover, the impacts of climate change are unequally distributed; while the industries of developed countries are responsible for the majority of greenhouse gas emissions the impacts are expected to have greater intensity in the developing countries (Ikeme, 2003). It should be noted that while the predominant impacts are considered negative, in some areas with a milder climate impacts can be positive. The crop yield, for example, is projected to increase due to rising average temperature over a range of 1-3°C (IPCC, 2013).

Despite small benefits, society should not solely focus on the mitigation of climate change but needs to simultaneously adapt to the adverse impacts. One of the most commonly used definitions of climate change adaptation is provided by the IPPC. Climate change adaptation is defined as the "adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities." (IPCC, 2007, p.869). There is a consensus on that the costs of taking action to adapt to the impacts of climate change in the short-term are much lower than the cost of the damages incurred resulting from the impacts (IPCC, 2007). The adaptive capacity of regional authorities is the main research topic of this research. To introduce the topic the governance of regional climate adaptation will be discussed first, followed by the relation between the adaptive capacity and climate change adaptation.

1.1.1 The governance of regional climate change adaptation

Even though the projections of climate change have improved in precision and scope many uncertainties remain in regards to the severity, distribution, location and time-frame of the impacts (IPPC, 2007). "The problem could be labeled as a 'wicked problem' because we are dealing with a completely new phenomenon associated with large-scale environmental and social change" (Van Nieuwaal *et al*., 2009, p.18). To deal with the 'wicked problem' of climate change adaptation actors, on multiple spatial levels, will have to cooperate on the interconnected issues to enable successful climate change adaptation. Climate change adaptation can be approached from the (inter)national level through the creation of international agreements, and form a framework to direct regional and local action. The climate system may be global in extent, but its manifestations are regional or local in their occurrence, character and implications (Hewitson *et al*., 2014). At the same time, regional and local actors can take the initiative in the implementation of adaptation strategies as they directly

feel the impacts. No clear consensus exists in regards to which path is the most effective (Galarraga *et al*., 2011). The capacity of lower level authorities will be influenced and restricted by policies and frameworks on the higher levels and vice versa (Adger *et al*., 2005). Consequently, each level must cooperate and take a multi-level governance approach in order to develop coherent adaptation strategies (EU, 2013). This relates to the notion of environmental governance where, through multi-level (i.e. local, regional national, international) interactions, actors cooperate in formulating and implementing policies in response to environment-related demands and inputs from the society for the purpose of attaining environmentally-sustainable development (Adger *et al.,* 2007). Within these multi-level networks, the regional level of government has a central role to play in climate change adaptation. The term regional governmental authority refers to a "form of sub-national government just above local governments or municipalities" (Galarraga *et al*., 2011, p.165). Regional authorities active in the environment and regional development can be identified as key-actors for sustainable regional development (Gaube and Sedlacek, 2003). As the link between the national and local level, their unique position allows for a more flexible approach than national government while closely coordinating and cooperating with the local level (Grecksch, 2013). Authorities on the regional level can play a crucial role given their proximity to actual problems in the translation of sustainable development into concrete actions (Hirschi, 2010). Furthermore their involvement in policy areas which are related to CCA (energy, transport, industry, housing and environment) explain the importance of regional authorities in climate policy discussions (Galarraga *et al.*, 2011; Hirschi, 2010). Moreover, many climate change impacts surpass the local level; impacts on natural resource sectors, such as agriculture, forestry, ecosystems, water resources and fisheries, and on human activities and infrastructure, benefit from a treatment following geographical characteristics (e.g. biomes, climatic zones and physiographic features such as mountains, river basins, coastlines or deltas, or combinations of these) (Hewitson *et al*., 2014). In other words, while a local governmental authority (e.g. municipality) is able to address heat-stress within a city the management of a river basin or mountain range which transcends the borders of the local territory is better addressed at a regional scale by a regional governmental authority (e.g. provincial or county). Regional authorities can form the basis from which policy and action is set up to address the impacts of climate change which transcend the local level but does not require the national government. The regional authority has the opportunity to create a coherent strategy which addresses the issues at an appropriate scale, but faces the challenge of operating in a complex policy field where responsibilities are unclearly defined or diffused between governmental levels and, autonomous action may have already been undertaken by other actors. This complex setting does not only require regional governmental authorities which can efficiently and effectively implement policy but due to the uncertainties of climate change they need to be able to anticipate and respond to expected and unexpected changes that may occur and change their actions and themselves accordingly. The case studies of this research, the Province of Groningen and the Fylkesmannen of Sogn og Fjordane, have been selected as the regional authority under study based on their activities in climate change adaptation and frontrunner position.

1.1.2 Adaptive capacity and adaptation

The ability of regional governmental authorities to empower internal and external actors to respond to short and long-term impacts either through planned measures or by allowing and encouraging creative responses is determined by their adaptive capacity (Gupta *et al.*, 2010). In literature, the adaptive capacity refers to a 'systems' ability to enable actors to prepare for stresses and changes in

advance, or adjust and respond to the effects caused by the stresses (Engle, 2010; Gupta *et al.*, 2010). In this research adaptive capacity is applied to regional governmental authorities. The adaptive capacity of regional authorities is thus defined as the degree to which regional authorities enable (internal and external) actors to respond to and cope with climate change, and the extent to which actors are allowed and encouraged to make changes to the regional authority to cope with climate change. The ability of actors to respond and anticipate to climate change can be influenced by factors such as access to financial and human resources, availability of a diverse set of solutions, acknowledgement of uncertainties and the extent to which learning from previous experiences to cope with current climate, and to apply these lessons to cope with future climate is stimulated (Brooks & Adger, 2005; Gupta *et al.*,2010). The adaptive capacity thus enables actors to adapt to climate change but does not necessarily reflect the extent to which they have actually successfully adapted to climate change. The presence of adaptations are, however, manifestations of adaptive capacity as they represent ways in which the actors of the regional authority has anticipated or responded to expected and unexpected changes (Smit, 2006). To further elaborate, adaptive capacity is the ability to design and implement effective adaptation strategies and anticipate and react to (un)expected impacts, but just because authorities stimulate actors and have the knowledge, capacity and resources to undertake adaptation, this does not guarantee action (Gupta *et al.*, 2010). The hypothesis is that the adaptive capacity indicates a higher probability for adaptation to climate change (Gupta *et al.,* 2010; Grothmann *et al*., 2013). A regional authority with a high adaptive capacity thus embodies flexibility, and is able to change the established path if, through learning processes, it has become clear the current efforts to adapt are unsuccessful. Thus, if the adaptive capacity is lacking (i.e. actors are not encouraged and able to change the regional authority when the situation demands it), additional efforts may be required to enable the regional authorities to be changed naturally (Gupta *et al.,* 2010).

1.2 Knowledge gap

As previously discussed, the regional governmental authorities play a critical role in climate change adaptation; they form the link between the national and local level and can support the translation of the more abstract policies and legislation to concrete measures. In the last 10 years, research concerning climate adaptation has seen a surge (Engle, 2010). Originally the term adaptation came from natural sciences and referred to “genetic or behavioral characteristics which enable organisms or systems to cope with environmental changes in order to survive and reproduce“ (Smit, 2006, p.283). It is also used to look at the ability of whole organizations to adapt to climate change (Gupta et al., 2010). There is literature discussing the definition of adaptive capacity and the factors that determine it (Adger et al., 2007; Smit, 2006; Gallopin, 2006; Kelly & Adger, 2000). There is research on the adaptive capacity of households, communities and nations (Gupta *et al.*, 2010). However, due to the complexity and diversity of the context in which adaptation takes place, the analyses lack a systematic approach to identifying the influential factors of the adaptive capacity (Grothmann et al., 2013). Gupta *et al.* (2010) have addressed this issue by developing a framework to determine the adaptive capacity of *institutions*. This framework has been expanded upon by including factors such as adaptation motivation, adaptation belief (Grothmann *et al*., 2013) and has been used to create other frameworks (Mees & Driessen, 2011). While there have been other case studies assessing the adaptive capacity on a regional level (Munaretto, 2011; Grescksch, 2013) the framework has not yet been applied to regional governmental authorities.

In general, the implementation of climate change adaptation at the regional level is highly challenging both due to the lack of clearly established practices and uncertainties of the distribution and severity of the impacts. There is a need to gain more insight into the regional perspective of climate change adaptation. Even though literature emphasizes that regional approaches are often more effective in taking national and local decision-making contexts into account, there is little examination into the governance approaches that most positively influence adaptive capacity (Kovats *et al.,* 2014; Medema *et al.* 2008). Smith *et al.* (2010) observe that very few empirical studies exist which analyze the adaptive capacity on the regional level. Franzen & Orlova (2008) argue that there is need for case-studies to gain insight into the public planning responses and their effect on the adaptive capacity. The knowledge gap, thus, does not relate to the identification of the relevant criteria to establish the adaptive capacity, but to the relation between the adaptive capacity and the manner in which regional authorities have set up climate change adaptation policy (processes). The adaptive capacity of regional authorities is not made up from separate or independent factors but they embody the governmental structure, policy processes and even the (professional) culture within the authority. There is a need to better understand the linkages between the factors of the adaptive capacity (Franzen & Orlova, 2008). This will give insight into the weaknesses and benefits of certain approaches and can lead to practical insights for regional authorities active in the field of climate change adaptation.

1.3 Aim & scope

The aim of this study is to gain insight into the adaptive capacity of regional governmental authorities active in climate change adaptation by analyzing and comparing the adaptive capacity to gain insight into the strengths and weaknesses of the current approaches to climate change adaptation of the regional governmental authorities. This research thus does not focus on the whole regional climate adaptation policy field, but is limited to a single regional governmental authority per region active in climate adaptation. The choice to limit to scope to a single regional authority is based on the complexity of the climate adaptation policy field in which a multitude of public and private actors are active, which are all influenced by policy made at the national, regional and local level and where the vertical and horizontal interactions are high in frequency. Establishing the adaptive capacity of a whole policy field would require a much more extensive research. Furthermore by limiting the scope to a single governmental regional authority the scope in terms of the activities in climate change adaptation can be broadened. Most literature focuses on a single sector (e.g. Grecksch, 2013; van den Brink *et al.*, 2014; Grothmann *et al.*, 2009) but this research has analyzed the full scope of climate change activities of the regional governmental authorities. Thus, this research solely focuses on the activities of the respective authorities and the main formal policies that guide their activities (e.g. legislation, programs and plans); autonomous actions undertaken by individuals, private institutions and other governmental organizations are outside the scope of the research. Nevertheless, policies and activities that take place in cooperation with external actors are included.

Due to the initial phase of climate adaptation policies the 'true' adaptive capacity cannot be established during the course of this research. Therefore, the focus of the research is to create a preliminary assessment of the adaptive capacity of the regional authorities. In practice, this means that the research has studied the output and the policy processes which show how the output was generated instead of the outcome of the policy.

The following research questions will be answered as part of the research:

Main research question
What level of adaptive capacity is present at the regional authorities, how can this level of adaptive capacity be explained and to what extent does the adaptive capacity contribute to securing climate change adaptation action?

Sub questions
-What are the main criteria which foster the adaptive capacity of regional authorities?
-What is the context in which the Province of Groningen and the Fylkesmannen of Song og Fjordane operate?
-To what extent does the adaptive capacity of the Province of Groningen and Fylkesmannen of Sogn og Fjordane enable climate change adaptation?
-To what extent is the adaptive capacity of the Province of Groningen and the Fylkesmannen of Sogn og Fjordane different or similar?
-What recommendations can be made to address the weaknesses to increase the adaptive capacity of the Province of Groningen and the Fylkesmannen of Sogn og Fjordane?

1.4 Societal and scientific relevance

Climate change will cause direct and indirect harm to citizens. Floods can destroy properties and livelihoods, extreme heat can lead to early deaths and crops can be damaged by droughts or extreme rainfall. Society expects the government to protect them adequately from such harms. Therefore, it is vital that the regional authorities foster the adaptive capacity of actors responsible for climate change adaptation. The implementation of climate change adaptation measures is still a relatively new policy field on the regional level (Adger *et al.*, 2007). Hopefully, the social relevance of this research is the generation of practical knowledge and lessons for policy makers active in climate change adaptation so that they can address the weaknesses of their regional authority to improve their capacity to address climate change impacts. Moreover, the insights and lessons that have been created as part of this research can act as a source of information and inspiration for other regions in Europe which aim to become more active in climate change adaptation.

In terms of scientific relevance this research gives valuable insights in the application of the adaptive capacity framework. Little research has been done to apply the framework to the regional level. The interactions between the national, regional and local level give interesting insights in how the stronger and weaker aspects of the adaptive capacity influence the manner in which policy is made, actors cooperate and learning takes place. The knowledge of these practical experiences needs to be built as climate change has not yet had a significant impact on planning processes (Mees & Driessen, 2011).

1.5 Research perspective

The central assumption of this research is that a high adaptive capacity of regional authorities fosters the ability of actors to successfully create and implement climate change adaptation measures. For this purpose, a framework has been created based on the work by Gupta *et al.* (2010) and Grothmann *et al.* (2013) to enable the analysis of the adaptive capacity of the two regional authorities. This framework has been presented in figure 1 which shows the six dimensions which represent the adaptive capacity: variety, learning capacity, leadership, resources, fair governance and willingness and perceived ability to adapt. The framework of analysis is not limited to the 'organizational' features of the regional authority but goes deeper by studying the norms which are part of the policy processes as well. The adaptive capacity of a regional authority is considered to be high when it: (1) enables (internal and external) actors to cope with climate change adaptation and (2) allows for and encourages actors to make changes to the regional authority to better cope with climate change. The next chapter will discuss the dimensions and criteria in more detail. Here, the manner in which the individual criteria and the dimensions lead to a higher chance for successful climate change adaptation to take place will be elaborated upon.

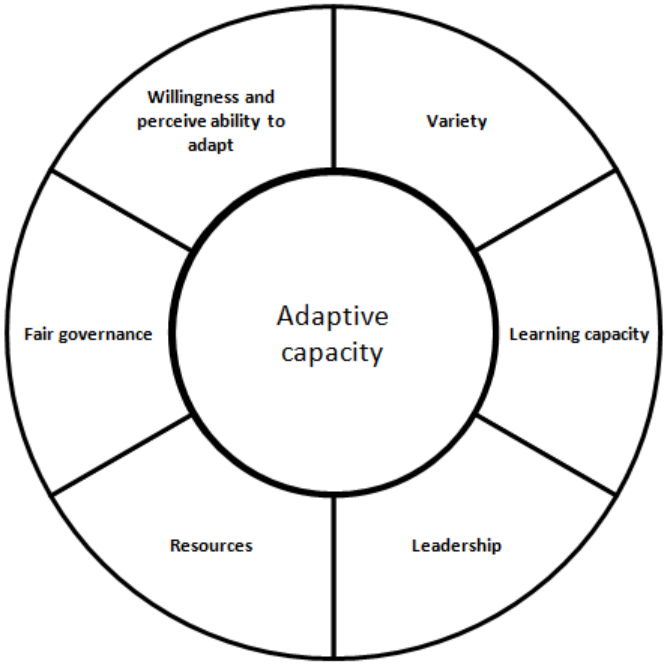

Figure 1: Adaptive capacity framework based on Gupta *et al.* (2010) and Grothmann *et al.* (2013)

1.6 Research methodology

This research employs a qualitative method using a cross-national comparative case study design. A case study is "an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident." (Yin, 2003, p.13). A case study allows for an in-depth analysis to bring an understanding of an complex object and can expand on information gathered through prior research. The approach can be employed to gain a better understanding of the relation between a phenomenon and the context in which it is occurring (Gray, 2004). In this case, the extent to which the condition of the adaptive capacity of a regional authority and the effect on the ability of regional actors to successfully implement climate adaptation policy is being investigated. By utilizing a comparative method analyzing regions situated in different countries the relation between the context and the adaptive capacity will be elucidated. It is expected that the cross-national perspective will offer additional insights governmental arrangements, underlying context and policy making processes affect the adaptive capacity. In other words, it is expected that, because the regional authorities are situated in different countries, the context in which the authorities operate and the manner in which they create and implement policy differs to a greater extent compared to regional authorities operating

within the same national context. These differences are expected to be reflected in a diverging level of adaptive capacity. The cross-national perspective might therefore elucidate which approach has a more beneficial effect on the adaptive capacity of regional authorities. Furthermore, it is expected that the individual criteria will give a more nuanced picture; certain criteria may perform better even if a certain approach leads to an overall lower adaptive capacity.

From these insights the research aims to draw lessons in regard to which dimensions or criteria of the adaptive capacity should be and can be changed in order to improve the ability of actors to successfully implement climate change adaptation. In order to achieve this, an in-depth study is conducted of the extent to which the condition of the adaptive capacity of the regional authorities. The research was performed through a total of three phases. As a first step the adaptive capacity framework was designed mainly based on the work of Gupta *et al.* (2010) and Grothmann *et al.* (2013). Here, scientific literature related to vulnerability and resilience, adaptive capacity (building) (e.g. Wejs *et al.,* 2013; Storbjörk & Hedrén, 2011), organizational learning (e.g. Crossan *et al.*, 1999) to problem framing (de Boer *et al.*, 2010) were used to expand upon the dimensions and criteria of the adaptive capacity framework. The second phase involved a combination of desk research and fieldwork. The desk research consisted of the analysis of literature, policy documents and more informal media related to the regional climate adaptation field within the respective region were utilized. This involved:

- Scientific literature on the governance, adaptive capacity, formal and informal institutions of the (regional) climate change adaptation policy field in the Netherlands and Norway.
- Formal policy and strategy documents of formal legislation, climate adaptation programs, activities and projects at the local, regional and national level. The focus was on the regional policy documents and strategies as these were the most relevant for the research.
- Grey literature such as evaluative reports from government agencies, white papers, information provided by external agencies on the regional climate adaptation policy field and conference papers or presentations
- Media, such as internet websites, news papers, booklets, workshop documentation

The data fieldwork was performed in the form of interviews with relevant policy actors. This phase included interviews with

- Actors directly active in the creation and/or coordination of the climate adaptation (activities) of the respective authority.
- Policy implementers, project managers or members active in the climate adaptation policy field from different departments within the regional authority
- Experts on the (regional) climate adaptation policy field
- External actors which cooperated in projects or activities with the regional authority

The combination of multiple data sources serve as a way to triangulate the data. By using a combination interviews from multiple perspectives, policy documents (national, regional and local) and the comparison between the two regions the ability to observe and verify the condition of the adaptive capacity is improved (Grey, 2004). The triangulation of research methods and sources has increased the internal validity of this research in terms of the trustworthiness of conclusions. The extent to which the results of the research can be generalized to regions active in climate change adaptation (external validity) is limited due to the qualitative research design. Nevertheless, the procedure to make the case-study selection and the application of the adaptive capacity framework

on both cases should improve the external validity. The analysis of the case-studies have been sent to key respondents in the region to verify the statements that were made. It is hoped that this research may identify patterns in climate change adaptation policy process

1.7 Case Study Selection

Regional governmental authorities were selected as the object of analysis. The impacts of climate change surpass the boundaries of local areas or cities; while heat stress can and should be addressed at the local level, the management of rivers or inter-connected natural areas are better handled at the regional level. The regional level plays a critical role in climate change adaptation; they form the link between the national and local level and can support the translation of the more abstract policies and legislation to concrete measures. Regional government authorities can be active in key-activities related to climate change:

- Implementation of national legislation
- The creation and implementation of a regional climate adaptation strategy
- Formal responsibilities in sectors related to climate change adaptation (e.g. water, spatial planning and natural habitat management),
- Forming cooperative networks between national, regional and local actors
- Provision of incentives for the local level to stimulate climate change adaptation,
- Providing support by supplying tools, information to foster the adaptive capacity of local authorities.

A total of 11 regions (see Annex 1) have been considered and the regional authorities the Province of Groningen and the Fylkesmannen of Sogn og Fjordane have been selected based on a number of background characteristics to improve the comparability. Both the regional authorities are based in European democratic countries, are situated in developed countries with a high level of wealth and fully developed governmental institutions, have economies which are increasingly influenced by globalization. In both nations the national government is increasingly active in the field of climate change adaptation and is working towards or has developed a national climate change adaptation strategy. The projected changes in climate in terms of temperature, precipitation and extreme weather are similar, although due to the large geographical differences (i.e. the below sea-level land in the Netherlands compared to the mountainous areas in Norway) the impacts of climate change do vary (Carina & Keskitalo, 2010). Furthermore the extent to which climate change adaptation policy has been developed at the regional level makes both regional authorities frontrunners. In general climate change adaptation is still underdeveloped at the regional level; climate change adaptation takes place mainly on the local level (i.e. municipalities/cities) (EU, 2013). In both regions (1) a regional policy plan/program on climate change adaptation has been developed, (2) the implementation of the climate change adaptation plan/program has commenced and (3) a regional governmental authority is present and responsible for the creation and/or implementation of climate change adaptation policy. At the Province of Groningen the climate change adaptation program has been running for three years leading to over 15 projects in which climate change adaptation is integrated. The Fylkesmannen of Sogn og Fjordane have shown activity in regards to climate adaptation from the year 2007 where they participated in the international program Clim-ATIC where early climate adaptation goals were defined: improvements in emergency responses to climate-related damage and an increase to the identification of regional and local risks (Clim-ATIC, 2007). Sogn og Fjordane is one of the first counties to have produced climate action plans that

balances between CCA and CCM goals and measures and leads the integration of CCA in spatial planning in Norway (Goodsite *et al.,* 2013) Nevertheless, both regional authorities are situated within a different context in terms of the characteristics of the climate change adaptation policy field leading to a different scope, governmental arrangements and flexibility of policy making processes. The differences in the condition of the adaptive capacity and the comparable context in which the regional authorities are situated in make these cases interesting to compare.

1.8 Structure of the research

In this section the structure of the research will be described to elucidate in which chapters certain sub-questions will be answered. In the following second chapter the 'adaptive capacity framework' will be described more extensively. The aim is to acquire in-depth knowledge regarding the criteria which determine the adaptive capacity of regional governmental authorities (sub-question 1). The theoretical framework which is utilized to analyze the adaptive capacity will be described. Furthermore, the dimensions and criteria will operationalized to enable the analysis of the regional authorities. In the third and fourth chapter the analysis of the Province of Groningen and the Fylkesmannen of Sogn og Fjordane will take place. The chapter introduces the regions via the description of the regional context of the climate change adaptation policy field. This description will include an analysis of the regional climate impacts, national governmental policies on climate change adaptation and the regional activities/responsibilities in regards to climate change adaptation. As part of the analysis each criteria and dimension will be scored leading to a concluding synthesis, which presents an overview of the institutional strengths and weaknesses of the regional authorities. Once the analysis of the case-studies have been concluded the third phase of the research will commence. A comparative analysis will be conducted comparing the institutional adaptive capacity of the two regional authorities. Here, the differences and similarities of the institutional characteristics will be discussed to gain insight. The performance of the dimensions will be linked, when possible, to the recommendations to address the weaknesses and strengths of the adaptive capacity. As a final step the conclusions on the main research question will be presented, the research methodology will be discussed and recommendations for future research will be made.

Chapter 2: Adaptive capacity framework

2.1 Introduction

In this chapter the framework that has been created is mainly based on the work of Gupta *et al.* (2010) and Grothmann *et al.* (2013) will be discussed in more detail. As a first step, the process through which the framework was constructed and the extent to which it has utilized, changed and expanded upon the existing frameworks which analyze the adaptive capacity will be discussed. The second step involves a general description of the dimensions and criteria to present an overview of how the adaptive capacity is analyzed. Then, the manner in which the dimensions and criteria have been scored is discussed. This includes a description of the process which has been undertaken to assign the scores, the manner in which the scores are aggregated and how the scores will be presented by color coding the results to improve the ability to communicate the results. The fourth and concluding step will involve a more detailed discussion of the dimensions and respective criteria. In this section the criteria will be operationalized.

2.2 Theoretical framework

2.2.1 Construction of the adaptive capacity framework

To enable the assessment of the adaptive capacity of the two regional authorities a framework has been be developed which includes the criteria that represent the adaptive capacity. This assessment framework enables the measurement of adaptive capacity via the following six dimensions: variety, learning capacity, leadership, resources, fair governance and, willingness and perceived ability to adapt (see table 1 below). The framework used in this research is mainly based on the "adaptive capacity wheel" framework developed by Gupta *et al.* (2010) and the work of Grothmann *et al.* (2013). Changes have been made to the 'adaptive capacity wheel' to add or remove dimensions and expand upon existing criteria. The dimension 'room for autonomous change', which was part of the 'adaptive capacity wheel' has been excluded. This dimension was focused on the extent to which actors were allowed and stimulated to adapt to climate change autonomously. The original framework Gupta *et al.* (2010) was designed to allow for a broader scope and analyzed the adaptive capacity of a whole policy field. As the scope of this research is limited to the adaptive capacity of a single regional authority and not the whole policy field, the ability of external actors to adapt autonomously is not applicable. Based on the work of Grothmann *et al.* (2013) the dimension 'willingness and perceived ability to adapt' has been added. Grothmann *et al.* (2013) argue that the adaptive capacity is not solely determined by the 'objective context' in which the regional authority operates, but that psychological factors such as the motivation to realize, support and/or promote adaptation to climate change and the perceived ability of actors to adapt play a vital role as well. Other changes are focused on operationalizing the criteria or more incremental changes. As Gupta *et al.* (2010) only described the criteria of the six dimensions but did not provide indicators to measure them in a transparent manner. Therefore, literature from the vulnerability, resilience, governance, co-management and political science field has been utilized to make incremental changes, elaborate and expand upon the criteria. Examples are: the use of Boer *et al.* (2010) to identify the variety of problem frames within policy processes, the use of Wejs *et al.* (2013) to identify means through which legitimacy is supported within (public) authorities and the use of Bovens (2003) to operationalize the criterion accountability. Consequently, due to the interpretation of the author and the use of literature to operationalize the dimensions and criteria the adaptive capacity framework will differ significantly from the original work.

2.2.2 Description of the dimensions

In this section, the dimensions of the adaptive capacity framework will be described to present an overview of the dimensions which determine the adaptive capacity. As previously discussed, the adaptive capacity framework consists of six dimensions: variety, learning capacity, leadership, resources, fair governance and willingness and perceived ability to adapt.

The dimension 'variety' is based on the assumption that, when dealing with complex, unstructured and wicked problems, there is no single optimal solution to handle the situation. By including multiple discourses, actors and solutions from different organizations and spatial scales, problems can be addressed through solutions suitable for the specific situation (Gupta *et al.*, 2010). This is closely relates to the notion of environmental governance where the need for multi-level solutions operating at the local, national, international and intermediate levels simultaneously is emphasized (Paavola, 2007). Variety requires an authority to be flexible and to be able to adapt to known and unknown impacts through a multitude of policy tools. This is to ensure that an authority will not suffer from path dependency where they are not able to adapt to unexpected changes due to a lock-in in a specific set of policy tools or technologies (Gupta *et al.*, 2010). Variety in programs, policy making processes and projects aimed at adapting to climate change thus stimulates actors to not focus on a single solution, but to take a broad perspective on the approach they take for the problem.

The dimension 'learning capacity' is centered around the idea that it is positive for the adaptive capacity of an regional authority to enable actors to continually learn from current projects and past experiences. This includes single loop learning (improved routines) and double loop learning (when social actors challenge norms and basic assumptions) (Gupta *et al.*, 2010). Within this dimension the need to gather and disseminate learned knowledge between internal and external actors which have participated in the policy making process has also been included. However, more dissemination of knowledge is not necessarily beneficial for authorities, due to the sensitive nature of certain knowledge. Nevertheless being open to potential new sources of knowledge improves the adaptive capacity (Adger *et al.*, 2007). The adaptive capacity of regional authorities is thus fostered when they critically reflect if the manner in which they perform their activities can be made more efficient and if they consider whether they have taken the right approach and set the right goals. The adjustments that are made as a results of the learning processes allow the regional actor to better *adapt* to the expected and unexpected impacts of climate change and make changes to themselves if it is deemed necessary based on their experience.

The third dimension 'leadership' revolves around to what extent the authority fosters leadership and enables leaders to respond to long term challenges, motivates other actors and makes changes to the regional authority (Gupta *et al.*, 2010). Leadership is essential in shaping change and reorganization in order to achieve the flexibility needed to deal with the uncertainties of climate change (Folke *et al.*, 2007). Leadership thus enhances the adaptive capacity of regional authorities as they serve as vessels of change; they can significantly shift the focus or direction of a regional authority. The changes, however, are not necessarily positive for climate change adaptation or the adaptive capacity. A leader can convince actors that addressing heat-stress is unnecessary or the personal responsibility of civilians. Furthermore, even when they foster climate change adaptation they can shift the focus to a single aspect or single solution (i.e. reducing variety). Nevertheless, the extent to which the regional authority fosters leadership improves the *ability* of actors to address climate change adaptation or change themselves; how the actors *use* their capacity to adapt is their choice.

The fourth dimension 'resources' analyses the extent to which sufficient resources are made available. Resources include financial, human (expertise, skills and labor) and authority (Gupta *et al.,* 2010). Without sufficient resources made available to actors, the ability to undertake action is severely hampered: financial resources are vital for the experimentation with adaptation strategies, actors need to have sufficient expertise to develop these strategies and have the political mandate (authority) to take decisive action (van den Brink, 2014). This dimension is strongly inter-linked with other dimensions of the adaptive capacity framework; if insufficient resources are made available the ability to experiment with multiple solutions (dimension variety), the ability of actors to spend time on evaluation and learning (learning capacity) and the perception of actors' on their ability to adapt will be reduced. The availability of resources is also affected by other dimensions. For example, a leader presenting a visionary plan may be able to convince actors of the need to allocate (additional) resources to climate change adaptation. The dimension resources thus influences the adaptive capacity of regional authorities by fostering or limiting the choice and flexibility; if the authority is limited to one aspect of climate change adaptation the regional authority may not be able to change itself based on learning processes, but if actors have ample knowledge and expertise the quality of the policy process and adaptation strategy may increase.

The fifth dimension is 'fair governance'; here it is assumed that the adaptive capacity of authorities increase when they adhere to the 'fair' governance criteria (Gupta *et al.*, 2010). Fair governance refers to the responsibility of governmental organizations and governing bodies to execute their responsibilities and exert their power in a way which does not solely benefit a certain group or area but is beneficial to the greater population. Fair governance ensures that corruption is limited, that governmental authorities take the views of external actors and civilians into account in their policy processes and that the policy makers can be held responsible for the results. Fair governance thus benefits the adaptive capacity as it enables and stimulates actors to conduct policy in a fair manner and be transparent to society. If the principles of fair governance are ignored a governmental authority may be blocked from implementing measures as society perceives them as inappropriate, resources may be squandered or policy makers become uncritical of results as they are not held accountable for them.

The final dimension 'willingness and perceived ability to adapt' is based on the assumption that when actors do not perceive climate change adaptation as relevant, or believe that successful adaptation to climate change is impossible or that adaptive measures are less likely to be taken (Grothmann *et al.,* 2013). As the adaptive capacity gives an indication of the likelihood of climate adaptation to take place, if actors do not perceive themselves able or are not willing it may lead to inaction or attenuate ambitions.

Dimension	Criteria	Definition
Variety	Variety of problem frames	The openness towards multiple problems frames
	Multi-actor, multi-level, multi-sector	Multi-actor, multi-level, multi-sector involvement in the policy making process.
	Diversity of solutions	The availability of a wide range of different policy options to tackle a problem

	Redundancy	The extent to which measures and policy processes allow for solutions including back-ups
Learning capacity	Trust	The extent to which the regional authority supports and promotes trust
	Uncertainties	The openness towards uncertainties
	Single-loop learning	The ability to reflect on past experiences and improve routines
	Double-loop learning	The ability to change basic assumptions and norms to address issues
	Institutional memory	The openness to the monitoring and evaluation of policy processes, outputs and outcomes
Leadership	Visionary leadership	The openness towards leaders who aim at constructing long-term visions
	Entrepreneurial leadership	The openness towards leaders that lead by example
	Collaborative leadership	The openness towards leaders who encourage collaboration between different actors
Resources	Authority	The provision of accepted or legitimate forms of power
	Human resources	The availability of expertise, knowledge and human labour
	Financial resources	The availability of financial resources to support policy measures and financial incentives
Fair governance	Legitimacy	Whether or not actions are perceived as appropriate and desired by external actors
	Equity	Whether or not governance rules are fair
	Responsiveness	Whether or not governmental patterns show response to society
	Accountability	Whether or not the actions of governmental authorities are accountable
Willingness and perceived ability to adapt	Adaptation motivation	Whether or not actors support and are motivated to adapt to climate change
	Adaptation belief	The perceived ability of actors to successfully adapt to climate change

Table 1: Adaptive capacity framework based on Gupta et al. (2010), Folke et al. (2005), Grothmann et al. (2013)

2.3 Scoring of the adaptive capacity framework

In this section, the manner in which the dimensions and criteria of the adaptive capacity framework have been scored, how the scores will be communicated and to what extent these methods differ from the source material will be discussed.

To enable a transparent method to determine and to communicate the adaptive capacity each criterion of the six dimensions of the adaptive capacity framework were scored on a five level scale: negative effect (-2), moderately negative effect (-1), neutral or no effect (0), moderately

positive effect (+1) and positive effect (+2). Gupta *et al.* (2010) originally scored the criteria of the 'adaptive capacity wheel' by using multiple researchers to independently study the research data and discuss the results. The scoring was based on the subjective interpretation of the research data and the discussions of the differences leading to consensus between the researchers. Due to limited resources and time it is not possible for this research project to utilize expert judgement in the form of using multiple researchers to analyze the collected data. In order to improve the reliability of data analysis and scoring, the results of the research were however reviewed by key policy makers which are part of the regional authorities. This step serves to both verify that the collected data is accurate and to enable a discussion of diverging opinions on the scoring in order to generate consensus on the results. Nevertheless, the process of scoring the dimensions and criteria is subjective process and requires good interpretation (Van den Brink *et al.,* 2014). After the analysis had been finalized the second step involved the calculation of the average for each dimension based on the score given to the criteria which were part of their respective dimension. In order to improve the ability to communicate the scores average values were color coded (see table 2 below).

Type of effect on adaptive capacity	Average score	Color coding
Positive effect	1,50 to 2,00	
Moderately positive effect	0,50 to 1,00	
Neutral effect	0,49 to 0,49	
Moderately negative effect	-0,50 to -1,49	
Negative effect	-1,01 to -2,00	

Table 2: Method of aggregating the scores and color coding the results

The comprehensive scoring method allows for increased transparency of the evaluation, but the meaning of the scores should be clarified as well. As previously discussed, the adaptive capacity of regional governmental authorities enables actors to adapt to climate change and make changes to the authority itself when required, but does not necessarily reflect the extent to which successful adaptation to climate change has taken place. The presence of adaptations are, however, seen as manifestations of adaptive capacity as they represent ways in which the actors of the regional authority has anticipated or responded to expected and unexpected changes (Smit, 2006). When analyzing the adaptive capacity this relation has been taken into account: both the extent to which, for example, expertise is available within climate change adaptation projects but also the extent to which measures or tools (e.g. training) are utilized to foster the expertise are included into the analysis.

Thus, the dependent variable is the adaptive capacity of the regional authority: i.e. the extent to which the regional authority enables actors to adapt to climate change and allows for changes to be made the authority itself when required. The independent variables are the dimensions and criteria which determine the adaptive capacity. The aggregated scores of the dimensions show the aspects of the regional authority which are the most inhibitive and are likely to need redesign and areas of strength which need to be preserved or expanded upon (Van den Brink *et al.,* 2014). Even though the dimensions have been given equal weighing, certain dimensions may play a more important role than others depending on the context. Understanding and explaining the contextual varieties is therefore an important step in applying the method (Gupta *et al.,* 2014).

Once the adaptive capacity has been assessed, dimensions which were scored low can be targeted for improvement if deemed necessary. A lack in human resources can be improved through

training or recruitment (Brown et al., 2008). If the trust between actors is a barrier to climate adaptation caused by constraints such as interdepartmental rivalry, clashing professional cultures, tensions and conflicts between societal norms, an agency can be hired to harmonize and mediate the conflicts (Storbjörk & Hedrén, 2011). Trust can also be built through legal contracts as they reduce the risk by aligning actors' expectations and behaviors before disagreement arises. It can also provide the possibility of setting sanctions if expectations are not met (Bachman & Inkpen, 2012). Capacity to improvise can be stimulated by providing incentives to individuals to adapt to climate change such as subsidies (Hallegatte *et al.*, 2011).

2.4 Operationalization of the dimensions

In this section the adaptive capacity framework will be operationalized. This entails a detailed description of the dimensions and the translation to indicators. As previously discussed, As Gupta *et al.* (2010) only described the criteria of the six dimensions but did not provide indicators to measure them in a transparent manner. Therefore other sources have been utilized to operationalize and expand upon the criteria. These indicators will, in a later chapter, be applied to the case-studies in order to determine the adaptive capacity.

2.4.1 The Dimension 'Variety'

The dimension 'Variety' is based on the assumption that when dealing with complex, unstructured and wicked problems, there is no single optimal solution or single actor capable to handle the situation (Gupta *et al.*, 2010). Thus, if the regional authorities foster a large diversity of discourses, actors and solutions, adaptation to climate change is more likely to be successful. The dimension is divided into four criteria: variety of problem frames, diversity of solutions, multi-actor, multi-level, multi-sector and redundancy.

The criterion 'variety of problem frames' relates to the complexity of the issues of climate change, depletion of resources and degradation of the environment which negatively affect the global society. While governments make policy to address the neglect of nature and people, they are believed to be insufficiently able to *individually* correct the imbalances (Nooteboom, 2006). Every proposed solution is likely to meet resistance from people and organizations with power who see their interests negatively impacted, since they either do not perceive a problem or may be unconvinced of the effectiveness of the solution. If organizations hold their fixed positions, based on objectives which are exclusively produced from within the organization, the approach to wicket problems will become fragmented (Termeer *et al.*, 2011). To foster sustainable development, the manner in which regional authorities create and implement climate change adaptation policy should be open towards multiple discourses, opinions and problem definitions (Gupta *et al.*, 2010). This means that actors need to appreciate different points of view and are willing to openly discuss the problem perceptions. This allows actors to align their interests, come to a common problem definition and based on that common understanding proceed to joint action to adapt to climate change leading to an enhanced adaptive capacity. In order to measure to what extent diverse frames are present a framework developed by Boer *et al.* (2010) has been employed. This framework defines four general framing dimensions by contrasting whether actors take a promotion or prevention orientation, and take a broad or narrow perspective (see table 3 below). The utilization of the table does not only provide insight in the variety of problem frames but helps find patterns in the frames that are present. For example, a regional authority which is struggling to find support for climate change adaptation from regional actors may frame the problem from a positivist perspective

(promotion orientation) and combine it with a promise of benefits in the short term. The variety of problem frames is thus seen as high when (1) *formal governmental policies and informal social patterns are open towards multiple problem frames* and (2) *multiple problem frames are present within policy processes*.

	Promotion orientation	**Prevention orientation**
Long term/ broad perspective	*Social progress frame* Aim for improving quality of life and/or harmony with nature *Middle way frame* Finding a compromise between polarized views	*Morality/ethics frame* Views the issue in terms of right and wrong and respecting or crossing limits *Pandora's box frame* Views the issue as a need for caution as the impacts can lead to catastrophes, crises and hazards.
Short term/ narrow perspective	*Economic development frame* Views the issue as an opportunity to improve competitiveness *Conflict/strategy frame* Views the issue as a conflict between power and interests	*Scientific uncertainty frame* Views the issue as a division between what is known and what is unknown. *Public accountability frame* Defines the issue as responsible use or abuse of science in decision making

Table 3: Problem framing based on Boer *et al.* (2010)

The criterion 'multi-actor, multi-level and multi-sector' relates closely to the notion of environmental governance where the implementation of policy through a cooperative process by multiple levels and sectors is emphasized (Paavola, 2007). The inclusion of a diversity of actors into the policy process is expected to lead to a larger pool of knowledge and resources which foster the social ingenuity to continuously generate tailor-made solutions (Gupta *et al.*, 2010). The indicators used to measure the extent to which the regional authority fosters the inclusion actors are (1) *existence of policy processes including actors from multiple levels, (2) existence of policy processes including actors from multiple levels, (3) level of participation and (4) presence of formal governmental policies and informal social patterns which emphasize or stimulate participation.* The first two indicators are straightforward: if the current policy processes show a variety of actors active in them from multiple levels and sectors the current institutions are open towards their participation. However, the level of participation is important as well; a participative process which includes actors for the whole duration or a policy process which includes external actors for a single brainstorm meeting affects the adaptive capacity differently. Finally the hypothesis is that if regional authorities) emphasize the need for the inclusion of actors through their plans/programs/legislation the chance is higher for projects to multi-actor projects to be created.

Regarding the third criterion, it is essentially the same line of reasoning as the first and second. The key difference here is that it involves the diversity of tools and measures. The impacts of climate change are uncertain, complex and require a flexible approach. Therefore it is important to stimulate a variety of solutions to ensure that there are always alternatives available when certain solutions prove to be inefficient or ineffective. Dependence of an authority on a single solution can lead to path dependency where unexpected changes cannot be sufficiently addressed due to a lock-in in a specific set of policy tools or technologies (Gupta *et al.*, 2010). To measure the strength of the criterion the following indicators are used: (1) *the existence of a variety of available solutions in*

policy processes and (2) t*he extent to which formal governmental policies and informal social patterns foster awareness of, and place emphasis on the need for a variety of solutions.*

The fourth criterion 'redundancy' relates to the assumption that no single solution can fully address the problems of CC. To ensure you can cope with unexpected situations when the 'regular' solutions fail redundant measures are required. They can be implemented in the form of overcapacity or back-up measures. A government can supply sandbags to civilians to limit damage during minor floods while they are strengthening the dikes as a long term solution. Redundant tools can also be required in cases where measures are sufficiently strong: an evacuation plan (back-up) can be useful in case of unexpected extreme events to increase the ability to cope with unexpected events. The following indicators are used to measure the strength of 'redundancy': (1) *presence of back-up or redundant measures*, (2) *How redundancy is perceived/treated (as a waste of resources or valuable contribution)*. The overview of the dimension 'Variety' can be found below in table 4.

Criteria	Definition	Indicators
Variety of problem frames	Openness towards multiple problems frames	-Presence of multiple problem frames within policy processes -Openness of formal governmental policies and informal social patterns regarding a variety of problem frames
Multi-actor, multi-level, multi-sector	Multi-actor, multi-level, multi-sector involvement in the policy making process.	-Existence of policy processes including actors from multiple levels -Existence of policy processes including actors from multiple levels -Level of participation -Presence of formal governmental policies and informal social patterns which emphasize or stimulate participation.
Diversity of solutions	Availability of a wide range of different policy options to tackle a problem	- The existence of a variety of available solutions in policy processes - The extent to which formal governmental policies and informal social patterns foster awareness of, and place emphasis on the need for a variety of solutions
Redundancy	The extent to which measures and policy processes allow for solutions included back-ups	-Presence of back-ups or redundant measures - How redundancy is perceived/ treated (waste of resources or a valuable contribution).

Table 4: Operationalization of dimension Variety

2.4.2 Learning capacity

The dimension 'learning capacity' is based on the idea that adaptive institutions should foster learning processes to enhance the ability of organizations to deal with the uncertain impacts of CC (Gupta *et al.*, 2010; Folke *et al.* 2005). Learning processes allow actors to reflect on and question the embedded ideologies, frames, assumptions, claims, roles, rules and procedures that are present. The following criteria are important for the learning capacity: uncertainty, trust, single-loop learning, double-loop learning and institutional memory.

The presence of trust between actors is a critical factor for learning. Trust is defined as "trust between individual and/or collective actors that is based on the decision of one party to rely on another party under conditions of risk" (Bachmann & Inkpen, 2011, p.284). Trusting someone is based on the relation between the personal assessment of the other party's competence and integrity, and the extent to which costs would be incurred if the other party turned out to be untrustworthy. As genuine learning processes require actors to reflect critically on past experiences, assumptions, frames and routines they need to be willing to expose themselves. Governmental authorities should foster an open culture which allow individuals to admit mistakes and criticize others while ensuring no conflicts arise or individuals feel unjustly treated. Processes which are too personal can lead to defensive action that prevents actors or current discourses from being critically reviewed to prevent embarrassment (Horton & Mackay, 2003). There are two kinds of trust relevant for this criterion: interpersonal trust and institutional trust (Nooteboom, 2003). Interpersonal trust depends on information that comes from the personal experience of an individual or group with particular others. When actors cooperate for a longer period, cooperation becomes easier because trust develops more trust (Nooteboom, 2003). The level of interpersonal trust thus correlates with the strength and intensity of ties between actors. The stronger the ties, the higher the interpersonal trust and the ability and willingness to mobilize resources (Rus & Iglic, 2005). Institutional trust is not based on the ties between actors but on the trust they have in the quality of the institutional system. Authorities can instill trust in actors and organizations when they (are perceived to) represent values such as impartiality, justice, accountability and embody a mediating role between parties (Rus & Iglic, 2005). Measures or tools can also support the building of trust; an independent mediator can be assigned to ensure impartiality in policy processes or (Bachmann & Inkpen, 2011; Rus & Iglic, 2005) In order to determine the level of 'trust' the following indicators are used: (1) the *extent of interpersonal trust between actors*, (2) the *extent of institutional trust between actors*, (3) the *presence of measures and tools that support trust building*.

The criterion 'uncertainty' relates to the need for governmental authorities to adequately deal with the uncertainties in regard to the severity and the distribution of regional CC impacts (Galarraga *et al.*, 2011). Uncertainty is the reason why the authorities responsible for CCA need to be adaptive. The tools need to be flexible, redundant measures are required for unexpected situations, climate scenarios are employed to show the differences in projected outcomes. If authorities do not learn to deal with uncertainty the implementation of CCA policy may be postponed or stopped (Kinzig & Starrett, 2003). Not addressing uncertainties adequately can also lead to a focus of a single tool or measure which can lead to path dependency (Gupta *et al.*, 2010). Therefore it is important for regional authorities to acknowledge, reduce and accept the uncertainties. The following indicators are used to assess the criterion uncertainty: (1) *the extent to which formal governmental policies explicitly acknowledge and discuss uncertainty* and (2) the e*xtent to which uncertainty reduced through technical or managerial means.* The first criteria refers to basic attitude whether uncertainties are explicitly acknowledged and discussed. These discussion in policy documents, reports and laws acknowledge and within the policy processes can use uncertainty to justify non-action but uncertainty can also be accepted and perceived as opportunity in processes of negotiations and reframing (Pahl-Wostl, 2009). The second criteria refers to the extent to which tools and measures are applied to deal or reduce uncertainty. Managerial tools can be used (e.g. participatory scenario development, risk dialogues and robust action) or technical tools (e.g. climate scenarios) (Pahl-Wostl, 2009).

Analyzing the learning capacity would not be comprehensive until the extent to which learning processes take place are assessed. Two types of learning are part of the learning capacity: single-loop learning and double-loop learning. 'Single-loop learning' helps organizations to better meet their present goals but does not modify these goals and priorities (Argyris, 1990). 'Double-loop learning' is a higher-order and systemic learning that scrutinizes and challenges goals and priorities as well as fundamental assumptions about problems and causal relations (Nilsson, 2006). Single-loop learning entails, for example, improving the techniques to plough agricultural land so that, in times of flood, water can be drained more efficiently. While the goal to reduce the impact of floods on agriculture has not changed, the ability of the organization to meet the goal has improved. Double loop learning involves a more fundamental change in organizational policy making. It is characterized by the search for and exploration of alternative routines, rules, technologies, purposes, and goals rather than merely learning how to perform present routines more efficiently. An example is the shift from top-down policy making to a more participative process which includes civil society. The underlying norm is that the use of knowledge from professionals and experts leads to an optimal design and that the implementation of policies has been changed as part of this learning process. The following indicators are used to analyze the extent to which single- or double-loop learning takes place: *(1) the presence of single- or double-loop learning on the project/activity level, (2) the presence of single- or double- loop learning on the program/organizational level.* The first criteria refers to whether regional authorities allow for and foster learning by stimulating activities or projects aimed at learning on the project or activity level and the second refers to a high-level learning on the organizational or program level.

Once learning has taken place, the knowledge needs to be retained and disseminated. This body of knowledge is referred to as the criterion 'institutional memory'. The institutional memory is defined as the whole of knowledge, expertise, experiences which are held by individuals which are part of a greater whole (group, organization or business) (Ostrom, 2005; Gunderson and Holling, 2002). The monitoring and evaluation of past experiences are an important aspect to fostering the institutional memory. This can take place through standardized procedures where the methodologies and frequency of evaluations are clearly defined or through more informal processes where stakeholders discuss the results and analyze where there is room for improvement. Whether achieved through a formalized procedure or an informal process the monitoring and evaluation processes should not be limited to collecting data and writing reports but amount to a genuine learning process. A critical reflection of actors on the collective performance requires a positive attitude to learning and improving the adaptive capacity of the institution (Horton, 2003). Furthermore, in order to ensure that the gained knowledge is disseminated throughout the organization an infrastructure needs to be present through which this can occur. The following indicators are used to analyze the extent to which the institutions foster a high quality 'institutional memory': *(1) The presence of evaluations (2) The presence of infrastructure to collect and disseminate learned knowledge.* The overview of the dimension 'learning capacity' can be found below in table 5.

Criteria	*Definition*	*Indicator*
Trust	The extent to which the regional authority supports and promotes trust	-The extent of interpersonal trust between actors -The extent of institutional trust between actors -The presence of measures and tools that

		support trust building
Uncertainty	Openness towards uncertainties	-The extent to which formal governmental policies and informal social patterns explicitly acknowledge and discuss uncertainty -Extent to which uncertainty is reduced through technical or managerial means
Single-loop learning	Ability to reflect on past experiences and improve routines	-The presence of single-loop learning on the project/activity level -The presence of single-loop learning on the program/organizational level
Double-loop learning	Ability to change basic assumptions and norms to address issues	-The presence of double-loop learning on the project/activity level -The presence of double-loop learning on the program/organizational level
Institutional memory	Openness to the monitoring and evaluation of policy processes, outputs and outcomes	-The presence of quality evaluations -The presence of infrastructure to collect and disseminate learned knowledge

Table 5: Operationalization of the dimension learning capacity

2.4.3 Dimension 'leadership'

The dimension 'leadership' revolves around how governmental authorities foster leadership and enable the leaders to respond to long term challenges, motivate other actors and make changes to the existing institutions (Gupta *et al.*, 2010). Leadership is "what enables an individual to shape the collective behavioral pattern of a group in a direction determined by his or her values" (Andresen & Agrawala, 2002, p.42). Leaders can have a significant impact on organizations by increasing the awareness of actors, reshaping problem definitions and offering innovative solutions, steering and coordinating action and building support to facilitate action. These changes can enable organizations to deal with the complex and changing environment (Folke *et al.*, 2005). In general leadership may sometimes conflict with variety; but good leaders are able to provide space for variety. Concurrently, a lack of leaders can lead to inertia in the policy making process (Folke *et al.*, 2005). Gupta *et al.* (2010) identifies three types of leadership which are important for the adaptive capacity of institutions: visionary, entrepreneurial and collaborative leadership.

Visionary leaders are leaders that fabricate new meanings to problems which can engage and change the opinions and values of actors to foster support for taking action (Gupta *et al.*, 2010). Westley and Mintzberg (1989) describe visionary leadership as the envisioning of an desired state, which when effectively communicated to other actors can empower them to take action. Instead of focusing on the negative aspects of a problem they reshape them into an opportunity for actors to distinguish themselves and gain a competitive advantage or status. An example is the creation of a long term plan by municipalities in which they envision a transformed sustainable city (e.g. CO_2 neutral in 2050) which also emphasizes the modernity and attractiveness of the city. Two indicators are used to measure the degree to which visionary leadership is present: (1) the *extent to which institutions and policy making processes promote or are open to visionary leadership* and (2) the *presence of visionary leaders*. The first indicator can be scored by looking at whether actors are open towards visionary thinking, if policy makers appreciate long-term plans or prefer practical short(er) term solutions. The second, focuses on the extent to which visionary leaders are present by analyzing whether the programs, projects and activities related to climate change adaptation show visionary aspects and focus on innovative long-term plans.

Entrepreneurial leaders can function as agenda setters, devising policy options to overcome inertia in policy making, aligning actors to foster support for certain solutions (Gupta *et al.,* 2010). While visionary leaders foster support through visions and rhetoric to convince actors, the entrepreneurial leader stimulates direct action and undertakings. They are the kind of leader who set a good examples or show how to address complex issues in practice. The entrepreneurial leader can function as an example internally to foster the activity of other departments, but can also stimulate undertakings by external actors. Entrepreneurial leadership can be stimulated by providing funds which allow policy makers to set up projects to 'show' how CCA can take place. Entrepreneurial leadership is stimulated when policy makers feel that there is a need for leadership to show how to implement CCA in practice and when current policy/projects are aimed at finding new practical tools and solutions and there are funds available for the translation of (abstract) goals into concrete measures. The following indicators are used to analyze the strength of the entrepreneurial leadership: (1) the *extent to which governmental structure and policy making processes promote or are open to entrepreneurial leadership* and (2) the *presence of entrepreneurial leaders*.

The third criterion is the 'collaborative leader'. They can be defined as leaders who are curators of talent and who motivate group members to action rather than givers of directives and orders (Kramer & Crespy, 2011, p.1025). Instead of working with actors via a vertical relationship, they attempt to create a space where actors can interact on a (more) equal level. The responsibilities and authority are diffused among actors to empower them to make decisions. Collaborative leaderships depend on the actors being willing to take on responsibilities and being creative enough to come to innovative solutions. If the actors within the process are passive they may benefit more from an approach of directional leadership. This type of leadership closely relates to the notion of adaptive co-management where the results of policy collaboration involves not just leader-to-group member exchanges, but also member-to-member exchanges (Berkes, 2009). Literature indicates that collaborative leadership where power is diffused among its members is more effective in generating successful policy (Kramer & Crespy, 2011). The following indicators are used to analyze the strength of the collaborative leadership (1) *the extent to which governmental structure and policy making processes promote or are open to collaborative leadership and (2) the presence of collaborative leaders* are the selected indicators. The overview of the dimension 'leadership' can be found below in table 6.

Criteria	Definition	Indicator
Visionary leadership	Openness towards leaders who aim at constructing long-term visions	-The presence of visionary leaders -The extent to which policy making processes promote or are open to visionary leaders
Entrepreneurial leadership	Openness towards leaders that lead by example	-The presence of entrepreneurial leaders -The extent to which governmental structure and policy making processes promote or are open to entrepreneurial leaders
Collaborative leadership	Openness towards leaders who encourage collaboration between different actors	-The presence of collaborative leaders -The extent to which governmental structure and policy making processes promote or are open to collaborative leaders

Table 6: Operationalization of dimension leadership

2.4.4 Dimension 'resources'

The fifth dimension 'resources' analyses the ability of institutions to ensure the availability of sufficient resources to enable actors to change and create institutions and enable the implementation of them. The following criteria are part of this dimension: authority, human resources and financial resources.

The first type of resource is authority. Authority is defined as power which is perceived as legitimate (Gupta *et al.*, 2010). Formal legislation and policies which forms the base of the authority of organizations dealing with climate adaptation are vital. If the authority of a governmental organization is perceived as illegitimate actors may not want to cooperate or will actively block the policy process. Internally authority can also enable or disable action. Without internal authority and clear delegation of responsibilities, managers may be unable or reluctant to devote staff time and resources to implementing significant policy changes for climate change adaptation (Jantarasami *et al.*, 2010). The assumption is that when: (1) *Institutions secure authority to enable climate change adaptation, (2) the extent of dependence on authority of external actors to implement policy*.

The second type of resource is human resources. This refers to the extent to which the regional authority foster the availability of expertise, knowledge and human labor. Climate change adaptation is a complex issue and policy makers will need a diversity of knowledge and expertise to enable them to address the issues. First, there is a need for knowledge regarding the climate systems and the expected impact of climate change. Secondly, as climate change adaptation calls for a multi-level, multi-actor and multi-sector approach, there is a need for knowledge and expertise in creating a policy arena where the actors can interact. Thirdly, there is a need for expertise in policy tools/measures which can address the climate change impacts. Regional authorities can foster the availability of knowledge in multiple ways: improving the knowledge and expertise of policy makers through training programs and allowing for the inclusion of external experts when required.

The third criterion is 'financial resources'. The need for financial resources to create and implement CCA policies is obvious. The creation of dykes and water retention areas to prepare for a high sea level and extreme weather are costly (Van den Brink et al., 2014). A lack of resources can lead to inaction, decrease the quantity and quality of learning processes and reduce policy ambitions within regional authorities. The availability of resources is not only determined by internal resources. External actors can provide funding or use can be made of (inter)national funding. Just as important as the availability of funding is the extent to which the availability of resources has been secured for the future. CCA is not a short term process but requires investments over a long term period. The following indicators are used to analyze the strength of the entrepreneurial leadership: (1) *Availability of internal and external financial resources* and (2) *presence of institutions which secure the financial resources in the long-term*.

Criteria	Definition	Indicator
Authority	Provisions of accepted or legitimate forms of power	-Formal policies or legislation providing authority to enable climate change adaptation -The extent of dependence on authority of external actors to implement policy
Human resources	Availability of expertise, knowledge and human labour	-The presence of sufficient human manpower -Educational background and experience of staff involved in

		adaptation policy -The availability of external experts/knowledge resources -The existence of training program to foster expertise and knowledge
Financial resources	Availability of financial resources to support policy measures and financial incentives	-The availability of internal and external financial resources -The presence of institutions which secure the financial resources in the long-term

Table 7: Operationalization of dimension resources

2.4.5 Dimension 'Fair governance'

The sixth dimension 'fair governance' is a difficult concept to clearly define. It relates to the degree to which policy processes do not only focus on efficiency or effectiveness, but take civil, cultural, economic, political and social rights into account. The concept of 'fair governance' focuses on whether authorities stimulate a responsive and accountable policy making process, acknowledge and address social dilemmas and promote legitimate policy processes (Gupta *et al.*, 2010). The criteria of the 'fair governance' dimension are: legitimacy, equity, responsiveness and accountability.

Legitimacy can be defined as "a generalized perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions" (Wejs et al., 2013, p.5). The legitimacy of actions can be guided by formal rules such as national legislation which assigns responsibilities and clarify the boundaries of power. However, power does not translate directly to legitimacy. The policy field of CCA is relatively new and the institutional rules, responsibilities, procedures and norms may not have been established. In this case the legitimacy of policies and actions is more unclear. Authorities can foster legitimacy by involving stakeholders and the public to become involved in the act of making policy and thus form the rules through interaction and negotiation (Wejs et al., 2013). The following indicators are used to analyze the strength of the criterion 'legitimacy': (1) the e*xtent to which formal governmental policies and informal social patterns support the legitimacy of CCA* and (2) the p*erceived legitimacy of actions*.

The second criterion 'equity' refers to the moral responsibility of the government to ensure that the vulnerability to the impacts of climate change and the negative effects of CCA measures are distributed as equally as possible between individuals and groups. Inequitable situations can arise when certain groups are more exposed or vulnerable to the impacts of CC due to their socio-economic situation and geographic location (Kruize *et al.,* 2007). The measures taken as part of CCA policy can also have an unequally high impact on individuals. For example, the construction of a dyke can have a disproportionally high impact on an individual land-owner, but may be very beneficial for the population in general. Even equally distributed impacts can result in inequitable situations as individuals or groups with low wealth are less capable to cope with negative impacts. When an equitable solution is not the preferable option redistribution mechanism can be employed such as compensation in case of severe impacts. The following indicators are used to analyze the strength of the criterion 'equity'*: (1) the extent of awareness of and attention given in projects and policies to the equity situation of certain population groups with respect to the exposure to the impacts of climate change (measures) and (2) the presence of measures which reduce inequitable situations*. Here it is assumed that the combination of awareness and attention given to equity in combination

with the presence of tools and measures which can address the situation will increase the capacity of institutions to address inequitable situations.

The third criterion 'responsiveness' emphasizes the need for policy making processes to show response to society. Regional authorities should enable interested actors to respond to policy developments and ensure policy makers to take the feedback into account (Gupta *et al.*, 2010). Showing response to society can be achieved by allowing relevant non-government organizations to participate in policy processes, acknowledging and responding to their feedback. Feedback can also be provided by external actors at certain points in the policy process through meetings or a formal written reply (Berman *et al.*, 2012). In order to ensure external actors are aware of the project's relevant information and options to provide feedback needs to be publicly available. The following indicators are use to analyze the strength of the criterion 'responsiveness': *(1) the extent to which actors can respond to and influence the policy process and (2) the presence of changes made to policy based on feedback from society.*

The fourth criteria 'accountability' concerns the need for policy makers within governmental institutions, the private sector or civil society should be held accountable for their actions to the affected stakeholders (whether groups or individuals). A concise definition of accountability would be "the obligation to explain and justify conduct" (Bovens, 2003, p.32). Here, accountability procedures involve the provision of evaluative data on the performance, the discussion of the performance by a forum and consequences attached to the performance. The following indicators are used to analyze the strength of the criterion 'responsiveness': (*1) The extent to which policy processes are transparent and (2) The presence of persons/groups held accountable for results of CCA efforts.*

Criteria	Definition	Indicator
Legitimacy	Whether or not actions are perceived as appropriate and desired by external actors	-The extent to which formal governmental policies and informal social patterns support the legitimacy of CCA -The perceived legitimacy of actions
Equity	Whether or not governance rules are fair	-The extent of awareness of and attention given in projects and policies regarding the equity of certain population groups with respect to exposure to climate impacts -The presence of measures which reduce inequitable situations
Responsiveness	Whether or not governmental patterns show response to society	-The extent to which actors can respond to and influence the policy process -The presence of changes made to policy based on feedback from society.
Accountability	Whether or not the actions of governmental authorities are accountable	-The extent to which formal governmental policies and informal social patterns foster accountability (procedures) -The presence of persons/groups held accountable for results of CCA efforts

Table 8: Operationalization of dimension fair governance

2.4.6 Dimension 'problem perspective'

The final dimension 'problem perspective' is based on the assumption that when actors do not perceive climate change adaptation as relevant or believe that successful adaptation to climate change is impossible or very unlikely that adaptive measures are less likely to be taken (Grothmann

et al., 2013). The criteria of the 'problem perspective' dimension are: adaptation motivation and adaptation belief.

Adaptation motivation is defined as the 'actors' motivations to realize, support and/or promote adaptation to climate change (Grothmann *et al*., 2013, p.3375). Here, the perceived risk for certain CC impacts and the perceived severity of CC impacts are the main determinants (Grothmann *et al.,* 2013). Other factors such as norms, values and personal beliefs can play a role as well in the motivation to adapt to CC as well. A low motivation of actors to adapt reduces the adaptive capacity as proposals to set up CCA policy are likely to meet resistance and are not able to compete for resources with other issues for which the motivation may be higher. This criterion closely relates to climate change awareness.

Adaptation belief refers to the conviction of a person/group/organization that they are able to adapt to climate change. This psychological factor is added as the assumption is that the perceived ability of an actor to adapt to CC does not necessarily correspond with the actual situation. Even if the 'real' adaptive capacity is sufficient in terms of resources, expertise and authority, the actor can underestimate their own ability to adapt. The underestimation of the adaptive capacity can lead to inaction or a reduction in ambition. Following Grothmann *et al.* (2013) the indicators to measure the strength of the criterion 'adaptation belief' are: (1) the perceived availability of effective (outcome-efficacy belief) and (2) the perceived availability of realizable (self-efficacy belief) CCA measures are available.

Criteria	Definition	Indicator
Adaptation motivation	Whether or not actors support and are motivated to adapt to climate change	-The level of motivation of actors to adapt to climate change
Adaptation belief	The perceived ability of actors to successfully adapt to climate change	-Perceived availability of effective CCA measures -Perceived availability of realizable CCA measures

Table 9: Operationalization of dimension problem perspective

2.5 Application of adaptive capacity framework

The adaptive capacity framework has been utilized to create a comprehensive overview of the regional governmental authorities. After an initial description of the regional authorities the framework has been applied by strictly following the structure describing each dimensions' criteria separately. In this way, the ease to compare the regions' adaptive capacity is also enhanced. As previously discussed, the analysis has been executed by utilizing scientific literature, formal policy and strategy documents and the use of grey literature. Moreover semi-structured interviews were conducted with key policy makers, coordinators, project leaders and regional experts. The questions of the semi-structured interviews can be found in annex 2. The interviews followed the structure of the framework, but at the same time allowed interviewees to give more extensive elaboration on certain aspects, such as how the regional authority was structured and arranged the policy making processes. Nevertheless, the analysis and application of the framework has been challenging and some critical remarks can be made:

- Scoring of the criteria is a subjective process. While the criteria have been operationalized and the scores have been discussed with key policy makers the scoring remains a subjective process.

- Some dimensions such as ‘fair governance’ are complex and abstract concepts. Therefore the translation to indicators has been challenging. This has been addressed by clearly operationalizing the criteria and combining the scores with an extensive description in the text to effectively communicate the results.
- The framework has been applied to two developed, western, democratic countries. The scoring of the adaptive capacity framework should therefore not be directly compared to developing countries where the institutional capacity of regional authorities are severely underdeveloped.
- The dimensions and criteria are weighted equally. Even though Gupta *et al.* (2010) indicate that weighing could be applied, no research has been conducted on the importance of certain criteria and to what extent the importance is context specific.

Chapter 3. Analysis Province of Groningen

Figure 1: Geographical location of the Province of Groningen

3.1 Introduction

In terms of climate change adaptation policy the Dutch provinces form the link between the national and the local level. They play a vital role in converting the more abstract knowledge on the national level into effective action on the regional and local level. This unique setting provides opportunities as they can be part of national and multi-regional programs, but also restricts them as they are bound to norms and regulations set at a higher governmental level. The Province of Groningen can be considered a frontrunner in the implementation of CCA. Their climate change adaptation program has been running for four years, leading to over 15 projects in which climate change adaptation is integrated.

The province is situated in the north-eastern part of the Netherlands and is populated by 582.000 inhabitants divided over a total of 23 municipalities. Its territory spans a total of 2.960 km^2 and it features natural areas such as the Wadden(sea), Lauwersmeer and the Reitdiepgebied (Ministerie van Economische Zaken, 2014). The economical heart is the city of Groningen; it is the largest city of the province with a total of 198.000 inhabitants and houses many important governmental organizations (including the province administration), the university of Groningen, the regional hospital and an expansive service sector (Provincie Groningen, 2014a). The economy of the Province of Groningen as a whole is based on the large agricultural sector (70% of Groningen consist of agricultural land), chemistry sector, ship construction and renewable and fossil energy extraction/production (Provincie Groningen, 2014a).

Before the analysis of the adaptive capacity of the Province of Groningen takes place, it is important to gain further insight in the region of Groningen. In the first four sections, the vulnerabilities of Groningen to climate change, the national adaptation policy, the responsibilities and structure of the Province and the CCA policy and projects will be discussed (4.2 – 4.5). Once the context has been discussed, the adaptive capacity framework will be applied to the province of Groningen. The criteria will be discussed individually after which the scoring for the dimension is presented. The chapter will be concluded with a synthesis.

3.1.1 Regional climate impacts

Regional climate projections play an important role in policy making in the Province of Groningen. As part of the national program 'Make space for climate!' (in Dutch: 'Maak ruimte voor klimaat!') the province of Groningen in cooperation with the KNMI (Royal Dutch Meteorology Institute), the Province of Drenthe and the University of Wageningen researched the regional impacts of climate change. This study utilized the four KNMI'06 scenarios which are based on the expected increase in temperature (1 ^{o}C or 2 ^{o}C degrees in 2050) and the changing airflow patterns in Western Europe. This research concluded that the primary impacts of climate change in the year 2050 compared to 1990 in the province of Groningen will include (Provincie Groningen & Provincie Drenthe, 2008):

- An increase in average temperature of 0,9 °C till 2,9 °C in summer and 0,9 °C till 2,3 °C in winter
- An increase in extremely hot days (>=30 ^{o}C) increasing from 2-3 to 4-14 days a year.
- A decrease in cold winter days (<= 0 ^{o}C during the day) dropping from 11 to 3 days a year
- An increase in average precipitation in the winter
- An increase or decrease depending on scenario in average precipitation in the summer
- An increase in days with extreme precipitation (>=15mm) from 9 to 11 days a year.
- A rise in sea level of between 15 and en 35 cm (does not include effects of regional ground subsidence).

- A higher discharge of rivers in winter and lower discharge in summer

These regional changes in the climate will have a multitude of impacts on the province of Groningen in terms of safety, water quality and biodiversity. First, climate change will put additional pressure on coastal defence and water management. The combination of sea level rise and soil subsidence increases the risk of flooding in coastal areas in the province and the increase in winter precipitation increases the risk of flooding of inland water channels (Provincie Groningen & Provincie Drenthe, 2008).

Second, the urban areas in the Province of Groningen will be impacted by the increase in temperatures and extreme weather impacts. More rainy days and an increased intensity of rainfall per year will require additional water drainage capacity and a change in general design of urban areas. If adequate measures are not taken, extreme weather can lead to property damage and disrupt daily life (Provincie Groningen, 2011). Urban areas will also require additional attention to address the increased heat stress. The increase in average temperature and increased frequency of extremely hot weather have a relatively high impact on urban areas. This phenomenon is called the 'urban heat island' effect and is induced by the relative high amount of land surfaces in cities which use material that store short-wave radiation combined with a high density of structures blocking the wind flow (EPA, 2014). High temperatures in urban areas can simultaneously lead to a higher chance of smog.

Third, for rural areas climate change has mixed impacts. The agricultural sector benefits from the increase in average temperature and milder winters as they lead to an extended growth season resulting in an increase in agricultural production (Provincie Groningen, 2011). At the same time, the increased temperature will be beneficial for harmful pathogens and can reduce the resistance of plants to diseases. Heat or prolonged droughts can cause growth retardation or damage to crops. Temporary flooding of agricultural fields can cause damage to crops and can create difficulties for agricultural machines in harvesting the products.

Fourth, the changing climate will also impact the areas with nature and high biodiversity in the province of Groningen (Provincie Groningen & Provincie Drenthe, 2008). Especially the periods of drought may lead to increased pressure on natural areas where desiccation has been a persistent issue for the last few decades. The streams, forests around fresh-water sources, woodland on peat and clay soils, marshes, wet heath and fresh stagnant waters belong to the most sensitive nature types to stress due to extreme heat and droughts. The effect on species and their ability to cope or migrate with the climate impacts is highly diverse. Species with preferences for a cold environment will be harmed considerably by the changes in temperature as will species living in Marshes due to the fragmentation of that land type.

To summarize: the Province of Groningen, being a regional authority, has to deal with a high diversity of impacts which will require changes in regional water management, agricultural production, the build environment and the management of natural areas.

3.1.2 National climate adaptation policy

The national climate adaptation policy in the Netherlands is fragmented and complicated. In the year 2006 a national program called 'Make space for climate!' (in Dutch: 'Maak ruimte voor klimaat!') was set up and led to the development of a national adaptation strategy in 2007. In time, the national CCA strategy was supposed to lead to the creation of concrete goals, a clear time-frame and a clear division of responsibilities (Algemene Rekenkamer, 2012). During this period, the national

government took on an active role in regards to CC; in order to stimulate CCM and CCA on the local and regional level, the national government formed agreements with the water boards, provinces and municipalities. The Interprovincial Council (in Dutch: Interprovinciaal Overleg), an organization through which the Dutch provinces cooperate, concluded the 'climate agreement' in 2009. The goal of the agreement was to make a coordinated effort to stimulate climate change mitigation and adaptation policy at the regional and local level.

At this point, a fundamental shift occurred on the national level. The 'Make space for climate!' program slowly ceased to exist in 2010 (Algemene Rekenkamer, 2012). The main cause was that the emerging national program called the "Delta Program" (in Dutch: Deltaprogramma) was made responsible for water security, availability of fresh water supply and climate adaptation in urban areas (Algemene Rekenkamer, 2012). The focus on the national level thus shifted from a broad perspective on CCA (including natural areas, infrastructure and public health issues) to a strong focus on water management. As a result of the shift on the national level the coordination and monitoring of the regional 'Climate Agreements' ceased to exist since they were closely linked to the 'Make space for climate!' program (Ministerie van Infrastructuur en Milieu, 2012). One part of the 'Make space for climate!' program did continue. The research program 'Knowledge for climate' (in Dutch: Kennis voor klimaat) still performs research on regional climate 'hotspots' (e.g. Schiphol mainport, the Waddensea and the Rotterdam metropolitan region) and thematic research (e.g. climate resistant cities, infrastructure and networks and the governance of CCA) (Kennis voor klimaat, 2014).

Currently, in response to the 2012 report of the Dutch Court of Audit (In Dutch: Algemene Rekenkamer), which criticized the limited coordination and scope of the current national CCA policy, the state secretary of Infrastructure and Environment has promised the development of a national climate change mitigation and adaptation strategy in 2017 (Ministerie van Infrasctructuur en Milieu, 2013). The year 2017 bears a special significance as it is the year in which the European Commission will report to the European Parliament and the Council on the scope and quality of national adaptation strategies across Europe (Algemene Rekenkamer, 2012). If the national adaptation strategies (in general) are deemed of insufficient quality, a legally binding instrument will be considered (EU, 2014).

In conclusion, the national level initially took a leadership position fostering the coordination and implementation of CCA at both the national, regional and local level. The end of the national adaptation program, however, led to the fragmentation of CCA policy and the stimulation to deal with CCA at the regional level was reduced. Nevertheless, the 'Delta Program' continues to foster CCA in water management and if promises are kept, a national CCA will be created in the year 2017.

3.1.3 Provincial structure and responsibilities

The governmental structure of the Netherlands consists of three administrative layers, those being the national government, the provinces and the municipalities. The provinces form the link between the national government and the local municipalities. The board of the provinces consist of the 'Provinciale Staten', the 'Gedeputeerde Staten' and the 'Commissaris van de Koning'. The 'Provinciale Staten' are elected every four years and assemble once a month. The 'Provinciale Staten' of the province of Groningen consists of a total of 43 members spread over 10 political parties (Provincie Groningen, 2012a). They establish the general outline of the provincial policy and monitor the implementation by the 'Gedeputeerde Staten'. The 'Gedeputeerde Staten' can be seen as the daily management of the provinces and consist of six commissioners in Groningen. Each commissioner has their own policy field (e.g. traffic and transport, water, energy savings or agriculture) and directs the

provincial administration in the implementation of the policy (Provincie Groningen, 2012c). The 'Commissaris van de Koning' is the chairmen for both the "Provinciale Staten' and the 'Gedeputeerde Staten' and is selected directly by the King every 6 years (Provincie Groningen, 2012a).

To enable the creation and implementation of policy the Province of Groningen, there are around 800 governmental officials working for the province. The province administration is divided into a total of 15 departments (Provincie Groningen, 2012b). These departments are not solely aimed at creating and implementing policy but include human resource management, general program management and maintenance of infrastructure in the province. Each department is led by a single head who are directed by a general management board (Provincie Groningen, 2012b). For a full overview of the departments and management structure see annex 4.

What can be considered the most important responsibility of the provinces in the Netherlands is spatial planning. Spatial planning is vital for the Netherlands as it is one of the most densely populated countries in the world. In recent years there has been a shift from spatial planning at the national level to delegating tasks to the provinces, metropolitan areas and municipalities (van der Brugge *et al.,* 2005). The province of Groningen directs the regional development via the 'Provincial Spatial Plan' (in Dutch: Provinciaal Omgevingsplan). Here, all the regional developments in terms of environment, transport, water and spatial planning are combined to create a cohesive vision. While the 'Provincial Spatial Plan' is not binding the municipalities are required to take the developments in to account in their planning processes. Other responsibilities include an active role in the management of water, air and soil quality, the development and preservation of nature and the monitoring of the municipalities and water boards. They are responsible for the monitoring the municipal finances through the evaluation of their financial report. They monitor the performance of the regional water boards by evaluating project plans and reviews of the current state of water management and the management of rivers in relation to high water and flooding (Ministerie van Infrastructuur en Milieu, 2014). The province has no direct legal tasks in the field of climate change adaptation. Indirectly, many of the responsibilities previously mentioned are related to climate adaptation:

- The 'Provincial Spatial Plan' can be employed to integrate or emphasize CCA. The content of the plan is integrated, despite the non-binding nature, in the policies of municipalities and water boards (Provincie Groningen, 2011). For example the province determines where roads, railways, shipping routes, industrial areas, agricultural and recreational facilities are to be situated. These plans can consider future impacts of climate change by for example ensuring agricultural areas are not build in locations which will face high water shortages in the future.
- Through monitoring of the water boards, the provinces are responsible for the water management at the regional level. They determine the area, the tasks and the further development of the water boards within their province (Brinkman, 2002).
- Creation of new natural areas, conservation of current nature and implementation of ecological main structure (In Dutch: ecologische hoofdstructuur). As climate change impacts the living conditions in natural areas connecting natural areas and determining where new ones are developed can be important policy fields for CCA (Rijksoverheid, 2014a).

3.1.4 Climate adaptation policy

The centre of the CCA policy of the Province of Groningen is the 'Climate adaptation program' (In Dutch: *Programma Klimaatadaptatie).* The program was first mentioned in the year 2009 as part of the 'Provincial Spatial Plan' (in Dutch: Provinciaal Omgevingsplan). Here the intention was presented to apply funding from the investment budgets of the Rural Areas (In Dutch: *Investeringsbudget Landelijk Gebied)* and Urban Renewal *(*In Dutch: *Investeringsbudget stedelijke vernieuwing)* to (1) create a plan for CCA in cooperation with the Dutch water boards and municipalities, (2) to create a stimulation fund in cooperation with other provinces and the central government, and (3) to cooperate with the national government on the National CCA strategy and the research program 'Knowledge for Climate' (Provincie Groningen, 2009a). As previously mentioned, the National CCA strategy was shut down in 2010 and consequently caused the coordination on CCA to be discontinued on the national and regional level (Algemene Rekenkamer, 2012). The Province of Groningen, however, did conclude the creation of a regional CCA program in 2012. The CCA program employs a project based approach to stimulate the integration of CCA in the policy making processes on the local and regional levels. Funds are made available to internal and external actors to propose projects which contribute to the overall goal of the program (Doornbos, 2014). The Province of Groningen sees their role as a general director and coordinator of CCA activities in the region. The main objectives of the program are:

- The preparation and implementation of CCA as an integral part of the regional development of the 'Veenkoloniën', 'Eemsdelta', 'Lauwersmeer' en 'Groningen-Assen'.
- Create and implement policy to make the "province and partners" climate-proof.
- Develop a long term vision on CCA
- Develop knowledge on CCA and put the gained knowledge into practice
- Generate awareness through the program and serve as a source of inspiration for the region.

To achieve these goals the Province of Groningen has developed a multitude of projects. Below, in table 10 the climate change adaptation activities of the Province of Groningen will be listed. This list is not meant to be exhaustive but serves to give a representation of the diversity of activities, policies and projects the Province of Groningen are active in.

Climate change adaptation efforts Province of Groningen

- Creation of a regional CCA program: *the centre of CCA efforts at the province of Groningen through which the general goals are presented and funding is provided to projects.*
- *Klimaateffectschetsboek Drenthe en Groningen: project aimed at developing regional climate change scenarios for the province of Drenthe and the province of Groningen.*
- *Project 'Klimaatadaptatie Lauwersoog': a project aimed at developing a vision for the regional development of 'Lauwersoog' by combining socio-economic aspects with climate change adaptation.*
- 'Agenda voor de Veenkoloniën': *the creation of a program bureau aimed at developing projects to strengthen the area 'peat colonies' (in Dutch: veenkoloniën) both in terms of social-economic development and adapting the agricultural activities to Climate Change by stimulation local cooperation, experimentation and pilot projects*
- Heat stress scan Groningen: *a project in cooperation with 'Kenniscentrum NoorderRuimte' and the municipality of Groningen to map the problematic areas in respect to heat stress in the city of Groningen*
- Pilotproject freshwater Eemsdelta: *a project aimed at integrating CC aspects such as heat-stress and increased precipitation in the socio-economic development of the Eemsdelta region.*

- Visie blauw groene gordel*: project aimed at analyzing whether there are economic opportunities in regards to large scale retention of fresh water in the Province of Groningen.*
- Droge Voeten 2050: *project aimed at identifying which measures the northern provinces and water boards should take to counteract the increased risk of flooding.*

Table 10: Activities of the Province of Groningen in regards to climate change adaptation

3.2 Dimension Variety

3.2.1 Variety of Problem Frames

Here, the variety of problems frames will be discussed. The fundamental idea is that actors need to acknowledge and appreciate different points of view and must be willing to openly discuss their problem perceptions and frames. This allows actors to align their interests, come to a common problem definition and based on that common understanding proceed to joint action to adapt to climate change (Nooteboom, 2006). Thus, if the regional authority fosters a large diversity of discourses and problem perspectives, the ability of actors to address climate change adaptation is improved. The variety of frames present at the province of Groningen have been identified by employing a framework developed by Boer *et al.* (2010) which defines four general framing dimensions by contrasting whether actors take a promotion or prevention orientation, and take a broad or narrow perspective (see chapter 2 table 3 for full overview).

The variety of problems frames is high at the Province of Groningen. The inclusion of a wide variety of actors within projects and the duality in goals of the climate change adaptation program (i.e. both improving security and fostering economic development) fosters the variety of problem frames present in the CCA projects. The most prevalent problem frame is the perception of CCA as a security issue. The framing is in line with the Pandora's box frame where there is a call for precaution in face of possible impacts. The framing of climate adaptation as a security problem is a result of extreme weather events in the past. The CCA program (Provincie Groningen, 2011) and multiple interviewees (Debets, 2014; de Vries, 2014) referred to the events of November 1998 where in the southern region of Groningen at the Noord-Willems canal the water level was extremely high (water was running over the dike at some locations) and at the eastern region where water was seeping through the dike, causing a near collapse. To increase the water storage capacity of the region, three polders were flooded to reduce the risk of flooding in highly populated areas. While these events cannot be directly linked to climate change, a respondent active during this period, regards the policy that followed the events as the start of the integration of climate change adaptation into regional policy making (de Vries, 2014).

CCA is, however, not only seen as a problem, but also as an opportunity to foster economic growth (Economic development frame) and to increase the quality of living (social progress frame). This is reflected in the project of 'Climate Adaptation Lauwersoog'. Here, efforts to meet the renewed standards for coastal protection are being combined with the creation of plan which envisions the future economic development of the Lauwersoog area in both the short and long term (Provincie Groningen & Gemeente Marne, 2011). Similar projects can be found as part of the projectgroup "Agenda voor de Veenkolonieën" as they frame CCA as an opportunity to combine nature development with increasing the competiveness of agriculture and the stimulation of recreation (Munneke, 2014).

Moreover, climate change adaptation is also framed as an issue that requires cooperation and compromise between stakeholders (Middle way frame). When dealing with coastal protection and water capacity, interviewees indicate that they feel that the technical solutions and expertise are already available (de Vries, 2014; Huis in 't Veld, 2014; Debets, 2014). While technical solutions may have to be adapted to the specific situation, the challenges lie in managing the interests of stakeholders to reach a politically and societally acceptable solution. Not all problems are perceived solely as a governance issue though. Adapting agriculture to the changing climate the problem is viewed as both technical and a governance issue. Technical solutions need to be developed through

pilot projects, but the creation of pilot projects requires contributions from both regional and local governmental authorities, farmers, farmer's associations, environmental NGOs and knowledge institutes.

In conclusion, the province of Groningen fosters a diverse set of frames. These frames are not in direct opposition of each other, but represent the influence and interests of stakeholders and the duality of goals of the CCA program. The criteria is therefore scored with a +2 rating as both the program and individual projects acknowledge and integrate different points of view (frames) within their policy making processes.

3.2.2 Multi-actor, multi-level, multi-sector

The extent to which the regional authority fosters the inclusion of actors from multiple sectors and levels is important for the adaptive capacity. It is assumed that an unstructured problem like CC requires a variety of actors participating in the policy process to foster successful CCA.

The inclusion of multiple actors is at the core of CCA policy making at the province of Groningen. The province administration envisions themselves not as a single actor but as a director that fosters regional development and supports other actors in successfully adapting to climate change (Provincie Groningen, 2013). The CCA program further stimulates cooperation by allowing external actors to apply for co-funding of their projects. The projects includes actors from multiple governmental levels: the provinces (Groningen, Drenthe and Friesland), water boards (Hunze & Aa's, Noorderzijlvest), ministries of the national government and local municipalities. Non-governmental actors are also present within the projects: environmental NGOs (e.g. Milieufederatie) and organizations that represent industry sectors (LTO Noord, Noordelijke Ontwikkelings Maatschappij). Visionary and pilot projects, in some cases, also allow individual actors to participate such as farmers and local business owners (Provincie Groningen, 2013). The project oriented approach thus has allowed the Province of Groningen to include a wide variety of actors. The only process related to CCA which did not include external actors was the creation of the CCA program itself (Doornbos, 2014). However, as the plan serves as a flexible guideline through which projects can be subsidized, the lack of involvement of other stakeholders in the creation process is of limited importance.

There no consolidated procedure through which stakeholders are included into projects but there is a distinction in procedure depending on the scale of the project; larger scale projects employ a more formal procedure than smaller scale projects. For example the project 'Visie Blauw-groene gordel Noord-Nederland' initially held a large stakeholder meeting through which stakeholders were made aware of the project and were able to give input on the development of a concept plan (van de Berg, 2014). The project 'Droge Voeten 2050' employed a stakeholder analysis to determine which external stakeholders should be included in the process, at what point and to what extent. Smaller scale projects determine the inclusion of stakeholders through a more informal process based on personal experience and their networks (Stuurgroep Droge Voeten 2050, 2010). Both types of procedures seem to work well within the projects as provincial policy makers often have access to an extensive network gained through cooperation on other projects. Therefore, when starting a new project, they are often aware of which stakeholders might be interested in participating.

The extent of participation in projects is largely determined by stakeholders themselves. In general, involved stakeholders participate for the full length of the project. None of the respondents could reminisce projects where certain actors were excluded from participation. In general, as long as the size of the working-group remained within practical limitations, stakeholders are allowed to join. The extent of participation is thus determined on an individual basis. For example within the

project “Regionale Droogtestudie Noord-Nederland” the NGO ‘Milieufederatie’ decide to reduce participation to non-participating members who did receive project information (in Dutch: Agendalid) (de Vries, 2014).

To conclude, the Province of Groningen actively fosters the inclusion of stakeholders from multiple sectors and governmental levels into the policy making processes both through the CCA program and within projects. Even though the process to include stakeholders are unstructured, especially at the smaller projects, this does not seem to harm to extent to which actors are included or level of participation. The criteria is therefore scored with a +2 rating as all indicators reflect that the inclusion of regional actors is at the center of policy making at the Province of Groningen.

3.2.3 Diversity of solutions

Here, the diversity of solutions employed by the province of Groningen will be discussed. The main assumption is that CC cannot be addressed by a single (type of) solution but requires flexible and robust solutions to deal with the uncertainties of CC and avert path dependency (Gupta *et al.*, 2010).

As previously discussed, the projects of the Province of Groningen included a variety of actors. The integration of actors from different sectors and governmental levels stimulates the knowledge available within projects. Even though the expertise of the Province of Groningen is limited in terms of CCA, the participative style of policy making generates a larger combined pool of knowledge. The extent to which knowledge and thus solutions are available does depend on the policy field. In the water management sector there is a diverse set of solutions available due to the expansive experience of the Dutch Water Boards (de Vries; 2014; Doornbos, 2014; Wijma, 2014). Solutions range from technocratic measures such a raising dikes, increasing draininge capacity of rivers to measures that require a participatory approach such as the use of agricultural land as water retention areas. In other policy fields (e.g. nature protection, urban CCA and agriculture) the availability of experience, tools and measures is much lower. Here, the Province of Groningen stimulates the creation of pilot projects to analyze the effectiveness, efficiency and practicality of innovative tools. The project group ‘Agenda voor de Veenkoloniën’ is a clear example of such a process. It is active in the agricultural sector using pilot projects for water retention and heat resistant crops (Munneke, 2014). Furthermore, as the climate adaptation plan does not steer the projects into a single technique or method the chances of suffering from path dependency are relatively low. Respondents do, however, indicate that they fear that certain (successful) pilot programs will not be followed up on (Debets, 2014). The lack of a clear development direction and reductions in availability of funding may cause a decline in the variety solutions as the development processes are not fully concluded.

The formal policies such as the CCA program of the province emphasize the need for adaptive solutions: “to withstand unexpected developments in the regional climate, the measures we use must be robust and flexible” (Provincie Groningen, 2011). The policy making procedures seem to foster a careful consideration of multiple solutions. Large projects which may have a significant impact on the environment are required to perform an ‘Plan MER’. A ‘Plan MER’ analyses the impact of plans through a comparison of policy alternatives. A ‘preferred’ alternative is presented based on environmental impacts and the cost and benefit analysis. The ‘Droogtestudie Noord Nederland’ (Currently called Deltaprogramma Zoetwater) first made a preliminary selection of specific tools and measures based on expert judgment (de Vries, 2014). This was done by the experts from the Dutch water boards as they had ample knowledge and expertise available to enable them to provide a broad selection of measures tailored to a specific situation. Then, through cost assessment,

negotiation between stakeholders and determining how practical the measure is for the specific case, the final selection is made.

In conclusion, on the project level of the Province of Groningen the norm in policy making is to carefully consider a wide variety of solutions. In general a large variety of solutions is available but when they are not readily available they are developed through for example pilot projects. The criteria is therefore scored with a +2 rating as a variety of solutions exist in current policy processes and both formal and informal formal governmental policies and informal social patterns foster awareness of, and place emphasis on the need for a variety of solutions.

3.2.4 Redundancy

Redundancy is important for the ability of actors to deal with the uncertainties of climate change. If certain measures fail, redundant systems can take over to ensure the function (e.g. protection against flooding) is maintained. Redundancy therefore measures the ability to cope with unexpected situations when the 'regular' solutions fail.

Redundancy is not a main consideration of the province of Groningen when designing and implementing adaptive measures. Policy documents indicate that due to budgetary constraints the aim is to use the measures which are as cost effective as possible (Provincie Groningen, 2011). Redundant measures are thus not preferred due to their inefficiency. Nonetheless, some redundant measures have been considered. The project 'Visie blauw groene gordel' analyzed whether water retention was required for the agriculture in Groningen. As the agriculture is dependent on the supply of fresh water from the 'IJselmeer', a large body of fresh water outside the territory of the province, the increased heat stress may negatively impact the agriculture as the demand for fresh water may be become larger than the supply (van den Berg, 2014). The retention of water served as a back-up measure for the regular fresh water supply of the 'IJselmeer'. The report, however, concluded that large-scale water retention was not cost effective as the fresh water from the IJselmeer was relatively cheap. Water management, thus, do show redundant measures. Certain areas have been assigned as 'flood areas' which will be flooded to protect densely populated areas in extreme situations. The trend to implement 'flood areas' has arising on the national level and is not a results of regional developments.

In conclusion, the formal governmental policies and informal social patterns emphasize effectiveness and efficiency over redundancy. Nevertheless some redundant measure have been implemented in the projects that are part of the CCA action plan of the province of Groningen. The criteria is therefore scored with a 0 rating (neutral) as within policy processes redundant measures are disincentivized (negative effect) but some redundant measures have nevertheless been observed (positive effect). The table with the scores can be found below (table 11).

Dimension	Criteria	Criteria Scoring	Explanation
Variety	Variety of problem frames	+2	-There is a high diversity in problem frames which represents the interests of a multitude of actors -The Province of Groningen fosters the integration of a multitude of problems and problem frames into policy processes and projects (e.g. the combination of regional development with CCA).

	Multi-actor, multi-level, multi-actor	+2	-Most CCA projects include actors from multiple levels. -Most CCA projects include actors from multiple sectors. -The CCA program and informal social patterns foster and emphasize the need for multi-level, multi-sector policy making and the province provides funding to external actors. -Actors can determine the extent of participation themselves.
	Diversity of solutions	+2	-In the water management sector a multitude of tools are employed due to high experience and in other sectors pilot projects are employed to stimulate diversity -Formal policy documents and policy making procedures emphasize robust, flexible and adaptive tools
	Redundancy	0	-Formal governmental policies and informal social patterns emphasize on efficiency and effectiveness instead on redundancy -In some projects redundant measures have been implemented

Table 11: Scoring of dimension 'Variety' for the Province of Groningen

3.3 Dimension learning capacity

3.3.1 Trust

In this section, the criterion 'trust' will be discussed. As genuine learning processes require actors to reflect critically on past experiences, assumptions, frames and routines they need to be willing to expose themselves. Authorities should foster an open culture which allow individuals to admit mistakes and criticize others while ensuring no conflicts arise or individuals feel unjustly treated (Bachmann & Inkpen, 2011). Furthermore, a high level of trust fosters the ability and willingness of actors to mobilize resources. The trust between stakeholders active within projects under the CCA plan of the province of Groningen is high and the institutions enhance the feeling of trust.

Respondents indicate that the trust has been built between actors through extensive cooperation on multiple projects. Actors know each other personally and have often been active in multiple regional agencies who are involved in CCA (Debets, 2014). For example the CCA program coordinator has worked for the water boards and is now active at the Province of Groningen (Doornbos, 2014). This has created a policy field where actors are aware of the different interests and capabilities present in the projects which leads to realistic expectations of the policy making process and project results. Respondents indicate that the level of trust in based on a combination of personal and institutional trust (van den Berg, 2014; Wijma, 2014; Munneke, 2014). Personal trust has been built through direct and continued interaction in projects. The institutional trust between actors is fostered because the Province is seen as a relatively independent actor who genuine works towards increasing the capacity of actors to adapt to CC.

In addition, the Province of Groningen utilizes measures and tools to foster the trust building within projects. In most projects a project coordinator is assigned who serves the role of mediator and acts as a relatively independent participant. In certain cases the mediator is hired from an external source, or a person from a government position is selected as they are perceived as relatively independent as well. To manage the project 'Visie Blauw-Groene Gordel', an external project coordinator was hired both to ensure independency and to limit the allocation of time and

manpower by the Province of Groningen (van den Berg, 2014). As part of the 'Regionale Droogtestudie Noord-Nederland' which is now part of the 'Deltaprogramma Zoetwater' (In English: Deltaprogram Freshwater) the Province of Groningen supplied their own project coordinator (de Vries, 2014). One respondent observed that the high amount of trust can also lead to negative effects. Actors can be hesitant to push certain issues or be critical in fear of damaging the existing relations. This negative effect of trust appeared to be limited to one project as other respondents did not observe this negative aspect of trust so this negative effect appears to have little impact on the CCA efforts of the Province as a whole (Debets, 2014).

In summary, both the level of interpersonal and institutional trust between the regional actors active in CCA in Groningen is perceived to be high. Trust building is further supported through the participative policy processes and the utilization of independent project managers. Due to this combination this criterion has been scored with +2.

3.3.2 Uncertainty

In this section, the manner in which the province of Groningen deals with uncertainty will be discussed. Awareness of and being able to deal with doubt and uncertainties is important for the adaptive capacity of organization, as when regional authorities do not learn to deal with uncertainty the ambitions in regards to CCA may be attenuated or discontinued (Kinzig & Starrett, 2003).

Dealing with uncertainties is integrated both in the CCA program of the province of Groningen and its individual projects. The CCA program emphasizes the need for robust and flexible measures and tools to be able to address the variable impacts of climate change. The tools and measures are considered robust when they have sufficient capacity to deal with unexpected or worst-case scenario impacts (Provincie Groningen, 2011). Flexible solutions refers to solutions that are relatively easy to revert back and allow for a change in strategy if results are disappointing. An example of these kind of solutions are the pilot projects to improve water efficiency or the use drought and flood resistant plants. If the results of these projects are disappointing they do not lead to path dependency as the pilot projects are implemented on a relatively small scale.

The uncertainty of climate change adaptation is clearly discussed and acknowledged both within the projects and the program. Uncertainty is reduced or made explicit mainly through technical means such as regional climate scenarios (Provincie Groningen & Provincie Drenthe, 2008). Regional climate scenarios are often utilized in both the CCA program and its individual projects. The scenarios serve as a way to accept the uncertainty of development as they allow for the presentation of the impacts of climate change based on a variety of socio-economic and environmental developments. The scenarios support accentuating the differences and serve as a guide for policy makers to determine which path future developments reflect. Respondents also indicate that uncertainty is discussed during the design and implementation of projects and is present in the various publications of reports, policy documents and booklets of most projects (Huis in 't Veld, 2014).

In conclusion, both in the CCA action plan and the individual projects uncertainty is discussed and integrated and the Province of Groningen provides in tools to integrate uncertainty in policy making or allows actors to develop the tools leading to a +2 score for the criterion uncertainty.

3.3.3 Single-loop learning

This section analyses the presence of formal or informal procedures and norms which guide and foster single-loop learning at the Province of Groningen. Single-loop learning is a vital part of the

adaptive capacity as it allows organizations to improve their routines and ability to meet their goals based on past experiences (Gupta *et al.*, 2010). The extent to which single-loop learning takes place will be discussed on a project level and the organization level (i.e. CCA program).

Single-loop learning is an important part of the CCA program and the individual projects. To begin with, the establishment of the CCA program of the Province of Groningen in itself can be interpreted as an expression of single-loop learning, as one of its main aims was to integrate CCA in the policy processes of the Province of Groningen. Moreover, on a administration level, a commission has also been set up by the province of Groningen aimed at supporting personnel in project management by providing feedback on specific questions and situations (de Vries, 2014; Doornbos, 2014). Here the expertise gained from past experiences of the commission are used to improve the routines of policy makers to reach goals in the current projects. Respondents have indicated that this feedback mechanism has had a positive effect on policy making and is appreciated by employees (de Vries, 2014; Doornbos, 2014). This, however, does not seem to be standard procedure and the commission is solely aimed at supporting Province employees and not whole project teams.

Single-loop learning is also an important aspect within the individual projects. The project 'Visie Blauw-Groene Gordel' developed a model in cooperation with the University Wageningen to simulate future socio-economic and spatial developments (van den Berg, 2014). Due to a lack of comparable data the model was not able to produce results at the expected level of precision. As part of the report, recommendations were made to improve the availability of comparable data so that the effectiveness of the model would be improved. Nevertheless, there is room for improvement in the learning processes of the Province of Groningen. The lack of formal evaluation procedures negatively impacts the extent to which single-loop learning takes place. At the end phase of projects a report is often published which outlines the main findings or results, but no formal evaluation take place (Doornbos, 2014; van den Berg, 2014; Huis in 't Veld, 2014). Additional lessons could be drawn to improve routines, measures and tools if the time were taken to look how policy making could be improved. Nevertheless, actors *do* indicate they use the gained knowledge in future projects, but the knowledge is not actively stored or disseminated throughout the administration to become part of the institutional memory.

In conclusion, the CCA program as a whole and the individual projects are aimed at learning how to integrate CCA into policy making. However, the limited extent of evaluations take place reduce the extent to which single-loop learning takes place. Therefore, the criterion has been scored +1 reflecting a moderately positive effect.

3.3.4 Double-loop learning

'Double-loop learning' is a higher-order and systemic learning that scrutinizes and challenges goals and priorities as well as fundamental assumptions about problems and causal relations (Nilsson, 2006). Double-loop learning, thus, assists in finding more fundamental flaws in the policy making processes and potentially change the goals and direction of current activities.

Double-loop learning is problematic within the Province of Groningen. The main reason is that the formal policies and informal social patterns do not stimulate a critical reflection on or the evaluation of the CCA program or the individual projects. In general, there seems to be a lack of critical reflection on the CCA program as a whole due to the manner in which the program has been set up and the professional culture within the Province. The program has been developed to stimulate the integration of CCA in regional development, foster knowledge development and

stimulate regional and local actors to become more active in CCA. The program, however, does not offer a clear targets or time-frames making the critical reflection on the underlying assumptions and goals is difficult. Moreover, the approach, goals and assumptions are not questioned:

- Does the CCA program sufficiently foster the integration of CCA or would CCA be part of the project regardless of the provision of funding?
- Does a visionary report on the development of a region lead to the continued integration of CCA in regional development?
- Is a project based approach the best for stimulating CCA on the regional level?

The yearly updated action plans list the current and completed projects but do not refer back to the established goals in 2010 (Provincie Groningen, 2013). The program coordinator indicates that there is a "project culture" within the province where actors quickly move on the next project once the current one has been completed (Doornbos, 2014). Project managers indicate that the guidance and influence of the CCA program on their projects is minimal. After the initial check of a project plan and the provision of funding there is very limited communication between the project and the program level to establish to what extent progress has been made and whether the projects are actually positively contributing to the goals of the CCA program (Debets, 2014; Vries, 2014; van den Berg, 2014). The ability to manage the program is further limited as only a single person is responsible for the program management (among other responsibilities). There is thus a focus on implementing current projects and communicating that there are funds available for CCA projects in the region but whether the current projects have sufficiently contributed to the overall goal, whether the correct goals have been set, whether the project based approach will successfully lead to an adequate integration of CCA in policy making is not questioned.

On the project-level, double loop learning appears to take place more frequently. The project 'Visie blauw-groene gordel' challenged the assumption that large scale water retention was profitable (van den Berg, 2014). The pilot projects are also an example of double-loop learning; the aim of the projects is to learn whether the right tools and measures are used and future actions are modified according to the difference between expected and obtained outcomes. In other words, if the implementation of the pilot projects have gone well, the developed tools will be used in practice, but if performance is below expectations the organization has learned that the tool needs adjustment or other tools need to be developed. The project group 'Agenda voor de Veenkoloniën performed an evaluation in 2005 and 2007. Here the assumptions were challenged as the evaluation analyzed whether the current methods addressed the aims and ambitions of the program, whether the correct goals had been set, whether the current way of policy making should be changed and whether a more participative policy process which includes additional actors should be stimulated (Koopman *et al., 2005*). The current norms, rules and procedures were challenged by this evaluation. However, even though the 'Agenda voor de Veenkoloniën' was co-funded as part of the CCA program of the Province of Groningen the projects were set up with a *separate* project group which directed the development within this specific region in the Province of Groningen. Therefore, the influence of the CCA program has been deemed to be relatively low on the extent to which evaluation took place.

In conclusion, the extent to which double-loop learning takes place at the Province of Groningen is very limited. Even though, on the project level actors are involved in double-loop learning, the lack of a critical reflection on the program as a whole is considered detrimental for the adaptive capacity of the Province of Groningen. Due to the lack of evaluations the ability of objectively determine whether the projects have taken the correct approach is not possible possibly

leading to squandered resources, underperformance or reduced quality as experiences were not discussed. Therefore, the criterion has been score with a -2 reflecting a negative effect.

3.3.5 Institutional memory

Here, the institutional memory will be discussed. The institutional memory is strongly linked to single- and double-loop learning as the availability of an infrastructure to disseminate learned knowledge gained in single- and double-loop learning processes fosters the institutional memory within the province as a whole.

The CCA program and other formal institutions of the Province of Groningen do not stimulate the evaluation of project results and policy processes or set requirements in terms of evaluation. The decision to evaluate and the extent of the evaluation is taken on a project basis. As expected, there is a high variation in terms of methodology and quality of evaluation. A group of projects which fall under the responsibility of the "Agenda voor de Veenkoloniën" project team were evaluated in the years 2005 and 2007 (Munneke, 2014). Here the evaluation was more extensive and critically assessed both the current projects results, policy processes and made recommendations to address the identified issues (Koopman *et al., 2005*). The evaluation *of the* project 'Visie Blauw-Groene Gordel Noord-Nederland' had a more informal procedure where the results and policy process had been discussed within the project team and with higher management (van den Berg, 2014). Other projects were not evaluated at all but most did produce reports, booklets which discussed the results of the projects. Various explanations were given for the limited extent of evaluation. First, the implementation of the CCA plan takes place through a multitude of projects. This has led to a norm where, once a project has been completed, the focus is shifted to developing a future project. This norm limits the ability of actors to critically reflect on the collective performance and indentify which parts of the policy process need improvement. Secondly, as the decision to evaluate is made by the project team itself they may be disincentivized to evaluate when the projects results are lower than expected. Third, in some cases the interest in the results of the projects had faded by the time it was completed, resulting in little incentive to perform an adequate evaluation.

Most projects related to CCA in the Province of Groningen have published reports, booklets through websites where information can be found by both internal and external actors. However, unless internal or external actors are looking for very specific information it is difficult to gain an overview of the activities of the Province of Groningen. The CCA program could potentially serve as an overview but as it is updated on a yearly basis, the information is not up-to-date. In some cases projects have been renamed (e.g. Droogtestudie Noord-Nederland) and new projects have not yet been added (e.g. Hittestress analyse stad Groningen). There is no central information hub available through which stakeholders or the general public are made aware of projects (Debets, 2014; de Vries, 2014; Doornbos, 2014). Policy makers at the province indicate that they do not have a clear overview available to them which can lead to overlap on projects, mistakes being repeated and relevant information not being available to them. An effort has been made to create an overview in the form of a 'projectmap'. However, currently only infrastructural projects have been filled in as most province departments have not yet provided the necessary information (de Vries, 2014). The creation of a clear overview is seen as beneficial by respondents as it would allow them, when starting a new project, to coordinate and exchange knowledge between projects and come into contact with relevant stakeholders.

In summary, the Province of Groningen do not provide for clear procedures or requirements in terms of evaluation nor foster a critical evaluation of policy. This creates a danger for loss of

knowledge within the province. If policy makers switch to another employer or retire the learned knowledge is lost as it has not been disseminated throughout the province. Furthermore, it is difficult for current projects to gain access to information which in theory can lead to a reduction in the quality in decision making. Therefore the criterion has been scored with a -2 reflecting a negative effect. The table with the scores of the dimension 'Learning capacity' can be found below (table 12).

Dimension	Criteria	Scoring	Explanation
Learning capacity	Trust	+2	-Due to extensive cooperation between most stakeholders the trust is high both in terms of institutional trust and personal trust. -Institutions further stimulate trust (building) by assigning independent project leaders or coordinators.
	Single-loop learning	+1	-The CCA program is aimed at stimulating single-loop learning through projects in multiple policy fields. -Single-loop learning is present in most projects but the quality is decreased due to limited evaluations.
	Double loop learning	-2	-The Province of Groningen strongly disincentivizes double-loop learning on the program level. -Some projects show double-loop learning but it is not actively stimulated by the Province of Groningen
	Uncertainty	+2	- Uncertainty is explicitly discussed in both CCA program and the individual projects. -Independent project managers are utilized to foster trust building.
	Institutional memory	-2	-There are no rules or procedures that foster or provide procedures for evaluation leading to a high diversity in quality. -There is no infrastructure or overview of project information or evaluative data.

Figure 12: Scoring of the dimension 'Learning capacity' of the Province of Groningen

3.4 Dimension Leadership

3.4.1 Collaborative leadership

Leadership is important for the adaptive capacity of institutions as it is a driver for change, showing a direction and motivating others to follow. A collaborative leader focuses on stimulating cooperation between actors and allows for the diffusion of responsibilities.

The formal governmental policies and informal social patterns of the province of Groningen actively contribute to the inclusion of stakeholders from different sectors and levels. The CCA program strongly emphasizes the role of the province as developer and director: Groningen aspires to contribute and support other regional and local actors in developing long term adaptation plans, development of knowledge and practical measures and tools, and integrating adaptation into the development plans of specific areas (e.g. Veenkoloniën, Eemsdelta, Lauwersmeer) (Provincie Groningen, 2011). A new project which is part of the CCA action plan is required to have gathered

support from external actors. Giving support to a plan does not only entail a certain level of interest or enthusiasm but requires stakeholders to provide financial support as well (Doornbos, 2014). This requirement could have had an inverse effect and served as a barrier, but insofar it has led to active participation and a high diversity and quantity of climate adaptation projects. When asked with which type of leader (project) leaders identify themselves the most with 'collaborative leadership' is mentioned the most often. Responsibilities are diffused among group members within the policy processes; i.e. there is no strong hierarchal structure. Projects leaders mainly coordinate action to ensure the goals are reached, communicate individually and through plenary meetings to align interests and provide information on progress to high management. The diffusion of responsibilities can have negative impacts, as one respondent described a situation where the diffusion of responsibilities led to a situation where none of the stakeholders felt responsible for ensuring the project made sufficient progress (Debets, 2014). However, this negative effect was only identified within one project.

In conclusion, the province of Groningen has successfully acted as a collaborative leader on the program and project level by both stimulating cooperation in the region and the participative style of policy making within projects where responsibilities were diffused between participants. Therefore, this criterion has been scored +2 reflecting a positive effect.

3.4.2 Visionary leadership

A visionary leader focuses on creating a long term vision through which he gathers support and challenges current institutions. Visionary leadership is both being promoted and disincentivized through existing institutions at the Province of Groningen.

The CCA program provides room for the creation of long-term visions for regional in Groningen. Multiple projects have been developed which aimed at forming a long-term vision (e.g. Regiovisie Groningen-Assen and Klimaatadaptatie Lauwersoog). The core of a visionary plan or program is the reshaping the current institutions (Gupta *et al.*, 2010). The creation of a long-term vision for Lauwersoog has not led to a revolutionary plan which challenges existing current regional development trends. The plan aims at the further development of existing strengths of the region (fishery, recreation, tourism) and to combine this with strengthening the dykes and increasing the capacity of the sluice. While this does not mean that the quality of the plan is low but the visionary plans do strongly reflect current trends instead of showing visionary leadership and challenging existing institutions.

Respondent also indicate that visionary plans that challenge existing institutions are unlikely to succeed. Visionary plans are perceived to lack realism and practical implications in the short to mid-term (van den Berg, 2014). It can be argued that the role of the visionary leader is to convince actors of the practicality of their vision. Nevertheless, the respondents at the Province of Groningen clearly indicate that they have a strong preference for solutions which can easily be translated into practical situations instead of relatively abstract visionary plans. The provision of 'best practice' tools and measure which can be applied to current and future projects are considered more useful (Doornbos, 2014). Furthermore, the elective four year cycle of the 'gedeputeerde staten' further complicates long-term decision making. Even the CCA program, which is aimed at the long-term development of the Province of Groningen, is set to run from 2012-2014 after which the future options for the program will be reviewed (Provincie Groningen, 2011).

In conclusion, while the CCA plan appears to foster visionary leadership, but in practice the projects do not challenge existing institutions through visionary long-term plans, the program is set

to run for a short time-frame and innovative long term visions are not appreciated by policy makers leading to a -2 score reflecting a negative effect.

3.4.3 Entrepreneurial leadership

An entrepreneurial leader is a leader that focuses on direct action and leads by example (Gupta *et al.*, 2010). The extent of entrepreneurial leadership can be examined both by analysing the province as a whole and on the project level.

Climate adaptation at the local and regional level is a relatively new field. The existence of a CCA program, including multiple projects which have been completed or have entered the implementation phase, is unique in the Netherlands. Only three provinces out of the twelve Dutch provinces have created a regional CCA program. It shows a level of commitment and ambition of the province to position themselves as a frontrunner in this policy field even if the program will only run from 2010-2014. As most practical knowledge, in terms of specific tools and measures, still have to be developed, the whole CCA plan and individual projects can be perceived as a form of entrepreneurial leadership. This does, however, not mean that CCA always features a dominant role in the projects; in many cases CCA is only one of many issues. This is not uncommon in CCA policy making: the integration of CCA in other projects through incremental changes and modifications are seen as the 'mainstreaming'. "It is extremely unlikely for any type of adaptive action to be taken in light of climate change alone" (Smit, 2006, p.285). The climate change adaptation program of the province of Groningen also fosters "entrepreneurial leadership" to some extent. The CCA plan has reserved a budget for climate adaptation which is available to both internal and external stakeholders to apply for funding if their plan supports regional climate adaptation. As the CCA plan has not set strict goals, this further fosters the ability of entrepreneurial leaders to create innovative projects and lead by example.

In conclusion, the existence of an extensive regional CCA program incentivizes entrepreneurial stakeholders and is positive for the adaptive capacity. However, current projects do not always highly prioritize CCA limiting the innovation and progress made in terms of CCA leading to a +1 score reflecting a moderately positive effect. The table with the scores of the dimension 'Leadership' can be found below (table 13).

Dimension	Criteria	Scoring	Explanation
Leadership	Collaborative leadership	+2	-Collaborative leadership is present in most projects -The Province of Groningen fosters collaborative leadership by providing financial incentives for collaboration and diffusion of responsibilities on a project level.
	Visionary leadership	-2	-Long-term visionary projects are present but reflect current developments instead of setting an innovative new direction. -Social patterns disincentivize visionary leadership due to the perception that long-term visionary plans lack practical solutions and the short-term perspective due to the four year election cycle.
	Entrepreneurial leadership	+1	-There are innovative projects present but CCA is often not highly prioritized

	-Institutions foster entrepreneurial leadership through the provision of funding and the flexible guidelines

Table 13: Scoring of the dimension 'Leadership' of the Province of Groningen

3.5 Dimension Resources

3.5.1 Authority

In this section the criterion 'authority' will be discussed. Authority is defined as power which is perceived as legitimate (Gupta *et al.*, 2010). Formal legislation and policies which form the base of the authority of organizations dealing with climate adaptation are vital. If the authority of a governmental organization is perceived as illegitimate actors may not want to cooperate or may actively block the policy process.

The authority of the province of Groningen is relatively low. The formal responsibilities and mandate of the Province are limited. As the national government has not assigned formal responsibilities in regards to CCA through legislation or a national CCA strategy, the Province of Groningen is dependent on external actors to be able to implement policy. While a more clear assignment of responsibilities was planned as part of the program 'Make space for climate!' (in Dutch: Maak ruimte voor klimaat!) efforts were ceased in 2010 (Algemene Rekenkamer, 2012). Within this institutional void most parties do perform a similar role to their formal responsibilities. Provinces in the Netherlands are the link between the central government and municipalities and already perform a regional coordinating role and are active in the monitoring of the water boards and municipalities (Rijksoverheid, 2014a). It is thus not surprising that the Province of Groningen performs a stimulating role through the CCA program as well. They do not have the mandate to individually implement CCA or 'make' external actors undertake action but can stimulate other actors. In water management projects the water boards hold the responsibility to ensure the safety levels are sufficient. Even in the visionary project aimed at the regional development of Lauwersoog, the suggested plans had to be authorized by the local municipality through spatial planning. Nevertheless, even though formal legislation and policy does not provide authority to the Province of Groningen, the activities of the Province within CCA are accepted. The government is seen as a relatively independent actor which strives for the common good and is seen as *the* actor to address environmental issues (i.e. climate change adaptation) (Debets, 2014; de Vries, 2014).

In conclusion, the authority of the province in regards to CCA is limited, unclearly defined and they are dependent on other regional actors. The relatively low authority limits but doesn't disable the Province of Groningen to foster regional CCA. Therefore, the criterion has been scored -1 reflecting a moderately negative effect.

3.5.2 Human resources

Climate change adaptation is a complex issue and requires a diverse set of knowledge and expertise. The educational backgrounds of the interviewees includes expertise in water management, spatial planning, chemistry and agriculture (Doornbos, 2014; de Vries, 2014; van den Berg, 2014; Wijma, 2014). Most interviewees have worked before on projects within the province of Groningen related to climate adaptation and/or have held positions in regional NGOs, water boards and consultancy firms. The educational backgrounds are thus not directly related to climate adaptation or climate change but does relate to the policy field and experience has been build up through work and project experience.

Expertise in project management and stakeholder communication are perceived as most important (Doornbos, 2014). Technical expertise is often provide by participating stakeholders or hired from an external source. The province of Groningen furthermore fosters the training of employees to some extent in areas such as mediation and project management (Doornbos, 2014). When insufficient knowledge or manpower is available for projects external sources are hired. For the project 'Visie Blauw-groene gordel Noord-Nederland' an external project manager was hired to reduce the work-load for province employees, to ensure independency of coordinators and a smooth policy process (van den Berg, 2014). To ensure both socio-economic and environmental aspects are adequately integrated in the management of the Veenkoloniëen, a separate agency has been set up as a permanent project management team (Munneke, 2014). For the management of the CCA program there is no separate group of people who take care of selecting and monitoring progress. A single person, who also holds responsibilities in other areas, manages all aspects of the CCA program. Even though respondents do not observe the lack of program management, as problematic they do indicate that the influence of the program is minimal and often limited to the development phase of the project when actors seek for funding.

In conclusion, the criterion human resources has been scored a +1 as in on the project level adequate human resources are available and training is provided to foster the required skills to manage the projects. On the program level, while the expertise is sufficient, additional human resources appear to be required to support the management of the program. This, however, does not seem to be a problem with the availability of human resources but merely requires a reallocation. Therefore the criterion human resources is nevertheless scored as moderately positive.

3.*5.3 Financial resources*

The need for financial resources to create and implement CCA policies is obvious. The creation of dykes and water retention areas to prepare for a high sea level and extreme weather are costly. A lack of resources can lead to inaction, decrease the quantity and quality of learning processes and reduce policy ambitions.

The precise expenditure on climate adaptation policy is difficult to determine. The CCA program indicates that around € 250.000,- is available per year from 2012-2014 (Provincie Groningen, 2011). However, the budgetary report of the year 2014 indicates that € 116.000,- has been spend on the Climate Change Adaptation program in the year 2013 and only € 59.000,- is expected to be spend in 2014 (Provincie Groningen, 2014b). Not all expenses are included in this number as some of the expenses made on projects where climate adaptation is a sub-goal have not been included in this number. The budgetary report indicates that climate adaptation policy is integrated both in the programs "Schoon/Veilig Groningen" (In English: Safe/Clean Groningen) and the program "Gebiedsgericht" (In English: Area-specific policy) (Provincie Groningen, 2014b). Assuming the € 250.000,- investment in CCA policy is met the sum is small compared to other policy areas. The mitigation of climate change and the transition to sustainable energy resources are given a higher priority on the policy agenda. The program "Energiek Groningen" (Energetic Groningen) has a budget of €4.2 million available for the year 2014 (Provincie Groningen, 2014b).

Even though the available budget provided by the province is limited, the budget available for the implementation of individual projects appears to be sufficient. While one actor, indicated that the scope of their pilot projects were severely reduced due to budgetary constraints all project leaders/coordinators felt that the budget was adequate to successfully conclude their projects. The

budgetary constraints are nevertheless considered one of the main barriers (Debets, 2014; Huis in 't Veld, 2014).

In conclusion, even though most projects appeared to have sufficient financial resources the current trend shows are steep decline in resources and the extent to which new projects are set up is limited. Therefore the criterion financial resources has been scored -1 reflecting a moderately negative effect. The table with the scores of the dimension 'Resources' can be found below (table 12).

Dimension	Criteria	Scoring	Explanation
Resources	Authority	-1	-National legislation and policy does not clearly define or assign responsibilities in regards to CCA to the Province of Groningen and thus do not grant authority. Some authority is gained through responsibilities which are related to CCA. -The Province of Groningen is dependent on (the authority) external actors to implement CCA but as the link between the local and national level this is a role they are well versed in.
	Human resources	+1	-Sufficient human labour is available to adequately implement projects but the overall program is managed by a single person. -Adequate expertise is available at the province to manage the adaptation program and projects. -Institutions allow for hiring of external technical expertise when necessary. -Training programs are available in order to foster management capabilities.
	Financial resources	-1	- CCA budget is relatively small and actual spending seems to have declined severely recently -Past and present projects are perceived to have received sufficient funding and combine internal and external resources.

Table 14: Scoring of the dimension 'Resources' of the Province of Groningen

3.6 Dimension Fair Governance

3.6.1 Legitimacy

Legitimizing climate adaptation measures is a challenge as its impact may not be visible in the short term and responsibilities may not yet be clearly defined (Wejs *et al.*, 2003). Suchman (1995, p. 574) defines legitimacy as 'a generalized perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions'.

On the program level the policy documents of the climate adaptation program of the Province of Groningen attempt to build legitimacy by emphasizing the need for early action to address the CC impact and the active role the government should play (Province of Groningen, 2011). The CCA program features a lengthy description on the climate changes expected in the region and how sectors are expected to be impacted. To further build legitimacy the CCA plan emphasizes the need for awareness building among the general public. Respondents indicate that, with the exception of water management, the general public is not yet aware or do not perceive the need to prepare for climate change (Debets, 2014; Wijma, 2014). The main reason for the perceived

legitimacy of the government to address CCA is because CC is a complex problem requiring a variety of societal actors to work together and the Province of Groningen has a broad experience in the management of such projects. Furthermore, the government is seen as a relatively neutral actor which genuinely aims to work for the public benefit.

The manner in which the policy processes have been set up may have contributed to legitimizing the CCA efforts of the Province of Groningen as well. Climate change adaptation is a relatively new policy field for which the institutions had not been clearly defined when the CCA program of the Province of Groningen was created. The participative policy processes, employed in most projects, may have served as a forum through which led the perception of the Province of Groningen as a legitimate actors to address CCA. At the same time it should be noted that the measures related to CCA projects only impact the general public to a limited extent. The creation of a long-term visions or testing innovative crops to stimulate adaptive agriculture do not have negative effects on the public. When invasive measures are planned the legitimacy of CCA may be challenged. The water management projects related to climate change adaptation have insofar not been met with significant resistance which challenged the legitimacy of CCA measures.

In conclusion, the Province of Groningen is seen as the legitimate actor to address climate change. Both through the legitimacy building on the program and project level the actions of the Province are perceived as legitimate resulting in a +2 score reflecting a positive effect.

3.6.2 Responsiveness

Regional authorities should enable actors to respond to policy making processes and stimulate policy makers to respond to the provided feedback (Gupta *et al*., 2010). Here, the extent of response through formal and informal institutions will be discussed.

The extent to which the province is required to respond to input or feedback from the public is governed through the national law 'Algemene Wet Bestuursrecht' (in English: general administrative law). There is no option for direct input or feedback from external actors on the CCA program of the Province of Groningen or the provision of subsidies to specific projects (Doornbos, 2014). Nevertheless, the CCA efforts are discussed in the 'Provincial Spatial Plan' (in Dutch: Provinciaal Omgevingsplan) which does allow external actors to present their views. Around 15 out of 348 reactions were related to CCA in response to the preliminary version of the 'Provincial Spatial Plan' (Provincie Groningen, 2009b). To each 'view' from society a response has been provided by the Province through the public policy document '*Reactions and comments to the concept version of the Provincial Spatial Plan'*. The reactions and comments of the Province of Groningen are limited to a brief explanation which accepts or refutes the arguments made by external actors. When the arguments are accepted the changes are limited to minor adjustments in the text of the plan. The influence of external actors on the overarching plan of CCA is very limited, but institutional patterns do show more response on the project level.

On the project level, the Province of Groningen shows response through multiple means. First and foremost, the broad inclusion of stakeholders into the policy processes fosters the integration of input and feedback from a diversity of actors such as the municipalities, water boards, environmental organizations, business sector organizations and (local) businesses. The integration of external feedback also takes place at certain key points in the policy making process. The project 'Visie Blauw-groene gordel Noord-Nederland' initially held a large stakeholder meeting through which stakeholders were made aware of the project and were able to give input on the development of a concept plan (van den Berg, 2014). The province has also shown response to unexpected events

which have had significant negative effects on its inhabitants. Currently, there is civil unrest about the earthquakes caused by natural gas production in the area. While this issue is not related climate adaptation, the province (and national government) were forced to respond due to the protests (Rijksoverheid, 2014b). While, as a results of the protests the gas drilling has been only limited by a small amount a fund has been made available to provide compensation for structural damage to building caused by the earthquakes (Rijksoverheid, 2014b). A similar response was observed after the flooding in 1998 where both on the provincial and national level additional funding and manpower were made available to develop and implement policy to ensure a higher safety level and water drainage capacity (de Vries, 2014).

In conclusion, the Province of Groningen shows response to actors to some extent within projects and through the 'Provincial Spatial Plan'. The extent to which action is undertaken as of a result of the responses is limited and direct input on the CCA program of the Province of Groningen is not possible leading to a scoring of +1 reflecting a moderately positive effect.

3.6.3 Equity

The second criterion 'equity' refers to the moral responsibility of the government to ensure that the vulnerability to the impacts of climate change and the negative effects of CCA measures are distributed as equally as possible between individuals and groups. Inequitable situations can arise when certain groups are more exposed or vulnerable to the impacts of CC due to their socio-economic situation and geographic location (Kruize *et al*., 2007).

Equity is not explicitly considered as part of the CCA program of the province of Groningen. There is no mention of inequitable distributions of climate change or the impact of socio-economic situations of actors/civilians in combination with their ability to adapt. The policy documents of the projects on CCA also do not explicitly consider environmental equity, but some of the projects do compensate for the unequal impacts of CCA measures in some projects. Implicitly, the approach of the Province of Groningen to address CCA in the most vulnerable areas does relate to equity. The 'Veenkoloniën' is one of the regions where the agricultural sector is considered vulnerable to droughts and extreme weather (Province of Groningen, 20110. As it is one of the main economic sectors in the area and is expected to be severely impacted the activities related to CCA , this could be perceived to address an inequitable situation. In one project, to optimize the competitiveness of the agriculture the land-use of some natural areas are being changed into agriculture and vice versa (Debets, 2014). If no agricultural land is available to trade the farmer may be compensated with money. In water management some agricultural areas are being assigned as flood-areas. More local issues such as inequality of heat-stress and availability of green space are, however, the responsibility of the municipalities and are not considered by the province.

In conclusion the Province of Groningen does not explicitly consider the inequality of CCA impacts but some projects do show compensation being provided for the unequal impacts of the CCA measures. As the indicators show mixed results and equity does not appear to play a significant role, the criterion has been scored 0 reflecting a neutral effect.

3.6.4 Accountability

In this section, the extent to which institutions give form to the accountability procedures will be discussed. Accountability can be defined as "the obligation to explain and justify conduct" (Bovens, 2003, p.32). The focus is on the accountability between the projects and management of the

program and province board as the criterion 'responsiveness' has already discussed the input given by public and external actors.

In terms of transparency, the Province of Groningen has published the climate change adaptation documents via the general website and all kinds of project documents are routinely published and accessible via internet. The reports of the project provide information on the goal and the general results, but give limited insight into the policy processes or the performance of projects through evaluative data. The extent to which actors being held responsible for conduct and performance is difficult due to the governance approach to policy making. The projects of the CCA program of Groningen are often part of national programs (e.g. Delta program) or locally set up program bureaus (e.g. Programma voor de Veenkoloniën). They include a wide variety of actors and address a wide variety of problems (from economic development to protection of biodiversity). The strong inter-linkages between internal and external programs and the cooperation between a wide variety of actors have made it difficult to establish clear accountability procedures. There is no single forum who holds the actors accountable for the performance. Respondents have indicated that when a project has not met expectations, the involved parties feel a shared responsibility for its failure. Internally a person may be addressed for the poor performance of a project but the extent to which this takes place is limited (de Vries, 2014). While often a report, booklet or website is available with information on the results no evaluation of the goal attainment or policy process is made. On a program level the extent to which actors are held accountable for the conduct and performance of the program is limited. As projects are not being evaluated, no infrastructure is available to disseminate learned knowledge holding *anybody* accountable for the progress made is not possible.

In conclusion the participative policy process makes it difficult to establish clear lines of responsibility leading to difficulties in establishing accountability. Furthermore, even though projects are relative transparent the project performance is not being evaluated leading to further difficulties in holding actors responsible for their actions. Nevertheless most projects do publish the information which is available to the general public. Therefore the criterion has been scored -1 reflecting a moderately negative effect. The table with the scores of the dimension 'Fair governance' can be found below (table 15).

Dimension	Criteria	Scoring	Explanation
Fair governance	Legitimacy	+2	-Legitimacy is sufficient due to legitimacy building in participative policy processes and the norm that the government should be active in environmental and security issues - Due the non-invasive nature of the CCA measures and the extreme weather events in the past the measures are seen as legitimate
	Responsiveness	+1	-Influence through formal procedures is limited but the broad participation of actors representing diverse interests positively influences the responsiveness -Province shows response to negative (extreme) situations in society on the regional level
	Equity	0	-Equity is not explicitly considered in the CCA plan of the province or project policy documents

			-In some projects, equity is fostered as actors are compensated when they are negatively impacted by CCA measures
	Accountability	-1	-The governance approach to policy making via projects make it difficult to establish clear accountability between actor -Projects are transparent by routinely publishing booklets, reports and information on websites but data on policy processes or evaluations is limited

Table 15: Scoring of the dimension 'Fair governance' of the Province of Groningen

3.7 Dimension Willingness and perceived ability to adapt

3.7.1 Adaptation motivation

Here, the indicator 'adaptation motivation' will be discussed. The adaptation motivation is defined as the extent to which decision makers and other actors to realize, support and/or promote adaptation to climate change (Grecksch, 2013).

All respondents indicated that they feel motivated to adapt to climate change. Opinions diverged on the time-frame in which time-frame CCA is necessary. One project manager said "there is a trend in weather which gives me the feeling that something is clearly changing. We need to be ready for those changes" (de Vries, 2014). Most respondents indicated that in the next 10 years they don't think CC impacts will be felt yet. However, preparatory work in the form of knowledge development and the creation of policy networks is deemed useful. Climate adaptation in the water sector is seen as most important, but nature development/protection and agriculture are mentioned as well. The perceived motivation of other relevant actors varies. Farmers are seen as unmotivated to currently participate in CCA, but it is expected that once there are economic incentives (whether through subsidies or actual CC impacts) the agricultural sector will quickly adapt. Environmental NGOs see climate adaptation in combination with mitigation as important as well.

While individual policy makers feel motivated, they consequently observe that the interest of the general board of the province is on the decline. The cause of the decline in attention for CCA is not entirely clear. The reduced focus on the national level (shut down of the national CCA strategy and 'climate agreements' between the provinces), the economic crisis and resulting budgetary cuts and the current focus on the earthquakes due to the extraction of natural gas may have had an impact. Multiple respondents agreed that these suggestions may be the cause but were not able to clarify to what extent these factors actually impacted the motivation to adapt to climate change.

In conclusion, the ability of the province and its regional partners to adapt to CC is perceived as high. The main challenge is in the governance of CCA. As the decision to allocate resources to CCA is made on the high management level the adaptation motivation has been scored -1 reflecting a moderately negative effect.

3.7.2 Adaptation belief

The adaptation belief refers to how actors perceive their ability to successfully adapt to climate change with the current expertise and knowledge they have available to them. Only if key actors are convinced of the success of adaptation will it also be possible to activate the other elements of adaptive capacity (Grecksch, 2013, p.809).

In general, respondents perceive their ability to successfully adapt to climate change as 'high'. They feel that the institutional capacity, expertise and the availability of tools is sufficient. The administration of the province sees their role as fostering CCA and cooperation between regional actors. They personally do not hold the expertise to select and implement the adaptive measures but are able to bring the required actors together to enable adaptation. The belief is especially strong due to the combined ability of actors to adapt to climate change. Even though the Province of Groningen is no expert in water management they do have extensive knowledge in the management of projects and networks. The combination of their knowledge with the expertise of the Dutch water boards fosters the perceived ability to adapt. The main challenge, from the perspective of the province, is the governance of CCA. Bringing the relevant actors together, securing the co-funding of the projects and creating a generally accepted strategy is considered a challenge.

In conclusion, there is a strong belief that sufficient CCA measures are available or can be developed. The actors consider the measures to be realizable and only see the governance of the policy processes as the main challenge. The criterion has been scored +2 due to the strong adaptation belief reflecting a positive effect. The table with the scores of the dimension 'Willingness and perceived ability to adapt' can be found below (table 16).

Dimension	Criteria	Scoring	Explanation
Willingness and perceived ability to adapt	Adaptation motivation	-1	-On the project level the motivation to adapt is high. -On the organizational level the motivation to adapt has declined.
	Adaptation belief	+2	-In general there is a strong belief that sufficient CCA measures are available or can be developed. -The actors consider the measures to be realizable but do see the governance of the policy processes as a challenge.

Table 16: Scoring of the dimension 'Willingness and perceived ability to adapt' of the Province of Groningen

3.8 Synthesis

The Province of Groningen can be considered a frontrunner in CCA and aims to be a regional director by stimulating the integration of CCA in regional and local policy making. To achieve this, a CCA program was created, using a project based approach to direct the activities of the Province and to act as a sign to the outside world that CCA had become a priority. The ultimate goal of the program is to mainstream climate change adaptation into the local and regional development processes (Province of Groningen, 2011). This means that the program aims to fundamentally change regional policy making so that CCA is explicitly considered. In this section, the results of and the inter-linkages between the dimensions and criterions will be discussed to gain insight into the strengths and weaknesses of the adaptive capacity of the Province of Groningen. It should be emphasized that the framework cannot and is not meant to evaluate the effectiveness of the program and its activities. Instead it analyses different aspects of the regional authority which shape the policy making processes of the CCA program, to foster successful CCA to take place.

The application of the adaptive capacity framework shows an interesting perspective on the adaptive capacity of the CCA program of the Province of Groningen. The main conclusion is that the Province of Groningen has an adaptive capacity that moderately fosters the ability of actors to implement CCA and make changes to the regional authority itself when required (see figure 2 and table 17 below). The adaptive capacity is, however limited by some institutional weaknesses

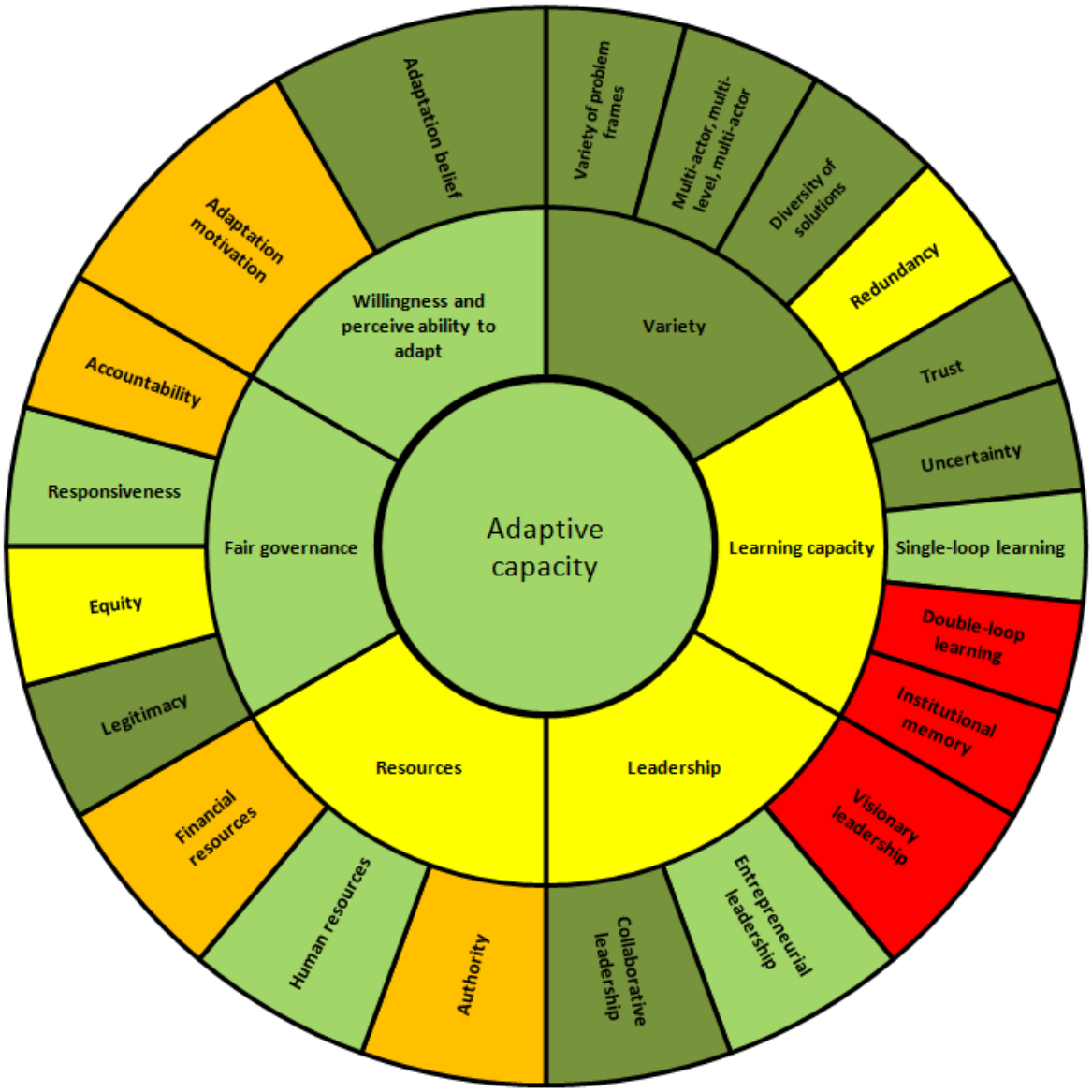

Figure 2: application of the adaptive capacity framework on the Province of Groningen

Type of effect on adaptive capacity	Average score	Color coding
Positive effect	1,50 to 2,00	
Moderately positive effect	0,50 to 1,00	
Neutral effect	0,49 to 0,49	
Moderately negative effect	-0,50 to -1,49	
Negative effect	-1,01 to -2,00	

Table 17: Color coding of the adaptive capacity framework.

which endanger the continuity of the CCA activities of the Province of Groningen. The exact average scores have not been presented in figure 2. This is a deliberate choice as it would give the impression that incremental differences in the numerical values denote the exact divergences in adaptive capacity.

The strongest dimension is '*variety*'. The approach of the Province of Groningen to CCA is quite broad and flexible: it ranges from the creation of visionary projects and urban heat-maps to agricultural pilot projects. The program has not set strict goals but has allowed for flexibility and innovation on the project level. The Province of Groningen does not dictate the policy processes but allows actors to align their interests, come to a common problem definition and common understanding to enable them to proceed to joint action to adapt to climate change. An example is the project group 'Agenda voor de Veenkoloniën', who within a separate project group cooperate with governmental organizations, knowledge institutes and representatives of the agricultural sector to test a diversity of agricultural measures to address CC impacts such as droughts, flooding and plant deceases. This open policy setting fosters the participation of a *variety of actors*, is open to multiple opinions, discourses (i.e. *frames*) and fosters a *diversity of available solutions*. The program stimulates *entrepreneurial* and *collaborative leadership*: internal and external entrepreneurs can apply for funding of the program to enable them to implement a CCA project. Moreover, there is a strong focus on co-funding projects; actors have to seek other regional interested parties to form coalitions and networks to start the development and implementation of projects (*collaborative leadership*). Even though responsibilities have not been clearly defined the approach has fostered the extent to which the Province of Groningen shows response to regional actors and society (i.e. responsiveness) and has allowed them to built *legitimacy* through interaction. The adaptive capacity framework thus shows strong interlinkages between the previously named dimensions and criteria which clearly affect each other as a results of the governmental arrangements and structure in which the climate change adaptation program of the Province of Groningen has been set up.

Nevertheless, the adaptive capacity framework has also given insight into the downsides of the flexible governance approach of the Province of Groningen. The 'learning capacity' of the province of Groningen is underdeveloped. Even though trust has been build between actors through extensive cooperation and uncertainties are acknowledged, the extent to which learning takes place and is disseminated is limited. There is a "project culture" to quickly move on the next project once it has been completed. While within individual projects continuous learning does take place, on an program level, the capacity to learn is problematic. There is no critical reflection or evaluation of the CCA program as a whole (i.e. double-loop learning); questioning whether the correct goals have been set, whether the scope should be narrowed or should be broadened or if the project based approach has sufficiently led to the integration of CCA in policy making. Moreover there is no infrastructure through which knowledge can be gathered and disseminated by policy makers. Multiple departments within the province are active within CCA but project managers indicate that they do not have an

overview or information hub to gain an overview of the activities. This is negative for the adaptive capacity as CCA needs a holistic, integrative approach throughout governance arrangements (i.e. no compartmentalization). The regional authority needs to be able to *adapt* to new developments and knowledge. If policy experiences are not evaluated or disseminated the regional authority is limited in their ability to notice negative or unexpected developments and change their actions accordingly.

The lack in learning capacity is interlinked with the criteria willingness to adapt, human resources and financial resources. Project managers indicate that while they still feel motivated to adapt to CC, see the need and would like to be more active in the policy field but at the same time observe that the willingness at the higher levels of the province administration is on the decline. Furthermore, the financial report of the Province of Groningen shows that the financial budget of the CCA program has halved last year compared to the year before. Even though current projects are continuing the number of projects that were recently set-up are limited (e.g. Heat stress scan Groningen). Furthermore on the organizational level few human resources are provided for the management of the program; a single person is responsible for the provision of the funding and the coordination. This is not a problem of expertise or competence but simply relates to the limited extent to which manpower is available for the management of the program. The only criteria which do not appear to be interlinked with other sections of the adaptive capacity framework are 'Equity' and 'Redundancy': policy makers do not appear to be aware of the relation between CCA and the criteria leading to neither of them being explicitly considered by the Province of Groningen.

In conclusion, the adaptive capacity framework indicates a moderately positive effect. The criteria thus indicate that the level of adaptive capacity has a moderately positive effect on the ability of actors to successfully implement climate change adaptation and make changes to the regional authority if deemed necessary. The activities at the Province of Groningen reflect this assessment: multiple projects have integrated CCA into their policy making processes, have generated new knowledge and tools and have led to concrete changes in practice (e.g. changes in spatial plan of Lauwersoog as a result of the project 'Klimaatadaptatie Lauwersoog). The approach, in general, allows actors to set up CCA projects and implement them. Whether the results of the projects can be considered a success, however, is difficult to determine due to the lack of learning capacity and management of the program. In practice, this lead to a risk of mistakes being repeated, learning experiences being lost and a disconnection between the original goals of the program and the extent to which the project contribute to the goals. Finally, below the key strengths and key weaknesses have been summarized to clearly communicate the results.

Key strengths:
(1) Variety in potential adaptation strategies to address CC impacts in regional developments (Variety dimension
(2) Inclusion of a wide variety of actors, sectors and governmental levels (Variety dimension)
(3) High trust established between actors due to extensive cooperation (Learning capacity dimension)
(4) The governance approach to policy using the combined expertise and knowledge of regional actors have led to a high perceived ability to adapt by actors
(5) The governance approach has simultaneously led to the activities and actions of the Province of Groningen to be perceived to be legitimate
(6) Uncertainty is acknowledged on both the program level and integrated into policy making on the project level.

Key weaknesses:
(1) Lack of double-loop learning on a program level due to a 'project culture' which focuses on moving on to the next project instead of evaluating the projects and disseminating the learned knowledge.
(2) Absence of infrastructure for informational gathering, exchange and dissemination of knowledge (Learning capacity dimension)
(3) Program management lacks human resources and investment in CCA is declining (Learning capacity dimension)
(4) Lack of visionary leadership due to a focus on projects which can be implemented in the short term and the perception that visionary projects/activities lead to impractical results.
(5) Unclear division of responsibilities on the national, regional level and multi-actor governance approach make it difficult to clearly establish accountability.

Chapter 4: Analysis Sogn og Fjordane

Figure 3: Geographical location of Sogn og Fjordane

4.1 Introduction

The county of Sogn og Fjordane lies in the Western part of Norway (see figure 3). It covers an area of around 16 thousand square kilometres and has a population of 110.000 people (Eurostat, 2014). Førde is the largest city in the region with a population of 12.000 citizens (Eurostat, 2014). The administrations of the regional authorities are located in the municipality of Leikanger (Fylkesmannen & Fylkeskommune) and Førde (Fylkeskommune). The region is predominantly active in agriculture, traditional fishery, aquaculture, production of aluminium and has a large hydroelectric power industry. The region is widely known for its Nærøyfjord which is part of the UNESCO world heritage (UNESCO, 2005).

As an introduction to the analysis of the adaptive capacity of the Fylkesmannen of Sogn og Fjordane the context in which they operate will be discussed. Here, the vulnerabilities of the region of Sogn og Fjordane to climate change, the responsibilities and structure of the Fylkesmannen, the interlinkages between the regional climate change adaptation policy with inter(national) and local policies, and the current and past action that is being undertaking to adapt to climate change will be discussed. In this section, the adaptive capacity framework will be applied to the Fylkesmannen of Sogn og Fjordane. The criteria will be discussed individually after which the scoring for the dimension is presented. The chapter will be concluded with a synthesis.

4.1.1 Regional climate impacts

Unlike the province of Groningen, climate projections play a much smaller role in the county of Sogn og Fjordane. The utility is perceived to be low due to the uncertainties and lack of precision of the projections (Stensvand, 2014; Aall, 2014a). Nevertheless, on the national level climate change projections are available which describes the range of climate impacts. The national projections divide Norway into 13 precipitation regions and six temperature regions (Ministry of Environment, 2010). This means that the CC projections of Sogn og Fjordane are grouped with similar coastal counties in the western region of Norway (Rogaland, Hordaland and Møre og Romdal). The primary impacts of climate change, in the year 2050 compared to 1990, in the county of Sogn og Fjordane will include (Ministry of Environment, 2010, p.48-56):

- An increase in average temperature of 1 °C till 2 °C. The projections indicate that the temperature increase will be greatest during the winter season.
- A decrease in cold winter days (<= 0 ^{o}C during the day) by between 10 and 60 percent in coastal regions.
- An increase in average precipitation between 2.4 to 14 percent. The increase of precipitation is higher in the winter than in the summer.
- An increase in days with heavy precipitation and a higher average amounts of precipitation for these days in all seasons.
- Rise in sea level of between 15 and en 37 cm. The rise in sea level is partially mitigated by the continental uplift in Scandinavia which is a result from the post-glacial rebound effect[1].

The changes in the climate will have a variety of both negative and positive impacts on the region of Sogn og Fjordane. National impact assessments have indicated that in Norway the net benefits may outweigh the costs attributed to climate change (Ministry of Environment, 2010). In part, this is due

[1] The process through which land that was suppressed under ice during the previous ice age is gradually rising in elevation (Whitehouse, 2014).

to the heavy reliance of the economy on the extraction of natural resources which are largely unaffected by CC (Carina & Keskitalo, 2010). Nevertheless, there are a multitude of impacts which can have a severe impact on the Norwegian society.

The changes in temperature, precipitation and variability in the weather will result in an increased frequency of extreme weather events that can cause flooding, avalanches , landslides and/or mud flows (Ministry of Environment, 2010). These natural hazards can cause severe damage to the build environment and infrastructure in Norway (Lisø *et al.*, 2003). While landslides generally are a result of construction activities they can be caused by prolonged periods of precipitation and in steep slopes with strong water streams (Ministry of Environment, 2010). In terms of snow, the projections show a decline in the snow season in the region of Sogn og Fjordane. Especially snowy areas situated at a lower below 500–1000 meters above sea level can expect a decline of 2-3 months in the snow season in the year 2100. As the snow season only lasts 2-3 months these types of areas would become snow free in the future (Ministry of Environment, 2010). Moreover, the reduction in snow will subsequently reduce the risk of 'normal' avalanches, but increase the risk of wet snow avalanches and slush flows.

The effect on the coastal glaciers is uncertain and depends on the balance between the positive and negative effects. The winter precipitation is expected to rise which leads to an increase in growth. At the same time, the increase in summer temperatures leads to an increase in the melting process. Due to the high levels of uncertainty it is not possible to determine which of the effects will be stronger (Ministry of Environment, 2010). The increased run-off do positively impact the power production through the hydroelectric power plants. The current projections expect an increase of 4% in electricity production in all climate scenarios (O'brien *et al.*, 2004).

The agricultural sector benefits the most from the temperature and precipitation changes. The projections show an increase in the growing season of 20-30 days in Norway up to the year 2050 (Ministry of Environment, 2010). In order to fully benefit from these changes the agricultural sector *will* have to adapt the types of crops and irrigations measures. At the same time, the increase of temperature may increase the incidence of pests and diseases and increase soil erosion (O'brien *et al*., 2004). The forestry sector shows similar projections; the growth period of the trees is expected to grow but the increase in pests and diseases may be harmful.

4.1.2 Governmental structure and responsibilities

The governmental structure of Norway is divided in three tiers; the central government, the county governments (Fylkesmannen and fylkescommune), and the municipal governments. There are a total of 19 counties and the 430 municipalities in Norway. The main responsibilities of the national government include the labor market, immigration, environmental issues, agricultural issues, law enforcement, national defense, foreign policy, high education and national road/railway construction (Kommunesektorens, 2014). The parliament, the Storting, has 169 members elected for a four year term and because Norway has a multi-party system the government has to form coalitions in order to gain the voting majority. The following ministries are important for the climate adaptation efforts at the Fylkesmannen of Sogn og Fjordane: the Ministry of Environment and the Ministry of Justice and Public Security. Part of the Ministry of Justice and Public Security is the Directorate for Civil Protection and Emergency Planning (DSB). They held the authority to oversee the civil protection and emergency work at the Fylkesmannen. Recently the Ministry of Environment has gained the responsibility to communicate and steer the Fylkesmannen in regards to CCA (Stensvand, 2014). The Ministry of Environment ensures that the Fylkesmannen adequately fulfill their responsibilities. As

the shift on the national level has occurred recently the impact it will have on the policy making processes, the prioritization of CCA and the availability of resources of the Fylkesmannen is uncertain (Stensvand, 2014).

4.1.3 The regional level

On the regional level, the Fylkeskommune and the Fylkesmannen are the main authorities. The Fylkeskommune "will focus mainly on the region's own needs, while the county governor, as the representative of the Government and the ministries, will focus mainly on national policies" (NMLGRD, 1998, p.1). The Fylkeskommune consists of a county council and a county authority. The county council is an elected body, with a total of 34 member in Sogn og Fjordane responsible for policy development, whereas the Fylkesmannen is responsible for the implementation of these policies. The county council's main responsibility is to act as a regional developer in the following fields: secondary education (high school), cultural affairs, communications, economic development and regional planning, including the development of the road system (Ness, 2010). In terms of activities regarding climate change the activities of the county council are limited to climate mitigation. There appears to be an unofficial separation in responsibilities between the Fylkeskommune and the Fylkesmannen where the activities in climate change mitigation and climate change adaptation are split between them (Stensvand, 2014; Helseth, 2014).

The Fylkesmannen (otherwise known as the County Governors) are the representative of the national government of Norway in each county. They are responsible for the implementation of the national policies and receive instructions from the respective ministries and directorates depending on the policy field. The Fylkesmannen fulfil a vital role as they are active in the translation of the national policy to concrete action on the regional and local level. The Fylkesmannen thus communicate the policies developed by the parliament (the Storting) to the municipalities and ensure that they are carried out within the guidelines provided by the central government and the tools developed by the Fylkesmannen themselves. The policy fields in which the Fylkesmannen are active include unspecialized health and social care, education, spatial planning, environmental protection, agriculture, emergency planning, local government finances (NMLGRD, 1998). In regards to climate change adaptation there are two main responsibilities that are relevant:

- Emergency planning and response
- Overseeing and evaluating the spatial plans of municipalities. Here, climate adaptation is included via RVAs (Risk and Vulnerability Assessments)
- A regional RVA of Sogn og Fjordane

4.1.4 Emergency planning and crisis management

As climate change is expected to increase the amount of flooding, land-slides, avalanches in the region of Sogn og Fjordane the reaction of local and regional authorities to extreme situations is an important part of their climate adaptation efforts. These responsibilities which fall under emergency planning are mainly reactive actions which are aimed at limiting the damage of extreme and/or unexpected situations (Fylkesmannen of Sogn og Fjordane, 2014a).

The division of responsibilities between authorities in respect to emergency planning and response in Norway is based on the existing division of responsibilities between the governmental levels. This entails that in general authorities have the responsibility for the same area in a crisis or disaster as in normal situations. In practice, the county governor is mainly active in the coordination and communication between the national government and regional/local authorities to ensure an

optimal response to the situation (Fylkesmannen of Sogn og Fjordane, 2014b). The Fylkesmannen only become involved in the coordination of disasters as per request of the local authorities (Husabø, 2008). Coordination during a crisis can take place directly from the Fylkesmannen to relevant actors or can take place through the County Emergency Council. This council consists of the relevant municipalities, the Fylkescommune, police and fire departments, health services, utility companies (i.e. electricity and water supply) and the NVE (Norwegian Water Resources and Energy Directorate) (Fylkesmannen of Sogn og Fjordane, 2014c). The Fylkesmannen are also to maintain the communication with the national government and the 'military leadership' of the situation (Husabø, 2008). In consultation with the County Emergency Council adequate action is taken and when municipalities deem it necessary requests can be made for national support of the Norwegian Home Guard and the Norwegian Civil Defence (Husabø, 2008). It should be emphasized that the role of coordinator does not entail the authority to act as the main decision maker; consensus is sought with the relevant actors and in case of strong disagreement higher level authorities can be contacted for consultation (Husabø, 2008). The Fylkesmannen also ensure that the municipalities have created a local crisis management plans. These plans can then be tested by setting up simulation exercises through the County Emergency Council to ensure the relevant actors know how to execute the emergency plans (Orheim, 2014).

4.1.5 Integration of climate change adaptation in spatial planning

The activities of the Fylkesmannen are not limited to preparing for and reacting to emergency situations. Since the year 2008 the Building and Planning Act requires municipalities to perform risk and vulnerability assessments for the planning area (Norwegian government, 2014). While in the region of Sogn og Fjordane, the risk and vulnerability analyses were already stimulated in the years before, the reformed act makes the risk and vulnerability analyses a formal requirement. The assessment should determine whether the land is suitable for development purposes and if any 'significant risks' are found the municipality is required to ensure that measures are taken to address the issues or prohibit the construction plans (Stensvand, 2014). The Fylkesmannen are the authority which evaluates the spatial plans, the risk and vulnerability analyses and supports the municipalities to strengthen their capacity to enable them to adequately perform their tasks in respect to spatial planning. The Planning and Building Act states that "all development plans pursuant to the Planning and Building Act shall include a risk and vulnerability assessment that identifies risk and vulnerability factors that have a bearing on the development in question" (Norwegian government, 2014).

This makes the following four layers of spatial plans relevant for the Fylkesmannen (Norwegian government, 2014):

- *Fylkeskommune plan (or county council plan)* is an spatial plan created by the Fylkeskommune and it forms the basis for the regional and municipal development. It is not a legally binding plan but is referred to when developing the municipality plans. The regional risk and vulnerability analysis of the county is performed by the Fylkesmannen themselves.
- *Municipal Master Plans* is an overall plan at the local level. It allocates land to certain land-uses (housing, industry, commercial districts), sets guidelines for the allocation of land and describes how the municipal land-use plan has complied with national plans and regulations. The social aspect of the municipal master plan is aimed at describing the long-term challenges, goals and strategies for the municipal community. This type of plan is required to included a risk and vulnerability assessment and is evaluated.

- *Zoning plans*: Zoning plans are required for the construction of major projects (or a combination of smaller projects) which may have a significant effects on the environment and population. Zoning plans are created before permits are provided for the individual building and can be designed by the local government and/or private actors.
- *Building development plan*: specific plan for the construction single (group of) buildings.

When a plan does not meet the requirements according to the evaluation of the Fylkesmannen it can be declined. As building the capacity of municipalities to adequately perform their responsibilities in regards to spatial planning is one of the central tasks of the Fylkesmannen the declining of a spatial plan can be seen as a final resort (Stensvand, 2014). Through websites of the national government and the Fylkesmannen tools, checklists and guidance documents are available and meetings, seminars and conferences are held and direct communication between relevant authorities takes place to build the capacity of municipalities (and relevant stakeholders).

4.1.6 Climate change adaptation efforts

Here, the climate change adaptation activities of the Fylkesmannen of Sogn og Fjordane will be listed. This list is not meant to be exhaustive but serves to give a representation of the diversity of activities, policies and projects the Fylkesmannen in Sogn og Fjordane are active in.

Climate change adaptation efforts Fylkesmannen Sogn og Fjordane
➢ *Creation of regional risk and vulnerability assessment*: a document which presents the current and future risks for the region of Sogn og Fjordane. Also serves as an example for the local implementation of risk and vulnerability assessments. ➢ *Evaluation of local spatial plans and risk and vulnerability assessments*: the main task of the Fylkesmannen of Sogn og Fjordane in relation to climate change adaptation. ➢ *Emergency planning:* Preparation for and coordination of emergency situations and ensuring local emergency plans are in place. ➢ *Yearly meetings of local spatial planners*: to provide updates on changes in spatial planning, presentation of new tools, to exchange of information between planners and to give feedback of the municipalities to ➢ *National official Norwegian report on climate change adaptation:* The previous county governor Oddvar Flæte headed the commission which wrote the national report on Norway's vulnerability and the need to adapt to the impacts of climate change. ➢ *Arealklim*: Is a research project headed by Vestlandsforsking (Western Norwegian Research Institute) aimed at investigating the relation between the severity of impacts of extreme weather events and (the quality of) spatial planning. The gained insights will be used to develop new management tools and course modules on natural hazards, climate change and spatial planning. The Fylkesmannen of Sogn og Fjordane are one of the actors participating in the project. ➢ *Clim-ATIC*: Participation in a project aimed at establishing advice and training service for community climate change adaptation across the whole of the Northern Periphery. One of the results was a training workshop for regional/local actors involved in or interested in CCA. ➢ *International climate conferences*: for example presenting regional spatial planning experiences related to CCA at the "*Second Nordic International Conference: CCA research meets decision making*".

Table 18: Activities of the Fylkesmannen of Sogn og Fjordane in regards to climate change adaptation

4.2 Dimension Variety

4.2.1 Variety of Problem Frames

Here, the variety of problems frames will be discussed. The fundamental idea is that climate change is an unstructured problem and is embedded in a large diversity of interests and perspectives. Hence, the regional authority should foster the variety as it is assumed that there is no single appropriate ideological framework, no unique optimal policy strategy or set of mutually consistent solutions (Gupta *et al.*, 2010). The variety of problem frames currently present at the Fylkesmannen have been identified by employing a framework developed by Boer *et al*. (2010) which defines four general framing dimensions by contrasting whether actors promotion or prevention orientation, and take a broad or narrow perspective (see chapter 2 table 3 for full overview).

Climate change adaptation is mainly being framed in line with the 'Pandora's Box Frame' at the Fylkesmannen of Sogn og Fjordane. The impacts of climate change are seen as danger that should be prevented both for securing the safety of the inhabitants and the increased cost efficiency when adapting early. However, the impacts of climate change are not only being perceived as a long-term impact. Actors indicate that there have been multiple recent extreme weather events which have caused severe disruptions of daily life and structural damages. The most mentioned example occurred on the night of 24 December 2011 when the cyclone Dagmar hit Norway causing high storm surges, blocking of roads due to rock slides, avalanches and uprooted trees and shut down of all telecommunications and electricity supply. These problems persisted for multiple days in some locations in Sogn og Fjordane (Stensvand, 2014). These observations are backed-up by research; results from the Arealklim project indicate that 1 to 3 out of 10 of the analyzed extreme weather events were outside of the natural variability (Aall, 2014b). Similarly, reports of the national government which address CCA emphasize the need to ensure the community is prepared for climate change and is able to react in extreme situations (i.e. landslides, power cuts and flooding) (Ministry of Environment, 2010). As the Fylkesmannen of Sogn og Fjordane are directly instructed by Directorates at the national level the similarity in regional and national problem frames is logical.

Nevertheless, the 'economic development frame' *is* present to a limited extent. The administration of the Fylkesmannen of Sogn og Fjordane mainly focuses on CCA through spatial and emergency planning. Here, there is no focus on positive economic effects climate adaptation may have. However, climate change is projected to have a positive impact on the Norwegian agricultural industry. The agricultural department of the Fylkesmannen is aware of these projections but feels that the positive effects are equal to the negative effects due to the increased risk of invasive species, diseases and pests. No immediate action is being undertaken at the agricultural department of the Fylkesmannen of Sogn og Fjordane to address the issues or gain from the positives CC impacts (Rekkedal, 2014).

In conclusion, both formal policies and social patterns strongly emphasize the dangers of CC in combination with the regional extreme weather events (i.e. Pandora's Box Frame). The focus on a single frame may limit the scope of CCA: the positive effects on the agricultural sector are not part of the policies on CCA. Furthermore, reframing of problems may serve to gain additional interest or funding: for example the *social progress frame* or *economic development frame* can serve to gain support or interest from actors that would normally not participate. Therefore, the focus on a single frame is perceived to have a negative effect on the adaptive capacity and has been rated with a -2 score.

4.2.2 Multi-actor, multi-level, multi-sector

In this section the extent to which the regional authority foster the inclusion of actors from multiple sectors and levels will be discussed. It is assumed that an unstructured problems like CC require high variety of actors active in the governance process to foster successful CCA and a high adaptive capacity.

CCA is mainly addressed through spatial planning at the Fylkesmannen of Sogn og Fjordane. The responsibility of the Fylkesmannen is to provide guidelines for the creation of spatial plans and evaluate the spatial plans presented by the municipalities. While this process includes actors from multiple governmental levels, being the Fylkesmannen and the respective municipality, it is not a participative policy process but exclusively a quality check and feedback moment. The emergency planning and coordination is a process which does involve a broader set of actors: the municipalities, the Fylkeskommune, police and fire departments, health services, utility companies (i.e. the electricity and water supply companies) and the NVE (Norwegian Water Resources and Energy Directorate). There are other activities which do include more actors but these are mainly side-activities. In order to foster the institutional capacity of the municipalities the Fylkesmannen participate in the development of tools to create spatial plans through research projects and organize yearly regional spatial planner meetings to exchange information. In these projects the Fylkesmannen fulfil the role of a participant and do not influence the extent to which actors are included. A surprising observation is the absence of environmental NGOs in any of the projects of the Fylkesmannen. While the interviewees at the Fylkesmannen had no clear explanation for their absence, an expert at the research institute Vestlandsforsking indicated that until recent years environmental NGOs were very reluctant to participate in CCA (Aall, 2014). Their perspective was that the focus should merely be on climate change mitigation. Aall (2010) observed that only under 15% of the articles published by "Friends of The Earth Norway" includes CCA. Climate change adaptation was perceived as a "non issue".

The extent to which actors are included hence differs depending on the activity. Even though the regional authority is open towards the participation of actors the top-down assignment of responsibilities and the hierarchical relationship between the national, regional and local level does not allow for a participative process through which CCA policy and measures are created and implemented. Therefore the criterion has been scored a 0 reflecting a neutral effect due to the combination of openness towards and inclusion of multiple actors in some activities but the exclusion of actors and inflexibility in changing the extent to which actors are included in others.

4.2.3 Diversity of solutions

Here, the diversity of solutions employed by the Fylkesmannen of Sogn og Fjordane will be discussed. The main assumption is that CC cannot be addressed by a single (type of) solution but requires a flexible approach to deal with the uncertainties of CC and avert path dependency.

As previously discussed, the formal legislation on the national level assigns the responsibility to the Fylkesmannen of Sogn of Fjordane. They focus on evaluating the implementation of RVAs by the municipalities and the provision of support to increase the quality of the implementation. In order to foster the institutional capacity of the municipalities the Fylkesmannen provide them with guidelines, checklists and hold yearly meetings to exchange knowledge between spatial planners (Orheim, 2014; Stensvand, 2014). Furthermore, the Fylkesmannen participate in research which, such as the Arealklim project project, have the aim to develop new management tools and course modules on natural hazards, climate change and spatial planning (Aall, 2014). The scope of current

tool, being the RVA, focuses only on new buildings/constructions and does not include all CC impacts such as the reduction of biodiversity. The ability of the Fylkesmannen to identify the full range of climate change impacts and to change the direction in policy making is limited by the sole focus on RVAs. There is a risk of path dependency: most research activities are aimed at improving the quality of RVAs and if in the future it is found to be an inadequate tool vast investments will be lost and no experience with alternatives will have been build. Furthermore, it can be questioned whether the RVAs are the optimal tool to create a coherent strategy on CCA or promote the integration of CCA into local spatial planning processes.

In conclusion, the formal national legislation strictly guide the Fylkesmannen of Sogn og Fjordane to foster the implementation of RVAs by municipalities as the main solution to ensure the integration of CCA in spatial planning. The Fylkesmannen are allowed to allocate resources to improve the quality of implementation but no emphasis is placed on the development of alternative solutions. Therefore the effect on the adaptive capacity has been scored -2 reflecting a negative effect as the focus on a single tool limits the ability of the regional authority to change direction if the current solution does not meet expectations.

4.2.4 Redundancy

Redundancy is based on the assumption that no single solution can fully address the problems of CC. To ensure you can cope with unexpected situations when the 'regular' solutions fail redundant measures are required. They can be implemented in the form of overcapacity or back-up measures.

Redundancy is not explicitly being considered in the reports or policy documents on CCA of the Fylkesmannen. Nevertheless, the manner in which the responsibilities are structured to emphasize the need to redundancy. The Fylkesmannen foster the integration of CCA in spatial planning (preventative measures) and are active in emergency planning (reactive measures). The emergency planning can thus be perceived as a back-up measure for the spatial planning activities. A clear example of a redundant measure is the outfitting of agencies with satellite phones to ensure communication is possible in extreme events. As the weather event in 2011 caused the failure of telecommunications which led to an uncoordinated effort to address the issues by a multitude of governmental agencies there was a strong need for a back-up communication system (Stensvand, 2014).

In conclusion, while redundancy is not explicitly considered the activities of the Fylkesmannen do indicate that the implementation of redundant measures is seen as useful. Especially the activities in emergency planning foster the implementation of redundant measures. Therefore, the criterion has been scored +1 reflecting a moderately positive effect. The table with the scores of the dimension 'Variety' can be found below (table 19).

Dimension	Criteria	Scoring	Explanation
Variety	Variety of problem frames	-2	-A limited diversity of problem frames is present. -Formal policies and informal social patterns emphasize CCA solely as a danger
	Multi-actor, multi-level, multi-actor	0	-Some CCA activities allow for the inclusion of multiple actors -Some CCA activities allow for the inclusion of multiple sectors -Extent of participation is extensive in

			emergency planning but in other activities the interaction is limited -Formal legislation and policies explicitly state which actors are included and are not open to additional participants
	Diversity of solutions	-2	-A very limited variety of tools is used -Formal institutions strictly guide to use of tools and do not foster researching other solutions. Actors do, however, participate in research projects which improve the quality of the implementation of the solutions
	Redundancy	+1	-Redundancy is not explicitly considered but the manner in which the responsibilities are structured (preventative and reactive) do show some consideration of redundancy. -The emergency planning activities are active in implementing redundant measures

Table 19: Scoring of the dimension 'Variety' of the Fylkesmannen of Sogn og Fjordane.

4.3 Dimension Learning capacity

4.3.1 Trust

Here, the criteria trust will be discussed. It is assumed that the stronger the ties, the higher the trust and the ability and willingness to mobilize resources. The trust between actors in the region Sogn og Fjordane is perceived to be moderate and respondents indicate that it is adequate for a normal working relationship (Orheim, 2014). The trust between the municipalities and the Fylkesmannen is mainly based on institutional trust. The municipalities trust in the independent position and expertise of the Fylkesmannen when they evaluate the spatial plans. The evaluation process is relatively impersonal and trust is not perceived to play an important role (Stensvand, 2014); the Fylkesmannen provide instructions to the municipalities before the planning processes take place and check the results provided by the municipalities. Feedback is provided through a letter or a meeting between the Fylkesmannen and the respective municipality (Stensvand, 2014). In theory these interactions can lead to conflicts; the RVAs can limit the space available for construction or can lead to additional costs to protect constructions. In Sogn og Fjordane the quantity of conflicts is relatively low compared to adjacent regions. The limited population growth leads to a low building pressure resulting in fewer conflicts (Stensvand, 2014). The need for trust for emergency planning is perceived to be higher. As lives could be at stake and emergency organizations are dependent on each other there is need for adequate trust in the ability to perform between involved actors. To build the trust and the ability to operate in an efficient manner emergency exercises are held. It should be emphasized that the role of the Fylkesmannen in terms of emergency planning is limited to the coordination and provision of information during emergencies through the County Emergency Council, and ensuring that municipalities have prepared emergency plans (Husabø, 2008).

The level of trust within knowledge development projects is based on both institutional and personal trust. The institutional trust is based on the perception that external actors such as the research institute Vestlandsforsking is seen as an independent, reliable research organization with a broad expertise in CCA. At the same time, personal trust has been established through the cooperation on multiple projects. The need for trust, however, is relatively low as the risk of participating in these projects is low. The Fylkesmannen, are often not the initiator but a participant.

Their participation requires manpower, but no financial contributions are made to these projects (Orheim, 2014). Since the investment of resources is relatively low the consequences of disappointing results have a smaller negative impact. This may explain the perception that a moderate amount of trust is sufficient.

In conclusion, the level of trust in the region Sogn og Fjordane between stakeholders is moderate and perceived to be sufficient for the current activities. While the interaction between the Fylkesmannen and the municipalities is relatively impersonal the respondents do not perceive a need for a high level of trust. Nevertheless, through the emergency exercises and the continued cooperation with the research institute Vestlandsforsking a moderate level of trust has been build. Therefore, the criterion has been score +1 reflecting a moderately positive effect.

4.3.2 Uncertainty

Here, the manner in which the regional authorities influence how actors deal with uncertainty will be discussed. Awareness of and being able to deal with doubts and uncertainties is important for the adaptive capacity of institutions as uncertainty can lead to inaction or attenuate policy ambitions.

Dealing with uncertainty is challenging in the region of Sogn og Fjordane, since the local effects of climate change and its impacts are not fully known. Nonetheless, the Fylkesmannen acknowledge the uncertainties of CC and foster the integration of them in local policy making. The regional RVA is the most prominent policy document which discusses the uncertainties of CC. The RVA lists the diversity of regional climate impacts and the extent to which the risks and vulnerabilities have been identified and to what extent uncertainties still exist. For example the regional RVA emphasizes the need for risk reduction by creating more detailed flood maps and land-slide maps and argues that additional resources should be allocated to the governmental agencies responsible for the creation of these maps (i.e. the Norwegian Water Resources and Energy Directorate (NVE)) (Fylkesmannen of Sogn og Fjordane, 2013). These maps will allow municipalities "to keep the risk of flood damage at an acceptable level by avoiding the establishment of new settlements, economic activity and infrastructure … in areas that may be subjected to damage or inconvenience as a result of floods and floods landslides (Fylkesmannen of Sogn og Fjordane, 2013, p.38). The Fylkesmannen thus acknowledge that uncertainties still exist and argue for a focus on technical tools to reduce uncertainty. No managerial tools are employed such as risk dialogues with stakeholders or experimentation with new measures or pilot projects.

In practice, risk is integrated into the spatial planning process by taking the upper range of the identified risks into account for the planning of new buildings: if the projected sea-level rise can potentially reach a maximum of three meters the construction of new houses can only take place in areas which are at least three meters above sea-level (Aall, 2014). Localities close to a mountain river which have a relatively high risk of flooding will not be build on unless measures are implemented to address the issue of flooding. The responsibilities to address the risks lie with the municipalities (Husabø, 2008). The activities of the Fylkesmannen are limited to checking whether the municipalities have considered CC risks in spatial planning. Respondents have indicated that they would like to assist municipalities better in translating the RVA to concrete measures but currently are currently unable to sufficiently perform this activity due to the limited resources and expertise.

In conclusion, the institutions of the Fylkesmannen are open to the discussion of uncertainties. The regional RVA, which serves as an example for local RVAs, openly discusses the uncertainties of CC (impacts). The evaluation of local RVAs fosters the acknowledgement and

integration of uncertainties and risk in spatial planning leading to a +2 score reflecting a positive effect on the adaptive capacity.

4.3.3 Single-loop learning

This section analyses the presence of formal or informal procedures and norms which guide and foster single-loop learning at the Fylkesmannen of Sogn og Fjordane. Single-loop learning is a vital part of the adaptive capacity as it allows organizations to improve their routines and ability to meet their goals based on past experiences (Gupta *et al.*, 2010).

One of the responsibilities of the Fylkesmannen is to instruct and provide advice to the municipalities in regards to the creation of spatial plans and the RVAs. As the experience of the Fylkesmannen in regards to CCA is still limited there is a strong focus on improving the routines, methods and tools they use to support the municipalities. However, there are very limited resources available to allocate to learning processes (Orheim, 2014). With only three policy makers working on CCA (among other responsibilities) and almost no financial resources to spend on research they depend on external research projects and networks to learn. One of the projects in which they participate is the Arealklim project of the Vestlandsforsking research institute. This project aims to analyze past natural hazards and related planning processes to develop educational modules and new management tools to improve the local- and regional planning processes. Here, the past experience and activities of the Fylkesmannen are used to improve the current planning routines (Aall, 2014b). Not all single-loop learning processes depend on external resources. On a yearly basis a meeting is held for all the regional and local spatial planners to exchange information and give feedback on the performance of the Fylkesmannen (Stensvand, 2014; Orheim, 2014; Helseth, 2014). A spatial planner from a local municipality perceived these meetings as a useful way to give feedback, exchange information with other spatial planners and to strengthen the relation with the Fylkesmannen (Kringlen, 2014). Moreover, the yearly evaluative report created for the national government supports single-loop learning. It extensively discusses progress made in regards to emergency planning and the implementation of CCA in spatial planning (Fylkesmannen of Sogn og Fjordane, 2014d). Nevertheless, while these activities serve as a way to make incremental changes the lack of resources limits the extent to which the policy makers can set up extensive internal learning processes.

In conclusion, with limited resources the Fylkesmannen of Sogn og Fjordane seek external sources to improve their ability to improve routines to reach their goals and improve the support they can provide to municipalities in their planning process. In this regard, the regional authority has succeeded in fostering the adaptive capacity as the external resources have supported improving current tools and routines. Nevertheless the lack of resources limit the ability to stimulate single-loop learning internally leading to a +1 score reflecting a moderately positive effect.

4.3.4 Double-loop learning

Here, the extent to which the regional authority allow for and stimulate double-loop learning will be discussed. Double-loop learning does not focus on improving existing routines but challenges the current norms and basic assumptions (Gupta *et al*., 2010).

The ability of the Fylkesmannen to challenge the basic assumptions and change current norms is limited due to the strict legislation at the national level which determine the scope of the activities of the Fylkesmannen. Responsibilities and tasks are assigned by the national government (Environmental department since 2014, justice secretariat before). The head of the department of

Civil protection and Emergency Planning describes the situation as "*We have to do what our government tells us to do*" (Stensvand, 2014). While the instructions received from the directorates at the national level allow for interpretation the responsibilities have been clearly established. This relation between the Fylkesmannen and the national government disincentivizes a genuine learning process which fosters the search for and exploration of alternative routines, rules, technologies, purposes, and goals. Improvements in efficiency to achieve the aims and goals are allowed (single-loop learning) but the restructuring CCA policy to increase the scope beyond emergency and spatial planning is outside of the authority of the Fylkesmannen. Nevertheless, policy makers at the Fylkesmannen do observe problems with the current implementation of CCA on the regional level. One respondent observed that the current scope of spatial planning, which is primarily focused on new constructions, is perceived to be problematic (Orheim, 2014). Policy in regards to existing buildings which are affected by CC has not been fully developed. A local municipality identified 20 buildings at risk from rock-slides and avalanches within their territory. The municipality does not have the financial resources to address the issues. Policy to address such issues, however, will have to be developed at the national level. Double-loop learning can take place through the national level. Through the yearly evaluation and other interactions with the national directorates information can be relayed on the encountered problems. However, the process of changing national legislation is a relatively long term process and limits the ability of the regional authority to adapt to new information.

In conclusion, the Fylkesmannen are a governmental authority which has been created to implement the policy of the national government. This set up limits the ability of the Fylkesmannen the challenge the current norms and basic assumptions and conduct double-loop learning. Even though policy makers have observed fundamental flaws in how CCA is implemented they do not have to authority to enact change leading to a -2 score reflecting a negative effect.

4.3.5 Institutional memory

Here, the criterion 'institutional memory' will be discussed. It is assumed that regional authorities should promote the creation and preservation of the institutional memory by stimulating the monitoring and evaluation of policy experiences and ensure knowledge is gathered and disseminated to relevant actors (Van den Brink, 2014).

The hierarchal relationship between the Fylkesmannen of Sogn og Fjordane and the Directorates at the national level fosters the evaluation of policy experiences. The Directorate of Environment instructs the Fylkesmannen on their responsibilities, goals and which areas demand additional attention. In order to communicate the progress made the Fylkesmannen perform a yearly evaluation. The evaluation of 2013 discusses the completion of the regional RVA and the extent to which the Fylkesmannen had to decline spatial plans due to the absence of a RVA or insufficient quality. In terms of emergency planning the extreme weather events, emergency exercises, evaluation of emergency exercises and the extent to which current (municipal) emergency plans are up-to-date are discussed (Fylkesmannen of Sogn og Fjordane, 2014d). The yearly report could, however, be improved in terms of critically reflecting on the past year: currently the focus appears to be on highlighting progress made instead of critically evaluating performance. Nevertheless, the report does criticize the required resources which were used to create the local and regional RVAs. It questions whether the benefits gained are in a good relation to resources spend and makes a recommendation to further specify procedures and content of the RVAs to increase the usefulness and efficiency of their implementation (Fylkesmannen of Sogn og Fjordane, 2014d).

Even though there is no clear infrastructure available through which information is disseminated the extent to which this negatively affects the institutional memory appears limited. In general the Fylkesmannen are very open towards making information publicly available. The spatial plans and RVAs of the municipalities are publicly available as the Freedom of Information Act and the Environmental Information Act apply to them (Norwegian government, 2014). In regards to the projects the Fylkesmannen take part in the information is much more dispersed. It is acknowledged by respondents that a clear infrastructure regarding the conferences, presentations and meetings and the results of the projects is missing to support the access of information. The information gathered through these projects should, in theory, be integrated into their policy tools and the regular channels through which they provide information to the municipalities. In regards to the provision of warnings The emergency plans themselves are available publicly as well but are aimed at the coordination of emergency agencies and are perceived to be not helpful for individual civilians (Stensvand, 2014). The information is thus disseminated through informal channels and learned experiences are integrated into information documents provided to relevant stakeholders. Moreover, general information in regards to CCA is disseminated through the yearly evaluation on which all departments of the Fylkesmannen cooperate.

In conclusion, the regional authority moderately foster the institutional memory of the Fylkesmannen of Sogn og Fjordane. Due to the top-down approach to policy making the Fylkesmannen are required to perform an evaluation for the national government on a yearly basis and reflect on their activities. Even though the dissemination of knowledge could be improved through a dedicated infrastructure the extent to which it negatively affects the institutional memory is limited there leading to a +1 score reflecting a moderately positive effect. The table with the scores of the dimension 'Learning capacity' can be found below (table 20).

Dimension	Criteria	Scoring	Explanation
Learning capacity	Trust	+1	-Perceived personal trust between actors is moderately high due to past cooperation -Perceived institutional trust is moderately high due to authority and relatively high institutional capacity Fylkesmannen -Limited measures or tools are utilized to build trust but neither do current policy processes negatively impact trust
	Uncertainty	+2	-Policy documents openly discuss the uncertainties of CC -The activities of the Fylkesmannen foster the integration of uncertainties in local policy making processes and focus mainly on technical means to address uncertainty
	Single-loop learning	+1	-The regional authority is open to improvements in terms of efficiency and effectiveness but there is a dependence on external resources for learning processes. -External research, emergency exercises and yearly planning meetings are all processes aimed at improving routines to improve the ability to reach goals
	Double loop learning	-2	-The top-down policy making approach to CCA

			strongly disincentivizes double-loop learning -Policy makers observe flaws in the current rules and norms but do not have the authority to address the issues
	Institutional memory	+1	-An evaluation of the climate change adaptation activities is performed on a yearly basis. -No formal infrastructure is available but the negative effect is limited as a single department is involved in CCA.

Table 20: Scoring of the dimension 'Learning capacity' of the Fylkesmannen of Sogn og Fjordane.

4.4 Dimension Leadership

4.4.1 Collaborative leadership

In this section the criterion 'collaborative leader' will be discussed. Leadership is important for the adaptive capacity of institutions as it is a driver for change, showing a direction and motivating others to follow. A collaborative leader focuses on stimulating cooperation between actors and allows for the diffusion of responsibilities.

As previously discussed, the activities of the Fylkesmannen of Sogn og Fjordane are guided by national legislation. In this regard, the ability of the Fylkesmannen to set up a collaborative policy process and act as a collaborative leader in the region of Sogn og Fjordane is limited. The roles, procedures and the steps the policy process should go through are clearly defined. The Planning and Building act states that "the county governor (i.e. Fylkesmannen) shall make sure that municipalities fulfil their planning duty pursuant to this Act. The county governor shall guide and assist municipalities in their planning functions"(Fylkesmannen of Sogn og Fjordane, 2014a). In practice, interviewees indicate, as a first step a formal message is send to the municipalities wherein the general guidelines and methodology of the spatial plan are discussed. Municipalities then prepare and send in the concept version of the spatial plan (Stensvand, 2014). The plan is evaluated by the Fylkesmannen after which an official response is given in which the spatial plan is accepted or when requirements are not met, the plan is decline and feedback is provided for the revision. The evaluative role thus does not allow for the Fylkesmannen to position themselves as a collaborative leader. Furthermore they do not have the resources to set up projects to stimulate regional actors to cooperate on CCA. While they are active as participants in research projects the Fylkesmannen do not have the authority direct the extent to which actors are included within those projects act as a leader.

While not directly related to the adaptive capacity of the Fylkesmannen of Sogn og Fjordane, the research institute Vestlandsforsking does fulfil the role of collaborative leader in the region Sogn og Fjordane to some extent. Through research projects as Arealklim and the development of a training package on adaptation for policy makers the research institute fosters cooperation between counties in Norway. While these research projects are not participative policy processes they do bring policy makers into contact which each other as the results are communicated through conferences and workshops. These projects may serve as a way to foster cooperation in the region of Sogn og Fjordane. Even the Fylkesmannen are in the dissemination of the results of the projects through presentations on their policy experiences at the conferences and workshops related to these projects (Norwegian government, 2014).

In conclusion, at the Fylkesmannen of Sogn og Fjordane collaborate leadership is disincentivized as their formal responsibilities and roles do not allow for a participative process or inclusion of a large set of actors. While the Fylkesmannen do cooperate in a multitude of projects aimed at knowledge development and exchange they do not fulfil the collaborative leadership role in these projects leading to a -2 score reflecting a negative effect.

4.4.2 Visionary leadership

In this section the criterion 'Visionary Leadership' will be discussed. Visionary leaders are leaders that fabricate new meanings to problems which can engage and change the opinions and values of actors to foster support for taking action (Gupta *et al.*, 2010). Westley and Mintzberg (1989) describe visionary leadership as the envisioning of an desired state, which when effectively communicated to other actors can enable and empower them to take action.

Respondents regard the participation of the previous County Governor of Sogn og Fjordane, Oddvar Flæte, in a national committee to study the Norwegian society's vulnerability and need to adapt to the effects of climate change as the start of CCA in the region and a significant step forward on the national level as well (Orheim, 2014; Aall, 2014a). Even though CCA had been mentioned in earlier government reports the creation the CCA report, named the 'Norwegian Official Report 2010: 10', may be seen as a shift in Swedish policy orientation. One political actor at the national level observed that: "In earlier days … one felt that adaptation was a bit like giving up [on emissions reduction] ... but as the years pass one has realized more and more that whatever we do, there will be climate change" (Keskitalo, 2010, p.12). The report contributed to raising awareness for CCA at the national level, assessed the climate change vulnerabilities of Norway and made recommendations to integrated CCA in public planning, to increase the institutional capacity at the local level and increase CCA research (Aall, 2012) Eventually the created momentum led to the revision of the planning and Building Act and set the requirement for considering security issues and flooding and erosion in spatial planning and local infrastructural development. The creation of the report, the participation of the governor of the Fylkesmannen and the changes to formal policies (i.e. Planning and Building act) in the form of increased responsibilities for the Fylkesmannen and the municipalities is a clear example giving new meanings to problems which can engage and change the opinions and values of actors to foster support for taking action (i.e. visionary leadership). Visionary thinking is, however, not fostered to take place within the regional authority. The Fylkesmannen focus on the implementation and not the creation of policy. While they can be considered a frontrunner in ensuring the RVAs are implemented at the local level these actions are aimed at improving the efficiency and effectiveness of current responsibilities instead of acting as a visionary leader. Furthermore as the Fylkesmannen do not have the authority to make fundamental changes only the governors position, which is often held by former politicians, has the opportunity to foster change as their network extends to the national level.

In conclusion, the limitation of the Fylkesmannen to be solely responsible for the implementation of policy and not the creation severely limits the ability of actors to perform the visionary leadership role. Even though the governor position does allow for influence at the national level the overall affect is deemed to be moderately negative (-1 score).

4.4.3 Entrepreneurial leadership

An entrepreneurial leader is a leader that focuses on direct action and leads by example (Gupta *et al.*, 2010). They are the kind of leader who show how to address complex issues in practice. The

entrepreneurial leader can function can both foster the activity internally and stimulate undertakings by external actors.

In Norway the Fylkesmannen of Sogn og Fjordane are considered to be a frontrunner in fostering the integration of CCA in spatial and emergency planning (Aall, 2014a). Interviewees indicate that over time and after a considerable amount of declined spatial plans the integration of CCA into spatial planning and the quality of the risk assessments are increasing (Stensvand, 2014; Orheim, 2014). Furthermore the gained knowledge and experience is communicated through projects and conferences to local, regional, national and international policy makers. Examples of the exchange of knowledge are the presentations on the integration of climate impacts in spatial planning by the head of Emergency planning of Sogn og Fjordane at the '*Second Nordic International Conference: CCA research meets decision making*' and the project '*Arealklim*'. Even though their activities are formal responsibilities they are/were showing entrepreneurial leadership by starting the integration of RVAs in local planning before the national legislation required it and are actively communicating the experiences to external actors. Nevertheless, actors are not actively stimulated to show entrepreneurial leadership in areas beyond the formal responsibilities. As previously discussed, the resources are very limited, no CCA projects are (co-)funded by the Fylkesmannen.

In conclusion, the Fylkesmannen of Sogn og Fjordane have shown entrepreneurial leadership by leading in the integration of CCA in spatial planning. However, beyond the formal responsibilities the regional authority does not foster entrepreneurs to undertake action leading to only a moderately positive effect. The table with the scores of the dimension 'Leadership' can be found below (table 21).

Dimension	Criteria	Scoring	Explanation
Leadership	Collaborative leadership	-2	-No collaborative leadership has been observed. -Institutions strongly disincentivize collaborative leadership as the tools do not allow for a participative policy process and collaborative leadership role is not fulfilled in external projects
	Visionary leadership	-1	-Formal responsibilities are focused on policy implementation and not the creation of visionary ideas/projects severely limiting the ability to fulfil the visionary leadership role -Previous county Governor Oddvar Flæte acted as a visionary leader by chairing national committee on CCA resulting in integration of CCA on regional and local level but on the regional level no visionary leadership has been observed
	Entrepreneurial leadership	+1	-The Fylkesmannen of Sogn og Fjordane have taken the lead in integrating CCA in spatial planning and are actively communicating their efforts. -Institutions allow for but do not actively stimulate entrepreneurial leadership

Table 21: Scoring of the dimension 'Learning capacity' of the Fylkesmannen of Sogn og Fjordane.

4.5 Dimension Resources

4.5.1 Authority

Here, the perceived authority of the county Sogn og Fjordane is discussed. Authority is important for the adaptive capacity of regional authorities as it fosters willingness to cooperate of relevant actors and can enable actors to take decisive action to create and implement CCA policy.

The Nordic planning tradition employs a top-down "allocation of responsibilitiesfrom the national level to the 19 Fylkesmannen and the 428 municipalities" (Keskitalo, E. C. H., 2010, p.302). Within the spatial planning policy field, the Fylkesmannen have the authority to supervise and evaluate municipal spatial planning and can decline the municipal spatial plans if they do not sufficiently meet requirements (Keskitalo, 2010). The authority of the Fylkesmannen is sufficient for the implementation of their formal responsibilities. As the resources on the local level are limited the municipalities are more open to accepting advice and instructions of the Fylkesmannen to support them in the execution of local RVAs. The municipalities of Norway govern a relatively small amount of inhabitants and consequently receive few financial resources from the national level. The municipality of Førde is the largest municipality in Sogn og Fjordane with a population of 12.500 and the smallest municipality of Solund only has 850 inhabitants (Eurostat, 2014). Respondents indicate that the municipalities with the smallest size struggle the most to adequately implement RVAs into their spatial planning processes (Stensvand, 2014).

Nevertheless, the scope of the authority and the responsibilities is limited. The Fylkesmannen have the authority to decline spatial plans if they do not meet the requirements but have no authority to stimulate regional actors to integrate other aspects of CCA into policy making. The agricultural and the environmental department do not have formal responsibilities in regards to CCA and while they are aware of possible negative effects of CC they currently are not taking action to analyze regional vulnerabilities or addressing CC impacts (Anonby, 2014; Rekkedal, 2014). The clear assignment of responsibilities thus both have a positive and negative effect on the adaptive capacity of the Fylkesmannen. The author considers the effect of the current level of authority to be moderately positive as it has enabled the Fylkesmannen to take decisive action to ensure CCA is implemented on the local level reflecting a +1 score. Nevertheless, as the authority is limited in scope in terms of CCA there is room for improvement to further foster the adaptive capacity.

4.5.2 Human resources

In this section the criterion 'human resources' will be discussed. The extent to which the regional authority foster the availability of expertise, knowledge and human labour is important for the adaptive capacity of regional authorities as CC is a complex issue and policy makers will need sufficient manpower and diverse set of knowledge and expertise to successfully adapt to CC.

The Fylkesmannen of Sogn og Fjordane have limited human resources available to them. Since the revised 2008 Building and Planning Act the department of Civil Protection and Emergency Planning has received additional responsibilities and tasks from the central government in regards to CCA (Norwegian government, 2014). The increase in responsibilities have, however, not been met with an increase in human resources. A report from the 'Office of the Auditor General in Norway' shows that in the years 2003-2006 the amount of FTE (Full Time Equivalents) declined from 4 to 2.8 at the department of Civil protection and Emergency Planning at the Fylkesmannen of Sogn og Fjordane (Riksrevisjonen, 2010). More recent data was not available but interviewees indicated that currently there are three employees active at the Fylkesmannen of Sogn og Fjordane as part of the department of Civil Protection and Emergency Planning (Orheim, 2014). Their time is not dedicated

solely on fostering CCA but covers all responsibilities of the department. Even though the policy makers perceive that CCA is given considerable priority in comparison to other counties in Norway the dedication of time and staff is modest. Adaptation is still a new policy field and there is a great need for expertise and knowledge to be developed.

The educational background and experience of the staff involved in adaptation policy is sufficient to carry out the current tasks. The educational backgrounds of the interviewees include economical geography, spatial planning and agriculture. Moreover, they have gained experience through the execution of their formal responsibilities but policy makers aim to improve the quality of advice given to the municipalities (Stensvand, 2014). For example, policy makers indicate that the translation from the RVAs to concrete measures is problematic for the municipalities. Interviewees indicate that the provision of more specific advice to further support municipalities is considered to be important but resources are inadequate to expand current activities.

In conclusion, the availability of human resources is under pressure as the responsibilities of the Fylkesmannen have been increasing but the amount of FTEs allocated to Civil Protection and Emergency Planning has been declining. While respondents indicate that they can perform their formal responsibilities there are very limited man-hours available to generate new tools and improve the quality of the evaluation of spatial plans. Therefore, the criterion human resources has been scored a -1 reflecting a moderately negative effect. The ability of actors to adapt to climate change and make changes to the regional authority is thus moderately negatively impacted by the availability of human resources.

4.5.3 Financial resources

This section entails the analysis of the availability of budget for the creation and implementation of CCA policy and measures. A lack of financial resources can lead to inaction, decrease the quantity and quality of learning processes and reduce policy ambitions.

Most financial resources of the Fylkesmannen at the department of Civil Protection and Emergency Planning are allocated to the execution of their formal responsibilities. There is no budget available for side-activities such as the creation of pilot projects or research: while they do participate in research projects only manpower is allocated to them. The financial resources, according to the respondents, are sufficient to perform the formal responsibilities (Stensvand, 2014; Orheim, 2014). While the numerical values of the financial budget were not available the activities performed in the year 2013 will be discussed to give insight were the resources were allocated to. In regards to spatial planning a total of 576 plans were evaluated in 2013 against 641 in 2012. Of these plans only 22 plans were declined for various reasons such as the exclusion of a RVA, too severe impact on biodiversity and conflicts in regard to conservation of beaches. In terms of emergency planning the Fylkesmannen have held emergency exercises through the emergency council. (Fylkesmannen of Sogn og Fjordane, 2014d). Moreover a regional RVA was executed to which the actors part of the emergency council contributed in terms of expertise and provision of data. Does the available budget, which is sufficient for the formal responsibilities, enhance the adaptive capacity of the regional authority. Gupta *et al.* (2010) argue that the financial resources should not only be available for the implementation but also experimentation with climate adaptation solutions. The Fylkesmannen of Sogn og Fjordane are dependent on external sources to further develop their tools and guidance material. Insofar the cooperation with research institutes such as Vestlandsforskning to develop knowledge is working well. Nevertheless, the dependency on external resources for knowledge development is an unhealthy situation. The budget, even though it is limited, is secured

for the long-term. As the responsibilities have been formalized through legislation on the national level it is expected that the integration of CCA in spatial planning and emergency preparation will continue. This continuity is positive for the adaptive capacity as it allows actors to make long term plans and reduces the focus on short term direct effects.

In conclusion, the criterion financial resources has been scored 0 reflecting a neutral effect on the adaptive capacity. The neutral score has been assigned as the indicators present a mixed view on the criterion. In general the budget is very limited and no financial resources are available for experimentation and project development. However, the financial budget is secured for the long term and through cooperation with external actors knowledge development takes place. The table with the scores of the dimension 'Resources' can be found below (table 22).

Dimension	Criteria	Scoring	Explanation
Resources	Authority	+1	-The level of authority is clearly defined and has enabled the Fylkesmannen to take decisive action to ensure CCA is implemented on the local level -The level of authority is limited in scope in terms of CCA and there is room for improvement to further foster the adaptive capacity.
	Human resources	-1	-The availability of human resources is under pressure as the responsibilities of the Fylkesmannen have been increasing but the amount of FTEs allocated to Civil Protection and Emergency Planning has been declining -The expertise is sufficient due to experience in formal responsibilities and participation in external projects -The external knowledge resources are available even though internally there is no funding available to provide funding -The extent to which training is available is limited
	Financial resources	0	-The financial resources are sufficient to perform most formal responsibilities but do not allow for knowledge development. -As the responsibilities are part of national legislation the provision of finances for the CCA is expected to continue in the long term

Table 22: Scoring of the dimension 'Resources' of the Fylkesmannen of Sogn og Fjordane.

4.6 Dimension Fair Governance

4.6.1 Legitimacy

In this paragraph the legitimacy of the actions undertaken by the Fylkesmannen are analyzed. The actions are legitimate when the generalized perception is that they are desirable, proper, or appropriate within the socially constructed system of norms, values, beliefs, and definitions (Suchman, 1995).

Legitimizing CCA to the general public does not play an important role for the Fylkesmannen of Sogn og Fjordane. The CCA plan only focuses on listing the projects related to CCA and does not attempt to legitimize them or provide a goal they are working towards. Unlike the province of Groningen, no climate change projections are employed to generate legitimacy or awareness. This may be due the general perception that climate change projects are of little use due to a lack of

precision in the county (Stensvand, 2014). The impacts of CC are mainly felt in the form or rock-slides, avalanches and extreme weather. To identify mountain slopes with a high risk of rock-slides specialist research is required at a level of precision that CC projections cannot provide. In similar fashion the website of the Fylkesmannen in Sogn og Fjordane provides no arguments to create awareness for or to support CCA. These observations are in line with the responsibilities of the Fylkesmannen: solely focused on policy implementation and not policy creation. They *must* ensure that the municipalities take adequate account of climate change in their decision-making, *have* the responsibility for supervising the municipalities preparedness planning and *must* explain the requirements and expectations of central government to the municipalities (Norwegian government, 2014). The legitimacy of the actions undertaken by the Fylksmannen are not questioned as the Fylkesmannen is the regional authority that is responsible for implementing national policy. Their role and responsibilities are considered appropriate and according to the current norms.

Furthermore the region has felt the impacts of multiple extreme weather events. One clear example is the hurricane Dagmar, reported to be the third-largest storm recorded in Norway for 50 years, which isolated over 7,500 people in Årdal, Høyanger, Balestrand, and Seimdalen and shut down electricity and telecommunications for multiple days (The Foreigner, 2011). Whether these events are directly related to CC is uncertain but they have generated awareness and a sense of urgency for CCA measures. Legitimizing specific CCA measures may be more challenging for the municipalities. They have the responsibility to translate the RVAs to the concrete measures. The local level may thus have a more important role in securing awareness and legitimacy for CCA policy, as well having a role in creating and implementing the measures.

In conclusion, the role and the actions of the Fylkesmannen of Sogn og Fjordane are perceived to be legitimate. As they are regional authority that is responsible for implementing national policy their role and responsibilities are considered appropriate and according to the current norms. Moreover, the current tools employed have limited impact on society. Therefore the legitimacy has been scored +2 reflecting a positive effect.

5.6.2 Responsiveness

In this section the criterion 'responsiveness' will be discussed. Responsiveness involves the extent to which the regional authority allows society to provide feedback to the actions and plans and the extent to which the organization shows an adequate response to the public input (Gupta, *et al., 2*010).

There are no formal means for society to directly respond to the actions undertaken by Fylkesmannen in regards to CCA. The evaluation of the spatial plans is a policy process which only involves the respective municipality and the Fylkesmannen. Society *can* respond to the municipal spatial plans as they do allow for public participation during the policy process. The extent to which the municipalities in Sogn og Fjordane are required to respond to input or feedback from the public is governed through the Planning and Building act, the Freedom of Information Act and the Environmental Information Act also apply to the spatial plans and risk and vulnerability assessments of the municipalities (Norwegian government, 2014). The municipality is required to make the concept version of the municipal master plan publicly available for commentary by the public (Orheim, 2014).

The response to events in the county and feedback given by society is indirect. The Fylkesmannen execute the policy created by the central government and are instructed by directorate of environment (Stensvand, 2014). Changes in legislation and the perception of CCA take

place through complex geopolitical changes at the national level. Husabø (2008) describes two main shifts in the perception of CCA at the national level. First, a shift in the 1990s where the focus of civil protection shifted from military risks to natural disasters. Secondly, the rise of importance of CCA when in 2007 a "cross-ministerial working group administered by the ministry of Environment was established, with a secretariat administered by the DCPEP, which now coordinates the Norwegian Climate Adaptation Program" (Hovelsrud, 2009, p.10). The national committee led by Oddvar Flæte, which studied the Norwegian society's vulnerability and need to adapt to the effects of climate change is another example of the growing important of CCA on the national level in Norway. Whether these changes are a direct response to society is beyond the scope of this analysis. It is, however, clear that the Fylkesmannen do not bear the responsibility or have the ability to fundamentally change their policy based on input from the society. Therefore, the indicator 'responsiveness' will not be rated as part of this analysis as it is not applicable to the regional level in this case.

4.6.3 Equity

The equity of environmental impacts relates to the moral responsibility of the government to limit the unequal distribution of CC impacts through preventative measures or the provision of compensation to affected actors. Sogn og Fjordane is a mountainous area where rock slides and avalanches are a common occurrences. It is obvious that houses situated nearby a mountain may be impacted more severely by CC than houses situated far away from mountain slopes. Furthermore some civilians may have more resources available to them to adapt to CC or recover from impacts. The extent to which the Fylkesmannen address these issues will be discussed in this section.

Equity is not explicitly considered in the policy documents of the Fylkesmannen of Sogn og Fjordane or the legislation on the national level. It does play a role implicitly through the RVAs and the compensation provided after natural hazards. The RVAs positively influence equity as they are used to identify high risk areas, spread risks and implement measures to reduce the risk in vulnerable regions. However, the RVAs do not address the inequitable situation of lower incomes. Policy regarding compensation of civilians has not yet fully been specified as the revision of the Building and Planning Act took place in 2008 (Orheim, 2014). Nevertheless, respondents indicate that when for example a rock-slide severely impacts a building which has been build in the period after 2008 and the negligence of the municipality is proven compensation will have to be provided (Orheim, 2014). The Fylkesmannen play an important role in preventing negligence of municipalities in regards to CCA. They bear the responsibility to ensure that an adequate RVAs are carried out and monitor whether municipal authorities (which have carried out a RVA) only allow construction to take place in areas where the level of risk is tolerable (Husabø, 2008). Whether buildings constructed before the year receive compensation is uncertain; interviewees indicate that this is decided upon on a case by case basis (Stensvand, 2014). The Energy and Water authority (NVE) handles compensation when CCA measures negatively impact actors. An example is the construction of a barrier against rock-slides and avalanches that are build on privately owned land. Compensation for natural disasters are provided by the 'Norwegian Natural Perils Pool' which is funded by a combination of insurance companies and the 'National Fund for Natural Damage Assistance' (Norsk Naturskadepool, 2008). As a result of the storm Dagmar a total of 25 million Euro (228 million NOK) was claimed due to the resulting damages (Norsk Naturskadepool, 2008). The provision of compensation for inequitable situations thus falls outside of the responsibilities of the Fylkesmannen and is not a result of the adaptive capacity of the regional authority.

In conclusion, determining the effect of the equity on the adaptive capacity of the regional authority is complex. Equity implicitly plays a role in the activities of the Fylkesmannen play through the evaluation of spatial plans and RVAs. Through this system they are responsible for ensuring new buildings are not exposed to high levels of risk. Explicitly the link between climate change adaptation and inequitable situations has, however, not been made in formal policies. Nevertheless, as the current activities promote the identification of inequitable situations and address them in the case of the new buildings the criterion has been score +1 reflecting a moderately positive score.

4.6.4 Accountability

In this section the criterion 'accountability' will be discussed. Accountability can be defined as "the obligation to explain and justify conduct" (Bovens, 2003, p.32). Accountability concerns the need for policy makers within governmental authorities, the private sector or civil society to be held accountable for their actions to the affected stakeholders (whether groups or individuals).

The responsibilities of the Fylkesmannen in Sogn og Fjordane are clearly defined although somewhat limited in scope. The official responsibilities of the Fylkesmannen can be divided into three areas. First, the evaluation of municipal spatial planning, which the includes RVAs. Here, the Fylkesmannen both provide advice and instructions to foster the institutional capacity of the municipalities and can decline the spatial plans when the consideration of CC is inadequate. Secondly the Fylkesmannen develop a regional RVA in which the observed risks are analyzed and recommendations are made to address the respective issues. Lastly, they are (partially) responsible for the management and coordination of crises (both natural and human made) and the development of emergency plans. These responsibilities have been assigned at the national level through the Planning and Building Act, Civil Protection Act and guidelines are provided through royal resolutions such as "Establishment of guidelines for regional coordinating responsibilities in the event of crises and disasters during times of peace" and "Responsibility of the County Governors and the Governor for civil protection and emergency preparedness (10). As the responsibilities of the Fylkesmannen are very clearly defined establishing accountability for the results is made easier.

The forum which holds the Fylkesmannen responsible for their results is the national government. The Fylkesmannen report on their activities to the directorate of environment. On a yearly basis the Fylkesmannen receive instructiong from this directorate and feedback on their actions of the past year. For example, in the year 2004 the Fylkesmannen of Sogn og Fjordane were ordered to increase efforts in regards to fostering the inclusion of Risk and Vulnerability Assessments in municipal spatial plans as "only 6 per cent of the county's municipalities reported having carried out RVAs in connection with land-use planning" (Husabo, 2008, p.19). The directorates serve as a forum which holds the Fylkesmannen accountable for the efforts. As the example shows the directorate keeps track of progress made in terms of CCA and provides instructions in areas where progress is insufficient. As the RVAs are required by law there is a clear direction towards which the administration of the Fylkesmannen works towards. Accountability does not appear to play a role in the research projects related to CCA in which the Fylkesmannen participate. As the allocated resources to these projects are very limited the achieved results are generally seen as positive.

In conclusion, the top-down nature of policy making in Norway positively affects the extent to which accountability is fostered by the Fylkesmannen of Sogn og Fjordane. They are directly accountable to the national directorates. The clearly established accountability fosters the adaptive capacity as the directorates ensure that changes are made in areas where performance is

insufficient. Therefore the criterion accountability has been scored +2 reflecting a positive effect. The table with the scores of the dimension 'Fair governance' can be found below (table 23).

Dimension	Criteria	Scoring	Explanation
Fair governance	Legitimacy	+2	-The CCA policy of the Fylkesmannen is seen as legimate due to the responsibilities being defined in national legislation and due to the general role of the Fylkesmannen as implementer of national policy. -- Due the non-invasive nature of the CCA measures and the extreme weather events in the past the measures are seen as legitimate.
	Responsiveness	n.a.	
	Equity	+1	-Equity is fostered through the implementation of RVAs but is not explicitly considered in formal policies. -Equity is considered in practice by providing compensation to individuals who are negatively impacted by CCA impacts or CCA measures.
	Accountability	+2	-Fylkesmannen are directly accountable to the national directorates which evaluate their performance. -Multiple examples are present of the Fylkesmannen being held accountable for CCA performance.

Table 23: Scoring of the dimension 'Fair governance' of the Fylkesmannen of Sogn og Fjordane.

4.7 Dimension Willingness and perceived ability to adapt

4.7.1 Adaptation motivation

Here, the indicator adaptation motivation will be discussed. The adaptation motivation is defined as the extent to which "decision makers and other actors to realize, support and/or promote adaptation to climate change (Grecksch, 2013).

The interviews, policy documents and literature show a high motivation at the department of Civil protection and Emergency Planning to adapt to climate change. Policy makers at the department of Civil protection and Emergency Planning perceive are well aware of and motivated to adapt to CC (Orheim, 2014; Stensvand, 2014). Climate change is perceived to be both a short and long term problem. The extreme weather events that have occurred in the last years are partially attributed as an effect of CC. Flooding, avalanches, mudslides leading to closed roads are "almost a normal situation here" (Stensvand. 2014). The perceptions of the interviewees are supported by results from the Arealklim project which indicates that in 1-3 out of 10 cases of extreme weather events and natural hazards were attributed to climate change as they were outside of the natural variability of the climate (Aall, 2014b). The danger of CC is immediate and through an increase in quality of spatial planning most impacts (7-9 out of 10) could have been prevented (Aall, 2014b). The motivation is also reflected at the higher political level as the activity of the previous Governor of Sogn og Fjordane in a national committee is perceived to still positively influence the prioritization of CCA. Currently, the Fylkesmannen in Sogn og Fjordane are considered to be the frontrunners in ensuring CCA is integrated in municipal spatial planning (Aall, 2014a). At the same time, the department of Civil protection and Emergency Planning is the smallest department at the Fylkesmannen. The high motivation is not reflected throughout the Fylkesmannen administration.

Even though the Environmental department and the Agricultural department indicate that they perceive CCA as an issue which will have to be addressed to protect biodiversity and the agricultural sector no policy has been implemented to address these issues (Anonby, 2014; Rekkedal, 2014). The limited scope and compartmentalization of CCA at the Fylkesmannen is detrimental for the adaptive capacity of the regional authority.

In conclusion, the Civil Protection department of the Fylkesmannen is motivated to adapt to climate change. However, the motivation to adapt to climate change is not high throughout the regional authority as the department of Environment and the department of Agriculture do not show the willingness to undertake action in regards to CC even though they do perceive the impacts of CC as problematic. Therefore, the criterion has been scored -1 reflecting a moderately negative effect.

4.7.2 Problem perspective

The adaptation belief refers to how actors perceive their ability to successfully adapt to climate change with the current expertise and knowledge they have available to them. Only if key actors are convinced of the success of adaptation will it also be possible to activate the other elements of adaptive capacity (Grecksch, 2013, p.809).

The department of Civil Defence presents a mixed view on their perceived ability to adapt. The process of integrating CCA through the RVAs has been challenging. An evaluation by the 'Office of the General Auditor' shows that the county governors observed a great variation in quality between the RVAs of the local municipalities. Furthermore 50% of the county governors requested assistance of the national government to increase their capacity to provide guidance on CCA to the municipalities. Respondents indicate that the amount and quality of RVAs have been rising but "we have to use more energy and resources to provide concrete advice to the municipalities" (Stensvand, 2014). The actors thus perceive the current measures as realizable but in terms of effectiveness the quality of the RVAs and the translation of the assessments to concrete measures requires improvement. To increase the quality of their advice the Fylkesmannen of Sogn og Fjordane partake in projects such as 'Arealklim' but these activities are secondary to their formal responsibilities. They are dependent on external organizations and the national government to provide support to increase their institutional capacity and knowledge base.

In conclusion, the integration of CCA in spatial planning has been a challenging process. The utility of employing RVAs is not questioned. It is mainly the ability of the Fylkesmannen and the municipalities to ensure optimal quality and the translation to concrete measures that remains a challenge. The criterion 'adaptation belief' has been scored +1 reflecting a moderately positive effect. This score has been applied as the Fylkesmannen perceive that both effective and realizable measures are available but nevertheless see that there is room for improvement.

Dimension	Criteria	Scoring	Explanation
Willingness and perceived ability to adapt	Adaptation motivation	-1	-High motivation at the Department of Civil Defence but low motivation to adapt at the Department of Agriculture and the Department of Environment (0)
	Adaptation belief	+1	-The Risk and Vulnerability assessments are seen as a very effective and appropriate tool - The quality of implementation of the current tools have been rising in effectiveness but nevertheless the realization of the CCA measures remain challenging due to limited resources

Table 24: Scoring of the dimension 'Willingness and perceived ability to adapt' of the Fylkesmannen of Sogn og Fjordane.

4.8 Synthesis

The Fylkesmannen of Sogn og Fjordane are considered a frontrunner in comparison with other Fylkesmannen in Norway in fostering the implementation of CCA on both the regional and local level. Initially the regional climate plan, which was the most prominent policy document used to select the region of Sogn og Fjordane, was perceived to play a vital role in dividing responsibilities and assigning roles to actors. In practice, the document served mainly as a way to communicate the activities in regards to CCM and CCA in the region. The Nordic planning tradition employs a more top-down allocation of responsibilities from the national level to the 19 Fylkesmannen and the 428 municipalities (Keskitalo, 2010). The Fylkesmannen receive their instructions from the national government and focus on the execution of those responsibilities. In this section, the results of and the inter-linkages between the dimensions and criterions will be discussed to gain insight into the strengths and weaknesses of the adaptive capacity of the Fylkesmannen of Sogn og Fjordane. It should be emphasized that the framework cannot and is not meant to evaluate the effectiveness of the program and its activities. Instead it analyses the characteristics of the regional authority to gain insight into the extent to which the governmental arrangements, policy making processes foster the adaptive capacity.

The application of the adaptive capacity framework shows an interesting perspective on the characteristics of the adaptive capacity of the Fylkesmannen of Sogn og Fjordane (see figure 4 and table 25 below). In general, the adaptive capacity shows a mixed perspective: there are multiple strong and weak aspects to the adaptive capacity of the regional authority. The main reason for the mixed perspective on the adaptive capacity relates to the governmental approach to CCA and the top-down relation between the national, regional and local level. Instead of employing a governance approach to policy making the Fylkesmannen employ a more traditional and hierarchal policy making style to foster the integration of CCA. This style of policy making was unexpected as the climate plan appeared to indicated a participative policy process. In terms of adaptive capacity this approach leads to some severe limitations.

The criteria of the dimension 'Variety' give clear insights into the negative effects of the focused top-down approach. An adaptive regional authority is flexible and is able to change its approach based on new information. Due to the top-down approach most aspects of policy making have been clearly defined: roles, tools and integration of external actors. This has led, in the case of the Fylkesmannen, to employing the RVAs as the only tool to identify risks and integrate CCA into spatial planning. Both in terms of scope (e.g. exclusion of biodiversity) and in practical use (e.g. difficulties in translating the results to practical measures) the RVA has shown limitations. It is possible that these limitations can be overcome but it nevertheless poses a risk as no alternative tools have been developed or explored. Moreover, the field of CCA is dominated by framing CCA as a danger and a problem. While the dominant impacts of CC are negative for the region of Song og Fjordane a broader perspective on CCA may serve to attract a higher diversity of actors and assist actors in gaining a different perspective on CCA leading to the exploration of alternative solutions. There is a reason for the manner in which the responsibilities have been assigned; the current role in CCA is similar to the role regional authorities and organizations have in other policy areas. At the same time, taking the same approach shows that climate change is addressed as a 'regular' problem

Figure 4: application of the adaptive capacity framework on the Fylkesmannen of Sogn og Fjordane

Type of effect on adaptive capacity	Average score	Color coding
Positive effect	1,50 to 2,00	
Moderately positive effect	0,50 to 1,00	
Neutral effect	0,49 to 0,49	
Moderately negative effect	-0,50 to -1,49	
Negative effect	-1,01 to -2,00	

Table 25: Color coding of the adaptive capacity framework.

climate change is considered to be a wicked problem. The dimension 'leadership' is affected in a similar manner by the sole focus on implementation and not on policy development. There is no room for visionary long term plans and as the roles and responsibilities have been clearly defined performing a collaborative leadership role is not possible. Nevertheless, the Fylkesmannen do show entrepreneurial leadership by being at the forefront in the integration of RVAs in local policy making and are actively communicate their efforts through conferences, within research projects and to the national government to inspire other actors (entrepreneurial leadership).

As previously mentioned, the focused top-down approach also positively affects the adaptive capacity of the Fylkesmannen of Sogn og Fjordane. Especially the dimensions 'fair governance' and 'learning capacity' reflect the positive sides of the approach. As the division of responsibilities and roles have been clearly defined on the national level the perception that the activities of the Fylkesmannen are appropriate and desired is high (i.e. are perceived to be legitimate). Furthermore the hierarchal relationship stimulates the Fylkesmannen to keep track of the process which has been made. As they are required to report to the national government on a yearly basis and receive instructions on areas which require additional attention the focus of the CCA efforts is clear. Furthermore, the regional authority is focused on the implementation of national policy and not the creation of CCA policy. Therefore the hierarchal relationship leads to positive changes to policy making as the policy makers are open towards the instructions and regard the feedback from the national level as positive.

The clear but limited scope also fosters the dimension 'learning capacity'. The department of Civil Protection and Emergency Planning aims to improve the quality of the advice provided to the municipalities to improve the implementation of RVAs on the local level. Even though limited resources are available for learning processes the Fylkesmannen have managed to participate in multiple research projects and have sought feedback from regional planners through yearly meetings. At the same time, due to the hierarchical relationship the Fylkesmannen are not active in double loop learning as they do not have the authority (or resources) to challenge the assumptions and fundamentally change the direction of policy. In other words, they do not have the authority to switch from the RVA to alternative tools, set different goals or expand their activities beyond spatial planning.

In terms of 'resources' the Fylkesmannen of Sogn og Fjordane have limited financial and human resources available to them to implement CCA policy. The department of Civil Protection and Emergency Planning is the smallest department in terms of staff and has no budget available to them to spend on research and project development. The expanded responsibilities have not been met with additional resources. In combination with the low institutional capacity of the municipalities the integration of CCA in spatial planning continues to be challenging. Nevertheless, by utilizing external financial and human resources the Fylkesmannen are able to participate in research projects.

In conclusion, the adaptive capacity framework indicates a neutral effect. The criteria thus indicate that the level of adaptive capacity has a neutral on the ability of actors to successfully implement climate change adaptation and make changes to the regional authority if deemed necessary. The aggregated score, however, does not sufficiently reflect the nuances of the adaptive capacity of the Fylkesmannen of Sogn og Fjordane. Van den Brink *et al.* (2014) argue that the adaptive capacity framework can support identifying weaknesses and strengths that can then be changed or further built upon. The provide a structure at the regional level the national government has assigned responsibilities based on the existing tasks of the regional authorities. The top-down approach of governmental authorities has hampered variety, leadership and double-loop learning. This analysis shows that on the regional level, there might be a tension between clearly dividing roles and responsibilities and adopting a multi-level, participative governance approach. However, the top-down approach does foster the regional authority to establish a clear focus and direction as they are held accountable by the national government for their performance.

Key strengths:

(1) Clearly established responsibilities in terms of climate change adaptation which foster a clear focus policy making

(2) Clever use of external actors for knowledge development as internal resources are limited.

(3) The hierarchal structure between the national government and the Fylkesmannen lead to clear accountability procedures which in combination with the institutional memory and single-loop learning processes improve the quality of policy making forward.

(4) Mainstreaming of climate change adaptation in existing policy fields (i.e. spatial planning and emergency preparedness)

Key weaknesses:

(1) Fundamental change in policy making as a result of double-loop learning is not possible as the Fylkesmannen are solely focused on policy implementation and not the creation of policy

(2) Risk of path dependency due to strong focus on RVAs as the sole policy tool.

(3) Limited scope in terms of climate adaptation. The responsibilities to integrate climate change adaptation into policy making processes does not extent to the environmental department and agricultural department. are not active in the field of climate adaption

(4) Limited human resources: smallest department in terms of people is responsible for regional climate change adaptation

Chapter 5: Comparative analysis

5.1 Introduction

The case studies of the Province of Groningen and the Fylkesmannen in Sogn og Fjordane show a perspective on CCA policy that has many similarities and vast differences. Both regional authorities can be considered front-runners and are struggling to translate the abstract objectives, targets and visionary plans to concrete action. In both cases the CCA efforts reflect the national level in terms of perspective and scope. At the same time, the extent of freedom and choice they have in shaping their policy differs greatly. In this chapter, these similarities and differences will be compared per dimension of the adaptive capacity framework. As a first step, the context being the regional climate impacts, the governmental structure, responsibilities and the CCA efforts will be compared. The intention of this analysis is to gain insight in to what extent the context in which the regional authorities operate influences their approach to policy making. The second step involves the comparison of the adaptive capacity of the two regional authorities per dimension of the adaptive capacity framework. The results will be employed to make recommendations on specific dimensions or indicators to strengthen the adaptive capacity of the respective regional authority. For both the first and second step the sections will be introduced through a table which presents an overview of the key similarities and differences.

5.2 Regional context

	Province of Groningen	Fylkesmannen of Sogn og Fjordane
Main climate change impact	Pressure on water network (both inland and coastal) leading to flooding or damage to agriculture	Stress on building environment and infrastructure through rock slides, mud slides, slush flows, avalanches and flooding.
National climate change adaptation policy	Focused on water management (i.e. Delta program). CCA strategy is expected to be concluded in 2017.	National CCA strategy focused on spatial planning and emergency preparedness.
Extent of formal responsibilities	Indirect: formal responsibilities in spatial planning, nature management and monitoring of regional and local authorities	Direct: formal legislation clearly defines CCA responsibilities and roles in terms of spatial planning and emergency preparedness.
Type of approach to policy making	Project based, governance approach which are integrated in regional development activities.	Top-down, hierarchal structure and integrated into existing activities
Scope of climate change adaptation activities	Diverse and broad in scope: projects in water management, agriculture and heat-stress	Narrow and focused: activities in spatial planning, emergency preparedness and participation in research projects

Table 26: General characteristics Province of Groningen and Fylkesmannen of Sogn og Fjordane.

5.2.1 Regional climate projections and impacts

The climate projections of the Province of Groningen and the Fylkesmannen of Sogn og Fjordane are difficult to compare as their selection of climate models, methodologies to downscale the projections, the use of scenarios and the level of detail are different. Nevertheless, in spite of the

divergence in characteristics a comparison will be employed to gain insight into the similarities and differences of the extent of climate change and expected impacts.

The climate projections indicate that the region of Sogn og Fjordane can expect a lower increase in average temperature (+1.5^0 Celsius) compared to the Province of Groningen (+2.4^0 Celsius) in the year 2050. Even though the projected temperature is almost a whole degree lower in Sogn og Fjordane, the change in climate is substantial. Moreover, the temperature change will lead to more extremely hot days resulting in droughts and more extreme precipitation and storms resulting in flooding and structural damages. Both regions will face a similar sea level rise of between 15 and 35-37 cm. The continental uplift of Norway, due to the post-glacial rebound effect, partially negates the sea-level rise but this surprisingly does not result in a difference in the projections of (relative) sea-level rise. However, in the province of Groningen the relative rise in sea-level may be further increased in some localities due to the exclusion of soil inclination from the regional CC projections (Provincie Groningen, Provincie Drenthe, 2014). In general, while the climate projections show meaningful differences the climate impacts show a larger disparity due to the divergences in geography.

The Netherlands, a country with 26% of its territory below sea-level, a long coastline and an extensive network of rivers, canals and ordinary watercourses, is mainly impacted by climate change in terms of water safety and coastal defense (Provincie Groningen, Provincie Drenthe, 2014). This is in contrast to Norway, where the impacts of CC are mainly felt in the form of rock slides, mud slides, slush flows, avalanches and flooding (Fylkesmannen of Sogn og Fjordane, 2013). While there have been examples of extreme situations in the Province of Groningen the frequency and the extent to which daily life is disrupted, the structural damage and the risk of civilian casualties are more substantial in the region of Sogn og Fjordane. It should be noted that these extreme events are part of the 'normal' climate of Sogn og Fjordane but are increased in frequency and intensity by CC. The need to adapt to heat stress caused by the Urban Heat Island effect is a problem limited to the urban areas of the Province of Groningen. Sogn og Fjordane has only a limited need to address heat stress due to the relatively low average temperature and the low population density (Eurostat, 2014).

There are similarities, both regions benefit from an increased growth season which positively affects the agricultural and forestry sector. At the same time, both regions will have to adapt their crops to the extreme weather events and increased risk of incidence of pests and diseases. The natural areas and ecosystems, in both regions, will be negatively impacted as the animal and plant species may not be able to adapt to the new range of weather/climate, may not be able to migrate due to unavailability or fragmentation of suitable habitats and may be negatively impacted by invasive species which compete for resources. In terms of tourism both regions may become more attractive due to the warmer climate. At the same time, for the region of Sogn og Fjordane the decline of cold days resulting in a reduction in snow (skiing areas) and the risk of retreating glaciers may reduce the attractiveness of the region.

5.2.2 National adaptation policy

The governmental structure through which CCA policy is given form started in a similar way in both the Netherlands and Norway; through the creation of reports and policy at the national level. In the Netherlands, the CCA program 'Make Room for Climate' was developed in 2006 resulting in a surge of climate adaptation research through the 'Knowledge for Climate' program and led to 'climate agreements' at the regional level between provinces (Algemene Rekenkamer, 2012). In Norway, CCA started through a series of 'Official Norwegian Reports'. The first report in 2004 outlined in one of

the chapters, through a basic analysis, the consequences of climate change for the Norwegian society and the second report (2006) referred to adaptation to CC as a 'new' security threat (Husabø, 2008). Due to the decline in military risks the focus had shifted to emergency planning and preparation for catastrophes and disasters (Husabø, 2008) In 2007, the Norwegian government established an inter-ministry program aimed at facilitating the analysis of vulnerability, knowledge development and coordination (1). Simultaneously, the emergence of CCA was fostered by research programs such as the RegClim program and research funded through the Council of Norway (Aall, 2012). At this point in time, both the national governments were making progress towards a national adaptation strategy by identifying the vulnerabilities, working towards a clear division of responsibilities and setting up a framework through which CCA would be coordinated.

It is during the following period that the policy field of CCA was shaped and the paths on the national level between the Netherlands and Norway diverged. The decisions made in the following period are still strongly reflected in the current CCA efforts at the regional levels. In the Netherlands, the 'Delta Program' was developed. This program strongly fostered CCA action in water related areas but concurrently led to a diminished attention to the 'Space for Climate' program resulting in a 'silent death' (Algemene Rekenkamer, 2012). The early end to the 'Space for Climate' program subsequently led to the ceasing of coordination between the provinces at the regional level. The 'Delta Program' in combination with the 'Knowledge for Climate' program have led to adaptive action in terms of coastal defence, water management and climate 'proofing' urban areas but have also caused a multitude of negative effects. A national evaluation indicated that due to the discontinuation of the 'Make Room for Climate' program the national policy lacks coherence, does not have a full overview of vulnerabilities leading to unknown risks, has not addressed some vulnerabilities in policy and is not monitored or evaluated as a whole (Algemene Rekenkamer, 2012).

In Norway, the dominant actors at the national are the Directorate for Civil Protection and Emergency Planning (DCPEP) in cooperation with the ministry of Environment. Their combined efforts eventually led to the revision of the building and planning act which fostered the inclusion of CCA through risk and vulnerability assessments at the regional and local levels (Husabø, 2008). The scope of CCA policy in the Netherlands had been reduced to water management and urban climate 'proofing' while in Norway the scope was strongly influenced by the DCPEP which led to the CCA efforts being directed at preparing and planning for natural hazards.

The direction the national CCA policy will take in the Netherlands and Norway is not entirely clear. In the Netherlands, in response to the CCA evaluation, a national adaptation strategy is planned to be completed in 2017. Preparatory work has commenced through the 'Knowledge for Climate' program to support the creation of the national CCA strategy. In Norway, a white paper representing the national adaptation strategy has been published in 2013. It outlines the consequences on nature and society, the framework through which the governmental levels operate and the need for coordination and knowledge development. As the strategy, insofar, has not led to legislative changes the impact of the national CCA strategy is unclear (Aall, 2014a).

5.2.3Regional governmental structure and responsibilities

An important difference between the Province of Groningen and the Fylkesmannen of Sogn og Fjordane is that the Province of Groningen is both responsible for the implementation of national policy and has the authority the create regional policy. In Norway, these responsibilities are separated at the regional level. The Fylkeskommune is similar to the province of Groningen in the sense that the 'county council' is elected by the regional population and focuses on the creation of

policy to, for example, foster regional development. The Fylkesmannen are the representative of the national government and their role is to implement national policy and supervise and support the local municipalities. The head of the Fylkesmannen, the county governor, is not elected but assigned by the national government. If both the Fylkeskommune and the Fylkesmannen were active in CCA the ability of the authorities to respond to CCA would, in this respect, be similar to the Province of Groningen. However, there is a informal division in responsibilities on the regional level in Norway: the Fylkesmannen is mainly active in CCA and the Fylkescommune is mainly active in CCM. This division has a substantial impact on the adaptive capacity of the Fylkesmannen and will be discussed in more detail in the comparative analysis of the dimensions of the adaptive capacity.

The main formal responsibilities of the Province of Groningen, in regards to CCA, are limited to regional spatial planning, monitoring of the water boards, implementation of the 'National Ecological Network' and the management of natural areas. The centre of the CCA efforts of the province of Groningen is the CCA program. The CCA plan and its individual projects are shaped by a policy network which consists of a multitude of plans and agreements such as the 'Provincial Spatial Plan', the 'Climate Agreements' between the provinces, 'Space for Climate program' and the 'Delta Program'. While some of these programs have been discontinued they influence(d) the creation and the implementation of the CCA plan (see chapter 3). In Norway, the responsibilities are not guided by a framework of agreements. The regional Climate Plan, created in cooperation between the Fylkeskommune and Fylkesmannen, is not the centre of their CCA efforts. Instead, the Fylkesmannen receive instructions directly from the ministries and directorates at the national level. Their responsibilities, in terms of CCA, are guided through the national legislation (e.g. the Planning and Building Act, Emergency Preparedness Act), royal resolutions and regulations (e.g. the 1997 guidelines on division of responsibilities in the event of crises). The formal responsibilities of the Fylkesmannen in Sogn og Fjordane are the evaluation and fostering of risk and vulnerability assessment of municipalities, a regional risk and vulnerability assessment, ensuring regional and local emergency preparedness and coordinating in the event of crises.

5.2.4 Conclusion

In conclusion, the extent to which climate change adaption policy has been developed and the governmental approach to policy making on the national level strongly influences CCA on the regional level. In the Province of Groningen the national level has a relatively low level of influence resulting in a broader scope and a governance approach. In the case of the Fylkesmannen the strict guidance of the national government has led to a focused yet narrow scope and a top-down approach in policy making.

5.3 Dimension Variety

	Province of Groningen	Score	Fylkesmannen of Sogn og Fjordane	Score
Variety of problem frames	High diversity in problem frames which represent the interests of a multitude of actors	+2	Both on the national level as on the regional level CCA is perceived mainly as a danger	-2
Multi-actor, multi-level, multi-sector	Inclusion of actors is at the centre of policy making	+2	Extent to which actors are included in guided by formal legislation resulting in broad inclusion of actors	0

			in some activities and exclusion of actors in others.	
Diversity of solutions	Broad inclusion of actors has fostered the expertise and there is room for the development and experimentation with new solutions	+2	Strong focus on the RVAs to foster CCA which increases the risk of path dependency.	-2
Redundancy	Some redundant measures have been implemented but no explicit attention is given to the relevance and importance of redundancy.	0	Redundancy is not explicitly discussed but the strong focus on emergency preparedness as back-up measure positively affects the adaptive capacity.	+1

Table 27: Comparison scoring dimension 'Variety'.

5.3.1 Variety of problem frames

The findings show that the Province of Groningen and the Fylkesmannen of Sogn og Fjordane, both in terms of variety of problem frames and the type of problem frames present, view CCA differently. The Province of Groningen perceives CCA as an economic opportunity to improve agricultural competitiveness, regional development and foster tourism (Economic Development Frame), as a security problem (Pandora's Box Frame), and as an issue requiring compromise between actors (Middle Way Frame). At the Fylkesmannen of Sogn og Fjordane the dominant frame is the perception is that CCA is required to prevent extensive damage to population and structures (Pandora's Box Frame) and to a very limited extent the improvement of the production capacity for the agricultural sector (Economic Development Frame). There are multiple factors which explain the problem framing and in both cases the dominant frames originate from the national level. In the Netherlands, water management, especially through the 'Delta Program', is presented as an economic opportunity. The Dutch politicians and the society perceive climate change more as a threat to economic development, rather than a safety risk (Kabat *et al.,* 2009). As the CCA program was developed as part of the 'Climate Agreements' between the provinces of the Netherlands and many of the water management projects are related to the 'Delta Program' the similarity in problem framing can be explained by these inter-linkages on the project level. In Norway, the Directorate for Civil Protection and Emergency Planning strongly influenced the scope of the CCA policy. "As the emphasis on military risks declined, and as Norway experienced serious natural disasters, non-military risks (i.e. CCA) were gradually pushed to the foreground" (Husabø, 2008, p.28). As the role of the Fylkesmannen is to implement national legislation and as they are guided and evaluated by national directorates it is not surprising that their problem frames reflect the national level.

Nevertheless, the influence of the national level aren't the sole explanation for the types of problem frames. The CCA projects of the Province of Groningen foster a wide variety of participating actors. These actors all have individual discourses and problem frames which have influenced the level of emphasis placed on certain frames. For example the projects at the peat colonies in Groningen the emphasis is placed on the availability of fresh water for agriculture and innovative techniques to secure the competitiveness of the sector and biodiversity. At the Fylkesmannen of Sogn og Fjordane this phenomenon is not present; the CCA policy has limited external stakeholder interaction. The emphasis on risks is actually bolstered by the regional natural crises that have occurred in the past such as the hurricane Dagmar.

5.3.2 Multi-actor, multi-level, multi-actor

The extent of participation of actors in the policy processes differs greatly between the Province of Groningen and the Fylkesmannen of Sogn og Fjordane. The Province of Groningen envisions themselves not as the dominant actor but as a director that fosters regional development and supports other actors in successfully adapting to climate change (Province of Groningen, 2013a). The Fylkesmannen of Sogn og Fjordane mainly interact with the municipalities. Their relation with municipalities is much more like between a teacher and student. The Fylkesmannen provide guidelines, instructions and evaluate the results. They do hold regional meetings with spatial planners to discuss progress, present new guidelines and tools and receive feedback but it is not a participative policy process. The province of Groningen needs the other actors to co-fund the projects, to gain their expertise, to be able to exert influence over the future regional development of Groningen. The Fylkesmannen do not need a broad variety of actors to perform their responsibilities in terms of spatial planning. However, they do participate in research projects to improve the tools they employ and to improve the advice they provide to the municipalities. Additionally, they do not have the capacity to (co-)fund projects and their responsibility is limited to implementation and not the creation of policy. The willingness and need to cooperate have thus led to a broad integration of a variety of actors in the CCA projects of the Province of Groningen. In Sogn og Fjordane, the responsibilities are clearly defined and the policy processes do not allow for a participative process. In order to improve their capacity to perform their official responsibilities they participate in research projects but these activities are limited due to availability of resources.

5.3.3 Diversity of solutions

The diversity of solutions strongly relates to the diversity of actors and the freedom and choice the regional authorities have in creating and/or implementing CCA policy. The Province of Groningen has a high diversity of solutions due to the high experience/expertise of actors and through to the development of tools through (pilot) project. Experience and expertise is especially available in the water management sector. In these projects they cooperate with the Dutch Water Boards and in some cases with the national government to develop a strategy and implement adequate measures for regional issues. The Water Boards have a long experience in water management and have developed, through time, a large diversity of policy options. The inclusion of these actors thus bolsters the availability of policy tools in water management projects. Pilot projects have been set up for stimulating CCA in the agricultural sector.

The Fylkesmannen of Sogn og Fjordane are strongly guided by national legislation in the usage of their tools. Their aim is to foster the quantity and quality of risk and vulnerability assessments at the municipalities. As the identification of risks is still a costly enterprise and the translation from the RVAs to concrete measures remains difficult the participation of the Fylkesmannen of Sogn og Fjordane in research projects are aimed at addressing these issues (Stensvand, 2014). While the RVA is a tool which can be employed to identify a wide spectrum of CCA impacts the singular attention to this tool can lead to path dependency as the current research is only aimed at identifying natural hazard risks for the build environment.

Again the strong guidance of national legislation limits the adaptive capacity of the Fylkesmannen as the tools they employ are limited in scope and can lead to path dependency. At Groningen the broad interaction with actors and stimulation of the development of solutions through pilot projects positively impact their adaptive capacity.

5.3.4 Redundancy

In terms of redundancy the Fylkesmannen of Sogn og Fjordane scores slightly high than the Province of Groningen (+1 against 0). In both regions the formal policies do not explicitly emphasize the need for redundant measures. In both regions there are redundant measures present. These redundant measures in both regions relate to extreme and emergency situations. In Groningen there are areas assigned as 'flood areas' which will be flooded when the dykes near densely populated areas are close to breaking. In Sogn og Fjordane emergency agencies have been outfitted with satellite phones to ensure communication during crises as communication has broken down in the past. The difference in scoring arises from the structure of the formal responsibilities of the Fylkesmannen: the activities are divided into preventative (spatial planning) and reactive (emergency preparedness). Even though redundancy is not explicitly considered the strong focus on reactive measures show that back-up measures are perceived to be important to address the uncertain impacts of CC.

5.3.5 Conclusion

While the limited number of case-studies do not allow for the results to be generalized a pattern does emerge from the application of the adaptive capacity framework. Assigning responsibilities from the national level, while not allowing for flexibility in the implementation (e.g. changing the utilized tools, the scope and the extent to which stakeholders are included) has a negative effect on the dimension 'variety' and the adaptive capacity of regional authorities. As climate change is considered to be a 'wicked' problem the approach of the Province of Groningen, who acts as an enabler and focuses on a broad participation from both the public and private sector, is more successful in fostering the dimension 'variety'.

5.4 Dimension Learning Capacity

	Province of Groningen	Score	Fylkesmannen of Sogn og Fjordane	Score
Trust	Due to extensive cooperation between most stakeholders the trust is high both in terms of institutional trust and personal trust.	+2	The activities of the Fylkesmannen of Sogn og Fjordane depend to a lesser extent on the presence of trust. Nevertheless, the level of trust is sufficient for their.	+1
Uncertainty	Uncertainty is explicitly discussed in both CCA program and the individual projects.	+2	Both the formal policy document and within their activities related to CCA uncertainty is integrated.	+2
Single-loop learning	Single-loop learning is present in most projects but the quality is decreased due to limited evaluations.	+1	Strong focus on improvements in terms of efficiency and effectiveness but there is a dependence on external resources for learning processes.	+1
Double-loop learning	Some projects show double-loop learning but it is not actively stimulated by the Province of Groningen.	-2	The top-down policy making approach to CCA strongly disincentivizes double-loop learning.	-2
Institutional memory	There are no formal rules that stimulate evaluation and no infrastructure to disseminate information is available.	-2	Yearly evaluation of their CCA activities but the infrastructure to disseminate knowledge is limited.	+1

Table 28: Comparison scoring dimension 'Learning capacity'.

5.4.1 Trust

Trust is an important aspect of the adaptive capacity of institutions. A high level of trust stimulates (deeper) cooperation between actors and enhances the ability and willingness to mobilize resources (Rus & Iglic, 2005; Bachmann & Inkpen, 2011). A high level of trust is especially needed in situations that involve high risk, dependency or uncertainty. Trust plays an important role in the Province of Groningen: as they provide funding to external parties and do not possess the expertise to individually carry out the CCA projects they need to feel confident that they can rely on the actors they cooperate with. For the Fylkesmannen of Sogn og Fjordane trust plays a less important role; their policy processes involve limited interactions with external actors and the level of resources allocated to fund projects are much lower. The difference in policy processes have strongly influenced level in trust between the regional actors and the extent to which tools are employed to foster trust.

The level of trust between regional actors in the Province of Groningen is high. The active engagement of the Province of Groningen in CCA has build trust between the regional actors. They are aware of each others capabilities and have realistic expectations of the results of the projects. Furthermore trust building measures are used such as assigning an independent project coordinator for the management of projects. The level of trust between actors is moderate at the Fylkesmannen of Sogn og Fjordane. The Fylkesmannen are mainly active in their formal responsibilities; these are relatively impersonal interactions which are required by national legislation. A moderate level of trust is required in spatial for a normal working relationship which has been fostered by an extensive working relationship between the Fylkesmannen and the municipalities but no tools are employed to actively stimulate trust building.

5.4.2 Uncertainty

The approach to uncertainty of both regional authorities appears to be similar. In both cases there is a focus on technical means to reduce trust. Actors appear to accept trust relatively easily and have accepted that it will be a consistent factor in climate change adaptation. Dealing with uncertainties is integrated both in the CCA program of the province of Groningen and its individual projects. The CCA program emphasizes the need for robust and flexible measures and tools to be able to address the variable impacts of climate change. The tools and measures are considered robust when they have sufficient capacity to deal with unexpected or worst-case scenario impacts (Provincie Groningen, 2011). At the Fylkesmannen the identification and discussion of risk is predominantly done through the regional RVA. The RVA lists the diversity of regional climate impacts and the extent to which the risks and vulnerabilities have been identified and to what extent uncertainties still exist. The Fylkesmannen acknowledge that uncertainties still exist and argue for a focus on technical tools to reduce uncertainty. Unlike the Province of Groningen, however, no managerial tools are employed such as risk dialogues with stakeholders or experimentation with new measures or pilot projects. Nevertheless, both regional authorities focus on reducing or making uncertainty explicit through technical means such as regional climate scenarios.

The approach to risk of both regional authorities benefits the adaptive capacity. Even though there is still focus dominant focus on technical means uncertainty does not seem to play a negative role in the policy processes or as a means to attenuate policy ambitions.

5.4.3 Single-loop learning

The manner in which the regional authorities have organized their single-loop learning processes are very different. In the Province of Groningen the CCA program as a whole fosters a continues single-loop learning process. The aim of the program is to foster the integration of CCA in individual projects and eventually lead to the general integration of CCA into policy making on both the regional and local level. The projects are in themselves single-loop learning processes. In visionary projects the routines to integrate CCA in regional development are improved. Pilot projects foster learning in regard to innovative techniques and tools. At the Fylkesmannen the activities are not focused on learning but on performing the formal responsibilities. Learning to improve routines and tools is a side activity for which limited resources are available. Nevertheless, by using the resources for a yearly meeting between regional and local planners and emergency exercises in combination with the participation in external research projects and CCA conferences knowledge is gained on how to improve routines and improve the implementation of the measures. The Fylkesmannen thus employ external knowledge networks to learn while the Province of Groningen forms a network with regional/local actors, learns though co-funding research projects and learns-by-doing.

5.4.4 Double-loop learning

The transition from single-loop learning to double-loop learning is problematic in both regions. Both the Province of Groningen and the Fylkesmannen focus on improving the current activities and routines (single-loop) and not on questioning the routines or challenging the goals and assumptions. There is a lack of a genuine critical reflection on whether the current activities sufficiently work towards the overall goal. The main difference is that the CCA program of Groningen is their own creation. The Province of Groningen, therefore, does have the authority to enact fundamental changes to the goals and the policy making approach.. The Fylkesmannen are bound by national legislation and do not have the authority to change the scope of CCA or use other tools than the RVAs to assess the impacts of CC in spatial planning. While they can communicate with the national government to propose changes or share experiences they are dependent on them for fundamental changes to the CCA policy or legislation. In both cases the negative effect on the adaptive capacity is of the same level (-2 score). Both regional authorities are under the risk of taking a fundamentally flawed approach. The Province of Groningen does not evaluate or reflect on the overall approach to CCA program and the Fylkesmannen of Sogn og Fjordane are not able to double-loop learn as they do not have the authority to make changes.

5.4.5 Institutional memory

The hierarchal relationship between the Fylkesmannen of Sogn og Fjordane and the Directorates at the national level fosters the evaluation of policy experiences. The Directorate of Environment instructs the Fylkesmannen on their responsibilities, goals and which areas demand additional attention. At the Province of Groningen this type of relation is not present as they are more independent. As a result, there is little focus on evaluation of past policy experiences while at the Fylkesmannen the activities are evaluated on a yearly basis. While the evaluation of the Fylkesmannen is underdeveloped in terms of critically evaluating the results the focus of the evaluation is clear: further improvement of current activities. The CCA program of the Province of Groningen lacks this clear focus. While the broad scope fosters the variety and flexibility, the level of goal attainment is difficult to evaluate. Furthermore, as they cooperate with regional actors and the

project are inter-connected with other CCA programs setting a strict and clear direction may lead to a disconnect with other authorities and CCA efforts.

5.4.6 Conclusion

Both regional authorities struggle with successfully setting up and maintaining the learning capacity. Both regional authorities are in need of additional knowledge in regard to climate change adaptation and have either set up or participated in projects to develop knowledge. At the Province of Groningen there is a focus on moving on from project-to-project which leads to a severe lack of evaluations while at the Fylkesmannen a yearly evaluation does take place but their ability to make fundamental changes to the policy making processes and goals is very limited. Both regional authorities have an underdeveloped 'learning capacity' which may impact their ability to adapt negatively as their ability to notice and/or act on fundamental flaws is limited.

5.5 Dimension Leadership

	Province of Groningen	Score	Fylkesmannen of Sogn og Fjordane	Score
Collaborative leadership	Openness towards co-funding of projects and diffusion of responsibilities enables actors to act as collaborative leaders	+2	The utilized do not allow for a participative policy process and collaborative leadership role is not fulfilled in external projects	-2
Entrepreneurial leadership	Provision of funding to both internal and external actors to set up CCA projects stimulates entrepreneurial leadership. However, CCA is often only a small aspect of the projects.	+1	They have taken the lead in integrating CCA in spatial planning and are actively communicating their efforts. Nevertheless, the activities are limited to their formal responsibilities.	+1
Visionary leadership	Visionary plans are perceived to lack realism and practical implications in the short to mid-term.	-2	Even though the former governor has acted as a visionary leader the focus on the implementation of policy limits the ability to act as visionary leader.	-1

Table 29: Comparison scoring dimension 'Leadership'.

5.5.1 Collaborative leadership

In respect to collaborative leadership the two regions show differences which can be explained by the manner though which they create and implement CCA policy and projects. The Province of Groningen aims to steer the CCA efforts through actively fostering cooperation between actors from multiple sectors and governmental levels in the region. In general the responsibilities are diffused within the projects. Projects are managed by project groups which are coordinated by a project leader. This set up could potentially lead to vertical relations as a single person hold the leadership position but respondents indicate that the relations between actors were horizontal. In Sogn og Fjordane the division of responsibilities and the inclusion external actors have been established at the national level. The Fylkesmannen adhere to these formal institutions and ensure the participation of relevant actors in line with the national legislation. Even though, in some of these policy processes, actors from multiple sectors and governmental levels are active the Fylkesmannen of Sogn og Fjordane do not show collaborative leadership; they 'simply' implement the policy to the best of their abilities. In the research projects, outside of formal responsibilities, they do cooperate in they fulfil the role of participant and do not have the authority to transform the policy process into a

participative policy process. Again, the ambitions of the Province of Groningen to steer regional CCA area and the strictly guided policy making process of the Fylkesmannen strongly impact their adaptive capacity in terms of collaborative leadership.

5.5.2 Entrepreneurial leadership

Both regional authorities are front-runners compared to similar authorities on their spatial level. Being a front-runner does not necessarily make you a entrepreneur. Entrepreneurial leaders stimulates direct action and undertakings. The regions have taken different approaches to CCA to stimulating entrepreneurial leadership. The Province of Groningen has made funds available to internal and external actors. Entrepreneurial leaders can make us to set up innovative projects. The Fylkesmannen of Sogn og Fjordane have shown entrepreneurial leadership by being early implementers of the RVAs on the local and regional level. Furthermore, they actively communicated their activities to other Fylkesmannen to provide insight into their experiences. Both approaches feature unique limitations. The Province of Groningen has not set strict terms for the design of projects. While this fosters the diversity it also leads to CCA becoming an insignificant aspect in some projects. The Fylkesmannen have a strict focus on their formal responsibilities and thus only foster entrepreneurial leadership within the scope of their activities. Neither approach is optimal but they do both moderately foster entrepreneurial leadership.

5.5.3 Visionary leadership

In terms of 'visionary leadership' both regions have been given a negative score (see table xxx) but the negative score is caused by different reasons. The Fylkesmannen of Sogn og Fjordane are limited by the top-down hierarchal approach to policy making while the Province of Groningen is limited by the perceived (lack of) usefulness of visionary plans by both internal and external actors.

On the surface, the Province of Groningen appears to be fostering visionary leadership as it has invested in projects aimed at forming a vision for the future developments of regions. However, instead of challenging the existing direction and norms these plans continue in the established direction. While the Fylkesmannen of Sogn og Fjordane are more restricted they have nevertheless shown a greater extent of visionary leadership compared to the Province of Groningen. The most meaningful impact on established legislation of policies can be achieved at the national level. As county governors, before their appointment, often were politicians active on the national level they have the network and the largest capacity to exhibit influence. While determining the exact influence of Oddvar Flæte as the chairman of the national commission which determined the vulnerability of Norway to CC is beyond the scope of this research it does show a certain level of commitment of the governor to head a national commission which specifically addresses CCA. Even though not all recommendations of the commission were implemented (e.g. increasing the funding for regional level to increase institutional capacity) the changes made to the Building and Planning Act formally introduced CCA to the regional and local level. Nevertheless, the dependence on the national level to enable visionary leadership is perceived to be negative for the adaptive capacity.

5.5.4 Conclusion

Stimulating leadership appears to be difficult for both regional authorities. The type of leadership that is fostered strongly depends on the governmental approach and goals of the CCA policies. The Province of Groningen aims to become a regional director and consequently allows and enables actors to show collaborative leadership. Leaders, within these regional authorities, do not appear to

be able (or willing) to break through the established mould. Nevertheless, in the areas where leadership is fostered the presence of leaders allows actors to show stronger progress.

5.6 Dimension Willingness and perceived ability to adapt

	Province of Groningen	Score	Fylkesmannen of Sogn og Fjordane	Score
Adaptation motivation	The motivation to adapt appears to be declining on the management level which endangers the continuity of the CCA program	-1	The motivation to adapt is limited to the department of Civil Protection and Emergency Planning. Other relevant departments do not show willingness to adapt.	-1
Adaptation belief	Due to the combined expertise of regional actors the availability of solutions is perceived to be high.	+2	The current tools are perceived to be sufficient but do need further development to ease the translation to practical measures.	+1

Table 30: Comparison scoring dimension 'Leadership'.

5.6.1 Adaptation motivation

In general, the motivation to adapt is high at the departments which are active in CCA in both regional authorities. However, the extent to which the level of motivation is representative for the whole organization (i.e. other departments and higher level management) differs. Due to the broad scope of CCA in the Province of Groningen a larger diversity of departments are active in CCA leading to a higher level of motivation to adapt throughout the organization. At the Fylkesmannen of Sogn og Fjordane the department of Civil Protection and Emergency Planning is the sole department responsible for CCA. As other departments, such as the department of Agriculture and the department of Environment, are not included and do not have formal responsibilities in regards to CCA their motivation to adapt is relatively low. Policy makers of the Province of Groningen have noted that the motivation to adapt has been declining. The CCA is planned to be concluded at the end of 2014 and in the future CCA should be mainstreamed in existing activities. However, how the transition from a project based CCA program to mainstreaming is expected to take place is not entirely clear. In combination with the limited responsibilities in terms of CCA and the decline in financial resources the reduced willingness to adapt could negatively affect the extent to which the province is active in CCA. The influence of the motivation to adapt on the extent to which CCA differs between the regions. The previous example of the Province of Groningen shows that the decline in motivation could severely impacts regional CCA. However, the Fylkesmannen are bound by formal responsibilities and therefore an increase or decline in motivation is expected to be less impactful. In sum, the motivation to adapt to CC at the Province of Groningen has been declining. As they have limited formal responsibilities this may have severe impacts on the CCA efforts. The motivation to adapt to CC at the Fylkesmannen is high but due to the narrow scope of the policy this level of motivation is only prevalent at the department of Civil Defence. As the responsibilities are formally secured in the national legislation the activities are expected to continue.

5.6.2 Adaptation belief

The adaptation belief at the Province of Groningen and at the Fylkesmannen of Sogn og Fjordane reflects the diversity of solutions and the availability of resources to expand these tools. The Province of Groningen perceives that they have a broad selection of measures and tools available to them. In

the sectors where these tools are not readily available they can be developed in cooperation with other regional actors. The Fylkesmannen of Sogn og Fjordane have more limited resources available to them. They are supporting the municipalities which are even more deprived of resources to implement the complex RVA assessments. They depend on regional and national research projects to further develop the tools to enhance the institution capacity of themselves and the municipalities. Both regional authorities believe, even though the scope differs, that they have the adequate tools to successfully adapt to climate change. Groningen doesn't have a particular direction in which they wish to develop additional tools; it is done on a per project basis. The Fylkesmannen wish to further develop the quality of the RVAs and the translation to concrete measures.

However, their perceived ability to realize the measures differs. In the Province of Groningen the governance of CCA is seen as the main challenge but as they have vast experience in project management this is a challenge they can overcome. The Fylkesmannen of Sogn og Fjordane perceive the implementation of RVAs as more challenging and argue that the national government would be most suited to assist in the further development of translating the RVAs to measures.

5.6.3 Conclusion

In conclusion, the dimension 'willingness and perceived ability to adapt' appears to be strongly interlinked with other dimensions and criteria of the adaptive capacity framework. An expansive network of actors fosters the availability of solutions and expertise subsequently leading to a high perceived ability to adapt. Subsequently, the perceived ability to adapt is higher due to the governance approach of the Province of Groningen in comparison to the top-down policy approach of the Fylkesmannen of Sogn og Fjordane. Adaptation motivation is strongly inter-linked with the dimension 'resources'. However, as the Fylkesmannen of Sogn og Fjordane have less influence over the expenditure of their budget the low 'willingness to adapt' may negatively impact the adaptive capacity to a lesser extent than the Province of Groningen who have the authority to fully shut the CCA program down.

5.7 Dimension Resources

	Province of Groningen	Score	Fylkesmannen of Sogn og Fjordane	Score
Authority	The Province of Groningen is dependent on (the authority) external actors to implement CCA but as the link between the local and national level this is a role they are well versed in	-1	The level of authority is limited in scope but clearly defined, and has enabled the Fylkesmannen to take decisive action to ensure CCA is implemented on the local level.	+1
Human resources	Sufficient human labour is available to adequately implement projects but the overall program is managed by a single person	+1	The availability of human resources is under pressure as the responsibilities of the Fylkesmannen have been increasing but the amount of FTEs allocated to Civil Protection and Emergency Planning has been declining	-1
Financial resources	CCA budget is relatively small and actual spending seems to have declined severely recently	-1	The financial resources are sufficient to perform most formal responsibilities but do not allow for knowledge development	0

Table 31: Comparison scoring dimension 'Resources'.

5.7.1 Authority

The need for authority and how authority is gained is different in both regions. The Fylkesmannen of Sogn og Fjordane gain their authority through their formal responsibilities; they are supposed to be active in the coordination of emergency planning and the evaluation of spatial plans. The relevant actors are aware of the legislation which defines these responsibilities and accept them. Their influence and power in these activities is seen as legitimate due to the formal institutions. The Province of Groningen has very limited formal responsibilities in regards to CCA and their authority originates from other sources. In general the government is seen as a relatively independent actor which acts to the benefit of society. Actions of the government to stimulate CCA are seen as genuine and as the main regional governmental institution their authority is accepted more easily. Secondly, the Province of Groningen is one of the main providers of funding in the CCA projects. Being a main financier fosters the acceptation of you exercising power in policy processes.

The extent to which actors exercise their power to steer actors into taking specific action differs as well. The Province of Groningen mainly work with participative policy processes and while they . The policy process is similar to the Dutch 'polder model' where consensus between actors is emphasized. At the Fylkesmannen of Sogn og Fjordane municipalities are first stimulated through instructions, guidelines and early warnings. If the requirements are then not met the Fylkesmannen employ their authority to decline spatial plans to 'force' the municipalities to implement RVAs into their planning processes. This measure, however, is seen as a last resort: out of 576 plans there were only 22 declined in the year 2013 (Fylkesmannen of Sogn og Fjordane, 2014d).

The authority is sufficient for the activities both regional authorities aim to perform. The Fylkesmannen have clearly defined responsibilities and uses them to change informal institutions at the local level while the Province of Groningen employs a more careful approach integrating CCA through consensus.

5.7.2 Human resources

In terms of human resources the Province of Groningen provides sufficient resources to implement their projects and the Fylkesmannen of Sogn og Fjordane provide sufficient human resources for the implementation of policy but not for further development of existing tools. The field of CCA is still relatively new and the tools to analyse and implement CCA measure are not readily available and the experience of policy makers is still limited. At the Province of Groningen the human resources provided for the projects are sufficient according to interviewees. There is enough manpower, expertise or options to hire expertise and training programs available to ensure the projects do not lack in terms of human resources. As multiple projects have developed tools or are aimed solely at testing innovative measures the expertise of policy makers is fostered during the process. Policy makers at the Fylkesmannen of Sogn og Fjordane indicate that they are still relatively inexperienced with the RVAs. There is insufficient manpower to increase the quality of advice provided to municipalities on the implementation of the RVAs. Participation to research projects is only possible when other responsibilities have been completed.

5.7.3 Financial resources

In policy making the availability of financial resources if often perceived as a barrier. In both regions, in line with literature, financial resources are seen as a barrier. However, the trend in spending on CCA appears to be different. Respondents in the Province of Groningen indicate that CCA is receiving less attention than in the past. The financial report of the Province supports this observation as the

budget allocated to the CCA program has decreased to almost half the original budget of € 250.000,- a year. The decrease in budget has not been clearly felt at the project level as respondents indicate that while CCA is receiving less attention the projects are still receiving adequate funding. Nevertheless, the steep decline in allocation of budget is a clear negative signal as the decision whether to continue the CCA program is made in 2014. At the Fylkesmannen of Sogn og Fjordane the scope in CCA is much smaller and the financial resources are insufficient to support knowledge development. There has not been a increase in funding simultaneously with the increase in responsibilities. The attention given to CCA, however, seems to have increased and the Fylkesmannen are continuously working, even with the limited budget towards the further integration into policy making.

5.7.4 Conclusion

The conclusion on the dimension 'resources' is that CCA in both regions remains a new policy issue which is struggling to compete with the long-standing issues which have established a clear position within the policy processes and departments. Even though both regional authorities have committed to giving CCA a higher priority making a continuous stream of resources available in the long-term is challenging. The Fylkesmannen of Sogn og Fjordane appear to have been more successful in the provision of resources as their authority has been formalized through formal legislation which appears to secure resources in the longer term. The Province of Groningen has seen a clear decline in resources allocated to CCA, but does work towards the integration of CCA in 'regular' activities.

5.8 Dimension Fair Governance

	Province of Groningen	Score	Fylkesmannen of Sogn og Fjordane	Score
Legitimacy	Legitimacy is sufficient due to legitimacy building in participative policy processes and the norm that the government should be active in environmental and security issues	+2	The CCA policy of the Fylkesmannen is seen as legimate due to the responsibilities being defined in national legislation and due to the general role of the Fylkesmannen as implementer of national policy.	+2
Responsiveness	Influence through formal procedures is limited but the broad participation of actors representing diverse interests positively influences the responsiveness	+1	Not applicable	n.a.
Equity	In some projects, equity is fostered as actors are compensated when they are negatively impacted by CCA measures but equity is not explicitly considered.	0	Equity is fostered through the implementation of RVAs but is not explicitly considered in formal policies.	+1
Accountability	The governance approach to policy making via projects make it difficult to establish clear accountability between actor	-1	Fylkesmannen are directly accountable to the national directorates which evaluate their performance	+2

Table 32: Comparison scoring dimension 'Fair governance'.

5.8.1 Legitimacy

The legitimacy of CCA is at a sufficient level in both regions. This is surprising because CCA is a relatively new policy field. Within a new policy field the institutions are often unclear and need to be

build (Wejs et al., 2013). There are two important aspects of legitimacy which will be discussed here: the legitimacy of the role the regional authorities have taken on and the legitimacy of CCA (measures).

The need to legitimize the role the regional authorities have taken on is in stark contrast to each other. In the policy documents of the CCA program the Province of Groningen states that their aim is to be the regional director of CCA policy (Provincie Groningen, 2011). This role of the Province of Groningen is not supported by (national) legislation and may not be seen as appropriate or desirable by regional actors and the general public. There are three factors which have contributed to the legitimacy building of the Province of Groningen. First the participative policy processes within the CCA projects have contributed to the perceived legitimacy as they allowed the perceived legitimacy to be formed in cooperation with the relevant regional actors. Second as the Province of Groningen co-funds the projects their steering of the direction of the projects and active participation in them is more easily accepted. Third the active role of governmental organizations in addressing environmental issues is in line with existing institutions. At the Fylkesmannen the responsibilities in regards to CCA are clearly defined in national legislation. There is no need to justify the role they perform as it is required by law. Furthermore the Fylkesmannen are the regional authority that is responsible for the implementation of national policy on the regional level and their active role in the implementation of the Planning and Building Act is seen as appropriate and desirable.

The legitimacy of CCA (measures) in general is more similar in both regions. Both regions have experienced extreme weather events which have fostered the awareness of and perceived need for CCA by the public and regional actors. While the Province of Groningen further emphasizes the need for awareness building in their CCA program and provides CC projections to support their claims no other activities have been observed which foster the CCA activities for the general public. Respondents in both regions indicate that the interest and awareness of the public is generally low and since the measures implemented as part of the CCA projects of the Province of Groningen and the RVAs and the emergency planning activities of the Fylkesmannen are non-invasive the perceived legitimacy is often a non-issue.

5.8.2 Responsiveness

As the regional authorities form the link between the local and national level their main interactions are with other regional institutions and organizations: their direct interaction with society is limited. Nevertheless, feedback from society can be communicated indirectly through organizations which represent certain interests (e.g. environmental organizations or industry sector associations), formal procedures which allow feedback on policy making, regional elections and the news or public protesting.

The analysis shows that the ability of Fylkesmannen of Sogn og Fjordane to show response to society is limited. While they can respond to feedback provided by municipalities to improve their performance in the provision of advice they do not have the authority to make fundamental changes. This responsibility rests with the national government. Furthermore the Fylkesmannen are also not elected by society but are considered to be a representative of the national government. The governmental structure and the limited authority of the Fylkesmannen thus do not allow them to directly respond to society. The governmental structure and authority is not a limiting factor for the Province of Groningen. The integration of a diverse set of actors in the CCA indirectly stimulates a response to society. Furthermore as ‘Provinciale Staten’ of the Province of Groningen are elected

every four years society can show their (dis)approval of the current overall performance of the province.

5.8.3 Equity

In both regions equity is not explicitly being considered in the formal institutions. Neither the CCA program/plan, legislation or policy documents relate CC to equity. Respondents also have difficulty in seeing the relation of equity to CCA. Nevertheless the identification of vulnerable areas and the implementation of CCA policy do positively affect equity. The Province of Groningen targets four regions (Eemsdelta, Veenkoloniën, Lauwersmeer and Groningen-Assen) which are relatively vulnerable to CC. The Fylkesmannen foster the identification of high risk areas by evaluating and stimulating the implementation of RVAs on the local level. Both activities will lead to a more even distribution of CC impacts.

Equity also relates to the inequality of resources civilians have available to them to recover from CC impacts. In both regions the institutions which guide compensation when individuals are negatively impacted by CC or CCA measures are not fully developed. The decision to compensate seems to very much depend on the specific situation. In the Province of Groningen farmers have been compensated when their land had been assigned as a 'flood area'. In Sogn og Fjordane civilians have been compensated when impacted by the hurricane Dagmar. Whether the level of compensation is adjusted for the level of income has not been established but these measures do mitigate the damage caused by CC. In other words, while the relation between CC and equity has not been acknowledged at the regional level the measures which are implemented and compensation provided do foster equity.

5.8.4 Accountability

In terms of accountability the analysis shows that the Fylkesmannen of Sogn og Fjordane perform better than the Province of Groningen. The difference in performance can be explained by three factors: the clarity of the established goals of the CCA policy, the extent to which evaluation is fostered by institutions and presence of a forum to which the regional authority are held accountable for their performance.

The established goals in terms of CCA in the Province of Groningen are very broad and difficult to measure. They aim to stimulate knowledge development, stimulate public awareness, integrate CCA into area oriented policy making and create visionary development strategies. Through individual projects the Province of Groningen aims to reach these goals but simultaneous does not stimulate the evaluation of individual projects or the CCA program. Even though the allocation of budget to provincial programs is determined on a yearly basis by the 'provinciale staten' the lack of evaluative data inadequately allows for policy makers to be held accountability for their performance. The CCA efforts of the Fylkesmannen of Sogn og Fjordane are more limited in scope but they do evaluate their performance on a yearly basis and receive instructions and feedback from the national level based on their actions of the previous year. As the responsibilities are clearly defined in national legislation the goal the Fylkesmannen works towards is clear. Furthermore as the Fylkesmannen are accountable to an external actor there is a clear division between policy implementers and evaluators. At the Province of Groningen the norm is to quickly move on to future projects instead of critically assessing the performance.

5.8.5 Conclusion

In conclusion, the relatively high score of the Fylkesmannen is surprising. In general, a governance approach to policy making which employs a participative approach with regional actors would be expected to achieve the norms of fair governance better. In this case, however, the governance approach does not appear to explicitly consider the aspects of 'fair governance'. The top-down approach of the Fylkesmannen is more successful in integrating 'fair governance' into policy making as many of the aspects of 'fair governance' have been integrated into the formal legislation.

5.9 Synthesis

In this section the overall synthesis of the comparative chapter will be presented. The averaged score are presented in table 33 which can be found below. As the table shows, overall the adaptive capacity of the Province of Groningen is slightly higher than the adaptive capacity of the Fylkesmannen of Sogn og Fjordane (moderately positive effect against neutral effect). The governance approach of the Province of Groningen affects the adaptive capacity more positively. This is mainly due to the strong focus on 'variety' both in terms of the inclusion of actors, presence of problem frames and the fostering of a wide variety of solutions. The approach of the Fylkesmannen to CCA, however, has positively fostered the 'Fair Governance' criteria as their position as implementer of national government policy in combination with the clearly defined accountability procedures have led to a high score on the dimension. Both regions feature unique strengths and weaknesses in the dimensions 'leadership', 'resources' and 'learning capacity'. The Province of Groningen is especially strong in 'collaborative leadership' due to their participative approach while the Fylkesmannen of Sogn og Fjordane foster 'visionary leadership' more strongly. The main problematic areas for the Fylkesmannen lie in the issue that a fundamental change in policy making as a result of double-loop learning is not possible as the Fylkesmannen are solely focused on policy implementation and not the creation of policy and the risk of path dependency due to strong focus on RVAs as the sole policy tool. The province of Groningen learning capacity is underdeveloped in terms of a lack of double-loop learning on a program level due to a 'project culture' which focuses on moving on to the next project instead of evaluating the projects and disseminating the learned knowledge.

	Overall score Province of Groningen	Overall Score Fylkesmannen of Sogn og Fjordane
Variety	+2	-1
Learning capacity	0	0
Leadership	0	0
Resources	0	0
Fair governance	+1	+2
Willingness and perceived ability to adapt	+1	+1

Table 33: Comparison of overall score dimensions

Chapter 6: Conclusion and discussion

6.1 Introduction

Despite the efforts of society to mitigate climate change it has become clear that even in the most optimistic scenarios climate change will occur. The issue of climate change is considered to be a 'wicked' issue due to the interconnected nature of climate change with other aspects of society, the uncertainties surrounding the distribution and consequences of the impacts, and the unclear and diffused responsibilities. To address the problem of climate change it is generally accepted that actors must take a multi-level governance approach in order to develop coherent adaptation strategies. Regional governmental authorities are in an unique position which allows for a more flexible approach than national government while closely coordinating and cooperating with the local level (Grecksch, 2013). Moreover, some impacts of climate change transcend the borders of local territory and are better addressed at a regional scale by a regional governmental authority. This research has contributed to gaining insight into the conditions which determine the ability of actors to successfully adapt to climate change and the relation between the level of adaptive capacity and the governmental approach taken by the regional authority. Therefore this research has analyzed and compared the adaptive capacity of two regional authorities. The following research questions guided the research:

The central research question is:
What level of adaptive capacity is present at the regional authorities, how can this level of adaptive capacity be explained and to what extent does the adaptive capacity contribute to securing climate change adaptation action?

Sub questions
-What are the main criteria which foster the adaptive capacity of regional authorities? (chapter 2)
-What is the context in which the Province of Groningen and the Fylkesmannen of Song og Fjordane operate? (chapter 3, 4)
-To what extent does the adaptive capacity of the Province of Groningen and Fylkesmannen of Sogn og Fjordane enable climate change adaptation? (chapter 3, 4)
-To what extent is the adaptive capacity of the Province of Groningen and the Fylkesmannen of Sogn og Fjordane different or similar? (chapter 5)
-What recommendations can be made to address the weaknesses to increase the adaptive capacity of the Province of Groningen and the Fylkesmannen of Sogn og Fjordane? (chapter 6)

6.2 Conclusion

6.2.1 Level of adaptive capacity

The results of the analysis show that the overall adaptive capacity of the Province of Groningen is higher than the Fylkesmannen of Sogn og Fjordane (see figure 5 below). Even though the Province of Groningen has reached an overall higher score the individual criteria show a more nuanced perspective on the results. The strengths and weaknesses of the adaptive capacity of the two regional authorities show meaningful differences. For the Province of Groningen the Dimension 'Variety' has been scored the highest of all dimensions. The focus of the Province of Groningen on creating regional climate change adaptation policy in cooperation with regional actors and the use of a diversity of solutions are the main reason for the high score. The same dimension is the main

weakness of the adaptive capacity of the Fylkesmannen of Sogn og Fjordane as their integration of actors and flexibility in the use of multiple solutions is much more limited. For the Norwegian regional authority the dimension 'Fair Governance' has been given the highest score. The combination of strong accountability procedures and the perceived legitimacy of their undertakings by external actors have led to a positive effect on the adaptive capacity. There are similarities as both regional authorities struggle with double-loop learning. The Fylkesmannen of Sogn og Fjordane are not able to make fundamental changes as their authority is limited to the implementation of policy while the Province of Groningen focuses creating multiple climate change adaptation projects but does not allocate time for evaluation to reflect on the climate change adaptation program as a whole. Furthermore, there is no infrastructure available through which the learned knowledge can

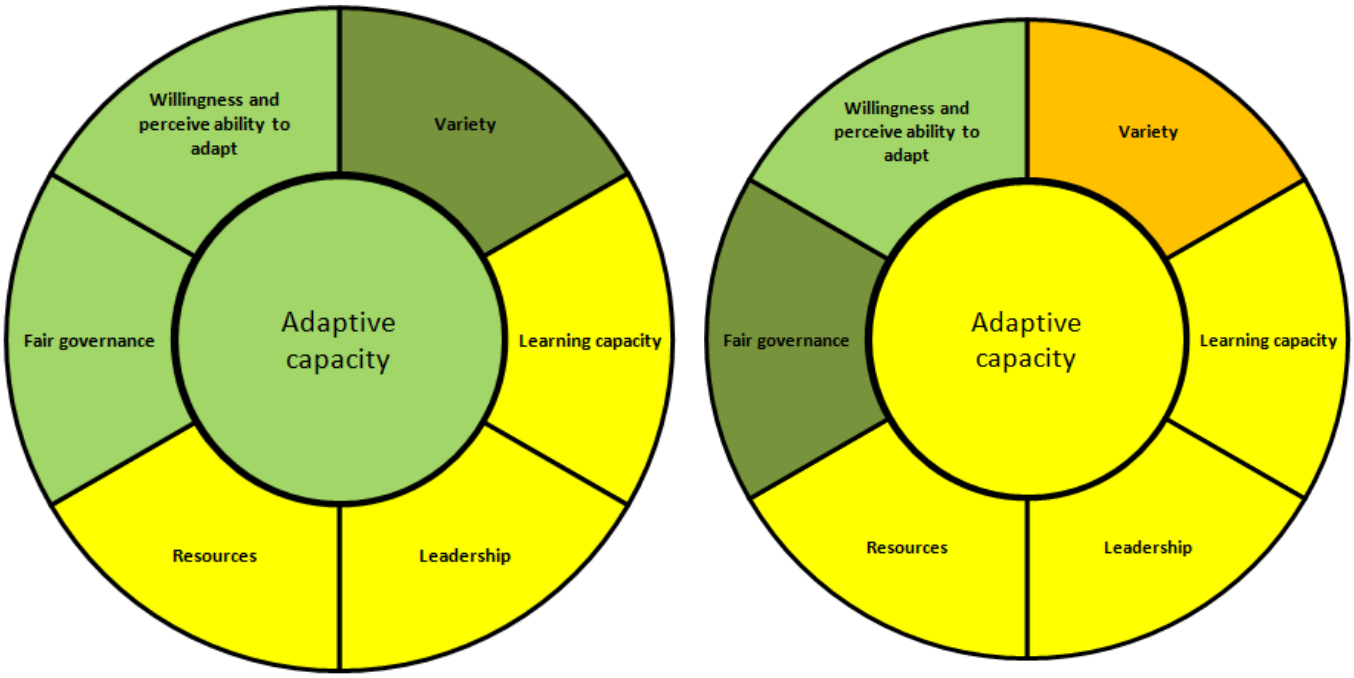

Figure 5: The adaptive capacity of the regional authorities (Province of Groningen, left; Fylkesmannen of Sogn og Fjordane, right)

be disseminated. Moreover the dimension 'resources' is problematic in both regions: securing continuous financial and human resources for the long-term remains a challenge when the negative effects of the impacts and the positive effects of the implemented measures are only felt in the long-term. The dimension 'leadership' is a mixed dimension in both regions: the extent to which the types of leadership are fostered and present at the regional authorities strongly depends on the governmental approach, which is surprising as one of the main features of a leader is their ability to bring about change. The dimensions and criteria of the adaptive capacity framework are, however, closely interlinked. The study of the individual dimensions gives a broad perspective on the adaptive capacity but to gain further insight the inter-linkages between criteria and underlying causes have been discussed in the following section.

6.2.2. Inter-linkages of the adaptive capacity framework

While the adaptive capacity framework analyses the adaptive capacity of regional authorities through separated dimensions, in reality all aspects of the regional authority are closely inter-linked. By studying these interlinkages a story emerges which gives insights into the beneficial and detrimental effects of the manner in which the regional authority creates and implements policy. It

has been found that the governmental approach taken by the regional authority greatly influences the adaptive capacity. The approach of the Province of Groningen to climate change adaptation is flexible, broad in scope and project based. It reflects a governance based approach to policy making where, through cooperation the 'wicked' problem of climate change adaptation is addressed. The approach of Fylkesmannen of Sogn og Fjordane is based on a top-down manner of policy making where the regional level is guided by the national government by assigning formal responsibilities and directing which climate change impacts should be addressed. These fundamental differences have a great effect on the adaptive capacity. The effects of and the reason for the governmental approach to policy making can be observed through the dimensions and criteria of the adaptive capacity framework.

1) Authority, legitimacy and multi-actor, multi-sector, multi-level

The extent to which the responsibilities were clearly defined differ between the regional authorities. The division of responsibilities between governmental authorities in the policy field of climate change adaption has not been clearly established in the Netherlands. Formally, the Province of Groningen, possessed little *authority* and does not have the expertise required to individually implement CCA. Therefore, employing a governance approach and assigning a considerable role to regional actors (*multi-actor, multi-level, multi-sector*) could be seen as a necessity for the CCA policy to be successful. Through cooperation the roles of the regional actors were established (building *legitimacy*) and the actors came to *trust* each other more. The Fylkesmannen of Sogn og Fjordane have been assigned responsibilities in terms of CCA (i.e. high *authority*). The extent to which actors are included during the execution of these responsibilities is clearly defined. In practice this has led to a diverging level of inclusion of actors based on the activity. Moreover, as the Fylkesmannen of Sogn og Fjordane have been assigned the formal responsibilities their actions (i.e. implementing national policy) are perceived to be legitimate. The institutional void thus served as a stimulus for the regional authorities to stimulate cooperation while the top-down assignment of responsibilities establishes authority and can both stimulate and limit cooperation.

2) Accountability, scope, coordination and learning capacity

The combination of clearly defined responsibilities and the narrow scope of climate change adaptation of the Fylkesmannen of Sogn og Fjordane in combination with the hierarchal top-down governmental approach fosters the extent to which learning takes place. The Fylkesmannen of Sogn og Fjordane are held accountable to the directorates of the national government for their results. Their activities are evaluated through a report presented on a yearly basis to the national government. The national directorate provides feedback and instructions based on the results which stimulate to focus on improving the quality of the implementation of formal responsibilities (i.e. single-loop learning). Furthermore the evaluations serve as a way to foster the institutional memory. The CCA program of the Province of Groningen features a broader scope in terms of CCA and does not strictly dictate the direction of the projects. Most projects are aimed at developing knowledge such as learning how to integrate CCA into regional development or developing new tools through pilot projects. However, the extent to which the individual projects and the program are evaluated is very limited. To gain funding from the Province the projects are checked initially but once the project starts the influence of the CCA program and the coordination is limited. Moreover, there is no central infrastructure through which knowledge is exchanged. This has led to a situation where actors are not aware of all the CCA projects within the province, even though they may be relevant. Lessons

learned within one project are not disseminated to others. For the Fylkesmannen, the national government serves as a forum to which the regional authority is held accountable. This in turn stimulates the regional authority to evaluate and to learn to improve their routines to improve their performance. At the province of Groningen, the CCA program could serve as the forum to whom the project managers are accountable. However, the program does not set requirements in terms of evaluation and does not serve as a central point through which knowledge is disseminated. The top-down hierarchal approach of the Fylkesmannen thus positively influences coordination and evaluation while the flexible governance approach insufficiently manages to stimulate actors to create a coherent approach and critically reflect on the overall progress.

3) *Variety of solutions, resources,* multi-actor, multi-sector, multi-level *and perceived ability to adapt*

As the policy field of climate change adaptation is relatively new, the availability of readymade tools and measures is limited in both regions. The Province of Groningen is an expert in the coordination and governance of policy making but lacks the technical expertise. Therefore, the participative policy making approach positively affects the adaptive capacity as it combines the knowledge and expertise of regional actors. When there are no solutions available, the actors are able to develop new tools and measures through pilot projects. The combination of a diverse and broad set of knowledge and the ability to develop measures and tools have subsequently led to a high perceived *ability of actors to adapt*. The top-down approach to CCA in Norway limits the variety of solutions. Here, the extent of cooperation between regional actors and the tools which are utilized are defined on the national level. The regional authority is thus not able to adapt their policy processes and tools based on prior experience or the situation. This problem is, however, addressed partially as the Fylkesmannen of Sogn og Fjordane participates in research projects as a side-activity to further develop the current tools. In conclusion, the governance approach positively affects the availability of solutions and resources, and consequently fosters the perceived ability to adapt. The top-down approach of the Fylkesmannen does not allow for flexibility in the use of measures and tools. Moreover, as the regional authority depends on their own technical expertise, which is limited, their perceived ability to adapt is relatively low.

4) *Adaptation motivation, resources and continuity*

The results of the analysis also give insight into the relation between the '*motivation to adapt*' and the '*availability of resources*'. At the Province of Groningen the decline of the motivation to adapt appears to have negatively impacted the availability of financial resources for the climate change adaptation program. The climate change adaptation program of the Province of Groningen was initiated in 2010 and is set to run until the end of 2014, after which a decision is made whether the program will be continued. The 'motivation to adapt' can therefore be critical in securing the continuity of the program as the Province of Groningen does not have formal direct responsibilities in regards to CCA. At the Fylkesmannen of Sogn og Fjordane the motivation to adapt at the regional authority is less relevant. As CCA has been integrated into national legislation it is expected that their efforts in regards to CCA will be continued both in the short and long-term. Here, the top-down approach to policy making positively affects the continuity of CCA while the more flexible governance approach of the Province of Groningen insufficiently secures long-term CCA.

6.2.3 From adaptive capacity to action

As previously discussed, the adaptive capacity of a regional authority refers to the extent to which the regional authority fosters the ability of actors to adapt to climate change and their ability to change the regional authority if deemed necessary. The ability to adapt, however, does not necessarily translate to undertaking climate change adaptation. Then, what is the value of the level of adaptive capacity for the extent to which regional authorities successfully address climate change? The value of the assessment of the level of adaptive capacity of the regional authorities lies in two points. (1) The level of adaptive capacity gives an indication of the prospect of successful climate adaptation. The general level of the adaptive capacity of the Province of Groningen indicates that the adaptive capacity has a moderately positive effect on the ability of actors to implement CCA and change the regional authority itself if deemed necessary. The level of adaptive capacity for the Fylkesmannen of Sogn og Fjordane reflects a neutral effect on the adaptive capacity. (2) The level of adaptive capacity becomes useful when supplemented with the identified strengths and weaknesses. The strength and weaknesses serve as a manner to gain insight into the risks of the taken approach and the extent to which opportunities are available. Here, the assumption is that a weak dimension or criteria has a high potential for improvement, whereas for a strong dimension or criteria it is more challenging to achieve improvements. However, the extent to which dimensions and criteria can be changed does depend on the context. In the identification of the weaknesses and strengths lies the societal relevance of this research as it is hoped that policy makers will be able to use these suggestions to strengthen the adaptive capacity of their respective regional authorities. The strengths of the governance approach of the Province of Groningen to CCA lies in the stimulation of:

- Variety in potential adaptation strategies to address CC impacts in regional developments (Variety dimension)
- Inclusion of a wide variety of actors, sectors and governmental levels (Variety dimension and collaborative leadership)
- Entrepreneurial leadership through the provision of funds to both internal and external policy makers
- Trust building through extensive long-term cooperation (Learning capacity dimension)
- The utilization of the combined expertise and knowledge of regional actors has led to a high perceived ability to adapt by actors (Willingness and perceived ability to adapt dimension)
- Legitimacy building in policy field where responsibilities have not been clearly defined. Through cooperation with regional actors the activities and actions of the Province of Groningen have become perceived to be legitimate (Fair governance dimension)
- Uncertainty is acknowledged on both the program level and integrated into policy making on the project level (Learning capacity dimension)

The opportunities for improvement in the approach of the Province of Groningen are in stimulating the:

- Learning capacity (institutional memory) by creating and maintaining an information infrastructure for the gathering and exchange of knowledge and learned experiences within the regional authority
- Learning capacity (single-loop learning, double-loop learning) by setting clear procedures in terms of evaluation to enable tracking progress, results and stimulate single- and double-loop learning

- Fair governance & human resources by allocating additional human resources to establish more clear accountability procedures between the projects and the CCA program, and to foster the program management to establish more clear direction and goal.

The strengths of the top-down government approach of the Fylkesmannen of Sogn og Fjordane to CCA lies in the stimulation of:

- The clear division of responsibilities which foster a clear focus policy making (Authority)
- Clear accountability procedures which in combination with the institutional memory and single-loop learning processes improve the quality of policy making forward (Accountability)
- Use of external actors for knowledge development as internal resources are limited. (Single-loop learning and Resources)
- Mainstreaming of climate change adaptation in existing policy fields (i.e. spatial planning and emergency preparedness).

The opportunities for improvement in the approach of the Province of Groningen are in stimulating the:

- Strengthen the cooperation with the Fylkeskommune, the other governmental regional authority which is elected and has the authority to create (CCA) policy. Currently, there is a unofficial separation between the two authorities; Fylkesmannen are active in CCA and the Fylkeskommune in CCM.
- Strengthen cooperation between departments at the Fylkesmannen to stimulate a broader scope, include a larger variety of stakeholders and expand the resources available for CCA.
- The use of a larger variety of solutions (i.e. tools and measures) to reduce the risk of path dependency due to strong focus on RVAs as the sole policy tool.

6.3 Discussion

This final section of the research reflects on the adaptive capacity framework, the research design, experiences gained from the execution of the research and makes recommendations regarding future research.

The adaptive capacity framework has proven to be a useful tool to assess the adaptive capacity of regional authorities. It offers a comprehensive way to analyze the relevant aspects of the regional authority to determine the level of adaptive capacity. It also enables the identification of patterns between the policy making approach of regional authorities and the level of adaptive capacity. Moreover, it allows for clear communication with policy makers through the translation of the results to the color coded figures. The clear communication of the results allows for and fosters the discussion of the strengths and weaknesses of the regional authority and will hopefully assist the authorities to target specific issues. The scientific relevance of this research has been in the translation of the framework to the regional level and applying it on authorities instead of institutions. Furthermore, by identifying the strengths and weaknesses of specific approaches to policy making this research has contributed to the identification of the inter-dependencies that exist within the framework. Finally, the research has contributed in translating the results of the framework to practical results which can hopefully be used by regional authorities which are active in CCA.

The translation of the results to numerical values, however, also leads to some negative effects. The scoring of the dimensions and criteria depend on the good interpretation of the researcher(s) and can be perceived to lack transparency. In order to limit the room for interpretation key respondents have been allowed to provide feedback on the allocated scores. Furthermore, the criteria have been operationalized to increase the transparency of the translation of the results to numerical values. Nevertheless, there is room for further improvement in terms of transparency and, the need for interpretation could have a negative effect on the ability to compare the results with similar research. Moreover, a low score in fair governance in a developed country may mean something different than a low score given in an undeveloped county. Another issue in the method is the impression given that the equal weighing of the dimensions reflect an equal level of importance per dimension. Based on the context, however, some dimensions may be of more importance than others. By clearly defining the context and the relation between the dimensions and criteria of the adaptive capacity framework this research has clarified the relative importance of the dimensions.

In regards to the research design, the broad perspective taken on the climate change adaptation plans, programs, and projects that are directly undertaken by the regional authorities is both a feat and a complication for the application of the framework. The broad perspective enables the analysis of the regional authority as a whole and gives insights into the scope and the level of integration of CCA into the policy making processes. However, actors active in different aspects of climate change adaptation (i.e. heat stress opposed to water management) within the same regional authority may possess different strengths and weaknesses while the adaptive capacity framework only allows for a single score. Through the in-depth description as part of the analysis chapters these relations and complexities have been clarified but it nevertheless posed a challenge during the execution of the research. Furthermore, the selection process of the interviewees may have led to a bias of the CCA activities of the regional authority to be perceived as more positive as the actors are part of the policy processes. This problem has been partially addressed by interviewing both internal and external actors. The respondents have been selected through snowball-sampling where by contacting key actors the contact details of other relevant actors were attained. The disadvantage of this method is that the interviewees have not been randomly selected and may not be representative.

Regarding the results of the research, it is believed that the application of a single framework, the use of a cross-national case-study and the collection of data both through scientific literature, policy documents and interviews have ensured the internal validity. However, due to the limited number of case-studies the external validity is diminished. Moreover, the cross-national comparative analysis has lad to valuable insights in the relation between the governmental approach and the level of adaptive capacity. The divergences in context and approach have led to a strong contrast between scores of the criteria and have highlighted the interdependencies within the adaptive capacity framework.

In terms of suggestions for future research, increasing the number of case-studies could serve as a way to gain further insight into whether the dimensions and criteria are applicable and relevant in other contexts. Furthermore, the relation between governmental approaches to climate change and the level of adaptive capacity could be expanded upon. It would be interesting to gain further insight into whether the barriers observed in the case-studies are fundamental flaws of the governmental approaches or are a results of the context or competences of the regional authorities.

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Annex 1: Overview pre-selection of regional authorities

Region	Country	Central policy document	Start of implementation	Regional authority
Greater Dublin Region	Ireland	Adaptation Strategy Greater Dublin Region	Since 2011	Dublin Regional Authority
Stockholm Province	Sweden	Adaptation Action Plan	Since 2010	Stockholm County Council
Province of Groningen	The Netherlands	Programma Klimaatadaptatie Provincie Groningen	Since 2012	Province of Groningen
Helsinki Metropolitan Area	Finland	Helsinki Metropolitan Area Climate Change Adaptation Strategy	Since 2008	Helsinki Region Environmental Services Authority
Styria	Austria	Climate Change Adaptation Action Plan for the Province of Styria	Since 2011	Provincial Government of Styria, Department of Spatial Planning
Sogn og Fjordane	Norway	Climate plan (incl. mitigation and adaptation)		Fylkeskommune and Fylkesmannen
Province of Limburg	The Netherlands	Climate adaptation action program	Since 2009	Province of limburg
Stadsgewest Haaglanden	The Netherlands	Midterm report 'Hotspot Region Haaglanden'	X	Stadsgewest Haaglanden (will be shut down in 2014)
Stadsgewest Rotterdam	The Netherlands	Adaptation Strategy Region Rotterdam (in development)	X	Stadsgewest Rotterdam (will be shut down in 2014)
Staffordshire County	United Kingdom	A Climate Change Adaptation Plan for Staffordshire County Council	Since 2011	Staffordshire County Council
Leicestershire County	United Kingdom	Leicestershire County Council Climate Change Resilience Action Plan	Since 2006	Leicestershire County Council

Annex 2: Interview questions (basis for semi-structured interview)

The interview started with a general introduction of the author, the research topic and aims, and the structure of the interview.

Introductory questions

- In which projects/policies are/were you involved which include climate change adaptation at the regional authority. If limited adaptation; mitigation can be included as well.
- Is this project a part of the climate adaptation plan/program or is it b
- What is your function/role within these projects/policies and the regional authority as a whole?
- To which policy phase has the project/policy progressed (creation/implementation/completion)?
- What is your work and educational background (criteria human resources)

Problem perspective

- What are the impacts of climate change expected to be in [region]. What is the source/basis of this information (i.e. national/regional/local climate projections or other sources)?
- What are the general goals of the regional authority to address climate change.
- Do you feel motivated to adapt to climate change?
- Do you feel other actors (internal and external) are motivated to adapt to climate change?
- To what extent do you feel that expertise/tools/ability is currently available to successfully adapt to climate change?
- To what extent does current policy reflect, enhance or diminish this feeling?

Variety

- What kind of actors (public/private, local/regional/national/international) are currently involved in the policy making process.
- How were these actors included (and others excluded)? (formal/informal rules)
- To what extent are these actors included into the policy process (phase and responsibilities)?
- How are different opinions, discourses discussed and aligned during the policy (formal and informal). Do actors view climate change differently (opportunity, safety-problem, untruth)?
- Which steps are taking to select policy measures or tools? Which variety of tools and measures have been considered for current adaptation policy?
- Are redundant measures being taken or allowed? These are measures that serve as a back-up

Learning capacity and knowledge exchange

- Is knowledge currently being exchanged with other actors within the project/policy?
- If so how does this process work, are certain criteria being used and what kind of knowledge is being exchanged?
- Are there local, regional, national projects/programs that stimulate knowledge exchange?
- Are there national laws which set requirements in terms of sharing public information?

- Do you feel the actors within the policy process trust each other? Is this trust based on personal relations or trust in the organization they represent? If there is little trust: how is trust build between actors?

Leadership

- Do you feel that there are leaders present who stimulate the adaptation policy?
- What kind of leaders are they? Are they visionary leaders: giving form to the long term vision of the organization, do they lead by example (being active in construction and implementation of policy) or do they lead by bring actors together and cooperate?

Resources

- Do current institutions (policies, rules etc) provide sufficient authority to climate change adaptation within your current project or policy making process both internally and externally?
- Do you activities require you to have a high level of authority?
- Do you feel there is sufficient expertise and knowledge available within the project/policy to successfully adapt? If not, are there training programs to stimulate adaptation knowledge, or programs to stimulate policy/project coordination and mediation? Are external actors hired?
- Is there sufficient manpower available to implement the policy/project?
- Do you have access to sufficient financial resources? From what kind of sources do you gain financial support? How do climate adaptation investments compare to mitigation and the total budget?

Fair governance

- To what extent is the legitimacy (public support for specific institution) taken into account during the policy process?
- To what extent does the policy process allow for input from society (responsiveness) and how is this input being taken into account?
- Who is the main responsible actor within your policy/project? How are the roles and responsibilities assigned? (accountability)?
- To what extent is equity being taken into account i.e. distribution of harmful and beneficial impacts from climate change and adaptation policy)?
- Is there information available or action being taken to enable actors and society in general to act in extreme situations?
- To what extent are individual actors stimulated to adapt to climate change through current institutions?
- Which steps are being taken to ensure actors are aware of the information?
- To what extent is the institution open towards and supports actors willing to adapt to climate change individually?

Reflection

- What do you perceive as the main barriers to climate change adaptation?

- How do you plan to evaluate this project/policy? Or how do you generally evaluate projects? Is this evaluation process standardized?
- What are the main lessons drawn from recent evaluations.
- *If interviewee only points out single-loop knowledge*; Has an evaluation ever lead to a fundamental change in (adaptation) policy making?
- *If there is no formal evaluation*; why not, is there an informal evaluation of results/process

Annex 3: Overview of interviewees

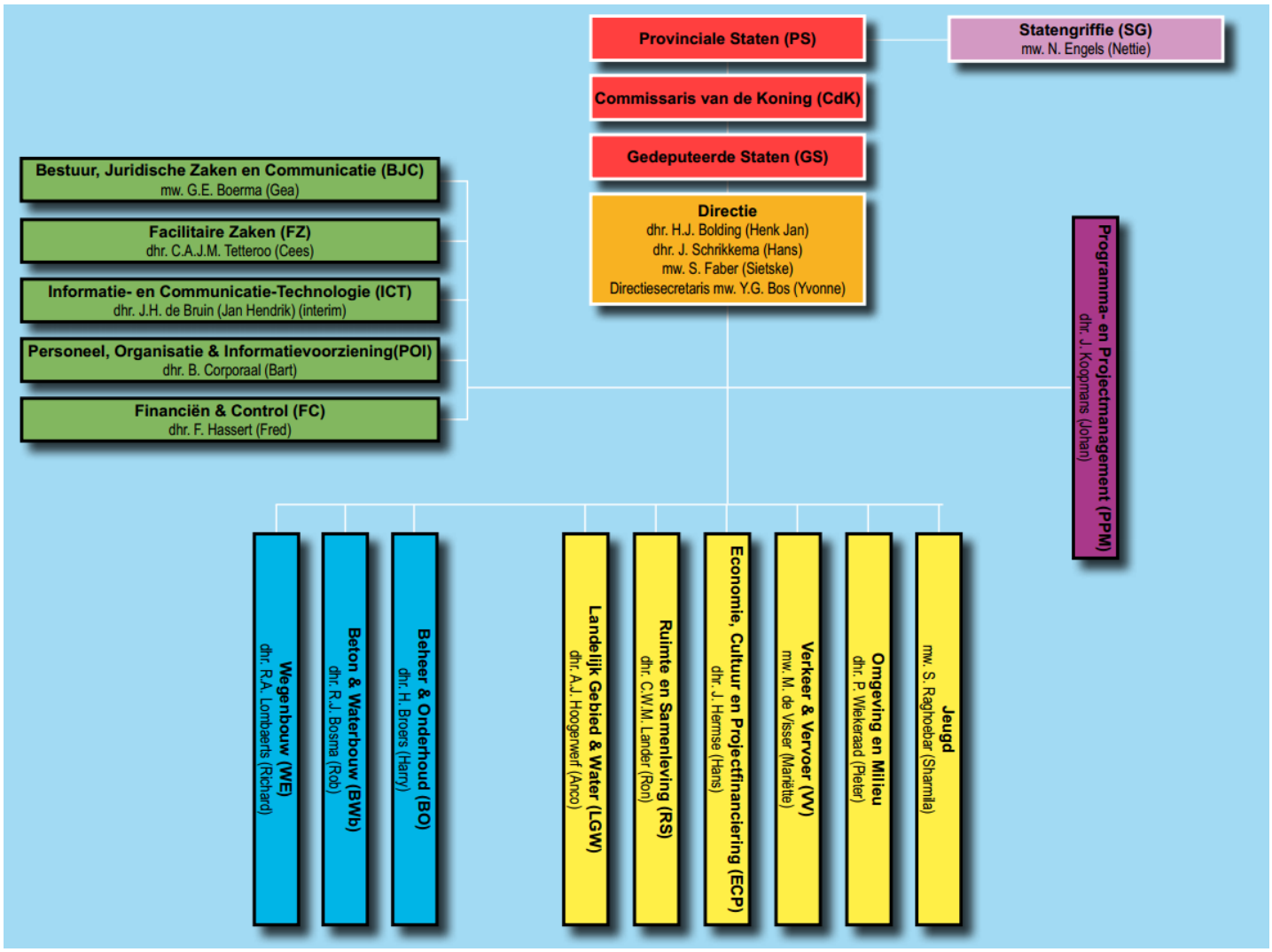
Interviewees for case-study Province of Groningen

Number	Date	Name	Function
1	27-2-2014	Frans Debets	Directeur Debets bv
2	27-2-2014	Lieuwe van de Berg	Policy maker spatial planning Province of Groningen
3	3-3-2014	Jos Huis in 't veld	Projectmanager at Province of Groningen
4	3-3-2014	Peter de Vries	Policy maker at Water department at the Province of Groningen
5	6-3-2014	Arja Doornbos	Climate change adaptation program coordinator
6	6-3-2014	Jaap Wijma	Manager Samenwerkingsverband Regio Groningen-Assen
7	12-3-2014	Ko Munneke	Program secretary and project leader for programbureau 'Agenda voor de Veenkolonien'

Interviewees for case-study Fylkesmannen of Sogn og Fjordane

Number	Date	Name	Function
1	22-4-2014	Elisabeth Veivåg Helseth	
2	24-4-2014	Eline Orheim	
3	24-4-2014	Haavard Stensvand	Head of department of Civil Protection and Emergency Planning – Fylkesmannen Sogn og Fjordane
4	25-4-2014	Carlo Aall	Head of research - Vestlandsforsking (Western Norwegian Research Institute)
5	28-4-2014	Arne Kringlen	Policy maker –Naustdal municipality
6	12-5-2014	Johannes Anonby	Senior advisor – Department of Environment – Fylkesmannen of Sogn og Fjordane
7	12-5-2014	Christian Rekkedal	Head of department of Agriculture - Fylkesmannen Sogn og Fjordane

Annex 4: Overview of governmental structure Province of Groningen



Annex 5: Overview of Governmental structure Fylkesmannen of Sogn og Fjordane