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Capacity Development for Strengthening Climate Information Services: The Case of NORCAP as a Provider of Expert Capacity

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Declaration

I, Helene Elvira Berg Henriksen, declare that this thesis is a result of my research investigations and findings. Sources of information other than my own have been acknowledged and a reference list has been appended. This work has not been previously submitted to any other university for award of any type of academic degree.

Signature:.....Helene Elvira Berg Henriksen

Date: 15.06.2021

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Abstract

Developing capacities of regional and national entities, as well as local communities, to strengthen the development and delivery of climate information services to foster climate-smart decision-making, is a pressing concern across Sub-Saharan Africa. Since the establishment of the Global Framework for Climate Services in 2009, scholars and actors within the fields of capacity development and climate information services have identified key constraints as well as opportunities for strengthening capacity across the continent, with particular attention to the need for increased support at national level to ensure enhanced resilience in vulnerable nations.

Through a qualitative case study approach, this thesis has applied the case of NORCAP to identify and discuss what NORCAP perceives to be the challenges and opportunities in fulfilling its objective of contributing towards strengthening climate information services in Sub-Saharan Africa through capacity development. To better understand the scope of identified challenges and opportunities of the Norwegian non-profit organisation in meeting its objective, this thesis draws on findings from three key-documents and semi-structured interviews with NORCAP staff and climate experts who served as key-informants. The thesis builds on capacity development literature and scholars of climate services, climate change adaptation and disaster risk reduction to shed light on how international capacity providers can and should provide capacity support to ensure sustainability of capacity development.

My findings suggest that NORCAP identifies several opportunities in its current approach to capacity development for climate information services, particularly at the national level in national meteorological offices. NORCAP upholds an extensive number of technical skills and expertise across varying fields of climate services, which has allowed the organisation to provide capacity support to partnering entities across a range of areas where capacity is lacking. However, targeting support to fragmented and weak institutions limits NORCAP's ability to ensure a broad scope of support at national level, particularly in Western Africa. My findings also suggest that NORCAP perceives to be challenged by its limited ability to provide funding for the implementation of activities, and heavily relies on the coordination and collaboration with international stakeholders to support its partnering entities in this regard. I conclude that NORCAP has identified and fostered several important opportunities to strengthen climate services since its initial work with climate services begun in 2015. However, NORCAP's impact mainly lies in its ability to strengthen capacities in regional and national entities, and many hurdles to are to be overcome to have a greater impact at the local level.

Abbreviations

ACMAD	African Centre of Meteorological Application for Development
CCA	Climate Change Adaptation
DRR	Disaster Risk Reduction
FAO	Food and Agriculture Organisation to the United Nations
GFCS	Global Framework for Climate Services
IGAD	Intergovernmental Authority of Development
IGAD ICPAC	IGAD Climate Prediction and Application Centre
NAP	National Adaptation Plan
NFCS	National Framework for Climate Services
NMHS	National Meteorological and Hydrological Services
NRC	Norwegian Refugee Council
OECD	Organisation for Economic Co-operation and Development
RCC	Regional Climate Centre
SEI	Swedish Environmental Institute
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change
UNISDR	United Nations Internal Strategy for Disaster Reduction
UNDP	United Nations Development Programme
UNDRR	United Nations Office for Disaster Risk Reduction
WMO	World Meteorological Organisation
WFP	World Food Programme

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1. Introduction

Over the past decade, there has been a growing focus on the need for enhanced resilience in the context of climate change and international development. This has led to a push for more integrated approaches to planning for and adapting to climate change and managing disaster risk to reduce vulnerabilities and enhance resilience (Harvey & Singh, 2017, p. 3). Included in this move is an increased emphasis on the use of climate and weather information in decision-making processes to empower decision-makers with appropriate climate information to meet society's climate-related challenges (Hewitt et al., 2020, p. 238). Building on this recognised need, the World Meteorological Organisation (WMO) spearheaded the development of the Global Framework for Climate Services (GFCS), established in 2009 (Bowyer et al., 2015, p. 534). With this framework, one of the main aims has been to increase capacity development to strengthen climate services and support interaction holistically between science and research, as well as communication with stakeholders, to ensure that the climate information is both actionable and usable (Bowyer et al., 2015, p. 534). This global initiative to provide climate services for societies has gained particular momentum in developing countries, and several efforts have since been made to ensure that vulnerable societies can make practical decisions about how best to adapt in ways that build resilience (SEI, 2019; Harvey & Singh, 2017, p. 3).

To ensure that climate services contribute to improved decision-making and enhanced resilience in vulnerable settings, the provided information and services need to be timely and of high quality, as well as relevant, comprehensible and accessible in order to assist individuals and organisations in society to make improved decision-making (Swedish Environmental Institute (SEI), 2019; WMO, n.d.). Furthermore, climate services need to support both climate change adaptation (CCA) and disaster risk reduction (DRR) policy and practice to effectively adapt to and manage the risks associated with an uncertain and warming climate (Street et al., 2019, p. 28; Harvey & Singh, 2017, p. 3; WMO, 2016; Bowyer et al., 2015). Although the number of actors that include climate services in their climate adaptation, climate resilience, and disaster risk reduction programs has increased in recent years, developing actionable climate information that can inform adaptation and risk-based decision making has been a particular challenge for climate services (Bowyer et al., 2015, p. 534; Hewitt et al., 2020, p. 241). A key issue is that many developing countries lack the capacity and resources to provide high-quality climate services (Harvey & Singh, 2017, p. 15; WMO, 2020, p. 1). Therefore, there is a dire need for increased capacity at regional and national levels to ensure that the

development of climate services addresses climate-resilient development issues, and is in support of adaptation and reducing the impact of climate-related disasters.

In recognition of this, is has been increasingly emphasised that the provision of effective and usable climate services requires input from multi-disciplinary personnel including meteorologists, climatologists, engineers, geographers, statisticians, mathematicians, economists, development practitioners, computer scientists and science communicators, to increase the capacity for enhanced resilience at the regional and national level in developing countries (WMO, 2020, p. 31). As follows, the international development and humanitarian communities have made several efforts to provide expert capacity and technical skills to increase the capacity of national institutions to develop climate information and services that support vulnerable countries to cope with climate-related events and disasters (Coughlan de Perez & Mason, 2014, p. 1; Hewitt et al., 2020, p. 238; WMO, 2015).

In Sub-Saharan Africa, knowledge and information on climate variabilities are crucial to enhances the resilience of populations in vulnerable settings. Since the establishment of the ambitious agenda set by the GFCS, countries across Sub-Saharan Africa have required enhanced international support for capacity development to increase the institutional and human capacity of National Meteorological and Hydrological Services (NMHSs) and Regional Climate Centres (RCCs) to develop climate information and products that will enhance resilience and support vulnerable populations (WMO, 2015). In an effort to respond to the need for increased institutional and human capacity, the Norwegian Refugee Council's (NRC) global provider of expert capacity to the humanitarian, development and peacebuilding sectors – NORCAP – begun supporting the GFCS with expert capacity through its '*Strengthening access to climate services in Africa'* project in 2015 (WMO, 2015; NRC, 2018). Recognising how several countries across Sub-Saharan Africa have been adversely affected by natural disasters and extreme weather events such as droughts and floods, NORCAP partnered with WMO of to deploy climate experts into the field to increase the capacity of national and regional entities to strengthen their development and delivery of climate information services (WMO, 2015). Since it the first project phase from 2015-2017, NORCAP has continuously supported on building capacity in Regional Climate Centres (RCC) and National Meteorological and Hydrological Services Centres (NMHS) in in Sub-Saharan Africa, as well as different UN agencies, and has done so with continuous donor support from the Norwegian Agency for Development Cooperation (Norad).

1.1 Purpose of study

In order to gain an understanding of the challenges and opportunities in strengthening capacity for climate services which can support climate-smart decision-making, this study explored NORCAP's perceived challenges and opportunities in fulfilling its objective of contributing towards strengthening climate information services in Sub-Sahara Africa through capacity development. As a key provider of expertise for climate services to regional and national entities, NORCAP serves as an interesting and valuable case to assess the challenges and opportunities alike of the ways in which capacity development can strengthen regional and national efforts to provide vulnerable populations with access to, and improved use of, climate information services. Furthermore, the study provides an opportunity to address the current capacity-gaps experienced within the RCCs and NMHSs where NORCAP provides expert capacity.

The area of research was explored by assessing key challenges and opportunities identified by NORCAP in providing expert capacity to RCCs and NMHSs for climate services. The study builds on previous theoretical understandings of sustainable capacity development for climate services to assess NORCAP's approach to strengthening of climate services through capacity development support. This thesis aims to contribute to an area of international development research which has identified the need for an increased understanding of the ways in which capacity development for climate services can lead to improved use and delivery of climate services for decision-making.

This body of work primarily considered literature from the fields of climate services and capacity development. It further explored literature on the interlinkages between climate services, climate change adaptation (CCA) and disaster risk reduction (DRR), drawing on differences and similarities to identify the ways in which capacity development can inform better decision-making for these domains. Literature on climate information delivery was also addressed. Keeping in mind that the global objective of adapting to climate change and reducing disaster risk is to reduce vulnerability and enhance resilience, this research also addresses these two concepts and the ways in which they are addressed by NORCAP in their work on climate services.

1.2 Research question

With the established objective and area of research in mind, this thesis will answer the following research question;

What does NORCAP perceive to be the challenges and opportunities in fulfilling NORCAP's objective of contributing towards strengthening climate information services in Sub-Saharan Africa through capacity development?

By applying this overarching research question, this study addressed different challenges and opportunities which have been identified by NORCAP since the start of its work with climate services, thus encompassing an extensive understanding of how NORCAP has tackled the different challenges faced and explored the identified opportunities. Addressing this research question also provides an understanding of how NORCAP works to strengthen capacity for climate services within its partnering entities, which further provided an opportunity to explore how NORCAP has supported increased access to, and improved use of, climate services and climate information across the countries in Sub-Saharan Africa where NORCAP provides capacity support. Thus, the purpose of applying this guiding research question was to identify and assess important challenges faced, as well as valuable opportunities to foster further strengthening of climate information services through capacity development.

The research question was addressed primarily by analysing data gathered from three extensive project reports which consist of comprehensive reporting on NORCAP's support to capacity development in national and regional climate entities since 2015. Data collected from three in-depth interviews with NORCAP climate experts and staff was also addressed and discussed to gain the views and perspectives of those coordinating and providing capacity support in the field. Two interviews were conducted with climate experts which uphold extensive experience and knowledge from the NORCAP climate services project. One additional in-depth interview was conducted with a NORCAP climate advisor with extensive experience on the coordination of the 'Strengthening climate services in Africa' project. By applying the collected data to this thesis, the different deployments and activities under the different project phases, as well as the perspectives and views of NORCAP experts and staff on challenges and opportunities in building capacity for strengthening climate services and access to climate information in vulnerable settings was addressed.

1.3 NORCAP

The Norwegian Refugee Council (NRC) is Norway's largest independent humanitarian organisation, with presence in more than 30 countries (NRC, 2018). 2021 marks the 75th Anniversary of NRC; however, NORCAP, has only been in existence for the past 25 years (NRC, 2018). As a response to the Kurdish refugee crisis in 1991, the UN Refugee Agency (UNHCR) turned to Norway for assistance, resulting in the establishment of what is known as NRC's global provider of expertise to the humanitarian, development and peacebuilding sectors, NORCAP (NRC, 2018). Although NORCAP is sectioned under the umbrella that is NRC, NORCAP has expanded into becoming a unique and leading global provider of support beyond humanitarian assistance, stretching its capacity expertise across the humanitarian, development and peacebuilding sectors. At the heart of NORCAP is its prequalified roster members, consisting of experienced humanitarian and development professionals, who in total have been deployed to more than 9,000 missions since the establishment of NORCAP in 1991 (NRC, 2018).

Today, NORCAP holds the position as a leading global provider of capacity, strengthening international, regional, national and local actors' ability to prevent, prepare for, respond to and recover from crises (NRC, 2017, p. 14). Thus, NORCAP's ultimate goal is to enable its partners to protect lives, rights and livelihoods of affected populations and strengthen their resilience before, during and after crisis. To this end, NORCAP seeks to enhance the capacity of the United Nations system, regional organisations, national and local actors, in all stages of a crisis, from prevention, preparedness and response to early recovery, peacebuilding, sustainable development, human rights and democratic governance. It is further of high importance to note that NORCAPs contribution in these areas is not at the direct beneficiary level, rather, its activities are targeted at improving the services of its partners and creating an enabling environment. Specifically, NORCAP's contribution to this overall goal is ensured through:

- Providing experts to strengthen and develop partner capacity, i.e. their ability to perform functions, solve problems and achieve objectives;
- developing strategic partnerships, i.e. formalised agreements with other organisations and actors to build on its respective strengths and expertise to reach common goals; and,

- advocating for more effective ways of working within and across the humanitarian development and peace sectors, through strategic engagement in inter-agency policy and communities of practice.

NORCAP has engaged in the drive for systematic change, and an integrated approach which seeks complementarity across the humanitarian- development and peacebuilding continuum. NORCAP's support to emergency response and longer-term peacebuilding efforts are coupled with specific thematic projects and efforts linked to development work and resilience, aligned with the global agenda and Norway's Humanitarian Strategy 2019-2023.

Under its current strategy, NORCAP has therefore been particularly focused on contributing to stronger linkages between humanitarian and development efforts. For NORCAP, this translates into strengthening capacity to work towards collective outcomes over multiple years, and also means drawing on the comparative advantages of different actors through joint analysis and joint programming in line with the United Nations Sustainable Development Goals (NRC, 2017, p. 14). To this end, NORCAP makes use of its experts and different thematic projects to improve protection, coordination, peacebuilding and resilience efforts globally (NRC, 2018).

1.3.1 Strengthening climate services in Africa

In a response to increasing natural disasters hitting vulnerable regions in Africa, NORCAP entered its first project phase in 2015, with the objective to strengthen climate services in Africa. The project came into existence due to the need for support on the practical implementation of the Global Framework for Climate Services (GFCS) (WMO, 2015). Under the agreement, NORCAP begun deploying expert meteorologists, hydrologists and other climate experts to support on the operationalization of the framework (WMO, 2015). This was in line with a multi-partner international initiative, spearheaded by the World Meteorological Organisation (WMO), to improve the provision and use of climate services like seasonal outlooks and drought monitors, with priority areas being in agriculture and food security, disaster risk reduction, water management, health and energy (WMO, 2015). Since then, NORCAP has expanded from the original objective of strengthening climate services through support to the GFCS and its regional partners, towards a much larger objective of improving the resilience of populations in vulnerable settings. From this, NORCAP now works with existing institutions and entities to build their capacity and expertise to better deliver services and interact with end

users and communities. Thus, NORCAP established a niche as a provider of support to regional climate service institutions, national meteorological offices, as well as the UN, and has deployed experts to improve data gathering, modelling and interpretation of the data available, to provide improved weather and climate services for sustainable decision-making. As part of its 'Strengthening climate services in Africa' project, NORCAP's support to the UN lies primarily in capacity expertise on climate resilience efforts, to ensure coordinated efforts with the work at the regional and national levels.

Although the project has developed since its establishment in 2015, the project continues to provide capacity building and support to the GFCS, primarily in the development and validation of National Frameworks for Climate Services (NFCS) in West and Eastern Africa. The future focus here is on the implementation of these national frameworks. Beyond the support to the GFCS, NORCAP experts also provide technical experts to support regional climate modelling, long term climate assessments, long range forecasts, hydrological aspects and interactive systems for hazard forecasts. Furthermore, the project provides support to better strengthen climate communication delivery, user engagement, community consultations for better understanding needs on the ground and co-production processes. NORCAP experts under the climate roster also support their host organisations with fundraising, program development for DRR and CCA, climate and security and climate insurance initiatives.

1.4 Thesis outline

The next chapter of this body of work outlines the central concepts applied in this thesis. Here, key concepts such as climate services, capacity development, human capacity, climate change adaptation and disaster risk reduction, as well as vulnerability and resilience, are defined and operationalised to lay the foundation of the analytical approach that will be taken. The following chapter reviews previous literature which reflects on climate services as a means to enhance resilience, the different capacity needs within the field of climate services, and how the development of climate services that can cater to the needs and requirements of the CCA and DRR communities. Chapter four presents the research design and methods used in this study. Additionally, the limitations and ethical considerations which apply to this particular thesis are described in the final section of chapter four. Following this, chapter five presents the findings, and takes on an analytical discussion of these findings. Here, a thematic approach is applied to discuss the main themes identified. The final chapter presents the conclusions derived

from the established discussion, and thus address how this corresponds with the overall research question. This chapter also demonstrates the main contributions of this research, and indicates any further limitations and suggestions for further research.

2. Conceptual framework

This chapter will lay out the key concepts used in this thesis, with the aim to anchor the key concept applicable to the research. Thus, this chapter will provide operationalised understandings and definitions of key concepts such as climate services, capacity and human capacity development, climate change adaptation and disaster risk reduction, resilience and vulnerability.

2.1 Climate services

Climate services are essential for adaptation to climate variability and change. Since the establishment of the GFCS, the aim has been to develop climate services which bridge the gap between the climate information being developed by scientists and service providers, and the practical needs of end-users (WMO, 2018). The overall definition which is applied under the GFCS therefore considers climate services as having derived from climate information, and can in simplistic terms be defined as; “a decision aid that assists individuals and organisations in society to make improved ex-ante decision-making” (WMO, n.d.). Building on this understanding, the global framework further elaborates that developing effective climate services requires information which facilitates climate-smart decisions that support efforts to mitigate the impacts of climate-related disasters, improve food security and health outcomes, enhance water resources management, and bring better outcomes in disaster risk reduction (WMO, 2018). Needless to say, the delivery of climate services involves multiple processes and levels, and require multi-disciplinary and cross-sector collaboration to effectively inform decision-making (WMO, 2018). This will be further explored in chapter 3.

Although the simplified definition above provides a broad understanding of the purpose of climate services, an operationalised definition of climate services needs to be established for this particular thesis in order to encapsulate the different products and services in relation to climate where NORCAP provides expert capacity. Thus, this thesis builds on the

understandings adopted by Bowyer et al. (2015, p. 534) and the European Commission alike, where the latter provides an understanding of the delivery and purpose of climate services, and the former defines the different products and services where climate data and information are gathered. Climate services will therefore be recognised as; *"...the provision of timely, decision-relevant, actionable, science-based information, and guidance on climate variability and change, and the associated environmental and social impacts, to assist decision makers (users) in the development of responses to manage their climate risks*" (Bowyer et al., 2015, p. 534). Following this understanding, the European Commission further defines climate services as;

"The transformation of climate-related data – together with other relevant information – into customised products such as projections, forecasts, information, trends, economic analysis, assessments, counselling on best practice, development and evaluation of solutions, and other services in relation to climate that may be of use for society at large. Includes data, information, and knowledge that support adaptation, mitigation and disaster risk management" (Brasseur et al., 2016, p. 80).

With this established operationalisation of climate services, these conceptual definitions will function as the guiding understandings of climate services throughout this thesis.

2.2 Capacity development

Within the context of international development, the concept of capacity building has been a central part of development policy for several decades, and has been widely adopted across the field of international development (Guy, 2016; European Commission, 2017, p. 2). Put simply, capacity is defined as "the ability of individuals, institutions and societies to perform functions, solve problems, and set and achieve objectives in a sustainable manner", and is a recognised definition established by the Organisation for Economic Co-operation and Development (OECD) (European Commission, 2017, p, 1). The concept of capacity building was introduced in the 1950s to make up for perceived shortcomings in the development aid and technical assistance provided by major international donors, and has since been a central part of development aid and assistance in developing countries. The notion of capacity building was thus meant to build capacity where international actors recognised a lack of ownership by recipients, incapacity to effect sustainable change, lack of inter-sectorial coordination, and insufficiently tailored-made approaches (European Commission, 2017, p. 1). Furthermore, the

term has commonly been used to refer to processes which only support the initial stages of building or creating capacities and is based on an assumption that there are no existing capacities to start from. Yet, in recent years, the concept of capacity building has moved from being considered as a "...process that supports only the initial stages of building or creating capacities", towards "...the process through which individuals, organisations and societies obtain, strengthen and maintain the capabilities to set and achieve their own development objectives over time" (UNDP, 2009, p. 54).

This understanding of strengthening capacity in developing countries has thus resulted in adopting a new term which goes beyond acknowledging the need to build something from the ground up (European Commission, 2017, p. 3). This new term is recognised as capacity development, and was established in order to better express an approach that builds on existing skills and knowledge, driving a dynamic and flexible process of change, borne by local actors (European Commission, 2017, p. 2). Since the coin of this term, several international actors and agencies have adopted different definitions of capacity development. Yet, the main recognition is that capacity development of individuals and institutions in developing countries is crucial to ensure successful development. Without supportive strategies, policies, laws and procedures, well-functioning organisations, and educated and skilled people, countries lack the foundation to plan, implement and review their national and local development strategies (UNDP, 2009, p. 2; Fukuda-Parr et al., 2002; Zamfir, 2017, p. 2). Capacity development therefore commonly refers to the process of creating and building capacities and their (subsequent) use, management and retention. This process is driven from the inside and starts from existing capacity assets (UNDP, 2009, p. 2).

Due to the multitude of established definitions to contextualise the concept of capacity development, this thesis applies the definition given by the United Nations Development Programme (UNDP), where capacity development is understood as "*the process through which individuals, organisations and societies obtain, strengthen and maintain the capabilities to set and achieve their own development objectives over time*" (UNDP, 2009, p. 53).

This understanding entails that for capacity development to be effective and durable, the different efforts under this approach must be expansive and hold a long-term endeavour that strengthens institutions and builds human resource capabilities on an end-to-end basis that not only addresses capacity gaps in knowledge generation and sharing but also in the processes that catalyse efforts to move from knowledge to action (Virji et al., 2012, p. 121). This

understanding further feeds into the establishment of another central concept of this thesis, namely human capacity development.

2.3 Human capacity development

A central component under the concept of capacity development is that of human capacity development (WMO, 2020, p. 31). Within the context of international development, human capacity development is recognised as an integral part of the process through which organisations and institutions build and maintain the capabilities to achieve their developmental objectives over time (WMO, 2020, p. 31). In developing countries in particular, the lack of human resources and technical skills limits institutional strengthening, which are a crucial for the given organisation or institution to achieve their development objectives and reach vulnerable communities. Strategic partnerships with non-governmental partners can help to ensure that capacity development is a sustained long-term effort that accomplishes both the development of human resources and institutional strengthening, however, this requires sustained support and funds (Virji et al., 2012, p. 121; Zuka, 2015, p. 1892-1893).

The definition of human capacity development established by the United Nations Food and Agricultural Organisation (FAO) under the 'Strategic Framework of Human Capacity Development in Fisheries' provides a valuable understanding of the process of human capacity development within the context of international development, and is therefore used in this thesis to operationalise the understanding of human capacity development for climate services (FAO, 2009). This given definition defines human capacity development as; "*the process by which individuals, groups, organizations, institutions, and societies develop their abilities - both individually and collectively - to set and achieve objectives, perform functions, solve problems and to develop the means and conditions required to enable this process"* (FAO, 2009, p. 1). Providing human capacity further helps to ensure the long-term sustainability of projects, and is key to ensure that organisations and institutions which lack capacity are provided with the right expertise, skills and knowledge to achieve their development objectives over time.

2.4 Disaster Risk Reduction and Climate Change Adaptation

Here, the central concepts of DRR and CCA, as well as their similarities and differences, are established to provide an understanding of how the researcher assesses the two concepts, and how these are addressed within the field of climate services.

Disaster risk reduction is defined by the United Nations Internal Strategy for Disaster Reduction (UNISDR) as; "*the concept and practice of reducing disaster risks through systematic efforts to analyse and manage the causal factors of disasters, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events*" (UNISDR, 2009, p. 10-11). Climate services can strengthen all phases of the DRR cycle, including through better informed climate risk and action assessments, early warning systems and response planning. However, to be effective for DRR, information about future climate risks should be easily accessible, based on harmonized datasets as much as possible and should include vulnerability and exposure information and be supported by capacity development (Street et al., 2019, p. 30).

Building on the understanding of CCA given by the United Nations Framework Convention on Climate Change (UNFCCC), adaptation to climate change here refers to "*...adjustments in ecological, social, or economic systems in response to actual or expected climatic stimuli and their effects or impacts*" (UNFCCC, n.d.). This definition further refers to "*...changes in processes, practices, and structures to moderate potential damages or to benefit from opportunities associated with climate change*" (UNFCCC, n.d.). Put simply, vulnerable countries and communities need to develop adaptation solution and implement action to respond to the impacts of climate change, both in response to current and future climate impacts" (UNFCCC, n.d.). There are a number of adaptation activities and processes which require effective and timely climate services (WMO, 2016, p. 5). These mainly consist of the collection of comprehensive and useful climate data, generation and provision of a wide range of information on past, present and future climate impacts, development of products that help improve the understanding of climate impacts on natural and human systems, and the application of these data, and information and products for multi- and cross-sectoral decision-making (WMO, 2016, p. 5).

2.5 Resilience and vulnerability

Although the concepts of resilience and vulnerability are not central to the objective and research question of this thesis, it is important to address how these concepts are understood by the researcher as they are addressed throughout the thesis. Thus, the understanding of these two concepts within this study will here be established.

Within the climate and development communities, the term climate resilience has gained increased traction as of late, and is widely understood as a guiding framework for the design of climate-resilient development policies and programmes (Clare et al., 2017, p. 17). Although many definitions exist for climate resilience in this context (hereafter referred to simply as 'resilience'), it can be broadly considered as; "*The capacity of all people across generations to sustain and improve their livelihood opportunities and wellbeing despite environmental, economic, social and political disturbances*" (Tanner et al., 2015, p. 23).

However, this definition serves as a rather simplistic understanding of resilience. Thus, this body of work will further apply the understanding of resilience, adopted by UN Office for Disaster Risk Reduction (UNDRR), as; "*The ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions"* (Begum et al., 2014, p. 363).

In contrast to resilience, Begum et al., (2014) define vulnerability as; *"The characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard*" (Begum et al., 2014, p. 363). Furthermore, the Sendai Framework for Disaster Risk Reduction provides the following definition of vulnerability; "*The conditions determined by physical, social, economic and environmental factors or processes, which increase the susceptibility of a community to the impact of hazards*" (UNDRR, 2015, p.10)

Although these definitions provide a simplistic understanding of vulnerability, particularly within the context of climate change, a broader definition given by Chambers (1989) provides an understanding of vulnerability in its entirety;

"*Vulnerability means not lack or want, but defencelessness, insecurity, and exposure to risk, shocks and stress ... Vulnerability here refers to exposure to contingencies and stress, and the difficulty in coping with them. Vulnerability has thus two sides: an external side of risks, shocks, and stress to which an individual or household is subject: and an internal side which is*

defencelessness, meaning a lack of means to cope without damaging loss" (Chambers, 1989, p. 1).

3. Thematic background

This chapter provides an overview of previous research and literature of relevance to this thesis. Thus, this chapter provides a broader understanding of the emergence of climate services, the different capacity needs within the field of climate services in Sub-Saharan Africa, and how the development of climate services can cater to the needs and requirements of the areas where climate services can have the greatest impact, such as the CCA and DRR communities.

3.1 Understanding climate services - Challenges and needs in Sub-Saharan Africa

Climate services have in recent years been seen as a means through which the vulnerability of Africa to environmental shocks and stresses might be reduced and livelihoods strengthened (Harvey et al., 2019, p. 82). However, climate services did not become a core focus for bilateral funding and NGOs activity in developing countries until the early-to-mid-2000s (Harvey et al., 2019, p. 82). Since then, the need for actionable climate information to inform policy and practice has emerged as a priority and led to the implementation of the Global Framework for Climate Services (GFCS), an international framework for climate services that links science-based climate predictions and information with the management of climate-related risks and opportunities in support of adaptation to climate variability and change, particularly in developing countries (Vaughan & Dessai, 2014, p. 590). The implementation of the GFCS thus enhanced the surge of interest in climate service development in developing countries, and are now seen to offer benefits across a range of scales in Sub-Saharan Africa (Harvey et al., 2019, p. 82; Vaughan & Dessai, 2014, p. 587). These benefits stretch from safeguarding investments into national infrastructure for long-term change which can support smallholder farmers, fishermen and pastoralists to "*protect property and human lives, access risk-management mechanisms like index-based insurance, and create long-term plans for a future that will be highly dependent on rainfall patterns, droughts, floods and other natural disasters*" (UNDP 2016, p. 7).

Recognising this, the international and national communities have increasingly built its efforts to respond to a changing climate in recent years, by investing in funding and research for "resilience building" (Harvey et al., 2019, p. 81). Greater attention to climate services has thus coincided with the increasing use of resilience as a framing concept which bridges short-term and response to climate and disaster risk with longer-term development agendas (Harvey et al., 2019, p. 82). With the rising interest in climate services in recent years, access to relevant and quality-controlled climate information is recognised as crucial to enable better informed decisions aimed at addressing existing and emerging weather and climate-related risks (Harvey et al., 2019, p. 81; Street et al., 2019, p. 29). As highlighted by Vaughan and Dessai (2014), there has been an increasing demand from society and governments to have access to information related to weather and climate in order to assist in the development of adaptation responses to climate risks (Vaughan & Dessai, 2014, p. 588). Harvey et al. (2019) further argue that this has generated opportunities for new types of funding and partnerships, including scaled up investment into climate services as a means of reducing vulnerability and building resilience (Harvey et al., 2019, p. 81).

As part of an important aspect within the adaptation agenda, humanitarian organisations, government entities and international actors have focused attention on climate services as a way to improve climate risk management and increase resilience, focusing in particular on the use of historical information, seasonal forecasts, and long-term climate projections (Vaughan & Dessai, 2014, p. 591). As a result, climate services now exist at local, national, regional, and international levels and in a range of different sectors, including agriculture, health, disaster risk reduction, water resources management, to name a few (Vaughan & Dessai, 2014, p. 591). Despite the recognised attention and increased investments, Harvey et al. (2017) highlight many of the existing gaps and challenges particularly faced by NMHSs in Sub-Saharan Africa (Harvey et al., 2017, p. 12). Examining the case of Burkina Faso, the authors particularly highlight the lack of human capacity such as staffing and technical expertise, lack of timely and efficient data to provide sufficient forecasting and early warnings, need for strengthened observational capacity, and the need for increased financial resources to retain and expand staff levels (Harvey et al., 2017, p. 12). Furthermore, they note how the existing capacities of the National Meteorological Centre in Burkina Faso (Météo Burkina) are not recognised by external parties, and often bypass the NMHS for regional institutions such as the regional African Centre of Meteorological Applications for Development (ACAMD) (Harvey et al., 2017, p. 12). The RCCs in Sub-Saharan Africa such as ACMAD and the Climate Prediction

and Application Centre (ICPAC) are recognised as holding greater capacities and being more established than the national centres, and thus sit on much of the resources and capacities needed to support national centres. As a positive aspect further noted in their research, Harvey et al. (2017) point to the increased efforts made by actors working with global and regional institutions to make use of and recognising the need to strengthen capacities at the national level, which has also been increasingly encouraged by WMO (Harvey et al., 2017, p. 12). Yet, beyond the value of regional centres to strengthen institutional and technical capacities, the authors further recognise the value of external and international partners to strengthen services and products such as gathering of data, generating forecasts and developing longer-term projections in national centres such as that of Météo Burkina (Harvey et al., 2017, p. 12).

In a review of African NMHS's conducted by Snow et al. (2016), the authors further highlight certain key challenges facing several of these NMHSs. Here, the authors recognise how inadequate financial support, lack of technical infrastructure, and a lack of trained, experienced staff limits the opportunity to further develop products and services which ensure sustainable decision making (Snow et al., 2016, p. 16). They further describe that in order for NMHSs to provide accurate and reliable forecasts to lessen the impacts of extreme events, they rely on being adequately funded and staffed (Snow et al., 2016, p. 18). However, to date these technological developments have not yet fully materialised in all African NMHS's, and many experiences higher levels of scarcity in terms of resource availability and funding (Snow et al., 2016, p. 18). Technology transfers, knowledge sharing, and regional cooperation are thus essential for African NMHSs to access and apply the existing knowledge used globally to ensure the provision of high-quality services (Snow et al., 2016, p. 19). The authors also found that keeping NHMS staff skills up to date is an ongoing challenge (Snow et al., 2016, p. 19). It is noted that staff training, and professional development are seldom available locally, making them expensive both in terms of time and money (Snow et al., 2016, p. 19). Further, as the skill sets required for meteorologists, climatologists and supporting technical staff are often readily transferable to higher-paying positions in the local private sector, or in the NHMS or private sector of another country, the retention of skilled staff is an issue. These factors have become disincentives for the leadership of an NHMS in a least developed country to significantly invest in staff training and development (Snow et al., 2016, p. 19). Furthermore, the authors identify how low funding of NMHSs from governments for the development and maintenance of infrastructure, observing systems, forecasting tools, staff competencies, and service delivery

mechanisms, further erode the ability of NMHS to undertake the continuous modernisation resulting from rapid advances in the science and technology (Snow et al., 2016, p. 20).

As climate services consists of a range of products and services, they can offer broad forms of analysis and provide information relevant to adaptation and risk decisions (Bowyer, et al., 2015, p. 534-535). According to Bowyer et al. (2015), these services in part comprise of climate observations, climate model forecasts, predictions and projections of possible future climates at a range of timescales, projected environmental and societal impacts, vulnerability and risk assessments, and decision support tools (Bowyer et al., 2015, p. 534). In order for these types of products and services to be relevant to decision-making for adaptation and reducing risks, strong partnerships across sectors and institutions are required (Bowyer et al., 2015, p. 535). Furthermore, Bowyer et al. argue that the actors involved needs to go far beyond the work done by the NMHSs, as climate services should be developed and provided by "...inter- and transdisciplinary teams including climate, environmental, social and political scientists, economists, and risk and decision theorists, as well as stakeholders" (Bowyer, et al., 2015, p. 535). This further requires the need to support and develop climate services institutions and their resources to further strengthen climate services, and cannot be met by one institution or organisation alone (Bowyer et al., 2019, p. 535; Vaughan & Dessai, 2014, p. 596). Harvey et al. (2019) particularly recognise the value of regional centres as prominent providers of data and analysis to NMHSs across the Sahel and wider Horn of Africa regions, as well as the crucial role of non-state actors to provide the capacity needed to strengthen both national and regional entities in Sub-Saharan Africa (Harvey et al., 2019, p. 90). They further argue how the added value of gaining support from non-state actors can provide technical skills which contribute to analysis, capacity development and research for climate services (Harvey et al., 2019, p. 90).

3.2 Beyond developing climate services – Communicating climate information services

Although increased investments and support at national and regional levels for the development of climate services has rapidly increased in recent years, the process of communicating climate information services in Sub-Saharan Africa still pose many challenges. Several scholars, such as Bowyer et al. (2015) and Vaughan and Dessai (2014), recognise the lack of connection between climate information users and providers, as they tend to be weak, and in some cases non-existent (Bowyer et al., 2015; Vaughan & Dessai, 2014). The capacity to extract and collect, analyse, and model data, combined with coordination and collaboration across sectors

to understand how the data relates to different sectors, are essential first steps to ensure the delivery of climate services (Vaughan & Dessai, 2014, p. 596). Yet, the success of a climate service depends on the quality of the climate information that underpins it. Thus, the quality of climate information alone is not sufficient to make climate services effective (Vaughan & Dessai, 2014, p. 590). Indeed, the technical and probabilistic nature of climate information makes it very difficult for non-experts to interpret. As a result, climate information is most effective when tailored to meet recipients' needs in terms of response strategies, cultural traits, and specific situations. If the information is not appropriately tailored to specific decision-making contexts, it will not be useful across a range of decision-making levels (Vaughan & Dessai, 2014, p. 596). In that regard, assessing the extent to which information is appropriately tailored is important to understanding the efficacy of climate services. Vaughan and Dessai (2014) discuss three important aspects of this tailoring process, which are "*…the perceived relevance of the information; the accessibility of the information; and the distributional impact of various groups, including those who may be more or less well-off*" (Vaughan & Dessai, 2014, p. 596).

Even in cases in which these connections do exist, climate information providers often do not fully understand the contexts in which decisions are being made. As a result, information is provided in a format that prospective users find difficult to understand and incorporate into decision making (Vaughan & Dessai, 2014, p. 590). While the impact of this may be neutral across socioeconomic groups in some situations, in other cases the inappropriate use of (or inability to use) climate information can increase users' risk exposure and vulnerabilities as they are not equipped with the right knowledge and information to make sustained decisions (Vaughan & Dessai, 2014, p. 590). These challenges have shifted the focus of both scientists and decision makers to holistic solutions derived from cross-disciplinary and participatory user-oriented research. In this way, climate scientists and service providers now strive to work closely with sectoral experts, practitioners, and policy makers in a process of joint problem solving (Vaughan & Dessai, 2014, p. 590).

It is important to bring about reflections on who the so called "end-users" are in the delivery of climate services, and what addressing the needs of different end-users entails at different levels of decision-making. As with the multitude of different services and products which comprise of climate services, so are the levels of different end-users reliant on the services provided. End-users of climate information services exist at all levels, from national to regional and district level governments, to farmers, pastoralists and fishermen at the grassroots level (West, 2014).

As such, climate services play a key role in providing information on climate change impacts, adaptation and mitigation measures for a wide range of end-users in creating understanding and raising awareness for decision-making (Raaphorst et al., 2020, p. 2). Furthermore, the end-users' perspectives are key in order to tailor climate services which meets the need of users at all levels of decision-making (WMO, n.d.). This responds to the need for co-production of climate services which can ensure iterative exchange between providers and users of such services and products (West, 2014; Coughlan de Perez et al., 2014, p. 3; Krauss & Von Storch, 2012, p. 223). Coughlan de Perez et al. (2014) further argue that *"...when working with end-users, the information provided by resource institutions needs to be directly relevant to the decision at hand*", as irrelevant information can cause confusion and ultimately cause inaction (Coughlan de Perez et al., 2014, p.1)

Thus, the extent to which information is presented to directly address user needs, rather than simply delivering technical information, is a critical factor to determine the sufficient use of the services and information provided. Furthermore, in order to ensure the usefulness of climate information for CCA and DRR, collaboration between end-users and information providers is essential. Yet, the interaction between climate services and the domains of DRR and CCA are seen as one of the key challenges in the use and delivery of climate services, particularly for root-level end-users such as farmers, pastoralists and fishermen (Coughlan de Perez et al., 2014, p. 1; Bowyer et al., 2015). This requires sufficient capacity of the regional and national centres providing services and products (Harvey et al., 2017, p. 13; Harvey et al., 2019, p. 90). Harvey et al. (2019) highlight how these capacities can be enhanced through external capacity support form non-state actors by strengthening communication, community engagement and accountability (CCEA), particularly at the national and local level, and is regarded as a central approach to ensure that climate services are developed in support of CCA and DRR (Harvey et al., 2019, p. 92).

Many recognise how meteorological services and climate centres across Africa lack sufficient human, financial and technical resources and capacity to engage with end-users and produce climate information in a format and language that is applicable to decision making (West, 2014; Raaphorst et al., 2020; Vaughan & Dessai, 2014; Harvey et al., 2019). Delivering tailored climate services that inform decision-making is thus a multi-front challenge. Bowyer et al. (2015) argue that "...*climate information needs to incorporate strong communication channels between decision-makers and knowledge providers to ensure knowledge exchange, facilitate two-way dialogue and shared learning*" (Bowyer et al., 2015, p. 535). This is particularly

important in relation to understanding user needs and existing knowledge, and the limits and capabilities of the science-based information provided (Bowyer et al., 2015, p. 535). West (2014) further notes the lack and ability of institutional forums to articulate information needs, as well as to communicate existing climate information in a wide range of languages to end-users at grassroot level (West, 2014).

According to Bowyer et al., (2015), climate information services are used both through top-down approaches, as well as through bottom-up vulnerability approaches to climate risk assessments (Bowyer et al., 2015, p. 535). They highlight the wide criticism given of the so-called top-down approaches, as it tends to present highly technical data which lacks the ability of providing decision-relevant information (Bowyer et al., 2015, p. 536). Through this justification, the authors further argue that for climate services to be useful and usable for different end-users "*...it is imperative that a sustained two-way dialogue is established between providers and users to support the co-generation of knowledge*" (Bowyer et al., 2015, p. 543). The authors further build on previous literature to depict three essential elements of ensuring the delivery of actionable climate knowledge which provides a useful framework within which to discuss user engagement in relation to climate services. These elements are namely saliency, credibility and legitimacy (Bowyer et al., 2015, p. 543; Coughlan de Perez et al., 2014, p. 1). The first refers to the perceived relevance of the gathered information, and relates to the provision of easily accessible and understandable products which can support climate-smart decision-making for adaptation and risk reduction across different sectors (Bowyer et al., 2015, p. 543). The element of credibility refers to the technical quality of the gathered climate information, and thus entail that the development of climate information services needs to be made to deliver products which enhance user capacity (Bowyer et al., 2015, p. 543). The third element of legitimacy relates to the ways in which the needs of different users are considered and realised in the final products that have been developed (Bowyer et al., 2015, p. 543). The three combined represent an ideal combination for the delivery of climate information services which can ensure climate-smart and sustainable decision-making across user levels, and in turn support decision-making for particular sectors and domains such as CCA and DRR (Bowyer, et al., 2015, p. 544).

Nevertheless, in order to ensure that the services and products developed at regional and national levels are communicated in a manner which sufficiently supports that of non-technical audiences and different sectors, strong levels of institutional and human capacity of the institutions communicating this information, is crucial (Harvey et al., 2019, p. 93). Harvey et

al. (2019) further recognise that effective communication is a major task for climate services, and is thus dependent on close collaboration between users and climate services providers in order to identify different coping and vulnerability levels, as well as how adaptive measures can support in managing current and future climate risks (Harvey et al., 2019, p. 92).

3.3 Capacity development for climate services

Several scholars concur that most meteorological and hydrological services in Africa do not have the capacity to produce and deliver high quality, reliable climate services (Hewitt et al., 2020; Adenle et al., 2017; Harvey et al., 2019; Snow et al., 2016). According to Adenle et al. (2017), the authors regard investment in climate data, scenarios and impact models as the first priority to deliver better climate services and progress adaptation to climate change (Adenle et al., 2017, p. 190). They also highlight the need for partnerships across key UN agencies such and national governments to ensure strengthened capacity (Adenle et al., 2017, p. 197). Yet, when fragmented collaboration and limited existing capacity to develop useful climate services is a reality, the understanding and use of climate data which should feed into decision-making is also often lacking (Adenle et al., 2017, p. 191). Few countries and governmental entities across Sub-Saharan Africa have reliable and detailed long-term datasets from which to determine if or how the climate is changing at regional and local levels (Adenle et al., 2017, p. 195). Thus, in order to strengthen the quality of climate information services for informing adaption and disaster risk decision-making, it is crucial to address data gaps and improve the quality of climate projections, forecasts, and impact models, and requires collaborative action by national governments, donors, and UN agencies (Adenle et al., 2017, p. 196).

Capacity development is emphasized as an overarching pillar in the GFCS, with the initial focus to strengthen capacities at regional and national levels to develop climate services for food security, health, water and DRR, as these areas have been regarded as areas in which climate services can have the greatest impact (Hewitt et al., 2020, p. 241). Since the establishment of the GFCS, numerous projects have been funded by a range of national and international development agencies to actively support climate resilience, climate risk reduction and climate change adaptation (Hewitt et al., 2020, p. 241). According to Hewitt et al. (2020), the number of actors that include climate services in their climate adaptation, climate resilience, and disaster risk reduction programs is growing (Hewitt et al., 2020, p. 241). Yet, although such positive developments are being recognised, the growth in demand for services requires an increase in

sector-tailored and end-user-focused climate service capabilities, as well as coordination to avoid fragmentary, contradictory, and piecemeal implementation (Hewitt et al., 2020, p. 241). For this to be ensured, particularly at national level, a wide range of technical expertise and resources is crucial (Hewitt et al., 2020, p. 246; WMO, 2020, p. 31). As many African national meteorological entities hold limited capacities to develop and deliver climate services, the confidence and trust in these national service providers risks being undermined. Hewitt et al. (2020) further argue how this lack of confidence in national entities can further diminish the ability to build capacity, as they are provided with limited financial and human resources (Hewitt et al., 2020, p. 245). Thus, the authors note how "*…the lack of resources, capability and capacity is at odds with the growing demand for climate services, and severely hampers proper co-development and delivery of sustainable climate services that can help society make effective decision*s" (Hewitt et al., 2020, p. 245). In their study, Hewitt et al. (2020) further note findings from a survey conducted by WMO of human resources in NMHSs in developing countries. Here, it was identified that several of the examined national entities experience "*...serious capacity gaps*", which spans across a range of professional areas crucial to strengthen the development and delivery of climate services and climate information (Hewitt, et al., 2020, p. 248). In their study on 'Identifying research priorities to advance climate services', Vaughan et al. (2016) further note the lack of understanding of specific capacity needs, as limited research has been conducted on the sorts of efforts that are most needed, most effective, and those that should be prioritised in different contexts (Vaughan et al., 2016, p. 70).

As part of a literature review conducted by Norad in 2015 on 'Norwegian Support to Capacity Development', they identified key findings across a range of different literature on capacity development (Norad, 2015). In part, the review is comprised of previous literature reviews completed by other international development actors such as the Swedish International Development Cooperation Agency (SIDA) and the World Bank (WB). Although this literature review does not particularly consider capacity development for climate services, it was guided by the question "*What characterises those strategies and interventions for capacity development support which seem relatively more effective, compared to those that seem relatively less effective?*" (Norad, 2015, p. 2). Thus, it provides an overarching understanding of what characterises successful capacity development (Norad, 2015). As part of this review, the authors addressed three overarching characteristics of successful capacity development, namely, "*...i) robust local ownership of the activities, ii) commitment towards the achievement of results, and iii) the importance of creating a collaborative atmosphere where people are*

brough together with clear lines of communication and joint decision-making processes" (Norad, 2015, p. 9). Bester (2015), further notes how external assistance for capacity development, such as that provided through capacity development projects and programmes by international actors, are less likely to develop sustainable capacities if national ownership and use of national expertise and systems are not ensured (Bester, 2015, p. 3).

Although the author recognises the significance and positive attribution of external assistance for capacity development, they further note that in order to ensure sustainable capacity development, it should be an ongoing process driven by "*...those whose capacities are to be developed*" (Bester, 2015, p. 3). Furthermore, it is here argued by the author that capacity development should be demand-driven and focus on outcomes, rather than solely relying on technical assistance which rather focuses on inputs (Bester, 2015, p. 3). These characteristics and reflections are key to all capacity development activities and processes, and need to be incorporated to ensure that capacities are sustained within the institutions being supported, in particular by when supported through external assistance such as through development and humanitarian initiatives (Bester, 2015, p. 4).

As part of an extensive paper developed by WMO (2020), where the authors provide guidelines intended for NMHSs and other climate services providers on how to best develop their capacities in the provision and use of climate services (WMO, 2020, p. 1). Here, WMO characterise capacity development for climate services as encompassing all elements of the climate services value chain, from climate data management and climate monitoring and prediction to service delivery and communication of relevant products to end-users (WMO, 2020). As part of these guidelines, WMO highlight the importance of building human capacity within NMHSs, and value it as *"...an integral part of the process through which organizations build and maintain the capabilities to achieve their developmental objectives over time*" (WMO, 2020, p. 31). Furthermore, they place importance on the fact that the process of building human capacity for climate services needs to be adaptive and flexible, and needs to involve information providers, government agencies, non-governmental organization and private sector, as well as information users of climate services (WMO, 2020, p. 31). They further argue that in order to ensure the delivery of effective and usable climate services for a given country or region, input from multi-disciplinary personnel is required (WMO, 2020, p. 31). This in part includes meteorologists, climatologists, engineers, economists, development practitioners, computer scientists and science communicators (WMO, 2020, p. 31). Yet, as has been argued by several scholars, national entities in particular lack the financial resources to recruit and

sustain staff which cover all required technical areas for climate services (Hewitt et al., 2020; Adenle et al., 2017; Harvey et al., 2019).

3.4 Climate services in support of CCA and DRR

The fields of CCA and DRR both aim at strengthening resilience of people and societies by managing risks and adjusting to climate change (UNDRR, 2020, p. 11; Street et al., 2019, p. 29). The approaches both tackle the impacts of shocks and stresses, and seek to make individuals, communities and societies more resilient and less vulnerable to them (Street et.al, 2019, p. 29). Yet, despite the shared objectives and obvious links between CCA and DRR, there tends to be a lack of coherence, as both have largely been developed as separate policy domains (Street et.al, 2019, p. 29; UNDRR, 2020, p. 28). In part, this is due to difference in temporality and spatial scales of the two, as well as the difference in actors involved and the different global processes they have emerged from (Street, 2019, p, 29; UNDRR, 2020, p. 28). Differences are also recognised in the political attention they are given, where DRR in particular has been given the short end of the stick (Patterson & McDougal, 2021; UNDRR, 2020, p. 28).

Many scholars argue that the limited connectivity between CCA and DRR also holds true with respect to the knowledge and evidence being generated within the two domains to support decision-making processes related to climate and natural hazards (Street, 2019, p. 29; UNDRR, 2020; OECD; 2020). In an attempt to support coherence in CCA and DRR, the international and national communities have placed an increased emphasis on the need for better weather and climate information to effectively adapt to and manage the risks associated with an uncertain and warming climate (Harvey et al., 2017, p. 3; Street et al., 2018; WMO, 2016; Bowyer et al., 2014). The coherence in CCA and DRR policy and practice thus relies on useful, relevant, credible and legitimate weather and climate data and information being accessible to policy makers as well as other state- and non-state actors (OECD, 2020; Street et al., 2019).

Following the establishment of the GFCS in 2009, the adoption of two defining global agendas in 2015, namely the Paris Agreement and the Sendai Framework for Disaster Risk Reduction, international actors and governments have been equipped with a political mandate for a more coherent approach to climate services in support of adapting to climate change and reducing disaster risks (OECD, 2020, p. 38). This has provided a valuable opportunity to explore important synergies between CCA and DRR, as society and governments are increasingly

working towards more integrated approaches to adapting to climate change and managing climate and disaster-related risks (OECD, 2020, p. 41; SEI, 2019; Bowyer et al., 2015, p. 1). It is important to note that the delivery of climate services in support of CCA and DRR cannot be met by the resources and capacity of a single agency or institution, and thus requires multi-disciplinary and cross-sectoral collaboration in order to enhance resilience in vulnerable settings (OECD, 2020, p. 41). Thus, in order to sufficiently develop climate services in support of CCA and DRR, increased institutional and human capacity development and collaboration across sectors and institutions are essential (OECD, 2020, p. 14). This is widely recognised under the GFCS and has been given increased attention from actors supporting climate services.

One of the four priority areas of the GFCS is on DRR, asserting that application of climate services in this field can reduce hydrometeorological disaster risk (Coughlan de Perez et al., 2014, p. 1; Street et al., 2019, p. 32). Street et al. (2019) further note how climate services are essential to the development of national adaptation plans (NAPs) and strategies (Street et al., 2019, p. 30). West (2014) also recognises how climate services needs to be regarded as a prerequisite for adaptation, and highlights a key effort made under the GFCS to address adaptation measures (West, 2014). This refers to the implementation of the 'Climate Services Adaptation Programme in Africa' (GFCS APA) in 2014, particularly supporting vulnerable populations in Tanzania and Malawi (WMO, 2018). This was the first multi-agency initiative to be implemented under the GFCS, and was implemented as a so called "flagship programme" to help develop user-driven climate services for food security, health and DRR in Malawi and Tanzania, funded by the Norwegian government (WMO, 2018). The aim has since its implementation been to increase the resilience of those most vulnerable to the impacts of weather and climate-related hazards, such as droughts and flooding, and associated health risks, including malnutrition, cholera and malaria (WMO, 2018; West, 2014; Luhunga et al., 2019).

To reach this objective, the programme has aimed to strengthen capacity both to develop and use climate services, as well as to co-produce climate services combining scientific and technical knowledge with traditional knowledge (WMO, 2018). Luhunga et al. (2019) recognise how the implementation of this programme into the National Adaptation Plan (NAP) process in Tanzania has been particularly beneficial (Luhunga et al., 2019). In their assessment of this implementation process, hey found that *"...the implementation of GFCS-APA programme in Tanzania has improved the availability, accessibility, and applicability of climate information to different stakeholders. This has in turn attributed to significant use of climate information in planning and decision making in target sectors: agriculture and food*

security, DRR, energy, health and water resource management. This has increased the adaptation capacity of vulnerable communities from the impacts of climate variability and change" (Luhunga et al., 2019, p. 650).

In an effort to further address coherence in CCA and DRR, particularly within the development of climate services, the Organisation for Economic Co-operation and Development (OECD) address the coherence between these fields in their extensive report on finding 'Common ground between the Paris Agreement and the Sendai Framework' (OECD, 2020). Here, the authors argue that the *"...availability of climate services must be matched by capacity of stakeholders to use the services to conduct risk analysis*" (OECD, 2020, p. 41). They further note that several countries operate with separate risk assessments for DRR and CCA, as well as under individual ministries. The authors also recognise how the processes for CCA and DRR also tend to be operated by different sources of funding, and argue for the needs and opportunities for streamlining processes and tools which respond to both climate and disaster risk assessments (OECD, 2020, p. 41).

Addressing the usability gaps of climate services, particularly in regard to informing decision-making processes in relation to adaptation, Raaphorst et al. (2020) argue for the need for climate change mitigation and adaptation to safeguard society against present and future climate-related impacts (Raaphorst et al., 2020, p. 2). This entails that decision-makers and stakeholders need to understand their responsibilities and obligations concerning climate change impacts and adaptation, and end-users need to be provided with sufficient information to make climate-smart decisions for themselves and their livelihoods (Raaphorst et al., 2020, p. 2). The authors further recognise how climate services are thus used to communicate climate information to adaptation professionals and other stakeholders to facilitate well-informed climate adaptive decision-making (Raaphorst et al., 2020, p. 2).

They further provide their understanding of climate services in particular relation to the information it provides about climate adaptation and mitigation measures, and how this information feeds into different decision-making processes by developing an understanding of present and future climate impacts, which in turn raises awareness for adaptation and disaster risk decision-making (Raaphorst et al., 2020, p. 3). They build on a previously established understanding developed by Hamaker et al., where the authors distinguish between climate data services, adaptation services, mitigation services and disaster risk management (Raaphorst et al., 2020, p. 2). Here, climate services are considered to be based on observational data, such as satellite data and measurements (Raaphorst et al., 2020, p. 2). This data is then used as input

for climate data services, such as climate models, forecasting and maps to assess useful information, often related to climate change impacts (Raaphorst et al., 2020, p. 2). This then feeds into the development of plans for adaptation, mitigation, and disaster risk reduction, and are based on the information and insights provided by the climate data services (Raaphorst et al., 2020, p. 2). In theory, these developed plans then intend to lead towards climate change action, namely adaptation and mitigation (Raaphorst et al., 2020, p. 2). This categorisation of climate services can be further understood through the below figure (figure 1):

Figure 1. Categorisation of climate services (Raaphorst et al., 2020, p. 2)**.**

This conceptualisation of climate services provides a theoretical baseline for how climate services can ensure decision-making for adaptation and disaster risk reduction. However, as has been highlighted throughout, several scholars have noted how a lack of understanding and coherence, differing funding streams and mechanisms, and the need for cross-sectoral collaboration makes it particularly challenging to develop climate services in support of CCA and DRR plans and decision-making.

4. Research methods

This study has applied a qualitative research approach, and is mainly based on document analysis, as well as selected key-informant interviews. The key-documents used for document analysis consisted of three extensive annual reports developed by NORCAP for the different project phases of the 'Strengthening climate services in Africa' project. The primary sources gathered consisted of three semi-structured interviews with key-informants, and were selected based on their affiliation with the NORCAP climate services project. The detailed selection criteria, relevance and use of all primary and secondary sources is justified below in sub-chapter 4.2.1.

Using a case study approach, the selected case for this particular study was NORCAP. NORCAP was selected as a pertinent area of study as it is a trusted global provider of expert capacity to governmental entities as well as the UN. Considering climate services as an emerging field with much need of strengthening and increased capacity, particularly across Sub-Saharan Africa, assessing what NORCAP perceives to be challenges and opportunities in reaching its project objective under the 'Strengthening climate services in Africa' project, was thus deemed as a pertinent area of study. As stated by Bryman (2016), a case study can focus on an organisation or single community. Thus, the case of NORCAP is defined as a single case, based on it being the study of the work of an international organisation. A broader understanding of the case study approach is also considered in this chapter (chapter 4.1).

The analytical approach of this thesis has followed that of a thematic analysis. This method was applied based on the usefulness this method for identifying, analysing, organising, describing, and reporting themes found within the data set, as well based on it being a flexible method (Nowell et al., 2017, p. 2). The themes identified build on the key findings of the data which was gathered, and thus provided analytical discussion around three key themes, with additional sub-themes identified. These are described in further detail under sub-chapter 4.2.2.

Lastly, this chapter also addresses the identified limitations of the study as well as the different ethical considerations which were taken into account throughout this thesis.

4.1 Research design: An intrinsic case study approach

According to Bryman, the basic case study entails a detailed and intensive analysis of a single case (Bryman, 2016, p. 60). Furthermore, Bryman emphasises that the chosen case is an objective of interest in its own right, and the researcher aims to provide an in-depth examination of its unique features (Bryman, 2016, 60). With this in mind, Johannessen et al. (2016) further argue that the use of a case study design allows the researcher to adapt and shape the case study approach in a way which best serves the purpose of their particular research (Johannessen et al., 2016, p. 81).

Crowe et al. (2011) build on Robert Stake's work, by arguing how it has been particularly influential in defining the case study approach within the scientific world, as Stake distinguishes between three different characteristics of a case study, namely the intrinsic, the instrumental and the collective case study (Crowe et al., 2011, p. 1). Building on Stoke's characterisation of these different case study approach, Crowe et al. (2011) describe how the intrinsic case "*...is typically undertaken to learn about a unique phenomenon. The researcher should define the uniqueness of the phenomenon, which distinguishes it from all others"* (Crowe et al., 2011, p. 2). The selection of NORCAP as the case study for this thesis can therefore be argued to follow that of an intrinsic case study. As described by Crowe et al. (2011), an intrinsic case study means that the case is selected not because it is representative of other cases, but because of its uniqueness, which is of genuine interest to the researchers (Crowe et al., 2011, p. 2). NORCAP holds a leading role within international development and humanitarian capacity development support. It is thus of interest to study how NORCAP, as a provider of capacity development support for climate services, works with partnering entities and institutions, and to what degree this contributes to strengthening their capacities.

Bryman however highlights an important criticism of case study design, which relates to its lack of ability to generalise results (Bryman, 2016, p. 62). Although this is justified, the purpose of applying case study design to research is not to generate findings which can be applied more generally to other cases, but rather to provide an in-depth and analytical understanding of the particular case being studied (Bryman, 2016, p. 62). This is an important perception underpinning this particular study. The aim of this thesis is not to generalise conclusions to other cases, but rather to produce a thorough and comprehensive understanding of what NORCAP perceives to be the challenges and opportunities in fulfilling its objective of contributing towards strengthening climate information services in Sub-Saharan Africa through

support to capacity development. By engaging in theoretical understandings of capacity development for climate services, the aim has thus been to gain a particular understanding of NORCAP and the organisations views on strengthening capacity for climate information services at the regional and national level.

4.2 Selection criterions, data collection and analytical approach

4.2.1 Selection of primary and secondary data sources

Prior to establishing the selection criterions of the selected key-informants, the population should be defined. At the time of identifying key-informants, the NORCAP climate roster consisted of a total of 20 climate experts. At NORCAP Head Office (HO), 4 individuals work directly and indirectly with the NORCAP climate services project. Once the population was established, experts under the NORCAP climate roster as well as staff from NORCAP HO working with the climate services project, were carefully identified and selected. Prior to the process of selecting key-informants, a set of criterions were established. The first criterion for the selection of key-informants was that they needed to either be deployed by or working with NORCAP under the climate services project. This meant that the selection of informants was based on experts deployed under the NORCAP climate roster and NORCAP employees working with the NORCAP climate portfolio. A second criterion was that the selected respondents needed to have knowledge of, or a background in disaster risk reduction and climate change adaptation within the humanitarian and development sector. This criterion was critical as the selected informants needed to have a general understanding of and experience in these domains to provide views and reflections on the ways in which their added capacity at regional and national levels influences decision-making for adaptation and disaster risk reduction. To ensure a certain degree of representativity of the selected respondents, an additional criterion was put in place, concerning the need to ensure that there was a balanced representation of male and female respondents, as well as concerning their level of expertise and experience. The chosen approach of selecting key-informants based on a set of pre-established criterions was deemed appropriate for answering the research question, as well as to adhere to a secure level of validity for this thesis concerning the selection of primary data (Leung, 2015, p. 325).

Initially, the aim was to select a total of five NORCAP climate experts and an additional key-informant from NORCAP HO. Yet, a multitude of factors limited the number of key-informants which were interviewed in the end. The limitations concerning this is addressed in detail under the limitations chapter of this thesis (chapter 4.3). Although the number of key-informants was limited, it was ensured that the small pool of key-informants consisted of respondents of different genders and level of expertise, following the pre-established third criteria for the selection of key-informants. The level of expertise was particularly considered in light of the climate experts' number and length of deployments under the NORCAP climate services project, as well as the length of employment for the key-informant representing NORCAP HO. In the end, two NORCAP climate experts and one project advisor from NORCAP HO were selected and interviews. Both climate experts have provided capacity to different countries and regions where NORCAP provides capacities for climate services. The added value of including a project advisor as part of the sampling pool also allowed for further representation of the different levels of expertise. The informants all hold an extensive understanding of the project as a whole, and thus served as a crucial key-informants in providing reflections on some of the key developments, challenges and opportunities of NORCAP's work under the climate services project. At the time of the interviews, the key-informants were situated in Niger, Mali and Norway. The key-informants situated in Niger and Mali are currently supporting NMHSs in the respective countries, as well as support to different UN agencies.

The use of key-informant interviews served as an additional contribution to the data collected from key-documents, as the secondary data formed the primary foundation of understanding how NORCAP provides capacity development support for climate services. The interviews also provided important data to understand the perceived opportunities and challenges in fulfilling the objective of contributing towards strengthening climate information services in the African countries where NORCAP is, and has, provided expert capacity. Prior to identifying the key-documents for analysis, it was important to ensure that the use of secondary sources adhered to a particular set of different criterions. Firstly, it was important to identify who had produced the given texts that were examined, and how its content related to answering the research question. This was important to ensure that the secondary data was collected by a trusted source, and that the purpose of the data reflected the data required for this thesis. Furthermore, it was considered to be of importance to take into consideration when the selected documents were published, and if they were representative to the phenomena that was being studied. Thus, to gain an extensive understanding of the ways in which NORCAP has provided capacity development

support for climate services, secondary data provided by the organisation on their deployments and activities throughout the climate services project were consulted and analysed. The consulted documents consisted of three extensive annual reports which provided information on the countries where NORCAP has deployed climate experts to RCC's, NMHS's and UN agencies over the different project phases, as well as different activities, opportunities and challenges that were identified.

The choice of combining document analysis with semi-structured key-informant interviews further ensured that the data collected and analysed provided an extensive understanding of what NORCAP perceives to be the challenges and opportunities in fulfilling its objective of contributing towards strengthening climate information services in Sub-Saharan Africa through capacity development.

4.2.2 Data collection and Analytical Approach

This thesis collected data through key-documents and semi-structured interviews with key-informants. The different methods used for data collection provided triangulation, which was important to increase the credibility and validity of the findings (Bryman, 2016). A semi-structured interview guide was established prior to conducting the interviews. Applying a semi-structured approach allowed for the questions to be addressed without following the structure of the questions rigorously, which allowed for a more open conversations throughout the interviews (Bryman, 2016). The three key-informant interviews all begun with a brief introduction to the topic and purpose of the thesis, and provided space for the respondents to ask any initial questions. As the interviews with the three key-informants progressed, the questions raised concerned their particular role and areas of expertise under the climate services project. Following questions concerned the countries and entities where NORCAP builds capacity, and provided space for the respondents to reflect on key activities and deployments which have contributed to strengthening the capacity of the entities where NORCAP aims to build capacity. Questions concerning key challenges of strengthening the capacity of the regional and national entities was also addressed. Considering the key-informants knowledge of and background in adaptation and disaster risk reduction, the informants were also asked questions related to the ways in which climate services for CCA and DRR are addressed as part of NORCAPs capacity support for climate services.

All interviews with key-informants were conducted in a manner which safeguarded ethical principles. To ensure confidentiality, informed consent was established prior to conducting each interview, and all were provided with written and verbal information on their anonymity throughout the process of conducting this thesis, as well as their right to withdraw their participation or any answers they had provided throughout the interviews. As I was not able to conduct field visits or meet any of the respondents in person, all interviews were conducted over accessible video conferencing tools such as Zoom and Microsoft Teams. This was preferred over phone interviews, particularly as two of the respondents were situated in Mali and Niger. For the key-informant situated in Oslo, the interview was also conducted over Zoom due to Covid-19 restrictions. Although not ideal, using video conferencing ensured that good report was established between myself and the key-informants, and also enabled the possibility to easily record the interviews which was beneficial for transcription purposes.

The aforementioned secondary sources used in this thesis ensured that the data analysed adhered to a broad overview of the different areas and activities that have been supported by NORCAP throughout all project phases of the climate services project. Here, the data collection process consisted of an extensive desk review of the consulted documents, and considered key aspects such as the development of the project over the different project periods, the entities and organisations where NORCAP provides support to capacity development for climate services, and key approaches, challenges, recommendations concerning the process of deploying climate experts for strengthening climate services. NORCAP's overall framing of the project was also considered, such as its mandate, theory of change, objectives and outcomes. The use of semi-structured interviews with key informants for data collection further facilitated possibilities to address areas that had not already been identified in the key-documents that were consulted and analysed.

The analytical approach of this thesis took on that of a thematic analysis. This is described by Nowell et al. (2017) as a method for identifying, analysing, organising, describing, and reporting themes found within a given data set (Nowell et al., 2017, p. 2). Building on previous literature and reflections on thematic analysis, the authors note how a key advantage of applying a thematic analysis approach is the theoretical freedom which it allows, "*...as thematic analysis provides a highly flexible approach that can be modified for the needs of many studies, providing a rich and detailed, yet complex account of data*" (Nowell et al., 2017, p. 2). They further note how this analytical approach offers a more accessible form of analysis, and is thus easily adaptable for researcher with limited research experience, such as students (Nowell et

al., 2017, p. 2). The approach also serves as sufficient when examining the perspectives of different respondents, as it allows for the opportunity to identify and highlight similarities and differences in response, as well as in generating unanticipated insights which the respondents may provide (Nowell et al., 2017, p. 2). Moreover, thematic analysis is deemed useful as it allows the researcher to take on a well-structured approach to handling the gathered data, which can feed into an organised outline of the analysis (Nowell et al., 2017, p. 2).

For this thesis, the primary and secondary data gathered undertook a thematic analysis approach, where the overarching research question primarily guided the identification of different themes for all the data that had been collected. The data analysis entailed identifying key themes from the interviews which has been transcribed manually from voice recordings and notes which had been undertaken during each interview, as well as the data which had been identified and extracted from all secondary sources. I did not go ahead with coding and identifying themes until all data had been gathered and structured, as this allowed me to better identify coherence and consistency in the challenges and opportunities that were found, as well as to identify other themes which may have been missed if the data analysis had been conducted in a more fragmented manner. Once all the data had been gathered, it was then systematised in order to code the data in accordance with the key findings. If this research had consisted of a larger sampling pool, a software programme such as Nvivo would have been deemed useful, however, as the data set did not concern the gathering of data from a very large number of respondents or documents, a manual coding process was deemed sufficient. This process consisted of placing all findings in Excel, which allowed me to both colour code and structure the findings under separate columns. It also allowed me to easily shift and change the findings as I went deeper into the analysis and identified different themes. The data analysis thus consisted of identifying key themes concerning challenges and opportunities found in the interview transcripts and annual reports.

The process of thematic analysis resulted in structuring the findings under the following main themes; strengthening capacity at regional and national level, strengthening coordination and collaboration, and strengthening communication of climate services. Furthermore, several sub-themes emerged from the identification of the three main themes. Arising from the analysis related to strengthening capacity at regional and national level were e*volvement of project scope, areas of expertise, lack of expertise for CCA and DRR and sustainability of capacity development*. The themes arising from analysis concerning strengthening coordination and collaboration were *national coordination and collaboration* and *linking national entities with*

UN. Lastly, the themes arising from analysis related to communication of climate services were *expert capacity for climate communication* and *informed access to climate services*.

By applying a thematic analysis approach, the findings and discussion aimed to ensure the production of credible analysis to answer this thesis established research question: *What does NORCAP perceive to be the challenges and opportunities in fulfilling NORCAP's objective of contributing towards strengthening climate information services in Sub-Sahara Africa through capacity development?*

4.3 Limitations and ethical considerations

The chosen methodological approach of this thesis presents a number of limitations. Firstly, the results from this research cannot be generalised beyond this particular case. As I chose a small selection of key-informants and documents which reflect the perceived notions of NORCAP, the conducted research only reflects that of one area within a single organisation. Thus, the external validity of this research cannot be ensured, as the results cannot be generalised beyond the specific research context (Bryman, 2016, p. 42). However, it should be noted that achieving external validity has not been an aim of this research, as generalisation beyond a selected case is difficult to ensure when using a case study approach, and thus tends not to be the aim when applying case study research (Bryman, 2016, p. 64).

Another key limitation which also reflects the possibility to generalise the results of the study, is the limited number of key-informants who were interviewed. Out of a total population of 24, only three key-informants were interviewed. Although I had identified several key-informants which fit the allocated pre-established criterions, time constraints and schedules limited the final number of participants which were able to participate as respondents. However, as stated in chapter 4.2.1, I made sure that the respondents who were interviewed in the end held representation of the pre-established criterions, such as level of expertise, experience and knowledge of the project, and gender-balance. This to some extent ensured that there was representativity in the final number of key-informants interviewed, however limited. Moreover, it is here important to note that although qualitative research in itself does not provide much opportunity to generalise findings and results, I recognise that a broader selection of key-informants would have strengthened the validity of the study (Bryman, 2016, p. 41).

Considering the trustworthiness of this study, it is important to question how the research design and methods for data collection and data analysis may have influenced the results of this study (Bryman, 2016, 384). As a researcher, it is important to reflect on the different criteria encompassing the level of trustworthiness of the study, namely the level of credibility, transferability confirmability and dependability (Bryman, 2016, p. 384). Due to the limited number of key-informants involved in providing perspectives on the challenges and opportunities important to answer the research question, important views and perspectives may have been missed, which may have impacted the credibility of the study. In order to ensure an improved level of credibility to this research, the secondary sources were important in providing further reflections on the perceived challenges and opportunities for NORCAP in fulfilling its objective of contributing towards strengthening climate information services in Sub-Sahara Africa through capacity development. Although this was not part of the scope of this thesis, it should be noted that it could have been valuable to also draw on the perspectives of partners where NORCAP provides capacity development support. It is here recognised that there would have been added value to have the additional perspective of those that are being provided with the support on capacity development for strengthening climate services, and how they perceive the need and relevance of NORCAP as a strategic partner on climate services. However, due to the scope and time restraints of conducting this research, these perspectives were not considered for this thesis.

Concerning the issue of confirmability, it is also important to note that the selection of NORCAP as a case was in part based on my own affiliation with the organisation. Since August 2020, I have been employed with NORCAP as part of their Climate and Energy Unit, and have worked closely with the '*Strengthening access to climate information services in Africa'* project since the start of my employment. This is important to highlight as it has undoubtedly influenced the information I have obtained, as well as the ways in which I have interpreted the information. My employment with NORCAP was valuable in identifying the annual reports and key informants as essential sources of data for this thesis, however, it is important to note how this may have influenced potential bias.

I also recognise that my role in NORCAP may have influenced the report between myself as an interviewer and the selected respondents for the key-informant interviews. I too recognise that the ways in which I have interpreted and analysed much of the data collected from the annual reports also relies on my knowledge of the progress, achievements and challenges of the project, beyond what is in fact stated throughout the documents and interviews which were analysed.

However, I would argue that my affiliation with NORCAP has also been useful in order to better comprehend the information gathered from data collection, and given me a broader understanding of how NORCAP works with climate services.

Particular consideration was made to adhere to ethical principles which need to be undertaken in qualitative research. This is particularly important when the research involves and influences individuals, as ethical issues may arise (Johannessen et al., 2016, p. 84). For this study, it was therefore crucial that I as a researcher ensured that different ethical considerations were made in order to mitigate any ethical problems that may arise when conducting a study with this type of research design and methodological approach. The research was reported to and approved by the Norwegian Centre for Research Data (NSD). Prior to each interview, I provided all key-informants with a letter of consent to be agreed upon and signed, as well as informing them of the purpose of the study and what their involvement as key-informants would entail. Establishing informed consent is crucial to any ethical study, and was given by all participants (Bryman, 2016). Both in the letter of consent as well as at the early stages of each interview, the respondents were ensured that their anonymity would be kept, and I also informed them of their right to withdraw their response at any time of the research process. Before proceeding to the questions raised for data collection, all respondents were also encouraged to raise questions before proceeding, in order to create space for any needed clarifications or concerns with their participation in the study. It is also important to note here that no names or other personal information was used in any part of this study, as was ensured by me as the researcher prior to conducting the interviews. All participants were also informed that any personal information gathered, such as names and email addresses through correspondence, will be deleted upon the completion of the study. Although names and other personal information was not used within the study, all informants were informed of how their affiliation with NORCAP would be highlighted, thus limiting their anonymity slightly. All informants agreed to this, and expressed no difficulties in being addressed in this manner throughout the research. It was important for me to ensure that all respondents were aware that these steps would be taken, to ensure that their rights, privacy and anonymity was considered throughout the process of conducting this study.

5. Findings and Discussion

This chapter presents the findings in the study and discuss these in relation to the reviewed literature and conceptual framework established in chapter 2 and 3. The findings are based on the data collected from the three project reports and the interviewees' answers, explanations and perceptions. The findings from the report will be illustrated by highlighting the project periods from where the data was collected. The findings identified from the key-informant interviews are illustrated through statements and quotes form the interviews, and discussion around their presented views and perspectives. All data collected is analysed and discussed in light of the theoretical understandings in the thematic background presented in chapter 3.

Furthermore, this chapter is structured into different sections based on the key themes which were identified through the thematic analysis of the data set. From this point on, the findings presented and discussed from the key-informant interviews will be referred to as KI1, KI2 and KI3. The key-documents used, namely the annual project reports, will be referred to based on the year they were documented (2018, 2019 and 2020).

5.1 Strengthening capacity at regional and national level

5.1.1 Evolvement of project scope

What became evident throughout all the analysed reports and interviews was that NORCAP has undertaken a comprehensive shift in its support since the first project phase. NORCAP's support in strengthening climate services first came about through the recognition that although climate infrastructure, collection and analysis of data and climate modelling had existed for years - also in less developed countries in Africa - the information has not always benefited the sectors that have relied on it the most (Annual Report, 2018). NORCAP's initial mandate under the first project phase (2015-2017) was to support WMO with human capacity and technical skills to support the initiative of the GFCS in RCCs involved in climate services to conduct assessments and assess the needs on the ground, with the aim to ensure long-term sustainability

and impact of projects. As was recognised by Vaughan and Dessai (2014) and Harvey et al. (2019), the implementation of the GFCS enhanced the surge of interest in climate service development across Sub-Saharan Africa (Harvey et al., 2019, p. 82; Vaughan & Dessai, 2014, p. 587). In recognition of this, one key-informant (KI3) noted how WMO initially requested NORCAP to support the GFCS to ensure the roll-out and validation of national frameworks for climate services (NFCS) for countries across Sub-Saharan Africa. The key-informant further explained how NORCAP's initial support to the GFCS was the first time NORCAP worked with climate services, and as with any new development project, the process of developing and understanding implementation processes a long-stretched and challenging process. When addressing the further development of NORCAP's work, it becomes evident that the initial objective was rather limited, as it only had the objective to support the GFCS with regional and sub-regional support. As has been argued by both Harvey et al. (2019) and Snow et al. (2016), the identified capacity gaps for the development of climate services are mostly existing at the national level, within the NMHSs (Harvey et al., 2019; Snow et al., 2016). Another key-informant (KI1) which has worked with national entities across Western Africa reflected on the work of the GFCS, and its ability to ensure capacity development;

"*What I discovered is that the GFCS didn't focus much on capacity building in the region. When it was first established, it functioned more as a proposal on what they were supposed to do, a nice written document, and it's clear that everyone knew which ways we needed to go with climate services in Africa. But in terms of implementation, there is not much that has been done, specifically in West Africa*" (Interview, 14 May, 2021).

Hewitt et al. (2020) provided important reflections on capacity development as an overarching pillar under the GFCS (Hewitt et al., 2020, p. 241). Yet, despite being an overarching pillar of the GFCS, what becomes evident when drawing on the expert's reflections, as well as the arguments noted by Harvey et al. and Snow et al., is that the sustainability of capacity development for climate services cannot solely be approached through a top-down approach (Harvey et al., 2019; Snow et al., 2016). Global frameworks are however useful in establishing a "guiding light" to adopt national strategies to inform and fund activities, yet, as was established by Harvey et al. (2019), international interest in climate services has not been in existence for many years (Harvey et al., 2019). However, capacity development, or capacity building, has been a key approach by the international community for several decades. It could here be argued that understanding capacity needs and how capacity development should be approached for climate services, still requires much needed understanding, in particular at the

national level. Thus, as NORCAP has not been involved in climate services for long, it should be noted that its efforts beyond the first project phase has in fact encompassed learning and understanding of where and how capacity development should be approached for climate services. However, the ways in which they ensure support to capacity development in national and regional entities still shows several limitations and challenges.

What becomes evident from assessing the annual reports from 2018, 2019 and 2020, as well as from reflections provided by all key-informants, is that in its second project phase (2018-2021) NORCAP established a broader objective for its work to support and build capacity for climate services. This meant that NORCAP no longer solely encompassed its support at regional level by providing capacities to WMO through the GFCS for the validation of national frameworks (Interview, May 31, 2021). Key-informant KI3 explained how this shift in many ways relied on NORCAP recognising the capacity needs and gaps at national level, as well as the increased knowledge and awareness of NORCAP by different institutions and organisations. In 2018 NORCAP thus adopted the objective of supporting regional and national entities in the development of climate services, with the overall objective of ensuring that populations in vulnerable settings have enhanced resilience (Annual Report, 2018; 2019; 2020).

As was argued by Bowyer et al. (2014) and Hewitt et al. (2020), the number of actors that include climate services in their climate adaptation, climate resilience, and disaster risk reduction programs has increased in recent years, yet developing actionable climate information that can inform adaptation and risk-based decision making has been a particular challenge for climate services (Bowyer et.al., 2015, p. 534; Hewitt et.al., 2020, p. 241). Drawing on the theoretical understanding provided by the scholars, it can be understood that developing climate services to enhance resilience is challenging unless the services are accessible and comprehensible in order to be properly utilized for decision-making. Thus, although climate services are developed, enhanced resilience of vulnerable populations cannot always be ensured. Drawing on a statement of relevance provided by KI3, the respondent highlighted that;

"*We (NORCAP) have until now mostly been able to strengthen the actual services provided at national and regional levels, the community impact itself, we are still not there*" (Interview, 31 May, 2021).

Nevertheless, it is here important to note how it was found that the climate services project works with existing institutions and entities to build their knowledge and expertise, so that they can better interact with end-users and communities to enhance their resilience. Reflecting back

on that argued by Harvey et al. (2019), climate services should be considered as a means of increasing resilience, as ensuring the sustainability and sufficient delivery of climate information services can support in bridging short-term response to climate change impacts with long-term approaches to decision-making, further supporting adaptation efforts and reducing the vulnerability risks of populations (Harvey et al., 2019, p. 82). Thus, the level of impact ensured by NORCAP to enhance resilience relies on the provided capacity to the existing institutions and entities NORCAP works with.

5.1.2 Differing levels of provided capacity

Considering the capacity provided by NORCAP to different institutions and entities, NORCAP made important developments to its mandate in the second project phase, as the organisation shifted from the initial focus on capacity support to the GFCS, towards a greater focus on building national capacity at NMHSs and provide support to coordination in regional climate centres, particularly for ICPAC in East Africa and ACMAD in West Africa (Annual Report, 2018; 2019; 2020). KI3 explained how the national entities where NORCAP currently provides capacity support are Mali, Burkina Faso, Senegal and Niger, and that they are also in the process of deploying to Sudan (Interview, 31 May, 2021). NORCAP has also previously provided capacity to Tanzania and Malawi, however, the informant noted how these deployments had ended in early 2021. For the cases of Tanzania and Malawi, the respondent also noted how there needs to be a close and through follow-up by NORCAP to make sure that the provided capacity and impact lasts beyond the end of the deployments.

The three key-informants all noted how the degree of capacity provided to the two regional centres differ greatly. KI3 explained how currently, NORCAP only has one expert deployed to ACMAD, while ICPAC has become one of its biggest partners, particularly over the past year. All experts argued, in some shape or form, that the reason for NORCAP supporting ICPAC to a higher degree than ACMAD, is mostly reliant on the institutional structures which are in place in the different centres. According to the informants, ICPAC is more established and much more well-equipped compared to ACMAD. It should be argued that the misrepresentation of NORCAP experts in ACMAD compared to ICPAC causes concern, particularly when considering the overrepresentation of fragile states in Western Africa compared to Eastern Africa. One key-informant with elaborate experience with providing capacity in the West-

African region, noted how ACMAD in particular is challenged by a lack of sustainable capacity development support;

"In terms of climate services, we need to have strong capacity building in Western Africa. If we look at ACMAD, it is a continental centre which is supposed to be the main centre where much of the GFCS products of Africa are to be developed and implemented. Yet, they still lack tremendous capacities, as they have limited human resources and technological equipment" (Interview, May 14, 2021).

Another informant (KI3) also stated that;

"*Strengthening regional capacity is important to broaden the capacity development of national meteorological centres, particularly strengthening ACMAD is important to strengthen climate services delivery in national meteorological offices in West Africa. NORCAP has provided capacity to ACMAD, but it is difficult because it is a fragile institution. There is also no clear understanding of who ACMAD reports to, even though it is a continental institution. It is not like ICPAC where it is easier for NORCAP to provide human capacity and technical expertise. There, they have many more resources and collaborative partners than ACMAD".*

It was also was found that NORCAP's support to the GFCS is still part of the second project phase, however decreased. One key-informant (KI2) argued that it is of necessity to continue support to WMO and the GFCS being that;

"*If you work with climate services, you have to work with WMO, as they are the biggest international actor within this field*" (Interview, 28 May, 2021).

However, recognising the shift and focus from GFCS to a more national focus for strengthening capacity, KI3 further recognised how NORCAP's work on climate services serves as a unique role, as the informant noted how NORCAP has continuously strived to ensure long-term results of its deployment and the expert capacity which they provide. The informant further noted that;

"Allot of what we do is ensuring that the capacity stays within the institution or organisation where we deploy experts, we are unique in that sense. When our experts leave, the capacity which we provide ensures that we leave something behind, either in terms of knowledge and skills, or in terms of products, services and tools which the national met offices can use" (Interview, 31 May, 2021).

As was reflected in the 2020 annual report, and also noted by the same informant following the above statement, was a key example of ensuring sustained capacity within institutions. The

example concerns ICAPC's development of a multi-hazard watch system which is used to provide decision-ready information to support transnational coordination and early action across borders in East Africa (Annual Report, 2020). The respondent (KI3) explained how this is a modern and user-friendly monitoring system to provide alerts against climate-related hazards, both for decision-making at national level but also to support decision-making at local level. NORCAP provided a key contribution in the development of this system by deploying a web developer and climate communication expert to lead the process of developing this system. According to remarks made by the respondent, the contribution made by the NORCAP experts was broadly recognised by ICPAC. This recent example highlights a key opportunity NORCAP has in providing long-term technical capacity, and show how support to capacity development at institutional level can help ensure that key products are developed for climate services delivery. This well reflects that argued by Harvey et al. (2017), where the scholars provided reflections on the value added of external and international partners to strengthen services and products at regional and national level (Harvey et al., 2017, p. 12).

5.1.3 Expertise for capacity development

The three annual reports provided an extensive overview of the different areas of expertise which NORCAP provides under the climate services project. Since broadening the scope of the project, NORCAP has mostly deployed experts to support and strengthen capacities for climate and regional modelling, climate insurance, early warning systems, climate communication, user engagement. One key-informant (KI3) explained how NORCAP provides capacity based on partner requests, which is then followed by a recruitment and deployment of experts which fit the particular capacity that is requested by an entity. As part of the results framework of the second project phase, one key outcome of the project is for NORCAP to work towards ensuring that "*Institutions are better equipped to provide improved information to user groups on extreme weather events, including floods, droughts and climate change*" (Annual Report, 2018). Thus, as a central point of action under the second project phase, NORCAP's support on strengthening institutional capacity is recognised as a key priority, in comparison to that of NORCAP's initial work with climate services which mostly consisted of the provision of human capacity and technical skills to support on different GFCS activities. What becomes evident from these findings is that NORCAP proves to uphold a highly specialised skill few other humanitarian and development agencies possess, which is how to select, deploy and follow up highly skilled experts deployed to vulnerable settings.

A key value of NORCAP which was found is that NORCAP funds the salary of all experts deployed. All key-informants argued for how fundamental this is to the regional and national entities where NORCAP provides supports, as they are reliant on this in order to obtain the technical and human capacity provided by NORCAP. Furthermore, all consulted reports showed how NORCAP climate experts provide various types of trainings for regional and national staff to enhance the technical capacities of the entities NORCAP supports. As was argued by Snow et al. (2016), the skill sets required for experts such as meteorologists, climatologists and supporting technical staff are often readily transferable to higher-paying positions in the local private sector, or in the NHMS or private sector of another country, thus making the retention of skilled staff an issue (Snow et al., 2016, p. 19). These factors can become disincentives for NHMS in developing countries to significantly invest in staff training and development (Snow et.al., 2016, p. 19). As was also brought to light by Hewitt et al. (2020) in chapter 3, providing technical expertise and resources are crucial for strengthening capacities in national entities. If this is lacking, the lack of confidence in national entities can further diminish the ability to build capacity, as they tend to be provided with limited financial and human resources, in particular from government funding (Hewitt et.al., 2019, p. 245). The technical and human capacity provided by NORCAP thus provides an opportunity to meet the challenges highlighted by the scholars, as NORCAP arguably highlights its ability to meet these needs thus closing many capacity gaps experienced in particular in national entities.

Since the initial stages of the project, the annual reports show how NORCAP has drastically expanded its pool of expertise over the years. The technical expertise which is provided has therefore been key in strengthening the technical capacities of NORCAP's different partners. Moreover, one interviewee (KI2), addressed how NORCAP should further ensure capacity building of its experts, to secure consistent growth and expansion of capacity and knowledge of all experts that are deployed to provide capacity support on climate services. The respondent further noted that many of NORCAPs climate experts uphold highly technical backgrounds, and are not always equipped to communicate the products and services which they develop. This issue seems to have been recognised by NORCAP. One example which came about from the 2020 annual report, was the delivery of a training package on communication, community engagement and accountability for NORCAP climate experts, as well as representatives from partnering national and regional entities. NORCAP partnered with an external provider of technical capacity to train its experts in the areas of communication, community engagement and accountability. This is recognised as an emerging area which stretches across the

international development and humanitarian fields, and was recognised by NORCAP to be of high relevance to the support provided at national and regional level for climate services. As a result of the training, several NORCAP climate experts have collaborated on a community engagement and accountability (CEA) assessment to evaluate to what extent the regional and national entities that NORCAP support are integrating components of CEA into their work. According to KI3, this assessment will be completed at the end of 2021.

5.1.4 Limited expert capacity for CCA and DRR

Concerning the importance of developing climate services which support decision-making for climate adaptation and disaster risk reduction, it was found that NORCAP has provided limited expertise which directly fosters these domains (Annual Report, 2018; 2019; 2020). From all consulted sources, it was found that NORCAP had received several requests for climate experts with expertise in climate change adaptation and climate mitigation, however, NORCAP noted in the annual reports that they only included the request directly related to climate services project, due to the limited scope of the project focusing more on strengthening capacity for the development of climate services. Albeit this, it was found that NORCAP had provided direct capacity for DRR under the climate services project in 2019, through the deployment of one DRR advisory expert. The expert was deployed to South Sudan with the purpose of providing expert capacity to the Ministry of Humanitarian Affairs and Disaster Management to develop a strategy on DRR, as well as support the early warning and climate services activities through the ministry for building climate and DRR resilience in the vulnerable communities. In the annual report, NORCAP noted how the expert has contributed to enhance the capacities to establish the functional structures to coordinate early warning and climate services at all levels in South Sudan. The expert deployment also showed evidence of ensuring better coordination between other DRR projects in the country, and also contributed to establishing the Early Warning Coordination Unit at the ministry. This unit would enable the development of early warning and climate service messages and disseminate to the community level.

Although it was found that NORCAP utilises its support towards adaptation, prevention and disaster risk reduction efforts, KI3 noted that NORCAP is lacking in terms addressing these two domains in its work with climate services;

"*This is one aspect of climate services, but the two domains in themselves are very broad and since we work very narrow with how we provide capacity, we haven't targeted sending experts with the intention of their expertise in CCA or DRR"* (Interview, 31 May, 2021).

As was found in chapter 3, the authors of the OECD report (2020) as well as Street et al. (2019) argued that developing sustainable CCA and DRR policy and practice relies on useful, relevant, credible and legitimate weather and climate data and information, and needs to be made accessible to policy makers as well as other state- and non-state actors (OECD, 2020; Street et.al., 2019). It was expressed by KI3 that NORCAP has considered working more strategically with its partnering entities at regional and national level, as well as the UN, to better support on these domains, however, no formal decision seemed to have been made. However, KI3 provided further perspectives on this, stating that;

We have seen that the experts that have a background in working with climate adaptation and DRR have made very positive contributions identifying gaps in developing climate services and information for those areas. Even though their Terms of Reference (TOR) does not specifically state that they are working on this, many of our experts still provide this expertise and understanding into their work both when working with the UN but also with national meteorological offices and regional climate centres" (Interview, 31 May, 2021).

Following this, the key-informants situated in Niger further recognised the value of having a background in the fields of CCA and DRR when supporting on strengthening capacity in regional and national entities in the development and delivery of climate services;

"*I have the experience working within humanitarian action and national entities on climate services, and I can understand the needs across this. But we all need to know this to act on understanding the link between climate service and into resilience activities such as CCA and DRR*" (Interview, 28 May, 2021).

As has become evident throughout the evolvement of NORCAP's work with providing capacity for climate services, it could here be argued that NORCAP sees it as an opportunity to further increase deployments which support further coherence in climate services for CCA and DRR. However, it is important to highlight what was addressed by the authors of the OECD report (2020), namely that the delivery of climate services in support of CCA and DRR cannot be met by the resources and capacity of a single agency or institution, and thus requires multi-disciplinary and cross-sectoral collaboration in order to enhance resilience in vulnerable settings (OECD, 2020, p. 41). Thus, in order to sufficiently develop climate services in support

of CCA and DRR, increased institutional and human capacity development and collaboration across sectors and institutions are essential (OECD, 2020, p. 14).

5.1.5 Sustainability of capacity development

This thesis adopted the understanding of capacity development as an ongoing process which should aim to build on existing capacities, knowledge and understanding in order to ensure building sustainable capacity within an entity or organisation. Throughout the different project phases, the consulted reports show that NORCAP has framed its capacity support through the use of the concept 'capacity building', and rarely make use of the concept 'capacity development'. However, as was argued in the literature presented in chapter 3, these terms are often used interchangeably within international development and humanitarian capacity development projects and programmes (Norad, 2015; Zamfir, 2017). More importantly, key findings which reflect what NORCAP perceives to be challenges and opportunities in ensuring sustainable capacity development for climate services are addressed.

Concerns regarding the sustainability of the capacities developed was found in all annual reports, as well as from all conducted interviews. From the consulted annual reports, it was found that NORCAP has drawn on lessons learnt throughout the different project phases, and acknowledge how their experience of deploying to African institutions and entities has demonstrated that material capacity is not enough to sustain capacities. Thus, training of regional and national staff has been recognised by NORCAP to be of high importance to ensure that the developed capacities are sustained within the entities when NORCAP deployments end.

As was argued by Harvey et al. (2019), the added value of gaining support from non-state actors can provide increased ownership of national entities to uphold the technical skills to deliver on their climate services work (Harvey et al., 2019, p. 90). However, the authors found that keeping NHMS staff skills up to date is an ongoing challenge (Snow et al., 2016, p. 19). It is noted that staff training, and professional development are seldom available locally, making them expensive both in terms of time and money (Snow et al., 2016, p. 19). Thus, NORCAP provides an important added value in ensuring that the developed capacities are sustained within the entities where NORCAP works once NORCAP deployments end.

Findings from the annual reports further showed how NORCAP acknowledges the challenge that experts in some cases acts as direct gap fillers because of the large human resource deficits

within many institutions. This 'direct gap filling' comes with the risk that once the expert leaves, the knowledge leaves with the deployed NORCAP expert (Annual Report 2018; 2019; 2020). While this is a risk, it was found that NORCAP considers expert support to develop the National Framework for Climate Services (NFCS) to be a sustainable effort to ensure coordination and national ownership across sectors. Additionally, NORCAP notes that RCCs ensure capacity building to NMHSs by providing trainings, which NORCAP recognizes as an important element in providing sustainable capacity development, even if the deployed experts at the regional levels are there for a limited period. As was argued by Bester (2015), external assistance for capacity development, such as that provided through capacity development projects by international actors, are less likely to ensure ownership if internal expertise and systems are not ensured as part of capacity development (Bester, 2015, p. 3). It was found that the experts deployed to regional centres are heavily involved in the delivery of trainings to build capacity at national level, and follow up on the type and number of trainings provided by the RCC's to the NMHS's. This is arguably and important value added by NORCAP experts in ensuring ownership of capacity development.

In the first project phase, it was experienced that experts who have been perceived to serve as 'direct gap fillers' were retained by host institutions (such as ICPAC) through other sources of funding, and thus became a sustainable and long term support to the institutions activities. To ensure that the support of NORCAP and the general capacity building of recipient institutions is as sustainable as possible, NORCAP has encouraged and supported both ACMAD and ICPAC to develop long-term strategies to build capacity and retain expertise and qualified personnel. This has included a strategy to sustain funding for current experts, as well as funding and planning for additional experts and training and capacity building of these.

Considering these reflections, it was found that a key challenge concerns the question of whether NORCAP is able to ensure that strategic partnerships are established, or if they will continue to struggle with functioning as a gap-filler to fill capacity gaps in both regional and national entities. This concerns NORCAP's ability to ensure sustainable capacity development, as several challenges have been found in regards to strengthening the institutional and human capacity of the different partnering entities, both at regional and national level.

In an effort to respond to this challenge, it was found that NORCAP conducted a Human Resource (HR) Capacity and Sustainability Assessment at ICPAC in 2019. The assessment was conducted by a recruitment and development adviser from NORCAP HO and a NORCAP climate expert who has extensive experience from working with ICPAC in the past. This was a

way of supporting ICPAC's commitment to human capacity development and hence to its strategic plan. The 2019 annual report elaborated on ICPAC's lack of a human resource development plan as a stand-alone policy document or as an integral part of its current strategic plan. Therefore, as part of the assessment, NORCAP developed a stand-alone monitoring and evaluation framework to act as a deployment strategy to ensure sustainability of NORCAP's support to capacity development in ICPAC. In the 2019 annual report, some key findings of the HR assessment conducted by NORCAP, showed that;

- ICPAC lacks a human capacity development plan that can be used as a reference for their human capacity development needs. However, human capacity development needs were cited in the following areas during the assessment: early warning information, energy assessment, tailoring climate information to health and energy sector users.
- Most staff at ICPAC have been project-based and their stay at ICPAC is limited to the projects' duration. There is thus no guarantee that the capacity developed has been sustained once projects end. NORCAP experts have therefore been widely engaged in fundraising and resource mobilisation for ICPAC in order to ensure longer-term approaches to staffing to sustain technical and human capacities.
- In most cases, the experts' Terms of Reference' (ToR), or job descriptions, have been too broad. This has been attributed to delays in getting the right experts for certain positions, as well as delays in experts getting to start doing the real work when the deployment starts.
- Without the official HR strategy, the previous and current deployments seem to be meant for "gap-filling" of the existing staffing gaps instead of developing institutional capacity. However, the communication team at ICPAC (which currently consists of a NORCAP Climate Communication Expert and User Engagement Expert) have progressively worked on getting staff regularly to ensure sustainability and continuity of the deployments.

From the 2020 annual report, it was found that a deployment strategy was developed in early 2020, encompassing a strategy for the existing and future deployments of NORCAP experts to ICPAC. Importantly, KI3 explained how the established deployment strategy to ICPAC ensures that all deployments are consistent for 24 months to ensure that these deployments are conducted in strategic manner, rather than serving as deployments for gap filling. It was further found that ICPAC and NORCAP have worked in collaboration to ensure the deployment strategy is operational and ensures sustainability and continuity of the deployments. As part of

the reporting on the assessment, NORCAP further noted how ICPAC worked on developing an institutional HR policy in 2020. However, as was found from the interview with KI3, ICPAC is yet to establish such a policy. The respondent further explained an important outcome from the HR assessment, which was that; "*They (ICPAC) realised that they need to have people in place so the experts can train them while they are there so that once a deployment ends, there is no gap*" (Interview, 31 May, 2021). It was also found that the assessment started the process of including more regional staff to work closely with the deployed NORCAP experts to ensure 'on the job' training and in turn ensure the expertise is carried out through host agency staff. These findings reflect the arguments established by Bester (2015) in chapter 3, where the scholar recognised that in order to ensure sustainable capacity development, it should be an ongoing process driven by "*...those whose capacities are to be developed*" (Bester, 2015, p. 3). Furthermore, it was argued by the author that capacity development should be demand-driven and focus on outcomes, rather than solely relying on technical assistance which rather focuses on inputs (Bester, 2015, p. 3). These characteristics and reflections are key to all capacity development activities and processes, and need to be incorporated to ensure that capacities are sustained within the institutions being supported, in particular when supported through external assistance such as through development and humanitarian initiatives (Bester, 2015, p. 4). The findings of the conducted HR assessment show how NORCAP has strived towards ensuring that the experts contributions are continued through proper resource build-up at the centre and by recruiting staff to ICPAC with adequate qualifications to take over after the NORCAP expert deployments end. Furthermore, these finds reflect the overarching characteristics of successful capacity development described by Norad (2015), namely ensuring, "*...i) robust local ownership of the activities, ii) commitment towards the achievement of results, and iii) the importance of creating a collaborative atmosphere where people are brough together with clear lines of communication and joint decision-making processes*" (Norad, 2015, p. 9).

As became evident in the 2020 annual report, a similar HR assessment was intended for ACAMD, in order to identify how the capacity support provided is sustained within the regional centre. However, due to Covid-19, this assessment was delayed. One key-informant noted that this assessment will likely take place at the later stages of 2021. Considering the previously addressed challenges which NORCAP has experienced in strengthening capacity in ACMAD, it should be considered to be of high importance to establish a strategic deployment plan to strengthen the development and delivery of climate services in Western Africa in particular. What was not found was any mention of plans to conduct similar assessments at national level.

This could be argued as current provision of expert capacity to NMHS's only consists of individual deployments, which differs in the case of ICPAC, where NORCAP currently has the most experts deployed under the NORCAP project. Nonetheless, this should be considered by NORCAP for future reference, as the organisation increasingly focuses its provided capacity at the national level.

5.2 Coordination and collaboration

5.2.1 National Coordination and Collaboration

Assessing the annual reports showed how NORCAP has had an important opportunity for to foster national coordination and collaboration for climate services throughout the different phases of its work with climate services. This was found to have been established through the initiative of the first project phase of the NORCAP climate services project, where NORCAP primarily provided expert capacity for capacity development to WMO and the GFCS. One key-informant (KI3) noted how the early deployments to support the roll-out of the GFCS has later fostered the establishment of a NORCAP GFCS team, which has been crucial in providing opportunities for multi-disciplinary and cross-sectoral collaboration at national level (Interview, 31 May, 2021). As was found by Coughlan de Perez et al. (2014) and the OECD, multi-disciplinary and cross-sectoral collaboration are key to ensure that the development of climate services can foster decision-making for areas such as climate adaptation and risk reduction, and are crucial when striving for enhanced resilience (Coughlan de Perez et.al., 2014, p. 1; OECD, 2020, p. 41) The number of NORCAP experts providing capacity to the GFCS in this team has decreased since the first project phase, and currently consists of three NORCAP climate experts. From the reports, it was recognised how these experts have widely contributed to the development of NFCS in different countries across Sub-Saharan Africa by organising and facilitating validation workshop with stakeholder and end-users (Annual Report 2019; 2020). A key achievement of the establishment of this team was identified in the 2019 annual report, as improved coordination at national levels, especially through the development and implementation of National Frameworks for climate services, has proved to bring key institutions together to plan for climate adaptation.

From the findings reflecting the establishment of this team, it becomes evident that the capacity development support to governments on developing and using tailored climate services

provided by the NORCAP GFCS team has been important to fill the identified shortcomings of the GFCS to ensure capacity development for climate services. As was previously raised, KI2 provided perspectives on the perceived shortcomings of the GFCS in providing capacity development. Thus, an identified opportunity by NORCAP to fulfill its objective of contributing towards strengthening climate information services through capacity development can be found through the establishment of the GFCS team. It was also found that the NORCAP GFCS team has been able to improve the coordination among the national and local stakeholders for climate services.

5.2.2 Linking national entities and UN agencies

What has become evident from the findings, is that NORCAP provides very limited support to the UN in its work with climate services, however, a certain degree of deployments are conducted to different UN institutions. Justifying this, KI3 explained that governmental entities cannot ensure the legally required security measures for NORCAP experts which need to be in place during deployments to the field. Thus, as a solution, NORCAP established hosting agreements with different UN agencies that are present in the countries where experts are deployed to national entities. In part, this represents a major challenge for NORCAP, as it requires extensive resources to identify, follow-up and establish agreements at national level. The additional need of establishing agreements with the UN has further exhausted the process. In comparison to other NORCAP projects, key-informant KI3 further explained that the climate services project differs from other NORCAP projects, as it provides a limited amount of strategic capacity to the UN. The informant went on explaining that since NORCAP has identified how capacity needs for climate services are mostly found at national level, UN has also not been a prioritised partner for the project concerning the need to develop capacities.

As was recognised by several scholars in chapter 3, strengthening climate information services is mostly of importance at national level (Harvey & Singh, 2017; Hewitt et al., 2020). However, the findings showed that partnerships with UN entities such as WFP, FAO and UNDP have been important in fostering collaboration and coordination in areas such as climate resilience, CCA and DRR, which all key-informants argued to be of high value to NORCAP's efforts in national and regional entities. What became evident from data gathered in the 2020 annual report is that through this, NORCAP has also evolved its strategic work with UN partners under

the later stages of the project. NORCAP currently has deployed experts to FAO and WFP to work with strengthening their climate services portfolios to further support efforts at the national level.

As was found by Adenle et. al. (2017), fostering partnerships across key UN agencies with national governments is part of ensuring strengthened capacities of both the UN and the national entities, and also provides key funding opportunities for the implementations of activities at national level that often lack due to limited human resources and monetary capacity (Adenle et.al., 2017, p. 197). Furthermore, Adenle et al. (2017) noted how fragmented collaboration and limited existing capacity to develop useful climate services is a reality, thus, it is important for a multi-sectoral and multi-disciplinary understanding to be in place, particularly at national level, for these kinds of collaboration to be deemed beneficial (Adenle et.al., 2017, p. 191).

An interesting example of how dual support of experts to national entities and UN has fostered increased coordination and collaboration, was highlighted by KI2. When asked about what the respondent considered to be an important opportunity for NORCAP at the national level, the respondent brought up a rather recent example of an opportunity found for collaboration between the meteorological office in Niger and WFP; "*At the national level, the added value of NORCAP is often the relationship NORCAP has with other regional and international entities prior to deployment, as well as the international experience the experts have before coming to national level*" (Interview, 28 May, 2021). The respondent further explained how before being deployed with NORCAP, the expert had worked as a programme and policy officer for WFP for several years;

"*This gave me the needed experience and relationships with WFP in countries such as Senegal and Niger, as well as WFP headquarters, to find useful opportunities for collaboration between with WFP and the meteorological office in Niger, where I have given most of my capacity support*" (Interview, 28 May, 2021).

Although the expert was found to be hosted by UNDP as part of ensuring the needed security measures, the respondent further explained that due to their previous relationship with WFP, the expert was able to function as a coordinating and advocacy role to foster increased funding and support by WFP to the meteorological office in Niger. "*This was something I had to facilitate to foster collaboration, and as a result we (Niger NMHS) now have a collaboration project stretching across four years with WFP"* (Interview, 28 May, 2021). Currently in the second funding year of the collaboration project, the respondent further highlighted how WFP

has been able to fund important parts of climate services activities for the meteorological office in Niger.

The key-informant provided an additional example of a recently organised event coordinated by the expert, which served the opportunity for the Niger meteorological office to open their doors to different national partners to learn about the existing capacities and work of the NMHS, in order to foster new collaborations. "*I facilitated the event because as a NORCAP expert based at UNDP I could link different stakeholders in Niger*" (Interview, 28 May, 2021). The respondent further explained how the added capacity of a climate expert from NORCAP in coordinating such an event was crucial to realise support and collaboration with the World Bank, FAO and OCHA. The respondent further stated how; "*After this event we saw that different organisations are now more invested in supporting the meteorological office in Niger because they know what existing capacities they have, and they know the difficulties they are facing"* (Interview, 28 May, 2021).

Drawing on the conceptual understanding of capacity development, these findings reflect the important notion of recognising existing capacities within entities when providing capacity development. Building on existing capacities within entities and institutions is thus recognised to be of importance to ensure a sense of ownership of the entities where capacity is provided (European Commission, 2017, p. 1). The findings further reflect the notion that NORCAP's opportunity to foster collaboration and coordination for national entities ensures that capacity development is recognised as *"...the process through which individuals, organisations and societies obtain, strengthen and maintain the capabilities to set and achieve their own development objectives over time*" (UNDP, 2009, p. 54). Furthermore, as was found in different capacity development literature in chapter 3, without supportive strategies, procedures, and skilled people, countries lack the foundational capacities to plan, implement their objectives (UNDP, 2009, p. 2; Fukuda-Parr et.al., 2002; Zamfir, 2017, p. 2).

The expert situated in Mali (KI1) provided further evidence of how NORCAP experts provide the opportunity to identify and foster collaboration between national entities and UN. The respondent explained how their deployment with the meteorological office in Mali and UNDP Mali has impacted opportunities for increased collaboration between the UN agency and the national entity. The respondent explained how prior to their deployment, the UNDP country office in Mali and the meteorological office had very limited collaboration, and stated that;

"*My work at UNDP feeds into the increased capacity provided to the meteorological office in Mali. Through my deployment and capacity support to these two entities, I have been able to link important focal points from UNDP and the meteorological office by organising a meeting with the UNDP Director in Mali and the Mali meteorological office to strengthen collaboration. This is NORCAPs uniqueness, as a supporter for capacity development. Being from NORCAP, I feel free to move between the national institution and the UN agency, and this only strengthens the capacity that is provided to both entities, particularly in terms of linking climate services with DRR and CCA*" (Interview, 14 May, 2021).

The experts in Mali and Niger, as well as the respondent from NORCAP HO, all provided reflections on how these are just some examples of the ways in which NORCAP climate experts have been able to link collaboration and foster funding opportunities for the implementation of activities. There has been evidence of these opportunities throughout the evolvement of the project, yet, the question remains whether more strategic partnerships with UN is needed to ensure increasing levels of collaboration, or if NORCAP should continue with its current model of deployments. Nevertheless, this identified opportunity reflects that argued by Adenle et al. (2017), where the assurance of multi-sectoral and multi-disciplinary understandings, particularly at national level, is deemed highly beneficial to foster collaboration (Adenle et.al., 2017, p. 191).

5.3 Communication of climate services

5.3.1 Expert capacity for climate communication and informed access to climate services

As part of its delivery of expert capacity for climate services, it was found that NORCAP has increasingly focused its efforts in improving the communication of climate services. From the interview with KI3, it was found that this was considered to be an area of importance for NORCAP in order to ensure that the capacities provided to develop services and products were also met with built capacity to properly communicate the climate information.

Key-informant KI3 stated the following when addressing NORCAP's work on strengthening climate communication;

"*When you gather and develop forecasts, whether that be seasonal forecasts (climate) or weather forecasts, that information is useless if it is not communicated properly. Therefore, this*

pillar of our project work is focusing on climate communication delivery. We provide climate communication experts and user engagement experts to provide capacity so that the national and regional centers can understand and better communicate what is happening on the ground and to provide them with impact-based forecasting" (Interview, 31 May, 2021).

As part of this pillar, the reports and interviews also brought about reflections on NORCAP's work to strengthen the co-production of climate services. Although it became evident that NORCAP has in particular increased its efforts on co-production over the past years, they recognise being far behind in terms of advancing their support on this specifically. Lack of funding to follow up on co-production is one of the key challenges identified by NORCAP in regard to co-production, as well as the local populations mistrust of the entities and organisations which provide and deliver the information (Annual Report, 2020). As was established by Vaughan and Dessai (2014), access to information related to weather and climate is crucial in order to assist in the development of adaptation responses to climate risks (Vaughan & Dessai, 2014, p. 588). Harvey et al. (2019) further argued that this has generated opportunities for new types of funding and partnerships, including scaled up investment into climate services as a means of reducing vulnerability and building resilience (Harvey et al., 2019, p. 81). Thus, NORCAP's added pillar on improving communication of climate services coincides with the recognised needs and opportunities established by the different authors. However, further engagement, collaboration and funding is needed to further explore NORCAP's opportunities to support capacity development for co-production of climate information services.

Further reflections provided by Vaughan and Dessai (2014) in chapter 3, showed how the literature argues that success of a climate service depends on the quality of the climate information that underpins it (Vaughan & Dessai, 2014). The scholars further explained that the quality of climate information alone is not sufficient to make climate services effective (Vaughan & Dessai, 2014). From the interviews, all respondents explained in some shape or form how the technical and probabilistic nature of climate information makes it challenging for non-experts to interpret. KI3 explained how NORCAP has recognised that climate information is most effective when tailored to meet recipients' needs in terms of response strategies, cultural traits, and specific situations. As a response to this awareness, NORCAP has increasingly deployed experts in climate communication since 2018. As was found in the 2018 annual report, ICPAC was identified as a regional centre which needs increased expertise to improve climate communication so that climate information is disseminated as efficiently as possible to the countries in the region, with the aim of reaching all the way to the end user.

Drawing on further perspectives provided by Vaughan and Dessai (2014), the scholars argued that if information is not appropriately tailored to specific decision contexts, it will not be useful to or usable by decision makers, and as a result, the information will not be utilized (Vaughan & Dessai, 2014). In that regard, assessing the extent to which information is appropriately tailored is important to understanding the efficacy of climate services. Addressing the three aspects of this tailoring process, the scholars argued for the need to address the perceived relevance of the information, the perceived accessibility of the information, and the distributional impact of various groups, including those who may be more or less well-off (Vaughan & Dessai, 2014).

Reflecting the arguments on Vaughan and Dessai (2014), KI2 provided important perspectives on how NORCAP experts with limited background and experience from understanding user needs and climate communication are challenged when working with the development of services and products for decision-making;

"*We should look for the use of climate information better in all deployments, and how to do the link between climate information and resilience activities in general, this is something important. Increased capacity building of NORCAP climate experts through trainings would be highly useful to make sure that those experts providing technical capacities go out of the science and understand the need of users at different levels. To have a better understanding of the development and humanitarian aspect would also be important to share climate information in the right way. It is really important for us as experts to understand DRR, emergency preparedness, humanitarian work, we all need to understand these different areas for climate services to better support on capacity development for climate services*" (Interview, 28 May, 2021).

As part of NORCAP's results framework, the project established the long-term outcome of ensuring "*Vulnerable populations in target areas have increased access to and improved use of better climate services and climate information*" (Annual Report, 2018; 2019; 2020). As part of working towards achieving this outcome, it was found that NORCAP initiated the conduction of pilot end-user assessments in Niger and Senegal in 2019, and continued in Niger in 2020.

One of the key-informants interviewed was identified as the expert supporting on the delivery of these assessments (KI2). Here, the key-informant described that the selected end-users were female and male fishermen, farmers and pastoralists in different communities in Niger and Senegal. The key-informant went on explaining that the assessment has the purpose of assessing

the accessibility and level of use of climate services by the identified end-users. As the assessment is part of NORCAP's results framework, it concerns the impact on access to climate services. The delivery of this assessment was important in establishing gaps and challenges on climate information services delivery in the communities where the assessment was conducted. One important take away of this assessment was the identification of needed implementation of certain activities in the communities. In particular, it was found that one community lacked access to a community radio to obtain important climate information for decision-making. Thus, the assessment provided a key recommendation to NORCAP for the need to implement a community radio. However, it was found that NORCAP lacks the funding for implementing activities, and thus relies on its experts and the national staff in the governmental entities to explore funding opportunities for the implementation of such activities. This is an important challenge to be recognised concerning the limitations of NORCAP's work in ensuring access to climate-services at all end-user levels. Recognising NORCAP's limitations in ensuring a measurable impact on enhancing access to climate information services, one key-informant (KI3) further elaborated by stating that;

"*Although focusing on the end-user is very important, and this is our current objective under the project, what we have realised is that the objective is too high for us as our impact is more concerned with capacity development into an organisation. A unique aspect of NORCAP is that we contribute into a broader organisation with our experts, but the challenge is that we cannot take credit for all the work being done by that organisation. We see that NORCAP under this project is challenged by the level of ambition of setting the impact level that high*" (Interview, 31 May, 2021).

As has been noted further above, NORCAP holds a highly ambitious results framework in comparison to the impact it is able to ensure regarding access of information by end-users. An aim of the project has been to document how many people are being reached on the ground. By conducting the end-user assessment, NORCAP has worked towards obtaining more "on the ground" information for the meteorological office in Niger and Senegal, and has been an important added value to ensure that NORCAP works towards being able to measure impact on the ground as well as the impact on capacity development in national and regional entities.

6. Conclusion

Developing capacities of regional and national entities, as well as local communities, to strengthen the development and delivery of climate information services to foster climate-smart decision-making, is a pressing concern across Sub-Saharan Africa. Since the establishment of the Global Framework for Climate Services in 2009, scholars and actors within the fields of capacity development and climate information services have identified key constraints as well as opportunities for strengthening capacity across the continent, with particular attention to the need for increased support at national level to ensure enhanced resilience in vulnerable nations.

In an attempt to provide an understanding of the opportunities and challenges experienced by an expert provider of capacity development for climate services, this thesis asked the question; *What does NORCAP perceive to be the challenges and opportunities in fulfilling its objective of contributing towards strengthening climate information services in Sub-Saharan Africa through capacity development?* Throughout this study, I have thus explored the main challenges, as well as opportunities which NORCAP has identified throughout the different project phases, and highlighted key trends and themes arising from this. From the findings and discussion of this thesis, it was found that to build climate resilience and ensure climate change adaptation, climate information needs to widely support the adaptation process. NORCAP addressed both opportunities and challenges in addressing this, as it concerns itself with the need to foster adaptation and risk reduction in different levels of decision-making. Providing experts from a range of different fields of climate services has ensured that NORCAP can foster needed support at both region and national level, as well as to the UN. However, a challenge has been to provide needed expertise beyond areas concerning development of climate services and products. Nevertheless, an increased focus on deploying experts in climate communication and user engagement has fostered support to both regional and national entities and strengthened their ability to engage and incorporate local needs and perspectives in the development and delivery of climate information services.

My findings suggest that the establishment of the climate services project has mostly provided NORCAP with valuable opportunities to develop strong partnerships at both regional and national level, as well as with certain UN partners through hosting agreements. As NORCAP climate experts have been deployed to support both regional, national and UN entities, collaboration and coordination has been fostered to increase funding in order to further strengthen the development and delivery of climate services. A key opportunity to ensure that national entities in Senegal and Niger are capable of gathering needed information from the ground to understand local needs was also identified by NORCAP, as they have supported on the delivery of end user assessments at the local level.

However, important challenges arouse from the findings. Although the study found that NORCAP strengthening capacity at several levels, the lack of implementation funding available to fund activities at regional and national level, impacts the influence of NORCAP beyond supporting with expert capacity for capacity development to climate services. However, NORCAP experts were seen to provide valuable opportunities for fostering collaboration and enhancing funding opportunities through their deployments, which has served as a key attribution to strengthening the capacities of NORCAP's partnering entities, in particular the national meteorological centers. Furthermore, while incorporating the concepts of resilience and vulnerability as central parts of NORCAP's project mandate for climate services, a key challenge addressed was NORCAP's ability to ensure enhanced resilience through its own efforts, as this is heavily reliant on the capacities strengthened and resources available in national and regional entities. The sustainability of the provided and developed capacities differs, and heavily relies on the partners ability to absorb the provided capacity by hiring permanent staff once deployments end. ICPAC was highlighted in all interviews as the entity where NORCAP has been able to ensure the most provided capacity, however challenges are faced when deploying to entities situated in fragile regions, such as ACMAD in West Africa.

This thesis has aimed to answer the following research question; *What does NORCAP perceive to be the challenges and opportunities in fulfilling NORCAP's objective of contributing towards strengthening climate information services in Sub-Sahara Africa through capacity development*? In final conclusion, NORCAP recognised holding key expertise to foster capacity development for climate services, and sees opportunities for fostering collaboration and strengthening capacity as an important means to an end in strengthening access to climate information services. NORCAP further recognised that it holds both the mandate and opportunity to further strengthen climate services as part of the so called "resilience agenda",

yet, several challenges need to be overcome in order to strengthen climate information services beyond the current abilities and scope of NORCAP in relation to its work with climate services.

Opportunities for further research beyond the approach made in this thesis are plentiful. Studying the case of NORCAP and the perceived challenges and opportunities in fulfilling NORCAP's objective of contributing towards strengthening climate information services in Sub-Saharan Africa through capacity development, has allowed for an understanding of what NORCAP perceives to be its added value as well as its shortcomings in working with strengthening climate services. Considering further research on this topic, it could be of interest to study the interrelationship between NORCAP and its partners for climate services, to assess how they perceive NORCAP as a provider of expert capacity to strengthen climate services and access to climate information. Here, it would be valuable to involve the capacity needs of partner entities, drawing on their own perspectives and views of NORCAP as a provider of expert capacity to address capacity needs. Further research could also benefit from addressing capacity development for strengthening climate services efforts in other humanitarian organisations, or even take on a comparative study of Norwegian donor perspectives in strengthening climate services in Sub-Saharan Africa. The varying opportunities for further research thus show the variety of important approaches to take in understanding capacity development for climate services. Beyond the focused approach of this study, the need to understand how to develop better climate and weather information, or climate services, should be explored further. Future research on climate services within the sphere of international development could thus further address challenges and opportunities of co-production, communication or community engagement and accountability, to name a few important areas. As has been addressed in this thesis, climate services is a rather new, yet rapidly growing field, and is reliant on broad levels of understanding and research to ensure that we know how to best develop services which support decision-making to enhance the resilience of the populations most vulnerable to a changing climate.

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Appendix 1: Interview Guide

Introduction

- Inform about purpose and structure of interview, use of data, possible consequences, right to withdraw, anonymity.
- Confirm that letter of consent has been received and signed in advance of the interview.
- Do you have any questions before we start?

Role under the NORCAP project 'Strengthening Climate Services in Africa'

- (If applicable) How long have you been deployed under the NORCAP project 'Strengthening Climate Services in Africa'?
- (If applicable) How long have you worked with the 'Strengthening Climate Services in Africa' project?
- What is your position under the NORCAP 'Strengthening Climate Services in Africa' project, and what does this role entail, in brief?

Main part

Climate services in Africa

- As an expert on climate services in Africa, could you describe the ways in which climate services has been developed over recent years?
- In what countries or regions are you seeing the most progress, or lack of progress, on climate services?

Capacity development for climate services

- In your experience, how crucial would you say that it is to provide capacity development for climate services in Africa?
- Where do you recognise the biggest needs for increased capacity development for climate services in Africa?
- Would you say that NORCAP is covering the countries and regions where increased capacity is needed?
- What have you noticed being the main capacity needs of institutions from working with climate services in Africa?
- How have you provided capacity to the institutions you support?

- How do you consider and recognise NORCAPs role as a provider of expert capacity for climate services?

Climate services in support of coherence in climate change adaptation and disaster risk reduction

- Do you recognise that the institution(s) you support under the NORCAP project are recognising the need for climate services to support coherence in CCA and DRR?
- Would you say that your role as a NORCAP climate services expert has been important in increasing the coherence in climate change adaptation and disaster risk reduction?
- In your experience, what are the biggest challenges when developing climate services in support of coherence in CCA and DRR?
- How do you think NORCAP could better support institutions to ensure that the capacity given for climate services supports coherence in CCA and DRR?

Concluding remarks

- Is there anything else you think is important that we have not yet covered?
- Do you have any questions?

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