Mid-Term Review of the Global Framework for Climate Services

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List of Acronyms

CAM	Commission for Agricultural Meteorology
CCI	Commission for Climatology
CHF	Swiss Franc
CHO	Climate and Health Office
CIMH	Caribbean Institute for Meteorology and Hydrology
CREWS	Climate Risk Early Warning Systems
COP	Conference of Parties
C3S	Copernicus Climate Change Services
DRR	Disaster Risk Reduction
ET	Expert Team
EUMETSTAT	European Organization for the Exploitation of Meteorological Satellites
FAO	Food and Agriculture Organization of the United Nations
GCF	Green Climate Fund
GFCS	Global Framework for Climate Services
GFDRR	Global Facility for Disaster Reduction and Recovery
GWP	Global Water Partnership
IBCS	Intragovernmental Board on Climate Services
IEA	International Energy Agency
IRENA	International Renewable Energy Agency
ISDR	International Strategy for Disaster Reduction
MOU	Memorandum of Understanding
NAP	National Adaptation Plan
NAPCS	National Action Plan for Climate Services
NDC	Nationally Determined Concentrations
NFCS	National Frameworks for Climate Services
NMHS	National Meteorological and Hydrological Service
PAC	Partners Advisory Committee
RCC	Regional Climate Centers
RCO	Regional Coordination Office
SBI	Subsidiary Body for Implementation
SDG	Sustainable Development Goals
TT-ORP	Task Team Operational and Resource Plan
TT-M&E	Task Team Monitoring and Evaluation
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UNISDR	United Nations International Strategy for Disaster Risk Reduction
UNITAR	United Nations Institute for Training and Research
UIP	User Interface Platform
WB	World Bank
WBCSD	World Business Council for Sustainable Development
WCC 3	World Climate Conference 3
WEMC	Western European Meteorology Club
WFP	World Food Program
WG	Working Group
WHO	World Health Organization
WMO	World Meteorological Organization

1. Preface

The origin of the Global Framework for Climate Services (GFCS) dates to the World Climate Conference 3 in 2009; and it came into operation in 2012 when the WMO Congress adopted the governing body of the GFCS and its Implementation Plan. During the past five years, the GFCS has help lead a growing field of climate services and, in the process, has made contributions to improvements in the production, availability, delivery, and use of climate services around the world. This is the first review of the GFCS (hereafter referred to as the Review). It is occurring in the second Phase of Implementation of the GFCS (2015-2018). This Review examines the GFCS from its inception through August 2017. The Review is designed to assess progress of the implementation of the GFCS, to determine strengths and challenges, and to provide guidance on measures that can better help the GFCS achieve its future milestones.

The Review team, based at the University of Arizona in the United States, comprises of Drs. Andrea K. Gerlak, Zack Guido, and Chris Knudson and graduate student research assistance from Marie-Blanche Roudaut. We conducted the Review over a four-month period, from late April to the end of August 2017. The empirical substance of the Review draws from interviews and group discussions with 81 individuals, a thorough review of GFCS documents, an online survey of 167 GFCS stakeholders, and the personal experience and professional expertise of the research team.

This Review could not have been possible without the generous time donated by the people we interviewed. The interviews lasted at least 30 minutes, and often continued for more than an hour. In fact, many people were willing to talk about the GFCS for longer than the call lasted and engaged in follow-up email exchanges. We are also grateful for the thoughtful answers and important perspectives provided by those who completed the online survey. When asked in the survey – what motivates you to work on climate services – survey respondents answered in compelling ways: “my duty as a citizen,” “to bring relief to people,” “to reduce vulnerabilities,” and “because of my desire to trigger a change.” These acts of participation in the review process are themselves evidence of the strong commitment and emotional relationship many people have with the GFCS.

We also want to thank the GFCS Office – Filipe Lucio, Erica Allis, and Veronica Grasso – for helping inform and coordinate data collection and for providing important feedback throughout the process. Emelie Larrodé from the GFCS Office also helped coordinate our travel to Senegal, Côte d’Ivoire, and Tanzania. Within these countries, we received tremendous hospitality from our hosts. In Senegal, Arame Tall and Alioune Kaere of the GFCS regional office, as well as the Director of the Senegalese National Meteorological Service, Mariane Diop Kane, arranged meetings with 10 individuals from five institutions and who themselves provided important insights during discussions. In Côte d’Ivoire, the Director of the National Meteorological Service, Daouda Konate, organized a group discussion between our team and 12 stakeholders who have participated in the NFCS process there. In Tanzania, the Director of the Tanzanian Meteorological Agency (TMA), Ladislaus Chang'a, along with TMA’s GFCS coordinator, Mecklina Merchades, made insightful presentations and facilitated group and individual interviews with eight individuals.

Finally, we would like to thank Meredith Muth, Stefan Rösner, Simon Mason, the GFCS Office, and the Monitoring and Evaluation Task Team for their input during this Review and its timely suggestions for its improvement. This Review has been composed in a spirit of collaboration, with an understanding that its outcome is intended to help the GFCS reach its full potential.

The authors, September 1, 2017

2. Executive Summary

The GFCS helps organize and guide a set of national, regional, and international arrangements that develop and provide climate services. The GFCS dates to the World Climate Conference 3 (WCC 3) in 2009 when governments, United Nations organizations, and non-governmental organizations agreed to strengthen the production, availability, delivery, and application of science-based climate prediction and services in support of decision-making in climate sensitive sectors. In 2012, the Extraordinary Session of the World Meteorological Organization (WMO) Congress established the governing body of the GFCS – the Intergovernmental Board on Climate Services – and approved the GFCS Implementation Plan. The Implementation Plan defines deliverables and milestones to be realized over 2-, 6-, and 10-year horizons.

The *Priority Needs for the Operationalization of the GFCS* (2016-2018) defines the GFCS as "neither a project nor an operational mechanism for project implementation. Rather, [the GFCS] fills an increasingly important need that is not being addressed through individual activities…. Many projects are being undertaken in isolation, in the absence of any master plan for alignment of project-level efforts and not conforming to relevant international standards. This can result in duplication of efforts, which may prove unsustainable or ineffective in the long term. In the absence of a robust and effective Framework, it will be difficult to ensure that lessons are learned and knowledge is transferred from these activities to inform new initiatives, approaches are standardized, and the best available scientific information is being utilized at national, regional and global levels" (WMO, 2015a, p.10). Therefore, the GFCS aims to stimulate effective action by helping organizations working in climate services collaborate more effectively, efficiently, and with common purpose.

The purpose of this Review is to assess the progress of implementing the GFCS, to determine its strengths and challenges, and to provide guidance on measures that can better help the GFCS reach its potential. The Review is intended to inform decision-making within WMO, which houses the GFCS, as well as the myriad intergovernmental organizations and national and regional actors that contribute to the GFCS.

The Review was conducted in Summer 2017 by an interdisciplinary team of social and physical scientists at the University of Arizona in Tucson, Arizona, U.S. The findings and recommendations are based on in-depth interviews, an online stakeholder survey, site visits to three African countries, and a thorough analysis of GFCS documents.

Findings

The Review commends the GFCS for key achievements in contributing to mainstreaming climate services across national, regional, and global scales. The key achievements are the following:

- The GFCS has elevated the awareness of climate services and the role they can play in development across global, regional, and national scales. This achievement should not be understated. The terminology, meanings, and methodologies that define climate services are new and emergent, and the GFCS is helping to create shared understanding. Increased awareness is a building block for funding and priorities, and the GFCS has had some impact on global research agendas as well as national activities.
- A principal stakeholder of the GFCS is the National Meteorological and Hydrological Services (NMHS) that the WMO represents. The GFCS is helping to legitimize these NMHSs as leaders of climate services within their countries. Importantly, the GFCS promotes an interdisciplinary approach that is helping to shift the theory and practice of information provision and development. Collectively, people are seeing the efficacy of climate services as based in a user-centric, demand-driven approaches to climate services.

- The GFCS has engaged in partnership-building across global, regional, and national levels. The Partner Advisory Committee reflects an impressive array of organizations. The formalization of joint offices has brought in new expertise to the WMO and GFCS. And, at the regional and national levels, National Frameworks for Climate Services are impetuses for new relationships, as too are some of the projects managed by the GFCS Office.
- After five years of GFCS activity, and across the diverse groups of people with whom this Review consulted, there is an overwhelming sense that the GFCS is as necessary today as when it was created in 2009. There are, of course, differing opinions about the form the GFCS should adopt, as this Review elucidates. Nonetheless, the GFCS has a built-in an ability to adapt and evolve.

A major part of the Review has been directed at identifying challenges. The most important challenges explicated in this Review are the following:

- The GFCS may be a victim of its own creation. The Framework put forth by the GFCS is widely accepted. It outlines a scope that extends across geographic, sectoral, and technical scales and that draws on diverse methods, partnerships, and expertise. The GFCS, however, is attempting to be the engine with inadequate human and financial resources, and in ways that do not maximize the advantages of its contributors.
- The GFCS has a governance structure that was approved under a set of expectations that have not materialized (in terms of expected funding and broader representation). Additionally, the governance structure is costly and heavy, and has left many people questioning its role. Therefore, the governance structure in its current form is no longer fit for purpose.
- Overall, we find a lack of clarity around roles and responsibilities within the GFCS, from issues of governance and project management, to its relationship to the WMO and contributions to major global agendas. Greater clarity is needed to best maximize potential and strengthen partnerships.
- The implementation of GFCS projects are perhaps the main source of contention within the GFCS network. Many view projects as going beyond the original scope of the GFCS, and the focus on Africa contributes to the perception of a geographic imbalance in GFCS efforts.
- The GFCS is a network of activities and organizations, one that requires active stewardship and a commensurate financial commitment. This GFCS Office would be this steward. However, the human and financial resources dedicated to the GFCS Office are inadequate for its mandate, and both the resources and scope of work need to be re-assessed.

Recommendations

On the basis of these, and other findings presented, the Review has the following recommendations:

- Revisit the Scope of the GFCS given its resources and focus on identifying priorities, knowledge translation, and connecting users and providers.
- Reframe the identity of the GFCS as a partnership.
- Reform GFCS governance to reflect this partnership.
- De-emphasize leading demonstration projects.
- Broaden GFCS focus beyond the eight prioritized countries.
- Advance national climate service activities by supporting NFCS.
- Enhance cross-scale linkages.
- Strengthen GFCS communications across multiple scales.
- Expedite the development and implementation of a monitoring and evaluation process.
- Provide guidance on data protocols and engagement.
- Focus on sharing lessons learned and exchanging knowledge.
- Cultivate and engage in more of the social sciences of climate services.
- Sustained engagement with global agendas.

- Increase investment in the GFCS Office.
- Adopt unambiguous language for future GFCS targets.
- Clarify the purpose and mechanisms of the UIP to climate services users and providers.

3. Introduction

3.1. Background and Context.

The Global Framework for Climate Services (GFCS) was agreed upon at the World Climate Conference 3 (WCC 3) in 2009; and its Implementation Plan was approved by the World Meteorological Organization (WMO) Congress in 2011. The GFCS is a WMO-led United Nations (UN) initiative that coordinates and facilitates WMO member states and stakeholders to provide climate information to assist decision-making. While there are many definitions of climate services, the GFCS defines climate services as providing climate information to assist decision-making in ways that involve appropriate engagement, an effective access mechanism, and in response to user needs (WMO, 2014a). The GFCS recognizes that effective climate services require linking a broad array of people and organizations working across global, regional, national, and local levels. Additionally, the GFCS identifies the need for myriad activities that draw from a diversity of expertise and experiences. These recognitions are embodied in the five pillars: (1) observations and monitoring; (2) the climate service information system; (3) research, prediction, and modeling; (4) capacity development; and (5) user interface platform (WMO, 2011). Together, the pillars span the supply chain, from production to use, and are designed to be integrative.

In 2011, the GFCS Implementation Plan was approved to help coordinate a growth in climate services organizations and activities. Its ambitiousness created high expectations that were hard to meet under most circumstances. Meeting these expectations proved more difficult when financial contributions became fewer than anticipated and with a small GFCS Office. Despite these challenges, the GFCS has created opportunities to advance climate services, to coordinate an expanding network, and to learn from past successes and challenges. Many people have stated that embracing both the positive and negative aspects of the GFCS is critical to its future. Additionally, many of those who provided their views for this Review recognize the need for a GFCS. Some 84% of 106 respondents from our online survey of GFCS participants stated the future potential of the GFCS to be very high or high, in contrast to only 5% who indicated low potential. The need for the GFCS is likely due, in part, to the rapid changes in climate services since 2011 when the Implementation Plan was approved. Today, there are more organizations implementing climate services, a greater awareness the role climate services play in fostering climate adaptation and contributing to development goals, and greater demand and large sums of money funding climate service activities worldwide. The vision and need for a “platform that will grow and link climate services in all countries and sectors in a more coherent, mature and global endeavor” is even more relevant today than in 2011 (WMO, 2011). This changing and expanding field makes this Mid-Term Review timely and important.

3.2. Purpose and Scope of Mid-Term Review.

As stated in the Terms of Reference for the Mid-Term Review of the GFCS, the purpose of the Review is to assess the progress of implementing the GFCS, as well as to provide guidance on how to improve implementation of the GFCS, and measure success of the activities implemented so far (WMO, 2017a). The Review will therefore answer three principal questions. (1) what have been the accomplishments of the GFCS?; (2) what have been its strengths and weaknesses?; and (3), what are recommendations for a viable future path for the GFCS?

The Review is organized as follows. Section 4 describes the methodology; Section 5 assesses GFCS implementation milestones pertaining to Phases I (2013-2014), II (2015-2018), and III (2019-2024); Section 6 reviews GFCS governance; Section 7 describes the mechanisms for GFCS implementation and engagement at the national, regional, and global levels; Section 8 outlines the GFCS contributions to major global agendas; and Section 9 provides recommendations based on the totality of the data collected. Also, in Section 10 and 11 are citations and annexes referred to in the Review.

4. Methodology

4.1. Data Collection.

Frameworks like the GFCS are agreed upon to create a common vision and purpose at strategic levels. Where strategy meets practice, the roles, functions, accomplishments, and governance of the GFCS take on different meanings. Consequently, there is a diversity of opinions on what the role of the GFCS should be, on what activities it should focus, and on how implementation should work. We synthesize the different perspectives gained from expert, key-informant interview; an online survey distributed to the broader GFCS network; site visits to three countries in East and West Africa;[1] and an analysis of strategic GFCS documents. We derive our analysis and conclusions from the totality of information contained in these sources. Occasionally, we use a quotation from an interview to illustrate a more common viewpoint we consider important to highlight.

We completed 53 interviews with key actors and stakeholders in the GFCS network, focusing mainly on individuals who work at global and regional scales. The GFCS Office provided a list of individuals they wanted to be interviewed; the research team also interviewed other individuals who were recommended to the team by the people we interviewed. We provide a list of these interviews and their organizations in Annex 1, Table A1.1. Most interviews were conducted by skype and lasted between 30 and 60 minutes. The interviews followed a semi-structured format. Our questions served as a guide. Each interview was unique, discussing topics germane to the experiences of the interviewee in more detail. We provide examples of the interview questions in Annex 2.

We conducted an online survey using Qualtrics survey software between July 21 and August 10, 2017. We emailed the survey to 724 people, including all Partners Advisory Committee (PAC) and Intragovernmental Board on Climate Services (IBCS) members, key WMO personnel, and other key individuals who have participated in the GFCS. For these groups, the GFCS Office provided the majority of email addresses; a small portion of email addresses were added from interview recommendations. Additionally, the survey was distributed to national level participants from Burkina Faso, Cameroon, Chad, Côte d'Ivoire, Malawi, Mali, Madagascar, Senegal, and Tanzania. These countries were identified by the GFCS Office, which helped obtain emails addresses.

A total of 167 people completed the survey, representing a 23% response rate. In the survey, we initially asked respondents if they had "sufficient knowledge of the GFCS to assess the added value of GFCS activities and accomplishments relevant to your area of expertise." This allowed us to analyze only those who responded yes. Of the 167 respondents, 128 self-reported sufficient knowledge of the GFCS and were then given the full survey. In this Review, we report on the answers from this group. The survey combined fixed response and open-ended questions (Annex 3 contains the survey). The survey sample has a large majority of respondents: (1) from Africa (57%); identifying their primary expertise as meteorology and climatology (67%); working at national and subnational scales (72%); and male (80%). Annex 4 (Figure A4.1) describes the sample's demographics. We analyzed the fixed response questions using descriptive statistics. Where appropriate, we disaggregated responses based on self-reported expertise (e.g. meteorologists), relationship to the GFCS (IBCS and PAC member), or geographic scale of work (global or regional). For open-ended questions, we coded the responses based on emergent themes and, at times, provide frequency counts of the themes.

[1] A site visit to Senegal provided an opportunity to meet representatives of the GFCS Regional Office in Africa, and to meet national meteorological and sectoral representatives to better understand their GFCS experiences. In addition, meeting meteorological and sectoral representatives in both Senegal and Côte d'Ivoire provided insights into the process for developing a National Framework for Climate Services (NFCS), including the challenges and benefits of the NFCS. The visit to Tanzania offered a window into the first phase of project implementation and provided insights related to partner coordination that can help inform future activities.

For our site visits, the GFCS Office advised us to visit Côte d'Ivoire and Tanzania. We added Senegal to meet with the regional coordination office there. We traveled between June 19-July 3, 2017, and conducted interviews and group discussions with 30 people (Annex 5, Table A5.1). Our conversations focused on the NFCS and a project implementation in Tanzania, among other GFCS topics.

We completed a document analysis to better understand the GFCS history, the milestones agreed upon by the GFCS governance bodies and process, contributions of PAC members to the IBCS, and more generally, the set activities GFCS members have undertaken. This information is used throughout this Review. And the documents informed our interview and survey questions. Annex 6 contains a list of publicly available information resources consulted for this Review.

4.2. Limitations to the Review.

There were several limitations the research team experienced during this Review. Although we aimed for regional and gender representation in our data collection, the people we interviewed and those who participated in the survey do not account for all the voices associated with the GFCS. The responses in the online survey, for example, are skewed heavily towards national level and meteorological service personnel, which is a function of the sampling method. Moreover, since much of the work of the GFCS is focused on Africa, this is also reflected in the online survey sample and our site visits. There is, however, substantial differences in the cultural, policy, and climate services capacities across GFCS actors and regions. Therefore, many of our site-visit observations will not be generalizable to other areas and contexts. Additionally, we did not conduct nor report on evaluations of projects during our site visits. These evaluations are a better fit for more comprehensive evaluation efforts (e.g. Laugerud et al., 2016). Finally, in reviewing the milestones, it was necessary that we interpreted some ambiguous language that was used to state the milestones. For this reason, there may be some unresolvable differences in opinion over the degree to which certain milestones were met. Nonetheless, while the 4-month timeline for this Review and the available financial resources informed a methodology that broadly scanned the GFCS network, we believe the data collected has allowed for the main benefits, challenges, and recommendations to emerge.

5. Assessing GFCS Implementation Milestones

5.1. Overview.

The GFCS Implementation Plan established key milestones for the Framework over three phases. In Phase I (2013–2014), the GFCS was to focus on establishing the infrastructure of the Framework and initiate and facilitate demonstration projects in the initial five GFCS priority areas. In Phase II (2015–2018), the GFCS entered the development phase, with a focus on developing and strengthening the core regional and national mechanisms for climate services. In Phase III (2019–2022), the GFCS will move into the expansion and continuation phase, with an emphasis on maintaining and sustaining the Framework's institutional mechanisms (WMO, 2017a). In this section, the Implementation Plan's milestones will be grouped together into five categories, according to the principal element of the Framework that they engage with: Pillars, Projects, Governance, Access, and Reporting.

5.2. Pillars.

The principal focus of the milestones, with respect to the five pillars, is the development of the User Interface Platform (UIP) pillar. According to the Annex of the Implementation Plan that is dedicated to the UIP, the UIP's function is to provide "a structured means for users, climate researchers and climate information providers to interact at all levels" (WMO, 2014a, p.v). Its objective "is to promote effective decision-making with respect to climate considerations by making sure that the right information, at the right time and in the right amount, is delivered, understood, and used" (WMO, 2014a, p.8).

5.2.1.Pillar Milestones.

When the Implementation Plan was written, there was not an existing UIP. Unlike the other pillars which had specific activities underway, such as the Global Climate Observation System, the UIP consisted only of disparate activities that linked providers to users. It was thus necessary to construct subsidiary milestones for just the UIP – written as goals to accomplish – at the timescale of the three Phases (WMO, 2014a). These goals apply to all the priority areas, and encompass one organizational goal, and four operational goals (grouped under Feedback, Dialogue, Outreach, and Monitoring and Evaluation). The UIP organization goals concern the establishment (Phase I), maintenance and improvement (Phase II), and sustainability (Phase III) of the institutional mechanisms of the UIP (WMO, 2014a). In addition to the UIP goals, there are also two other specific pillar-related milestones: (1) the convening of pillar-specific dialogues at global and regional levels (beginning in Africa) to organize management of activities (Phase I); and (2) the establishment of active technical committees for each of the five pillars (Phase II).

5.2.2.Pillar Milestones Review.

The UIP has four key elements: there is the goal of building *dialogue* between climate service users and providers; identifying the optimal methods for obtaining *feedback* from user communities; improving climate literacy in the user community, and literacy of the climate community in user needs though *outreach*; and developing monitoring and *evaluation* (M&E) measures for the Framework that is agreed between users and providers. The progress on meeting these UIP elements are considered in the subsections on the relevant milestones below. Progress in meeting Phase II and III milestones has been helped by increased funding. In 2015, the funding for UIP was increased in its revised budget, eventually constituting more than 70% of the budget for all the pillars. A large part of this increase in the UIP budget was due to special purpose contributions from Norway that were earmarked for UIP projects. In 2016, the UIP pillar received CHF 6.75 million, more than 60% of the pillar budget (WMO, 2015b, p.38-9). Progress toward meeting Phase III milestones was seen as mixed in the online survey taken by GFCS stakeholders. Respondents viewed progress toward creating effective dialogues between users and providers, and toward improving climate literacy, most favorably, with more than 70% saying that there had been at least some progress in these two targets. Progress toward creating methods for obtaining feedback, and M&E improvements in climate services, were seen as less favorable, with 50% seeing at least some progress being made.

During Phase I, there were several kinds of pillar-specific dialogues at global and regional levels. In order to identify priorities for implementing the GFCS, with respect to its pillars and priorities, regional consultation workshops were held. These workshops, which have continued into 2017, address gaps and needs for climate services for the regional implementation of climate services. “The workshops bring together regional and national stakeholders, including experts from the National Meteorological and Hydrological Service (NMHS), users, academic institutions, the private sector, and key decision-makers” (GFCS, 2017a). During Phase I, regional workshops were held in South East Asia; Latin America; for Least Developed Countries in Asia; and for Small Island Developing States in the Caribbean; and in the Pacific. Regional climate conferences were also held to identify specific research priorities, including the Climate Research for Development Agenda for Africa, which was established through the Africa Climate Conference in 2013 (Arusha), and the 2014 World Climate Research Programme’s conference for Latin America and the Caribbean held in Montevideo. The WMO also has assisted Climate Outlook Forums in facilitating UIP dialogues.

Technical committees for each of the five pillars will not be established by the end of Phase II. It was decided that the cost was too high, and that they would potentially duplicate the WMO technical commissions. According to an interview with a PAC member, there was a desire to add to a technical underpinning to the governance structure in order to address specific technical questions as required. And this desire has ultimately been fulfilled through a proposal approved by the IBCS at its second

session, and subsequently approved by the WMO Congress in 2015. The adopted proposal is to establish a Working Group (WG) or Expert Team (ET) under the supervision of the IBCS. The membership of the WG or ET is chosen in consultation with IBCS members and the GFCS partners, and as a matter of priority, the PAC members, and is limited to two people. The mandate of the WG or ET is of limited duration and is dedicated to the technical question (WMO, 2014a).

5.3. Projects.

The GFCS milestones concern two distinct kinds of projects. The GFCS projects are those that are funded by the GFCS Trust Fund, or from other funding mechanisms provided by members and partners, and that must adhere to nine criteria. These projects are monitored and evaluated, and are required to report to IBCS. In contrast, GFCS contributing projects are not intended to be funded by the GFCS Trust Fund, and need only meet a subset of five of the nine criteria.[2] Typically, these are activities that are implemented by PAC members, or member countries. These projects are monitored and evaluated, and report on a voluntary basis to IBCS.

5.3.1. Project Milestones.

For Phase I, the milestones are to (1) implement the initial projects; (2) complete the demonstration projects; and (3) have the projects develop national or regional capacities, enhance access to observations, and/or build research capacity. For Phase II, the funding that the Framework has engaged for climate-related development projects is to be at least US$150 million. And for Phase III, that funding target is US$250 million.

5.3.2. Project Milestone Review.

The initial projects were conceived in the Implementation Plan as a way of giving impetus to the Framework and concretely achieving many of the milestones described in this section. In order to achieve the goals of the individual projects, it was necessary to improve the communication between climate services providers and users in a systematic and coordinated manner; and it was necessary to build capacity and bridge gaps in service delivery within specific countries. The overarching goals in the projects were to lay a foundation for success for the GFCS and to build credibility among users and governments. (See section 5.2.2. for further analysis of how GFCS stakeholders perceive the success of the projects.) The GFCS website lists eleven GFCS projects. Four of them predate the beginning of the Phase I in 2013, and a further three began after the end of the Phase I in 2014 (GFCS, 2017b). The goal for the initial projects was to have them be completed within the first phase so that they could serve as models to be replicated in other countries. However, none of the projects were completed in that timeframe. In the end, the thinking on GFCS projects changed over time. Reflection on the initial projects conducted in the first two years (Phase I) showed the GFCS what the needs were. A decision needed to be made between proceeding to implement projects in all 70 countries, or to focus on a smaller subset. The latter approach was chosen, and this decision was supported because it was able to more easily show the benefits of climate services. Along with the decision to implement GFCS projects in a smaller number of countries, it was decided that climate services projects could best be accomplished through GFCS contributing projects where the funding did not need to issue from a Geneva-based Trust Fund. In this way, several US$ billion have been spent on climate services globally. The GFCS has moved away from operating a trust fund for projects to serving as a technical advisor and services coordinator so that climate services are more harmonized. There remains, however, a lack of coordination in funding. At a GFCS Meeting on Implementation Coordination in September 2014, it was reported that there were over “100 projects

[2] For GFCS project, and GFCS contributing project, criteria, see: http://www.wmo.int/gfcs/project_criteria.

directly contributing to country-level climate services implementation in 16 countries, with a combined budget of over USD 700 million" (WMO, 2015b, p.9). These projects were not aligned in their efforts, resulting in duplicated efforts, and unfilled user needs.

5.4. Governance.

The GFCS is principally governed by the IBCS, an intergovernmental body that reports to the WMO Congress, and whose membership is open to all UN-member countries. Created by the Extraordinary Congress of WMO in 2012, the IBCS is responsible for developing and implementing the GFCS, as well as coordinating the global and regional levels. The IBCS is complemented by the PAC, an advisory board whose membership consists of partner organizations.

5.4.1. Governance Milestones.

The Phase I milestones are to (1) implement the necessary governance, management, and reporting frameworks; and (2) establish the Intergovernmental Board and Framework Secretariat to oversee the GFCS. The Phase II milestone is to have the governance Framework closely involve at least five UN agencies or programs; and the Phase III milestone is to increase the number of UN agencies or programs to at least eight.

5.4.2. Governance Milestones Review.

For the Phase I milestones, the governance, management, and reporting frameworks were accomplished through setting up the IBCS, including the Management Committee and the PAC as part of its substructures. A Framework Secretariat was established in the form of the GFCS Office in WMO. This Office, along with World Health Organization (WHO)–WMO Joint Office, and staff exchanges between WMO and other key partners – WHO, Global Water Partnership (GWP), and World Food Program (WFP) – were the main ways that the GFCS governance structure was implemented in Phase I (WMO, 2017b, p.10). Moreover, during Phase I, National Frameworks for Climate Services (NFCS) were initiated in ten countries: Burkina Faso, Niger, Mali, Chad, South Africa, Belize, Senegal, Tanzania, Malawi, and Dominica (GFCS, 2017a).

The potential to meet the Phase II goal of working closely with at least eight UN agencies or programs is good considering that there at least eight PAC members that UN agencies or programs: Food and Agriculture Organization of the UN (FAO), UN Development Programme (UNDP), UN Environment Programme (UNEP), UN Educational, Scientific and Cultural Organization (UNESCO), UN Institute for Training and Research (UNITAR), World Bank (WB), World Food Program (WFP), and WMO. Additionally, there is close involvement with the WHO through a joint office. While the closeness with which these bodies work with the GFCS varies, as PAC members their involvement is necessarily limited by their role of informing topics and decisions through its input to the IBCS, rather than directly voting on GFCS affairs. One UN agency-PAC member representative stated "…PAC members should be able to interject as member states do. Ultimately, if we don't have voting power that wouldn't bother me that much because it is an intergovernmental governance and there has to be some limits so that it's state representation. But just a little more of a platform for the PAC members to speak." Through interviews and the survey, we found that PAC members from UN agencies and programs highly value the GFCS, but desire that they can provide more input in the GFCS's decision-making, and that there is more coordination among the PAC members. The GFCS has responded, in part, to this by co-locating the most recent PAC and IBCS Management Committee meeting to bring the two groups together more closely. The degrees of involvement of the UN agencies and programs with the GFCS varies by organization. There is a strong perception that the GFCS is led by the WMO, and it is not an equal partnership among the UN agencies, or other affiliated organizations more widely. The closeness of collaboration with the GFCS also varies greatly by UN agency as well. Among the UN agencies, the GFCS has had three joint offices located in Geneva with representatives from the WHO, WFP, and GWP. The WHO-WMO and GWP-WMO Joint Offices are currently staffed, while the

WFP one is not (See section 5.4.1 for more on joint offices). Moreover, through interviews we learned that within some UN agencies, individuals lacked both awareness of the GFCS mission, and that their organization was affiliated with it. This lack of agency-wide awareness inhibits their close involvement.

5.5. Access.

The accessibility of climate services, along with their quality and relevance, are principal goals of the GFCS. At the inception of the GFCS, the accessibility of climate-related data varied widely across the world. While climate services were improving on the whole, many countries had no climate services at all. Developing countries, in particular, needed support to ensure that existing information was known to, and accessible by, potential users.

5.5.1.Access Milestones.

The Phase I milestones are to (1) engage user communities, and to demonstrate the value of climate services at regional and national levels; (2) distribute the Implementation Plan to stakeholders; and (3) develop and deliver services for the priority areas. Phases II and II build on (3) by having the goals of improving access to climate services worldwide in the priority areas (Phase II); and facilitating access to improved climate services worldwide and across all climate-sensitive sectors (Phase III).

5.5.2.Access Milestones Review.

As an early part of the process of engaging user communities, the Implementation Plan was made available to stakeholders through the GFCS website. The website and the GFCS newsletter are the principal means by which the GFCS communicates with their broad community. The website and newsletter allow for examples of development and the applications of climate services to be documented and publicized. The use of the website for publicizing requires, however, a prior awareness of the GFCS. The lack of awareness of the GFCS is a conclusion often presented by PAC member representatives. This lack of awareness, and engagement with user communities, is linked to perceived utility of climate services. A PAC member representative told us that they have had conversations with colleagues about the value of climate services with their regional office. “They see it as raising the profile in the region… [but] I have a hard time making the benefits of climate services apparent to them… We are getting very few examples of what the GFCS brings to managers.” Despite some difficulties at the national levels, the GFCS has also established and supported national dialogues on climate services and NFCSs. This has involved NMHSs and other relevant ministries, user groups, and donor communities. At the regional level, the GFCS has strengthened regional structures for the provision of climate services, principally through Regional Climate Centers. The six RCCs that span the earth are designed to “deliver more regionally-focused high-resolution data and products as well as training and capacity building” (WMO, 2017c).

The development and delivery of climate services for the priority areas differs among the priority areas, but also within the areas depending on which PAC members, member countries, and government ministries within countries are involved. PAC involvement in the delivery of services varies considerably. While certain UN agencies have joint offices, and staff exchanges, with the WMO (WHO, GWP, WFP), others have joint offices not linked to the GFCS (FAO), and most other agencies do not have joint offices. Moreover, countries differ in how their NMHS office have responded to the additional task of delivering climate services in coordination with their partner ministries, such as the water or agriculture sectors. Despite the uneven outcome of service delivery within particular pillars, broad conclusions for each of the pillars can be drawn. Within agriculture and food security, the GFCS brings together WFP, WMO, FAO to enhance coordination among sector partners and develop joint pilot proposals. They do this by supporting greater communication between climate scientists, researchers and key stakeholders in at national, regional and global levels. Within disaster risk reduction, the GFCS works with NMHSs, national disaster management agencies, and International Strategy for Disaster Reduction/UN International Strategy for Disaster Risk Reduction

(ISDR/UNISDR) to support risk analysis, risk reduction and financial protection at the national level. This work aligns with the regional, national and local disaster risk reduction strategies laid out in the Sendai Framework for Disaster Risk Reduction 2015–2030. Within energy, the GFCS is working to implement an Energy Joint Office that would support energy user interface for climate services. Working through WMO, International Energy Agency (IEA), Western European Meteorology Club (WEMC), World Business Council for Sustainable Development (WBCSD), International Renewable Energy Agency (IRENA), the GFCS is also designing programs, tools and services to deliver climate information to the energy sector. Within health, in addition to the WHO-WMO Joint Office (where the Technical Support Unit has developed a health user interface for climate services), the GFCS supports country-level climate and health working groups, and multi-hazard risk monitoring and early warning for health protection in collaboration with NMHSs, ministries of health, and research institutions. Within water resources, the GFCS, in conjunction with the WMO, GWP, NMHSs, water managers, UN-Water members, and NMHSs, supports integrated help desks for flood and drought management, and dialogues for climate services in water-sensitive regions.

5.6. Reporting.

The principal mechanisms that GFCS entities use to report their progress in meeting goals and filling gaps climate services, and to communicate their activities have been developed as part of the Communication Strategy. Supported by the WMO's Communications and Public Affairs Office, the GFCS's Communication Strategy is part of the UIP pillar (see 5.4.2 for more on GFCS communications).

5.6.1.Reporting Milestones.

For Phase I, the milestones are to (1) initiate reporting structures that enable national, regional and global entities to report on their efforts to meet near-term targets and address gaps in current climate service capabilities; and (2) to communicate the activities and accomplishments of the Framework to stakeholders. For Phase II, the milestone is to develop an active reporting and communications program to ensure that services are delivered effectively. There are no Phase III milestones.

5.6.2.Reporting Milestones Review.

During Phase I, the principal mechanisms for reporting on GFCS activities were established. In order to raise awareness of climate services developed through the GFCS, and publicize good practices, a dedicated website was developed and implemented. In particular, Germany and Switzerland have contributed to the website to show progress of the GFCS across the world. The website has allowed for easier distribution of reports, videos, and outreach through press releases and social media. However, the website has limited ability to speak to people beyond the circle of GFCS affiliates. According to an IBCS representative, "… only those who know about the GFCS will find… best practice information on the website… It is our responsibility to communicate the GFCS." In addition to the website, there is a newsletter that has a membership of approximately 450 people, through which key documents are distributed. Currently, the GFCS Office only has 30% communications support from WMO, though the GFCS Secretariat has stated that the office needs a full-time communication person. The communications and reporting structures are being expanded in Phase II. Under the approved 2016 communications strategy, the GFCS website will be updated, a Help Desk will be developed, and there will be targeted campaigns to raise political awareness and GFCS support.

Despite these established structures, there remains concern that more needs to be done to share best practices, and communicate what has and has not been working. Despite these accomplishments, there is a mixed sense of how the GFCS has performed in its communications role. In response to the statement that the GFCS has increased awareness of climate services, 40% replied that the GFCS had been very or extremely effective, with only 4% replying that the GFCS had not been effective. However, the success of the communication strategy to report on elements of the

GFCS's mission has been perceived to be less successful. In response to the statement – The IBCS promotes effective communication between global, regional and national stakeholders – 34% disagreed or strongly disagreed against 21% agreeing or strongly agreeing. In addition, 40% of respondents stated that the GFCS had a low or very low success in establishing a communications strategy, with 25% stating it had a high or very high success doing so. However, survey respondents stated that establishing an effective communications strategy is important. When asked – In comparison to the past, which climate service activities require greater attention? – the most common response, at 31% of respondents, was to "communicate lessons learned and best practices".

5.7. Milestone Findings.

1. The GFCS community largely supports the goal of developing the UIP. Unlike other pillars – such as observations and monitoring; the climate service information system; and research, prediction, and modeling – which are seen to be the focus of the WMO, the UIP is perceived to be a principal responsibility of the GFCS. However, the exact function and purpose of the UIP is unclear to many GFCS members and stakeholders, with the name, in particular, seen as confusing.
2. Funding for climate services projects lacks coordination despite the organizing frameworks laid out in the GFCS projects, and GFCS contributing projects. The majority of climate services projects have been conducted outside of the GFCS, without any plan for aligning their efforts with other projects, with the result that efforts were duplicated, and gaps in user needs remain.
3. The involvement of PAC members within the GFCS varies greatly by organization. While the target of eight UN agencies or programs involved in the GFCS has been met at a numerical level, the engagement level ranges from joint offices with WHO, WFP, and GWP, to other agencies wherein its involvement with the GFCS is not well-known to its employees.
4. The GFCS has facilitated a range of activities and outcomes that have enhanced climate services within the pillars by coordinating the work of PAC members, member countries, government ministries, academics, and other stakeholders.
5. Establishing an effective communications strategy is an important goal for GFCS stakeholders. Survey respondents stated that communicating lessons learned and best practices is the climate service activity that, in comparison to the past, requires the greatest attention. However, according to many, the GFCS has been successful in increasing awareness of climate services.

6. GFCS Governance

6.1. Overview.

It is important to recognize that the GFCS's plans and structure were shaped by the political environment of its inception. The WCC 3 occurred several months prior to the 15th session of the Conference of Parties (COP 15) to the United Nations Framework Convention on Climate Change (UNFCCC) in Copenhagen. After COP 15, the politicization of climate increased and the GFCS governance was developed to include both WMO member states and partner organizations. At the same time, however, governments wanted a central role in deciding GFCS affairs, so an IBCS that reported to the WMO Congress and was open to membership of all countries was developed. The IBCS also included a Management Committee and several Task Teams, as well as the PAC – an advisory board to the IBCS – which consisted of partner organizations whose membership could expand and contract.[3] At the time, the advantages of the GFCS governance included having "a clear

[3] Following the decision of the WCC 3 to establish the GFCS, a task-force of high-level independent advisors (HLT) was appointed through an intergovernmental process to prepare a report that was to include recommendations on the proposed elements of the GFCS and the next steps for its implementation. The report of the HLT was endorsed by the Sixteenth Session of the World Meteorological Congress, which entrusted the

and independent realm of responsibility, direct accountability to governments, potentially strong involvement of national technical experts and the independence and high profile that would help secure good access to United Nations system entities and processes" (WMO, 2011, p.15).

6.2. The Intergovernmental Board on Climate Services (IBCS) and its subgroups.

The IBCS was created as the main governing body of the GFCS. Formed at the Extraordinary Congress of WMO in 2012, it oversees and provides the overall management of the development and implementation of GFCS and coordination at the global and regional levels (see Terms of Reference in WMO, 2012). Each member of WMO is entitled to designate representative(s) to serve as member(s) of the IBCS and to appoint a principal member as a main focal point for matters relating to the IBCS (normally from the NMHS). The WMO Congress mandates that the IBCS run GFCS business. The IBCS is accountable to the WMO Congress. Any decision put forth by the IBCS must be approved by the WMO Congress, which meets every four years.

In 2013, the first session of the IBCS approved the Implementation Plan and a Compendium of initial GFCS projects for immediate implementation; and created the Management Committee and PAC (WMO, 2014b). The Management Committee carries out the decisions and requests of the IBCS during the intersessional period. The PAC is the GFCS's stakeholder engagement mechanism. Recognizing the high costs of annual IBCS meetings, the IBCS agreed at its second session in 2014 to a "light touch approach" where meetings would be convened every four years in the intersessional period prior to WMO Congress sessions. Additionally, the IBCS agreed that the Management Committee would meet once a year to provide advice, oversight, and management of implementation of the GFCS in the intersessional period (WMO, 2014c). The Management Committee of the IBCS is composed of 28 members and includes representatives from each WMO Regional Association.[4]

The Management Committee has established two task teams to lead important advances in GFCS implementation. The Task Team on the GFCS 2015-2018 Operational and Resource Plan (TT-ORP) led to *The Priority Needs for the Operationalization of the GFCS (2016 -2018),* hereafter *Priority Needs of the GFCS*, which identifies the priority activities needed to advance implementation of the GFCS. The second task team is for Monitoring and Evaluation (TT-M&E). The TT-M&E is set up to help promote M&E activities and develop criteria, processes, and metrics. Additionally, there have been discussions to create a third Task Team on Data Policy and Emerging Issues to review requirements for data and products developed or acquired, to report on unmet data requirements, and make recommendations for priority requirements and data sources.

There are several benefits of the IBCS. First, the IBCS has brought together members of the national meteorological services to develop and distribute climate services around the world. In this way, it has positioned the meteorological services to be the leaders of climate services in their respective national contexts, and the IBCS has offered a level of prestige to national meteorological representatives. The GFCS has helped shift mindsets and practices away from the traditional unidirectional flow of information and towards a user centric approach to climate services. As one interviewee stated, "There has been the beginning of a mind shift by many met services facilitated by the GFCS. I don't

WMO with the responsibility of developing the Implementation Plan, draft Terms of Reference and Rules of Procedure for the IBCS, and its substructures (WMO, 2011).

[4] The Management Committee shall be composed of 28 members including the Chairperson and Vice-Chairperson, or co-Vice-Chairpersons, with the following distribution across RAs: Region I (Africa): 6; Region II (Asia): 5; Region III (South America): 3; Region IV (North America, Central America and the Caribbean): 4; Region V (South-West Pacific): 4; and Region VI (Europe): 6 (see WMO, 2014c).

think you can get the same buy-in by many met services without the GFCS being their vehicle. It has open some doors and minds in some places."

Second, the IBCS has helped to lead the GFCS. Through its Management Committee and task teams, the IBCS has advanced implementation of the GFCS, and most recently through the *Priority Needs for the GFCS,* the IBCS, through its subgroups, is working to prioritize GFCS activities to meet intended targets, and monitor and evaluate progress in key elements of the Framework (WMO, 2015a). Another notable activity has been the development of a M&E process for the GFCS with roles and responsibilities for actors outlined (WMO, 2017b). The IBCS has provided a stable and formal governance structure for the GFCS. According to the online survey, there is broad agreement that the GFCS governance has been able to respond and adapt to changing circumstances. A third notable success of the IBCS is its influence on funding streams. Forthcoming calls in the next 1-2 years for Horizon 2020 projects by the European Commission are expected to reflect the priorities of the GFCS in the Research & Innovations program, especially with regard to the experiences and needs of the PAC members and their work in Africa.[5] Links are also being established, through the IBCS and leaders of the WMO, to align GFCS efforts with partners investing resources in support of climate services-related activities, like linkages between the Copernicus Climate Change Services (C3S)[6] of the European Union with the GFCS's Climate Services Information System to make critical data available, and linkages with partners like the World Bank and UNDP to ensure that investments under the Green Climate Fund (GCF) and Adaptation Fund are aligned to maximize the benefits of investments and minimize duplication (WMO, 2017d).[7]

Two important original intentions of the GFCS's governance structure that did not materialize as originally expected have resulted in some challenges. First, although it was expected that countries would designate members to represent the GFCS sector priorities, member countries instead designated permanent members which in practice serves to replicate or mimic the WMO Congress. This has raised a question of representation and has led some participants in the GFCS to argue that the GFCS prioritizes met service efforts. Without the sector connections, the IBCS is not tightly linked to climate service users. Second, the initial expectation was that financing for climate services would be an element of the GFCS, and a Trust Fund was created as a mechanism for the IBCS to disperse funds. The intended role of the IBCS was to prioritize and decide on activities. However, funding for the GFCS Trust Fund has not materialized as expected even though considerable investments in climate service are being made globally. As a result, the IBCS has less to act or decide upon.

Two common criticisms expressed about the governance of the GFCS are that it is a heavy, duplicative governance structure and that it places "partner" organizations in a lesser, advisory role. In response to the high costs of the IBCS meetings, back in 2014, the GFCS advanced a "light touch approach" where the IBCS would meet every four years in the intersessional period prior to WMO Congress sessions. Despite the lower frequency of meetings, many participants and observers of GFCS governance see it as cumbersome and costly. One WMO leader recently described member dissatisfaction with GFCS governance this way: "developed countries see the governance structure as a waste of resources and developing countries want something to happen in their countries."

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[5] For more on Horizon 2020, see European Commission, 2017a and 2017b.

[6] The Copernicus Climate Change Service, a major European initiative, indicates that it is "a major contribution from the European Union to the WMO Global Framework for Climate Services (GFCS) and its Climate Monitoring Architecture." See Copernicus, 2017.

[7] An example mentioned is in Burkina Faso where resources from the Climate Risk and Early Warning System (CREWS) initiative led by WMO, the World Bank Global Facility for Disaster Reduction and Recovery (GFDRR), and UNISDR are being leveraged with resources from United States Agency for International Development (USAID) funded project to support the implementation of the National Action Plans.

The second common criticism is that partner organizations do not have direct input into GFCS decisions. One interviewee stated, "In the process of setting up their governance structure they alienated the partners who they needed the most for resources and political buy-in. That is a fundamental structural constraint of the GFCS – that the governance model itself does not facilitate the user ownership, leadership, and engagement." The sidelining of the partners has resulted in a governance structure that is not as participatory, inclusive, or equitable – or as attuned the needs of users – as originally envisioned.[8] IBCS and Management Committee minutes highlight the need for more partnerships and coordination among actors and challenges in implementing the GFCS related to ensuring effective partnerships, and mobilizing both resources to enable implementation of critical activities including coordination with key partners and initiatives, and appropriate member support.[9]

Our analysis of survey findings suggests that your view on representation in and effectiveness of GFCS governance really depends on where you sit; if you are a member of the IBCS or Management Committee, in contrast to the PAC, you are more likely to think that there is effective communication between global, regional, and national stakeholders and more specifically, that the IBCS promotes effective dialogue between IBCS and PAC members. Although IBCS representatives report that the PAC is effectively helping coordinate technical, advisory services, and planning support for initiatives at the national level, the PAC members participating in the survey indicate otherwise. Overall, through both interviews and survey analysis, we find dissatisfaction with the current governance arrangements. Many people expressed the need for a less heavy and costly governance mechanism, that is more inclusive of PAC members. Many WMO representatives expressed their opinion that the IBCS was no longer a viable governance body.

6.3. Partner Advisory Committee (PAC).

Presently, the PAC currently consists of 15 organizations, representing a broad range of partners from the WMO and WHO, WFP, WB, and EUMETSTAT. Membership has been expanding over the years and this list of PAC and partner organizations is impressive and represents major international development, humanitarian, and scientific organizations that have been and will continue to work in areas that draw from and strengthen climate services (GFCS, 2017c). The PAC has met six times since October 2014 and schedules meetings biannually. During the last five meetings, 28 different organizations have attended the PAC meetings in person (Annex 4, Table A4.1).[10] The number of participating organizations has been relatively similar. The routine and continual presence of many organizations demonstrates a commitment to the PAC, while several PAC members and observers do not appear to be dedicated to participating in person (Annex 4, Table A4.1).

Organizations in the PAC do not represent member states and under the current governance structure, the PAC does not vote on GFCS affairs. Rather, the PAC informs topics and decisions through its input to the IBCS. The PAC's Terms of Reference state that it operates under the guidance of the IBCS, with the mandate to discuss GFCS stakeholder issues concerning implementation of the GFCS. Specifically, the PAC is asked to provide expert advice and recommendations on stakeholder implementation issues to the IBCS, to raise awareness within the GFCS Stakeholders, and to prepare and share information accordingly (WMO, 2016a).

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[8] The High-level Task Force expressed that the GFCS governance arrangements should be participatory, consensus-oriented to the extent possible, accountable, transparent, responsive, effective, efficient, equitable, and inclusive (WMO, 2011).
[9] As an example, see WMO, 2014b and WMO, 2016a.
[10] The participant list for the first PAC meeting in March, 2014 is not available online.

The benefit of the GFCS to the PAC has been stated as “if the PAC utilizes the global Framework as a common tool, a common vehicle for working together, everyone could achieve more than each working separately” (WMO, 2017e, p.2). For many people, the GFCS has achieved success in creating a common language and set of principles. This is true among PAC members we interviewed and the broader GFCS community, as evidenced in the online survey data. In addition, the convening power of the GFCS has also provided some benefits to PAC members. For example, interacting in person with diverse partners has fomented collaborations. It has also allowed some of the partners to articulate the needs of their stakeholders which has helped build an appreciation among the group for the context in which they work. One interviewee stated the benefits this way: “to contextualize the world and to think outside the box, and to maybe derive partnerships at a bilateral level, these are important benefits [of the PAC]”. Nine PAC members responded to the online survey. They described the strengths of the GFCS as related to coordinating different groups working on climate services and providing a common framework to guide discussion and partner contributions. Similarly, the respondents perceived the GFCS to have been most effective at “facilitating and enhancing connections between users and providers” and “coordination of existing activities.” Additionally, five of the nine PAC respondents believe they are better equipped to promote and implement climate services through their participation in the PAC.

The PAC also has experienced obstacles. We highlight the more prominent ones expressed in the interviews and online survey. There were several challenges that were discussed repeatedly by PAC and non-PAC members alike. First, there appears to be a lack of ownership of the GFCS by partner organizations. People perceive the GFCS as a WMO-initiative and not as an equal partnership. The governance structure of the GFCS has been one of the main impediments to partner engagement and buy-in. One interviewee noted that despite the PAC members drafting a large portion of the GFCS documentation, the PAC members were not given a voice in a formal setting. Second, there is a cultural difference between the WMO and partner agencies. The WMO has a mandate for setting global norms and standards and brings with it administration and formality. Since the PAC is managed by the WMO, administration and formality have characterized PAC interactions. Consequently, there is a perception that the PAC has been focused too much on bureaucratic issues. Third, the role of the PAC within the GFCS is not well defined. Despite the terms of reference previously noted, there are ongoing discussions about what the PAC should do. Fourth, partner organizations often make decisions about implementation at regional and national levels, and some PAC members are restricted in their ability to align GFCS priorities with PAC organization priorities. For at least some of the PAC organizations, there is lack of awareness of the GFCS, climate services in general, and the specific ways in which climate services can add value to decision making at the sectoral level. This constrains the diffusion of information from PAC members to their networks. Finally, many of the partner agencies have large climate service portfolios that are advancing at rapid paces. Consequently, to date the PAC is perceived not to have harnessed its full potential. During interviews with PAC members, the obstacles were at times presented as outweighing the benefits of the GFCS. In the online survey, the open-ended question about the perceived weaknesses of the GFCS reinforced the obstacles related to ownership and PAC’s role within the GFCS.

Despite these challenges, recent evolutions in governance are perceived to be moving in the right direction. In 2016, the PAC and IBCS Management Committee co-located their meetings to increase PAC participation. This has been perceived by both the Management Committee and PAC members as an important step to increase PAC involvement and to improve communication. One survey respondent referred to the joint meetings as: “The most helpful interactions happen at joint undertakings of the PAC and Management Committee to date.” Furthermore, PAC members see a bright future for the GFCS. In the survey, eight of nine PAC respondents saw a very high (1) or high (7) future value of the GFCS. This both shows that the GFCS is a work-in-progress and that the GFCS can better harness the climate service network. In interviews, PAC members stated that the GFCS is still at an early stage and that it is important to embrace its shortcomings in order to improve.

6.4. The WMO and the GFCS.

The GFCS is a high priority area for the WMO. Recently, the GFCS was moved from its independent status reporting the WMO Secretary-General into the WMO's Climate and Water Department to better facilitate integration and cooperation with other WMO bodies. Presently, WMO leadership is engaged in discussions around how the GFCS can be better connected to the WMO activities. These discussions are part of broader internal governance reform efforts at the WMO.[11] One WMO representative we interviewed reported that the WMO has started to focus on things that the WMO can do for the GFCS and in doing so, they are realizing that many of their activities are GFCS-relevant, including data rescue, seasonal forecasts, and flood forecasting. Another WMO leader stated it this way, "The WMO has faced the GFCS – and the GFCS is us."

Generally, the heads of WMO departments and programmes think that too much attention has been given to governance and meetings and not enough has been given to "practical research." As one interviewee stated, there has been "too much time on outreach and not enough on the research pillars and the core work". Others report that there has been "too much focus on national efforts when fundamentally the GFCS is a global effort." Given a lack of resources, some at the WMO think that the GFCS is "stretched too thin and should narrowly focus on a few pillars." Although it has been deemed a priority, it is clear that WMO officials do not see the GFCS as the sole pathway to climate services within the WMO. One WMO leader stated: "Do partners believe in the GFCS or in climate services? I think they believe in climate services and so the GFCS may not be the selling argument."

Through our interviews, we encountered a perception of the GFCS by many individuals, notably those not directly linked to the WMO, that the GFCS is moving away from a vision of the GFCS as a partnership and toward the GFCS as a program of the WMO. The dominant view we find within the WMO today is that the GFCS is transitioning toward providing technical advisory, planning, and coordination services as opposed to project implementation. Within the WMO, this approach is expected to better enable the WMO to leverage the GFCS brand to obtain more of the investments being made in climate services. The Climate Risk Early Warning Systems, or CREWS, is an example of what this might look like. A partnership between the Global Facility for Disaster Risk Reduction, France, the World Bank, the WMO, and UNISDR, CREWS finances weather stations, radar facilities, and early warning systems in poor and vulnerable countries where weather data is unreliable or lacking (See GFDRR, 2017). Its design is modeled on the GFCS Disaster Risk Reduction (DRR) exemplar and according to an interviewee, the partners acknowledge its alignment with the GFCS DRR objectives. Another view within the WMO is that the GFCS should evolve to become a program similar to its World Weather Watch, a flagship WMO program dating back to the early-1960s that set up a global infrastructure and network around data exchange (WMO, 2000, p.8).[12] Under this approach, the WMO would then distribute responsibilities for the GFCS across all its departments and merge existing staff.

6.4.1. WMO Technical Commissions.

When the IBCS and its subsidiary bodies were created, it was not explicit how WMO's technical commissions would interact with them. The eight WMO technical commissions are responsible for studying meteorological and hydrological operational systems, applications, and research. The technical commissions are therefore important aspects of the GFCS pillars, but they have no formal

[11] See Section 16, WMO, 2017h.
[12] The World Weather Watch monitors and researches the global climate, manages climate data and provides the application of information for sustainable development and works with the United Nations Environment Programme (UNEP) in aspects related to the impacts of climate change. The Programme supports the GCOS, the WMO/UNEP Intergovernmental Panel on Climate Change (IPCC), and other climate-related programmes.

role or legal status to interact with the GFCS. The absence of a technical underpinning to the governance structure existed for some time (especially as there were discussions around creating technical committees for the pillars; see section 3.2.2 for further discussion) with small adjustments made to how WMO technical commissions and regional associations participate in GFCS governance. By 2014, the need for a two-way interaction mechanism to be established between the IBCS and the WMO constituent bodies was recognized by the Management Committee (WMO, 2014b). IBCS chairpersons were invited to update the WMO's Executive Council periodically; and regional associations and technical commissions were invited by the IBCS to attend its meetings and sessions. In response, the technical commissions began to adapt their way of working to align with the GFCS (WMO, 2014d). For example, the Commission for Agricultural Meteorology (CAM), which plays a critical role for the implementation of the agriculture and food security priority of the GFCS, identified a set of global initiatives in agricultural meteorology corresponding to the GFCS's five pillars. The CAM also discussed collaborating with the FAO and WFP, among others, to engage in the implementation of UIP activities. Additionally, the Commission for Climatology (CCl) established an Implementation Coordination team on the CSIS and identified a high-level advisor for the GFCS. The technical commissions and regional associations have been involved in various consultations held by the GFCS, including developing the *Priority Needs for the GFCS*.

In 2016, to coordinate the contributions of the WMO to the GFCS, the WMO's Executive Council established a mechanism to advance WMO contributions to the GFCS through the regular joint meetings of presidents of regional associations and presidents of technical commissions (Resolution 6 (EC-67), WMO, 2015c) and endorsed a country-focused results-based framework for WMO support, with the participation of technical commissions, regional associations, and co-sponsored programmes, to GFCS implementation (Decision 16 (EC-68), WMO, 2016d). Most recently, CCl was realigned with GFCS pillars to allow technical programs at WMO to feed into the GFCS, setting up priorities and implementations through these technical bodies. As one interviewee stated, "This has been an important readjustment. Now real, legitimate services are offered like the climate service toolkit and other products which did not exist even 10 months ago." In addition, the WMO has been engaging its technical commissions through its work to strength hydro-meteorological services in partnership with the GFCS, the World Bank, and the Global Facility for Disaster Reduction and Recovery (GFDRR) (WMO, 2016b).

Presently, the WMO is reviewing its technical commissions to determine how they can be transformed into more action-oriented bodies and how the GFCS can be better connected to the broader WMO activities. In this way, the WMO can better see how it can contribute to the GFCS and how it can provide benefit to WMO members. One long-term participant in the GFCS thinks the WMO can play a greater role in setting protocols and data standards, especially in high priority countries and around best ways to disseminate difficult and uncertain data. Despite the movement towards more regular engagement with technical commissions, for many we spoke with, it remains unclear how the technical representatives or programs of the WMO work with or contribute to the GFCS. Several observers call for "greater clarity" from the WMO on how to work with the technical element of the GFCS to better provide climate data in a usable form for end users. Many WMO representatives express the need for greater resources to produce climate services.

6.5. Key Findings for Governance.

1. Despite the benefits of the IBCS to GFCS governance, including bringing together members of NMHSs to develop and distribute climate services, leading the GFCS through important governance processes, and influencing external funding streams, many people question its present utility.
2. Views of the effectiveness of GFCS governance depends on where you sit; members of the IBCS and its subgroups are more likely to think that there is effective communication and

dialogue across geographic scales and governance bodies than partners.
3. The PAC partners do not feel sufficiently engaged in GFCS governance.
4. The WMO is now examining its internal governance structure and looking to see how the GFCS best fits into their organizational structure.
5. There exists confusion, and at times tensions, in defining roles and responsibilities associated with the GFCS for various governance bodies, including the IBCS and its subgroups, the PAC, and WMO organs.
6. Generally, WMO representatives express the need for more resources to produce climate services, while partners generally express the need for greater capacity and ability to contribute to the governance, but not necessarily greater implementation responsibility.
7. The governance mechanisms are not appropriate to meet GFCS goals. They don't address some of the key challenges around user needs. Although there were some early benefits of the governance mechanisms for GFCS implementation, the governance structure is no longer fit for purpose.

7. Mechanisms for Implementation at National, Regional, and Global Levels

7.1. Overview.

The GFCS is envisaged as a set of national, regional, and global arrangements that coordinate activities and build on existing efforts to provide climate services. Broadly speaking, the GFCS currently is pursuing a "wide" and "deep" approach to its implementation (WMO, 2016c). The "deep" approach involves more intensive engagement in a limited number of contexts, notably in six countries – Burkina Faso, Tanzania, Bhutan, Papua New Guinea, Moldova, and Dominica – in which PAC members agreed to coordinate efforts. In addition to these countries, Colombia and Peru were identified as candidates for additional coordinated WMO support. The Implementation of GFCS projects is a principal mechanism for the deep approach, and it is seen as a means to demonstrate that the development, provision and use of climate services can improve outcomes. The "wide" approach targets 70 countries identified in the GFCS Implementation Plan as needing support. In theory the tools, methods, results, and lessons learned from the more focused efforts in the 8 countries feed into the wide approach (WMO, 2016c).

GFCS activities at the national, regional, and global scales differ. According to the Implementation Plan, at the national level the Framework will be developed and coordinated by each national government, and key national organizations, to ensure that all participants can express their needs and requirements for successfully implementing climate services (WMO, 2011). At the regional and national levels, the Framework will cooperate with multilateral efforts to address regional needs, for example, through knowledge and data exchange, infrastructure development, research and training and by providing services. At the global level, the Framework focuses on defining the global goals, needs, and large-scale activities required for successfully implementing the Framework. This includes agreeing on international standards and international products. Below, we discuss the mechanisms that tie these scales together separately, including knowledge transfer and communication.

7.2. National Mechanisms.

The GFCS states that developing and delivering products for national users, establishing relationships between producers and users, and capacity development are best undertaken at the national level. There are four primary ways the GFCS contributes to national activities. First, the GFCS provides guidance in both the conceptualization and implementation of climate services. These are mainly produced in documents such as Climate Knowledge for Action (WMO, 2011) and the Exemplars (WMO, 2017f). The GFCS also contributes to national activities via a fast-tracking, or "twinning," approach that uses the capacities of advanced NMHSs to support less capable NMHSs (WMO, 2015d). The GFCS states this approach "will use twinning arrangements, peer-to-peer support among

NMHSs, and provision of surrogate products and services as innovative means for building and strengthening capacities, while at the same time ensuring sustainability by laying the ground work for long-term capacity development needed to generate such services locally…." (WMO, 2015d, p.2). The third and the fourth mechanisms relate to GFCS support for NFCS and GFCS projects. While the NFCS is "the coordination mechanism that through dialogues involving all the stakeholders ensures that the entire value chain for the production and application of climate services in the country is effectively addressed" (WMO, 2016c, p.5), GFCS projects are coordinated efforts to show the value of the GFCS approach to climate services. Because the NFCS and the GFCS projects represent perhaps the two most important national-level activities to date, this section focuses on these efforts.

7.2.1.National Frameworks for Climate Services (NFCS).

The NFCSs create dialogues between relevant stakeholders who engage in the production and application of climate services. These dialogues can be seen as critical components of establishing adequate coordination and collaboration, as well as a vital mechanism to establish legitimacy of climate services and the role of each stakeholder within the production and application system. In the process of supporting the NFCS, GFCS helps establish the NMHS as a primary coordinating role for climate services. GFCS promotes a structured approach to the NFCS that starts with a baseline assessment, followed by a NMHS-led consultation process that identifies major gaps, user needs, and priorities for climate services. These then form the content of a national action plan for climate services (NAPCS). A high-level meeting with stakeholders and government ministries is then convened to obtain political support, funding, and agreement on the steps for implementation. The NFCS places the NMHS central to organization and leadership, while also aiming for an inclusive process with relevant national organizations that play key roles in delivering climate services. According to the GFCS, the form of the framework and the governance around it should ultimately be determined by the country in order to take into account each country's existing infrastructure and national needs (WMO, 2014a, p.56). In Africa, a GFCS regional coordinator supported by contributions from the Norwegian Government, along with the GFCS Office, aids NFCS efforts. There are 12 countries in which NFCSs have been or are being formed. To date, legislation instigated through the NFCS has been approved in Madagascar, Mali, Niger, and Chad.

It was clear from the people with whom we spoke in Senegal, Côte d'Ivoire, and Tanzania that these countries have received many benefits from the NFCS process. (We summarize these in Table 1, found in Annex 4.) Moreover, survey respondents who stated that they have participated directly in developing an NFCS were asked to identify its benefits.[13] The benefit most frequently identified by the 81 respondents who completed the question was "increased collaboration between national meteorological services, national ministries, and other organizations." Other highly cited benefits included: the "increased information sharing among participating organizations", and "elevated the importance of climate services and adaptation in national development agendas," among others (see Annex 4, Table A4.2). There is correspondence between the main benefits articulated in the online survey and those from people we consulted in the three African countries, providing some indication that these benefits are experienced in other regions as well. These samples, however, are not independent. Additionally, interviews revealed that not every country needs, or desires, an NFCS, as explicitly acknowledged within GFCS guidance materials (WMO, 2014a, p.56). Both the need and desire appear to be more pertinent to African countries than other regions. It is therefore justified that the only GFCS regional coordinator is currently positioned in Africa.

Yet, the NFCSs encounter several challenges. The people with whom we spoke in Senegal, Côte

[13] Most of these individuals are from the African countries of Burkina Faso, Cameroon, Chad, Côte d'Ivoire, Malawi, Mali, Madagascar, Senegal, and Tanzania.

d'Ivoire, and Tanzania perceive challenges to be related to resources, national political support, and communication. First, there appears to be greater demand for the GFCS coordination services of the NFCS than resources for their support. The 12 countries in which NFCSs have been or are being formed represents a heavy work load for the small regional office, such that there is little ability to expand. Second, the activities identified in the NAPCSs have yet to be realized due to a lack of financial support. In the online survey, the lack of funding for the NFCS was the most frequently cited obstacle in an open-ended question. Of the 72 respondents, 28 identified funding in some capacity as a main impediment in the NFCS process. Additionally, the NFCS and NAPCS have yet to be realized in some countries because the frameworks are not approved at governmental levels. This was also mentioned frequently in the online survey. Finally, sharing experiences and lessons learned between countries and regions is both a weakness and an opportunity. If NFCS continues to be a focal point for the GFCS, extending participation of those who have experienced the process, developing concise case studies, and convening regional meetings were activities mentioned as particularly useful.

Given the benefits of the NFCS stated to us in site visits and in the online survey, the GFCS's support for NFCSs is one of its main contributions, and should an emphasis moving forward. The main ways the GFCS can contribute to these efforts is by (1) providing guidance on the process while accepting that the NFCS is not a one-size-fits-all approach; (2) helping to raise the political will to expedite NFCS approvals; (3) facilitating the sharing of experiences and lessons learned; (4) providing human resources to help organize meetings (e.g. via a regional coordinator or coordinators); and (5) helping raise funds for projects articulated in the NAPCSs. We also emphasize the need to consider the NFCS as a flexible approach that may not be necessary for all countries. In some cases, the promotion of the NFCS appear to be driven from the top down, which runs counter to the GFCS belief that "whether a national level implementation plan should be developed would be a question worthy of consideration, but again at the discretion of each country" (WMO, 2014a, p.56).

7.2.2.GFCS Projects.

The implementation of GFCS projects is outlined in the GFCS Implementation Plan. While some donors have contributed sizeable financial resources to the GFCS Trust Fund, the total contributions have been less than expected. Nonetheless, the GFCS has allocated substantial resources into developing, supporting, and managing "demonstration" projects that meet particular criteria.[14] There are 11 GFCS projects currently listed on the GFCS website (GFCS, 2017b). The emphasis on projects appears to have increased in recent years as a way to develop lessons learned and demonstrate the value of climate services. Both these benefits could help raise capital for the GFCS Trust Fund, inform future GFCS activities, and provide lessons learned that enable activities to be brought to scale more effectively and efficiently. The strategy to raise resources and implement projects is progressing as WMO recently was accredited as an implementing agency for the Green Climate Fund (WMO, 2016a).

However, there are divergent views about the GFCS's role in implementing projects according to the people whom we spoke with and surveyed. This is a main source of disagreement that leads to an unsettled GFCS identity. This can be best summarized by two contrasting points of view. On the one hand, "[the GFCS] should be a framework and nothing more than that. A framework under which countries and their supporting climate, development, or humanitarian partners share experiences, agree ways to work together, agree on goals, get useful guidance on context and networking," And on the other, the projects have been "necessary to figure out how to work and to upscale." We outline below the benefits of demonstration project and their critique, emphasizing that the demonstration

[14] For GFCS project criteria, see: http://www.wmo.int/gfcs/project_criteria.

project approach requires further discussion among key members of the GFCS network.

According to about 85% of the survey's respondents, the GFCS is seen to be at least moderately successful at creating and delivering climate service projects. It is not surprising that respondents working at the national levels, many of whom are meteorologists and climatologists and who are connected with the met services, hold this position. These individuals are likely beneficiaries of the projects. However, those results are also not sensitive to the scale at which the respondents work. The same percentage of the respondents who are engaged predominantly at global and regional scales viewed the GFCS to be at least moderately successful at delivering projects, although the sample size is smaller (68 compared to 34). Additionally, the people with whom we spoke during our site visit to Tanzania generally expressed positive views and outcomes related to the project "Climate Services Adaptation Programme in Africa - Building Resilience in Disaster Risk Management, Food Security and Health." The main benefits articulated by those involved in demonstration projects, both in Tanzania and in interviews, were described as: (1) enabling collaborations with new organizations who previously have not worked together; (2) raising awareness of climate services; and (3) helping to begin a change in practice within communities engaging in climate service. A main strength of the GFCS projects is therefore that it brings people and organizations together. This benefit is supported by a larger view of the GFCS expressed by the online survey participants, who were asked to report on the strengths of the GFCS in an open-ended question. Of the 93 open-ended responses, the three most frequently mentioned strengths focused on the themes of: connecting people and facilitating collaborations; developing guidance about climate services; and raising awareness about climate services (Annex 4, Figure A4.2). Additionally, some of the lessons from these projects are informing subsequent project phases and the designs of new proposals. For example, developing tailored products for the end user in the "Climate Services Adaptation Programme in Africa" project has been difficult. This has led to a greater emphasis in other GFCS project efforts to build capacity in the development and delivery of products. The crossover of lessons learned from these projects results from the involvement of the GFCS Office in the project management and proposals since the sharing of lessons learned from these projects with the broader GFCS community has been minimal. And yet, there was recognition that the communication of lessons learned from these projects has been inadequate. This has likely prevented methods, results, and lessons learned from this "deep" approach to feed into the "wide" approach as intended.

On the other hand, the interviews produced detailed information about the projects, predominantly from GFCS affiliates working at the global and regional levels, that were generally critical of the approach, although there were both positive and negative expressions about the GFCS projects. This viewpoint argued that GFCS projects led by the GFCS Trust Fund should be either abandoned or reduced in scope and was centered around four main critiques. First, the WMO is not fit to be a fund manager. One interviewee stated this as: "its credibility as a fund and program implementer is not very high now," citing the limited human and financial resources are as playing into this narrative. Additionally, the WMO, and by extension the GFCS, is not set up to be an operational organization. Operations in countries bring with them challenges and constraints which are better known, and dealt with, by local agencies and development groups than the WMO. Rather, the GFCS should "build on other mechanisms for country programs… The needs are still high; the importance of the Framework is still there. But, they have to take out this country program thing. This is beyond the scope of the whole WMO." Second, the Framework is intended to be global, whereas working with only a few countries runs counter to this principal. This was summarized by one interviewer who stated: the "GFCS is not building a framework that can be used by all members. They cherry pick nations they are working with to develop climate services. Instead the GFCS needs to develop a broader framework that can be applied globally." Third, the country approach raises country selection concerns. This is summarized by an individual who stated: "the country-to-country approach makes some countries and institutions feel they are not part of the GFCS" and "the challenge is to motivate the fundraising in a very balanced way." This suggests a desire for the GFCS to focus more broadly

than on eight countries. Fourth, there is a high number of ongoing climate service projects by many different organizations (see, for example, a summary of climate service activities in the six GFCS priority countries).[15] Yet, there does not appear to be any organization monitoring or overseeing these activities. The identification of ongoing project, gaps, and synergies would be an important monitoring and communication activity that would help direct funding and instigate collaborations among the entire network. Finally, in addition to these five positions, we also note that the GFCS projects have become a focal point within the GFCS Office. With the limited human resources in the office, project management replaces other activities the GFCS Office could do.

7.3. Regional Mechanisms.

At the regional level, the GFCS network includes Regional Climate Centers (RCCs), a GFCS regional coordinator office located in West Africa, and regional offices that are part of the partner organizations. These actors bridge the national and global scales, contributing both to national and regional initiatives and also provide input into higher level discussions, such as those that occur during IBCS and PAC meetings. This Review did not directly consult with regional partner offices and their personnel. Rather, we focus on RCCs and the GFCS Regional Coordination Office (RCO).

7.3.1. WMO Regional Climate Centers.

WMO RCCs support capacity building for, and the creation of regional information services and products to support, regional and national climate activities of WMO members (WMO, 2017c). We interviewed personnel from three WMO RCCs who have been substantially involved in GFCS activities. In these cases, the RCCs leverage their technical capacity to boost the activities of the NMHSs. This is the case with the Caribbean Institute for Meteorology and Hydrology (CIMH), which develops regional products such as seasonal climate forecasts, coordinates activities like the Caribbean Climate Outlook Forum, and provides technical training to meteorological and hydrological service personnel. Several of the RCCs noted that the GFCS has helped elevate the importance of climate services in their region, which they assume has increased the credibility of the regional centers and their network within donor, regional, and national funding agendas. Additionally, the GFCS has been a guidepost for some of their activities. For example, it has developed awareness for a user centric approach and has clarified what constitutes a climate service. One interviewee stated the benefits of the GFCS as: “to some extent we were doing parts of the pillars, [but] I don’t think we were doing them holistically until we zoomed in on what the GFCS was saying. And it helped us focus not just on providing information, but it has to be useful to someone, and by useful, I mean they can interpret it and apply it.” Finally, at least in one case, the GFCS has helped broker a memorandum of understanding (MOU) between WMO RCCs on work related to a GFCS demonstration project which is seen as an important step forward in the collaboration between these institutions.

7.3.2. GFCS Regional Coordinator Office.

There is one RCO. It is located in Senegal, Africa and began in 2015 with support from the Norwegian government. It has 2 main technical staff. The RCO routinely interacts with the GFCS Office and is considered part of the GFCS. However, the RCO also has flexibility to define its scope of work. The RCO’s activities have been focused largely in 12 countries in East and West Africa in support of the NFCS process and national action plans, regional and national GFCS projects, and other GFCS personnel deployments made by the Norwegian government.

A main benefit of the RCO has been aiding the NFCS, which produces a set of benefits outlined in the

[15] Spreadsheet: http://bit.ly/2iJqqIQ (see: GFCS, 2017d).

previous section (See Table 2, Annex 4). One of those benefits is the identification of climate services needs and priorities at the national level, which in turn has helped satisfy a main demand by RCCs, regional partners organizations, and others at the global level. Yet, the RCO has a small staff and is unable meet an increasing demand for its services currently. This constraint limits the RCO from expanding the NFCS to other countries. Moreover, the office is unable to communicate lessons learned vertically to national and global scales, which could be useful for both improving the NFCS process and to connect resources from global to national levels. One interviewee highlighted the potential value of a RCO, which is not present in their region by stating: “we need coordination mechanism so we can learn from each other, that the developing countries can learn what others are doing, to develop capacity.” In some ways, the RCO is a victim of the success of NFCS, which has contributed to the identification of needed climate service projects. Yet, there are inadequate resources in many countries advance from identification to implementation. This represents a new horizon for the RCOs. The funding opportunities at global levels, such as CREWS and Horizon 2020, and from climate service initiatives by organization like those in the PAC, stimulate a need to help national meteorological services and stakeholders develop proposals for these projects. It also creates a role for enhancing coordination between donors and project implementers.

The RCO occupies a unique position within the GFCS network. It is dedicated specifically to GFCS affairs and is positioned as an intermediary between the national and global levels. It can therefore bridge geographic scales by communicating national and regional knowledge to global levels, and vice versa. It also can connect users and producers of information via NFCS and similar processes. And, it can link financial and human capitals between donors and implementers by creating synergies in ongoing efforts and identifying new opportunities. The RCO model appears to be a fruitful mechanism to advance GFCS milestones and climate services generally. With further review by the GFCS, multiple RCOs could represent a coordinated network that extends regional GFCS representation beyond East and West Africa.

7.4. Global Mechanisms.

At the global level, the GFCS has established four main mechanisms to help guide activities: the IBCS, PAC, joint offices, and the GFCS Office. In the previous section, we discussed the IBCS and the PAC. Here we discuss the joint offices and GFCC Office, and summarize the main benefits and challenges in Table 3, Annex 4.

7.4.1. Joint Offices.

The GFCS has drawn from three formal co-located partnerships. These offices have been located at the WMO in Geneva and have housed representatives from the WHO, WFP, and GWP. Currently, the WHO-WMO and GWP-WMO Joint offices are staffed, while the WFP liaison is no longer operational. We focus on these two joint offices below. The joint offices were established to facilitate GFCS and partner interactions, create partner representation within GFCS and WMO activities, facilitate exchanges of technical capacity, and guide sectoral-focused activities. The mandates of the partner personnel go beyond the GFCS. These relationships marked an evolution toward more direct partner and GFCS engagement. There are also WMO-based energy and disaster risk focal points to the GFCS that can be considered a less formal version of the joint offices. Combined, they cover the five priority GFCS sectors.

The WHO-WMO Joint office, referred to as the Climate and Health Office (CHO), has contributed to the GFCS in three ways. First, the CHO has shaped some GFCS-related projects, including in East Africa. Second, the CHO has made health sector expertise more accessible to the WMO. The WMO traditionally has not focused on health as much as sectors such as agriculture and water. The CHO has therefore helped develop within WMO a stronger heath and climate connection. Finally, the CHO has raised awareness of the GFCS in the health sector and has, consequently, stoked demand for

health-specific climate and weather information among its users and partners. There are therefore many opportunities this relationship can pursue, some of which were noted in the 2015 WHO-WMO Climate and Health Office Progress Report (Shumaker-Guillemot, 2016). However, financial and human resources for the CHO are inadequate to realize all these opportunities and the CHO's is beyond its current capacity. This has been attributed in part to the CHO performing project management duties for a GFCS demonstration project in East Africa, which was not originally envisioned within the CHO's scope of work.

The GWP-WMO Joint Office has been staffed since 2013, emerging from a previously established WMO-GWP partnership focused on flood plain and drought management. The GWP-WMO Joint Office contributes to the GFCS by bringing members of the water management users network into the climate service discussion and by adding technical input to GFCS documents and discussions, such as the water exemplar, *the Priority Needs for the GFCS*, and the M&E. At the moment, the benefits derived from this joint office are mostly related to process. Moving beyond process to create tailored products is seen as a needed next step for the GWP's water management stakeholders.

The joint offices all have different organizational relationships with the GFCS and WMO. The relationships that have formed, and the coordination between GFCS Office, the joint offices, and other technical commissions have been to date opportunistic and *ad hoc*. There are also different understandings of the roles of these joint offices' personnel vis-a-vis the GFCS. Consequently, how these joint offices interact with the GFCS and with other WMO groups is unclear.

7.4.2.GFCS Office.

The GFCS Office consists principally of four individuals: the GFCS director, a senior program manager, a project officer, and an administrative assistant. Additionally, there is a WMO communications person with 30% time allocated to the GFCS and the GFCS Office helps guide Norwegian Refugee Council deployments in Africa, including a regional coordination office located in Dakar, Senegal. The function of the GFCS Office is to "enhance mechanisms for user engagement and service delivery" (WMO, 2015b, p.12). Specifically, this function includes: supporting projects; establishing national legislative and policy frameworks; coordinating GFCS governance and implementation; communication and outreach; feedback and knowledge management; and M&E.

The first three functions are the main focal points of the GFCS Office's current activities. In support of projects, the GFCS Office has been designing projects, coordinating them, and in some cases playing a leading role in their implementation (e.g. the GFCS Adaptation Programme in Africa). Moreover, the GFCS Offices is playing a key role in mobilizing resources. This includes leading the development of three project proposals.[16] GFCS Office activities are fairly constrained for communication and outreach, feedback and knowledge management, and M&E. Currently, the GFCS Office does not have capacity in knowledge management or in M&E. While there is a M&E task team, and a M&E process and methodology have been approved by the IBCS (WMO, 2015e), human resources are a main impediment. In fact, 49% of the survey respondents (N=90) stated that little or no progress has been made by the GFCS in developing measures for M&E climate services. Consequently, it is likely that many of the GFCS efforts are going unnoticed. Additionally, the GFCS Office has in its mandate communication and knowledge translation. There have been successes here. The GFCS Office has helped coordinate and has contributed to major GFCS guidance documents that have become a main benefit to the GFCS network. However, the GFCS Office does not have communication expertise and only limited human resources, which curtail the ability to broaden the reach and engage in more

[16] (1) Enhancing Climate Services in the 3rd pole Region; (2) Linking Climate Knowledge to Action for Resilience in the Sahel and (3) Climate Services for Energy.

knowledge sharing activities. Communication is thus recognized within the survey as both a main benefit of the GFCS (Annex 4, Figure A4.2) and a main weakness (Annex 4, Figure A4.3). Similarly, interviewees expressed both optimism and desire for future GFCS improvements in communication. This juxtaposition underscores the added value the GFCS can make by investing in communication. As one interviewee summarized: "Where [the GFCS] could be useful is the WMO…[which] is not well built for partnerships, information sharing, and networking among non-technical people. So, the GFCS in my mind – in the absence of the WMO taking on a much more open consultative role with users, as well as their members – the GFCS could provide that space…. So, it could provide the neutrality of discussions between users and providers which the WMO is currently unable to do."

This sizable scope of work is not solely the responsibility of the GFCS Office. However, most of the GFCS network – including PAC members – are not funded for GFCS tasks. As one interviewee stated, in reference to contributing to a white paper: "From my side, and I suspect my other colleagues in the PAC may also suffer from this, but being the PAC rep. is an add-on to my already 100% job." Therefore, the GFCS Office bears a large responsibility of completing the GFCS's day-to-day work. The Help Desk provides an example of the GFCS Office's role in new initiatives. The Help Desk is meant to enhance GFCS communities, and initiating this requires the GFCS Office to organize the scoping workshop; draft documentations like Terms of References for the Help Desk steering committee and consultants; develop a work plan; and convene steering committee meetings.

The important role of the GFCS Office will continue, and likely grow as the GFCS matures. This was evident in the survey as 74 respondents identified 14 distinct activities on which the GFCS Office should focus. The five most frequent themes, accounting for 62% of the responses, included (in order of most frequently cited): facilitating partnership development, supporting capacity development, sharing information, connecting financial resources to people, and raising awareness of the GFCS. These responses offer guidance on more clearly defining scopes of work within the constrained resources. Some of these align with the responsibilities identified in the *Priority Needs for the GFCS*. However, only in five occasions was project implementation identified. Rather, there was more emphasis on helping raise funds, creating collaborations, and raising awareness – all of which would foster project development – than on project implementation.

The GFCS Office is a small team with limited funding. Despite this, the GFCS Office has been involved in many activities that have at times caused backlogs and bottlenecks in work, according to our interviews. The recent *Priority Needs for the GFCS* acknowledges the need for additional resources. It states: "For 2016 and the years that follow, a considerable amount of extra-budgetary resources will be required in order to sufficiently finance the increase in GFCS-related project activities. In order to ensure the effective delivery of such a high number of project activities, the WMO Secretariat, along with the GFCS Office, will require additional operational supports, including a number of supplementary program and administrative services. These operational supports will need to include an increase in both staff and non-staff resources directly and indirectly linked to GFCS project activities" (WMO, 2015b, p.43). Currently, however, the resources allocated are not adequate to meet the activities identified in the *Priority Needs for the GFCS*.

7.5. Knowledge Transfer and Communication.

The GFCS's communication strategy aims to create an increase awareness about climate services, engage stakeholders and users, strengthen Framework brand recognition, and foster a sense of ownership among stakeholders (WMO, 2014a). In this respect, the communication strategy is entwined in the UIP. Furthermore, communication efforts are a principal means of connecting resources, knowledge, and personnel across the global, regional and national scale. It is expected that the strategy would evolve as the Framework is implemented and that both traditional communication avenues and new tools would be used. In 2016, the Management Committee

approved a communication strategy focused on upgrading the GFCS website, creating a Help Desk, conducting targeted campaigns to raise political awareness and support to the GFCS, producing materials for the GFCS website, creating the GFCS newsletter, WMO Bulletin and partners' publications, and developing case studies (WMO, 2015e).

The objectives of the communication strategy place responsibility on the entire GFCS network. For example, at regional and local scales, engaging stakeholders and users and fostering a sense of ownership are best engendered through UIP activities. More informal communications occur during PAC and IBCS meetings and activities at the national levels (e.g. demonstrations projects and NFCS) to which the GFCS Office contributes. At the global level, communication activities are led by the GFCS Office, which relies on support provided by the WMO Communications Division and a communication's officer in the Climate and Water Department with 30% time allocated to the GFCS. However, interviews highlighted insufficient resources dedicated to communication and knowledge transfer but also the advantageous position the GFCS has in being an effective knowledge broker. This was summarized by one interviewee who stated: "the feeling is this [knowledge translations] is something they [the GFCS] have not done well with the limited resources and capacity they have. They are moving in that direction…. We have heard so much about knowledge transfer and coordination, sharing best practices, helping to better connect individual activities. In theory, the GFCS is the unique neutral platform to do just that. They don't have the bias, they are not a development bank…. They are in the prime position to do that but it is so hard to mobilize resources to do knowledge transfer." GFCS is also in a prime position to articulate not only the successes but also the shortcomings of climate services, which people believe will benefit the GFCS network.

Currently, the principal means for publicizing GFCS activities is the webpage and newsletter sent to approximately 450 subscribers. The Help Desk will be an additional mechanism. It will be a web-based portal that is scoped to host an impressive range of information.[17] An additional staff person is expected at the end of 2017 to support the Help Desk. However, it is not clear if this Help Desk has sustained funding. Information portals require continual stewardship, especially in this case considering the Help Desk's scope. Further, it is unclear if the Help Desk will reach beyond those who already interact with the GFCS. As one interviewee stated, "putting things on a website is not how to communicate; that will just reinforce greater connection with the existing peer group."

Broadly speaking, a plurality of survey participants, across geographic scales of work (regional vs. national), identified the GFCS as having had moderate success in establishing a communication strategy to date. 42% of survey respondents cited moderate success, while about equal percentages believe that success was more and less than moderate. The importance of communication for the GFCS is underscored by interviewees who often identified communication as an area to strengthen.

A strategy, however, is different than implementing activities. In the survey, 22% of the respondents identified connecting information to people and communication as a main weakness of the GFCS. Interviews often identified few published case examples from projects or from NFCSs that document what has and has not worked. Further, interviewees included the recognition that GFCS experiences provide a wealth of information that would benefit the entire community, particularly by documenting aspects of the GFCS that are challenging. One interviewee expressed this as: "it is important [for the

[17] The Help Desk is expected to provide examples of currently available weather/climate products and services and their use in decision making processes; detail the benefits of incorporating climate services into decision making processes, policy, and practice (returns on investment); provide lessons learned and good practice on effective delivery and application of climate services; and provide and national levels access to resources, methodologies, tools, products, publications as well as the possibility to seek assistance and connect to a climate service community of practice. See: WMO, 2017i.

GFCS] to embrace some of the failures as a really valuable lesson for us all." In summary, there is broad recognition that the communication activities are not taking advantage of the full opportunities afforded to the GFCS, and this relates to both human and financial resource constraints.

7.6. Key Findings for Mechanisms for Implementation at National, Regional, & Global Levels.

1. The implementation of GFCS projects are a main source of contention within the GFCS. This is an important strategic issue for the GFCS to resolve and will contribute to creating a more shared identity. While the benefits of GFCS projects manifest at the national level where the resources are directed and partnerships created, it is unclear to what extent the benefits outweigh the challenges. Many interviewees view projects as going beyond the original scope of the GFCS, and the focus on Africa contributes to the perception of a geographic imbalance in GFCS efforts.
2. The NFCS appear to have generated important benefits at the national level. These include the creation of partnerships, improvement in the awareness of climate services, and identification of climate service priorities. These are evident at least in Africa where the NFCS has been focused.
3. The RCO has helped the GFCS generate benefits at the national level, notably through the NFCS process. With further review, the RCO model could be extended as a regional network to help achieve future GFCS milestones.
4. Many users and implementers seek more success stories and lessons learned that help provide the proper rationale and guidance for climate service activities. Better GFCS communication and M&E can help this cause, particularly because the GFCS is in an advantageous position to articulate both successes and shortcomings.
5. Nearly half of the survey respondents stated that little or no progress has been made by the GFCS in developing measures for M&E of climate services. Additionally, GFCS communication was commonly cited as a weakness. Therefore, it is likely that many GFCS efforts are going unaccounted for and unnoticed.
6. An increase in resources and expertise for communication would achieve multiple GFCS objectives, including raising awareness of GFCS and the value of climate services, mobilizing resources, and sharing success stories and lessons learned.
7. The joint offices have produced benefits for both the WMO and GFCS. However, relationships appear more opportunistic than strategic.
8. The importance of the GFCS Office will likely grow as the GFCS matures. Individuals across the GFCS network view many benefits of the GFCS Office, and commonly believe the work should focus on: facilitating partnerships, supporting capacity development, sharing information, connecting financial resources to people, and raising awareness of the GFCS.
9. The human and financial resources dedicated to the GFCS Office are inadequate for its mandate. This contributes to backlogs and bottlenecks in work and work flows that are more reactionary than strategic. Moreover, the GFCS Office is the only entity funded specifically to support the GFCS network, particularly for global scale activities like organizing meetings and connecting people and information across global, regional, and national scales. Continued funding at the current level for the GFCS Office will limit the effectiveness of the entire GFCS network.

8. GFCS Contributions to Major Global Agendas

8.1. Overview.

The GFCS aims to influence major global agendas. According to the *Priority Needs of the GFC*S, the GFCS "serves as a voice for uniting many different parties, complementing the existing programs and initiatives contributing to climate services, building on existing capacities and potentials, and providing momentum and tangible progress towards this fast-growing field" (WMO, 2015a, p.5) The GFCS seeks to contribute to global and national goals identified in the United Nations 2030 Agenda for Sustainable Development, the Sendai Framework for Disaster Risk Reduction 2015–2030 (Sendai

Framework), and the Paris Agreement adopted under the UNFCCC in 2015. Here we explore how activities implemented under the GFCS have contributed to the major global agendas.

8.2. GFCS Contributions to Major Global Agendas.

The 2030 Agenda for Sustainable Development is one global effort the GFCS is thought to support in terms of filling current gaps in climate services. According to the GFCS Management Committee, "The identification and articulation of the GFCS activities supporting the SDGs should thus be a major, collective endeavor for all GFCS partners" (WMO, 2015e, p.14). In 2016, a *White Paper on the Contribution of the GFCS to Transforming Our World: The 2030 Agenda for Sustainable Development* was produced (WMO, 2017g). The white paper communicates the GFCS to a broader audience and helped to strengthen the role of the PAC within the GFCS around the development agenda. It reports: "Climate Services Providers and the services that they provide are critical in supporting the achievement of the 2030 Sustainable Development Agenda as the majority of the 17 Goals and many of their 169 targets as well as activities to be implemented under the internationally agreed objectives are weather and climate sensitive" (WMO, 2016d, p.6).

The GFCS also links to the Sendai Framework. Here the relationship has been synergistic: the GFCS disaster risk exemplar is based on Sendai and the GFCS is recognized in the Sendai Framework. Under priority 4, at regional and global levels, the Sendai Framework aims to "promote the further development of and investment in effective, nationally compatible, regional multi-hazard early warning mechanisms, where relevant, in line with the Global Framework for Climate Services, and facilitate the sharing and exchange of information across all countries."[18] In outlining future GFCS efforts and targeted investments through the *Priority Needs of the GFCS*, the GFCS calls attention to target 7 which calls for increases in the availability and access to multi-hazard early warning systems and disaster risk information and assessments (WMO, 2015a, p.29). The GFCS developed the publication *White Paper on the Contribution of the GFCS to Transforming our World* to help clarify the role of the GFCS and climate services in the Sendai Framework. It establishes a link between climate, Sustainable Development Goals' 11 targets (to make cities and human settlements inclusive, safe, resilient and sustainable), and the goals of the Sendai Framework around disaster risk reduction.

Finally, the GFCS aims to strengthen partnerships with the UNFCC in support of the National Adaptation Plan (NAP) process (WMO, 2016a). With *Climate Services for Supporting Climate Change Adaptation*, a supplement to the technical guidelines of the National Adaptation Process, the GFCS provides details on the role and contribution of NMHSs and the value of climate services in the assessment of climate risks and vulnerabilities (WMO, 2016d). The GFCS hopes that this document will increase the use of climate services in national adaptation planning and practices (WMO, 2016a). The GFCS is recognized in the UNFCCC processes and present at COP meetings. It was reported that this supplement is being used to develop a training module that will be delivered in the UNFCCC regional workshops to people involved in NAP processes. Efforts are being made to have the GFCS directly reporting to the Subsidiary Body for Implementation (SBI) of the UNFCCC (WMO, 2016a).

Increasingly, the GFCS is seeing the NAPs as "crucial vehicles for climate action" in that they provide a basis for collective action in a country and can allow for the allocation of climate change financing needed for implementation (WMO, 2017d, p.3). In addition, the NDCs are also being seen as key instruments for enabling climate action under the UNFCCC. The GFCS sees the potential to empower the NMHS through the NAP process of the UNFCCC. One interviewee described it this way: "You can get the NDC from the country and this gives guidance on what the country sees as its climate

[18] Priority 4 is Enhancing disaster preparedness for effective response and to Build Back Better in recovery, rehabilitation and reconstruction; see UNISDR, 2015.

sensitivities. Then you can look at the climate services pillar to see what the climate services chain might be and work with the country and regional organizations to provide what needs to be done. Finally, you can work on tailoring of particular products with the country." Through the GFCS Adaptation Programme in Malawi and Tanzania, the GFCS gives direct support of activities to support the NAP process, including the development of a health NAP in Malawi where the NMHS is collaborating with health authorities on using climate information to inform the process.

In 2016, the GFCS found that 66 Parties out of 189 (35%) have used climate services terminology in their Nationally Determined Concentrations (NDCs), with sub-Saharan Africa, Latin America, and the Caribbean invoking climate services the most (WMO, 2017d, p.4). One interviewee suggested that based on their analysis, some 40% of the NAPs are talking about climate services, suggesting that there is evidence of the mainstreaming of climate services through the NAPs. When survey respondents in our online survey were asked about the main benefits of the NFCSs to date, 48% indicated that it has "contributed to National Adaptation Plans, other national development plans, and efforts to meet Nationally Determined Concentrations for greenhouse gas emissions." One of the main benefits of the NFCS, as reported by 63% of survey respondents, is that it has elevated the importance of climate services and adaptation in national development agendas.

In our survey, 44% of respondents indicated that the GFCS has been extremely or very effective at contributing to major climate service, adaptation, and development agendas like the Sendai Framework, Paris Agreement, and the Sustainable Development Goals. This is in contrast to 33% of respondents who indicate that the GFCS has been moderately effective and 22% who indicated not effective at all. But again, we find that perspective depends upon where you sit. Only 40% of PAC members reported that the GFCS has been extremely or very effective at contribution to major global agenda in contrast to 83% of IBCS members.

Indeed, we see evidence of the GFCS in some major global agendas. Yet, some people are uncertain where the GFCS fits in or relates to these agendas. Interviewees reported that GFCS links with the Sendai Framework and the SGDs are not widely known within the development and disaster risk management communities but rather are more limited to a "smaller pool of met-focused experts who understand and work with the GFCS." Further, although there have been efforts led by PAC partners (especially around climate services within the UNFCCC), many PAC members are uncertain if they are meant to take on a leadership, coordination, or communication role. Others are worried that the PAC will go too far. As one interviewee stated: "There is a danger of the PAC running parallel and outside the purview [of the GFCS] on a lot of these big global initiatives."

8.3. Key Findings on GFCS Contributions to Major Global Agendas.

1. The GFCS has influenced major global agenda around development, disaster risk reduction, and climate change.
2. The production of documents and white papers is the dominant way the GFCS communicates the importance of climate services for major global agendas.
3. There exists some ambiguity around the roles and responsibilities of GFCS actors in contributing the major global agendas.

9. Recommendations

Recommendation #1: Revisit the Scope of the GFCS given resources and focus on identifying priorities, knowledge translation, and connecting users and providers.
The GFCS vision for climate services is comprehensive and expansive. There are also numerous organizations now involved in climate services. What seems to be missing are: (1) ongoing assessments of who is doing what, where, and how; (2) what works and doesn't; and (3) the creation

of spaces for user and provider interactions. Under resource constraints, the GFCS can add substantial value to the climate service network by focusing on these activities.

Recommendation #2: Reframe the identity of the GFCS as a partnership.
Is the GFCS a framework, network, partnership, WMO program, or constellation of initiatives? There is no consensus. The lack of a shared meaning or identity of the GFCS contributes to uncertain roles, responsibilities, and support for the GFCS. We recommend that the GFCS take action to reframe itself as a *partnership* by enabling greater partner contributions to the GFCS governance; clarifying the roles and responsibilities of GFCS stakeholders in their Terms of Reference, including the IBCS and PAC members, GFCS Office, and joint offices; and focus GFCS activities on coordinating the partnership while deemphasizing GFCS-led project implementation.

Recommendation #3: Reform GFCS governance to reflect partnership.
There is a growing dissatisfaction with the GFCS governance structure. It is seen as duplicative with the WMO Congress, expensive, not sufficiently inclusive of partners, and better fit for a funding reality that did not come to pass as expected. While some governance reforms have been recently made, a dialogue around governance reform is desperately needed with participants in GFCS governance. As a partnership, the GFCS can help connect technical producers at the WMO technical commissions and end users of the information, thereby focusing on what the GFCS calls the UIP. The governance structure would therefore be smaller and focused on enabling core set of activities centered on identifying priorities. While no perfect governance model exists for the GFCS to emulate, the Expert Panel in Polar Monitoring Observations and the International Land Coalition, among others, can be studied for inspiration on lighter, more flexible and responsive approaches to governance.

Recommendation #4: De-emphasize leading GFCS projects.
There are divergent opinions on the net effect of GFCS projects. At national and regional scales, the implementation of GFCS projects have generated benefits that relate to supporting national meteorological services, building partnerships, raising awareness of climate services, and helping change practices among climate service implementers. Yet, there are development and operational challenges to projects that fall outside the WMO and GFCS Office core strengths, while placing burdens on the limited time and resources of GFCS staff. Moreover, contributions to the Trust Fund have not materialized as expected. Given available resources and the competitive advantages of the WMO member states and partner organizations, the GFCS at the global level should reduce its role in leading and/or managing GFCS projects.

Recommendation #5: Broaden GFCS focus beyond the eight prioritized countries.
The GFCS is promoting a “wide” and “deep” approach. However, limited resources create an inherent tension between these objectives. The focus of GFCS projects in a few countries, for example, inhibits activities that could reach other regions. And yet, there exists a strong desire for the GFCS to expand to more countries, to emphasize the “global” in GFCS. Reconciling the wide and deep approaches requires revisiting roles to determine where the GFCS can add the most value.

Recommendation #6: Advance national climate service activities by supporting NFCS.
The NFCSs have helped establish partnerships, create user and provider engagement opportunities, and identify climate service priorities. This activity appears to have a high return on the GFCS investment. There also appears high demand for more NFCSs, at least within Africa. The GFCS and regional coordinator offices should continue to support NFCSs. An important next step after the NFCS is to raise funds for activities articulated in the NFCS.

Recommendation #7: Enhance cross-scale linkages.
The GFCS regional office in West Africa has played an important role in supporting GFCS activities in 12 African countries. We see value in expanding this concept to other regions. Multiple regional

coordination offices would serve the entire community. Their activities would be defined by the region, including the support of NFCS where needed, and they would collaborate to share experience and lessons learned. Regional coordination offices would bridge GFCS boundaries. They link geographic scales by communicating national and regional knowledge to global levels, and vice versa. They connect users and producers of information by convening workshops and developing UIP engagements. And, they bridge financial and human capitals between donors and implementers by creating synergies in ongoing efforts and identifying funding opportunities and research priorities. These regional offices would create more balanced GFCS geographic representation.

Recommendation #8: Strengthen GFCS communications across multiple scales.
GFCS communications can be strengthened in several ways. First, augmenting resources and expertise to communicate widely on GFCS activities would increase brand exposure, raise awareness of GFCS and the value of climate services, help mobilize resource, and reach a wider audience. Second, the communication strategy is combined with the UIP, and UIP efforts by the GFCS are seen as a main potential source of added value to climate service but also a pillar that remains largely underdeveloped. The communication strategy therefore requires clarifying what should be communicated, by whom, and how. An M&E plan will aid this clarification. Third, there is a need to move beyond the passive communication mechanisms, like the GFCS webpage (and the proposed Help Desk) to develop new innovative ways to engage global, regional, and national communities.

Recommendation #9: Expedite the development and implementation of an M&E process.
It is very likely that many of the successes and activities that could be attributed to the GFCS are going unnoticed because there is no formal recording process or metrics to track. A M&E plan has been developed that identifies metrics and a process for monitoring that will be helpful to the entire climate service community. Moreover, an M&E process can facilitate recording lessons learned, allow for better communication of key messages, identify changing priorities, and inform GFCS management decisions. The GFCS Office is tasked to coordinate the development of M&E indicators, with support from the TT-M&E. The implementation of a GFCS M&E will require added human and financial resources, and should be given immediate attention.

Recommendation #10: Clarify the purpose of mechanisms of the UIP to stakeholders.
Along with increased funding for the UIP, it is necessary to have both climate services producers and users – who are linked by the UIP – recognize its existence, purpose, and function. Given the all-encompassing nature of the UIP, and the central role it plays in the GFCS's core mission, users and producers of climate services should understand how to support it, and operate effectively within it.

Recommendation #11: Provide guidance on data protocols and engagement.
Despite the mission and strong expertise of the WMO in developing and promoting data standardization, there is a lack of protocols globally around climate services. The WMO can play a heightened role in the development of international standards, including procedures and protocols around how to share uncertain data, what is the best way to disseminate difficult and uncertain data, etc. The newly proposed Task Team on Data Policy and Emerging Issues can help serve as the mechanism to partner with WMO programs and departments to review current data standard and practices, and propose areas for new protocols and procedures. Further, the GFCS can work with WMO technical commissions to standardize national and regional processes around climate services through the Global Data Processing and Forecasting Systems.

Recommendation #12: Focus on sharing lessons learned and exchanging knowledge.
The world of climate services is fragmented and diffuse. The GFCS should play a key role in synthesizing and sharing lessons. Activities related to the Help Desk, which are under discussion, is a step in this direction, but in addition to this effort, we recommend the following activities as potential initiatives the GFCS could lead to avoid duplication of efforts and promote an environment of learning:

- Synthesize current knowledge on climate services in a state-of-the-science report, which could be authored at regular intervals and include input from member states and partner organizations;
- Systematically review and synthesize the demonstration projects to catalog the benefits, challenges, and lessons learned to share with the broader community;
- Map the existing project investments to identify overlap, opportunities for collaboration and leveraging, and to minimize the duplication of efforts;
- Develop guidance on working with or alongside private sector companies.

Recommendation #13: Cultivate and engage in more of the social sciences of climate services.
Although many of the partner organizations possess social science professionals, and some meteorological service organizations are expanding their capacity in the human dimensions of climate services, the GFCS network appears to be dominated mainly by those in the physical sciences. Yet, many components of climate services require social science expertise, including understanding climate service needs, communication, evaluation, stakeholder engagement, and knowledge brokering. The skill sets of knowledge brokers, for example, are not often taught in traditional meteorology and climatology (e.g. Brugger et al., 2016). The GFCS network would be enhanced by supporting and drawing from social science engagement, perhaps through more partnerships with universities and encouraging the hiring or training of personnel at regional levels. The integration of social science training and expertise within the meteorological services could help advance activities related to the UIP, and support WMO initiatives like its service delivery strategy (WMO, 2014e).

Recommendation #14: Sustained engagement with global agendas.
The GFCS was conceived to promote awareness of climate services as a means to increase activities and inform agendas. In light of the Paris Agreement and other related international efforts, there is an enhanced opportunity to integrate climate into national priorities of risk reduction and satisfy international commitments. Yet, the GFCS has more work to be done to increase awareness of its role in supporting other major global agendas. Engagement beyond those with the GFCS is critical. For climate services to be recognized more in implementation, a better sense of the priorities, needs, and good practices are necessary. This demands more than white papers and exemplars and requires that the GFCS is engaged and monitoring what is happening in these other global agendas and actively trying to inform them and leverage them to attract funding.

Recommendation #15: Increase investment in the GFCS Office.
The GFCS plays important roles in the advancement of climate service globally. Many of the recommendations offered here will require some stewardship by the GFCS Office. However, there is currently a lack of human resources for operations coordinated in the GFCS Office, including communication, M&E, and convening meetings. Increased investment in the GFCS could help meet milestones articulated in the Implementation Plan and, more importantly, steward the GFCS partnership in ways that lead to amplified benefits in future years.

Recommendation #16: Adopt unambiguous language for future GFCS targets.
If the GFCS establishes future targets to be met, as was done at the beginning of the Framework, the language used should be unambiguous, so that reviews can be conducted with a minimum of conflict over how the meanings of the targets are interpreted. While the language should be clear, it need not be objective – with all value terms eliminated – or that the targets are measured only in numbers, for example, number of PAC members or funding goals. It is rather that when qualifiers like “necessary” or “closely” are used (as they are in the governance milestones section 2.4.1), the reviewer must determine what constitutes a necessary governance framework, or what constitutes close involvement of a UN agency with the GFCS. Future targets should define such qualifying terms so that it is clear whether, for example, the governance structure has met the necessary requirements.

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11. Annexes

Table 1. Main benefits for and challenges and gaps in national-level mechanisms: NFCS and demonstration projects. Benefits and Challenges for NFCS are those articulated during interviews and site visits; Annex 4, Table A4.2 shows online survey responses related to the NFCS.

	Main Benefits	Main Challenges and Gaps
NFCS	***Coordination.*** The NFCS has helped identify roles and responsibilities that can lead to more efficient resource allocation; compels some organizations to share information; and grants convening power to ministries part of the NFCS process.	***Resources.*** There is a high demand for GFCS support of the NFCS in Africa that current human resources are unable to support. NFCS are focused in Africa, and some other regions could also benefit from this process
	Networks. The NFCS has created opportunities for new and more frequent interactions between national meteorological services, ministries, partners, and stakeholders.	***Institutional Support.*** There has been delay in having the NFCS signed into decree by higher levels of the government.
	Awareness, Knowledge, and Information. The NFCS has helped elevate the importance of climate services within national development agendas; NFCS has helped sectors articulate their climate and weather information and service needs; NFCS legitimatizes and improves credibility of information produced by the meteorological services.	***Communication.*** There is a lack of experiences and lessons learned about the NFCS shared between countries and regions.
	Synergy with other Programs. The NFCS has contributed to National Adaptation Plans and other national development plans, and provided a means to meet Intended Nationally Determined Contributions for greenhouse gas reductions part of the UNFCCC.	
	Identification of Needs. The NFCS has led to the creation of National Action Plans for Climate Services, which identifies activities for climate service initiatives.	
Demonstration Projects	***Collaboration.*** GFCS projects have enabled collaborations with organizations who previously have not worked together.	***Resources.*** Human and financial resources are inadequate at the national level to implement climate service projects, particularly those identified in the NAPCS.
	Awareness. GFCS projects have raised awareness of climate services among partners and users.	***Capacity.*** The WMO is not best positioned to be a fund manager and to manage operational climate service projects.
	Guidance. GFCS projects have helped evolve the practice of climate services within NMHS to be one more focused on user needs, while also emphasizing that users need to have a more central role in project design and execution.	***Communication.*** There is a lack of experiences and lessons learned about the demonstration projects shared between countries and regions.
	Scope. The implementation of GFCS projects extends beyond the initial scope of GFCS; GFCS projects are only focused in a few countries.	

Table 2. Main benefits for and challenges and gaps in regional-level mechanisms: RCCs and RCO.

Key Benefits
Awareness. The RCC's have seen evidence that the GFCS has elevated the importance of climate services in their regions, and possibly raising the credibility of climate service implementers vis-a-vie donor, regional, and national funding agendas.
Guidance. The framework has been a guidepost for some RCC activities.
Collaboration. The GFCS has increased connections and formal relationships between users and producers of information, including in one case the signing of an MOU between two RCCs; the RCOs have played an important supporting role in NFCS process in East and West African countries, leading to several coordination related benefits (Annex 4, Table A4.2).
Main Challenges and Gaps
Knowledge Gaps. Assessments of climate service activities in the regions are limited.
Coordination. Stewardship of a knowledge network is needed to help connect people (users, implementers, and funders), information to people, and financial resources to people.
Scope. GFCS efforts have been more focused on Africa than other regions.

Table 3. Main benefits for and challenges and gaps in global level mechanisms: GFCS Office and Joint Offices.

Key Benefits of the GFCS Office and Joint Offices
Resources. The GFCS Office and joint offices have played important roles in connecting resources across global, regional, and national scales, particularly through the design and development of projects and project management.
Coordination. The GFCS Office enables the governance of the GFCS, in part by supporting PAC and IBCS meetings and in communicating GFCS affairs to the broader GFCS network. The GFCS Office has helped coordinate and has contributed to major GFCS guidance documents that are a main benefit to the GFCS network.
Awareness. The GFCS has elevated the profile of climate services within donor organizations and organizations working at regional and national levels. GFCS documents as well as the individual and mass communication efforts advanced by the GFCS Office and joint offices have contributed to this GFCS-wide achievement.
Communication. The GFCS Office stewards the GFCS website, which is currently the principal mechanism for communicating with the broader climate service community. The GFCS Office is also a leading hand in the conceptualization and development of the Help Desk.
Key Challenges of the GFCS Office and Joint Offices
Resources. The GFCS Office supports foundational activities that steward the GFCS network and advance the GFCS goals. The resources allocated to the GFCS Office, however, do not match the scope of work. Similarly, the financial and human resources for the CHO are inadequate to realize the opportunities it has helped generate.
Coordination. There is a lack of clarity of how the sectoral representatives (joint offices, liaisons, WMO focal points) interact with the GFCS Office and other WMO groups.
Roles. There is a general lack of clarity about the role of the GFCS at the global level. This includes GFCS Office activities vis-a-vis current resources and the PAC's role.
Communication. There remains high demand for guidance on climate services (e.g. working with the private sector); the GFCS website and newsletter has limited reach.

11.1. Annex 1. List of Key Informant interviews

Table A1.1. Key individuals Interviewed.

Name	GFCS Assoc.*	Organization
Adrian Trottman	Reg. Clim. Center	Caribbean Institute for Meteorology and Hydrology
Alastdari Hainsworth	WMO	World Meteorological Organization
Alexander Frolov	IBCS	World Meteorological Organization
Ana Bucher	Other	The World Bank
Anne Wetlesen	PAC	Norwegian Refugee Council, NORAD
Astrid Tveteraas	PAC	Norwegian Refugee Council
Ayse Altunogle	Program Focal	World Meteorological Organization
Ben Lamptey	Reg. Clim. Center	African Centre of Met. Applications for Development
Chris Hewitt	M&E Task Team	UK Meteorological office
Daniel Kull	PAC	The World Bank
David Grimes	WMO	World Meteorological Organization
Deon Terblanche	WMO	World Meteorological Organization
Diarmid Campbell-Lendrum	WMO	World Meteorological Organization
Diogo De Gusmao-Sorensen	PAC	European Commission
Elena Manaenkova	WMO	World Meteorological Organization
Erica Allis	GFCS Office	World Meteorological Organization
Ernest Afiesimama[1]	WMO	World Meteorological Organization
Felix Hounton[1]	WMO	World Meteorological Organization
Filipe Lucio	GFCS Office	World Meteorological Organization
Frederik Pischke[2]	PAC	Global Water Partnership
Gherard Adrian	IBCS	Germany Weather Services
Guoguang Zheng	IBCS	World Meteorological Organization
Jens Sunde	IBCS	Norwegian National Meteorological Institute
Joachim Saalmueller	PAC	EUMETSAT
Johannes Cullmann	WMO	World Meteorological Organization
John Harding	WMO (PAC)	World Meteorological Organization
Joseph Mukabana[1]	WMO	World Meteorological Organization
Joy Shumake-Guillemot[2]	Joint Office/PAC	World Health Organization
Juan Carlos Fallas Sojo[3]	IBCS	World Meteorological Organization
Katiuscia Fara	Joint Office/PAC	World Food Program
Lars Peters	WMO	World Meteorological Organization
Lina Sjaakik	WMO	World Meteorological Organization
Lisa-Anne Jepson	Program Focal	World Meteorological Organization
Maxx Dilley	WMO	World Meteorological Organization
Meredith Muth	M&E Task Team	National Oceanic and Atmospheric Administration
Omar Badour	WMO	World Meteorological Organization
Petteri Taalas	WMO	World Meteorological Organization
Ravind Kumar	IBCS	World Meteorological Organization
Richard Chourlaton	Other (PAC)	Tetra Tech
Robert Stefanski	WMO	World Meteorological Organization

Roberto Boscolo	WMO	World Meteorological Organization
Rodney Martinez	Reg. Clim. Center	Centro Internacional para la Investigación del Fenómeno de El Niño
Rupa Kumar Kolli	WMO	World Meteorological Organization
Selvarajuv Ramasamy	PAC	Food and Agricultural Organization
Simon Mason	Other	International Research Institute for Climate and Society
Stefan Rosner	M&E Task Team	Germany Weather Services
Tessa Kelly	PAC	International Federation of Red Cross
Veronica Grasso	GFCS Office	World Meteorological Organization
Whenjian Zhang	WMO	World Meteorological Organization
Xiu Tang	WMO	World Meteorological Organization
Yinka Adebayo	WMO	World Meteorological Organization

* Associations in parenthesis represents those previously held and discussed during interviews
[1] Interviewed as a group; [2] Interviewed twice; [3] Written interview;

11.2. Annex 2. Sample Interview Questions

Interview questions differed slightly depending on the interviewee. Below is a sampling of these questions. They were only a guide. Each interview evolved uniquely in accordance with the interviewees expertise.

Partners and GFCS Member-States Representatives:

1. In what capacities have you been engaged in the GFCS?
2. How has the GFCS supported your work in climate services?
3. What aspects of the PAC process have been effective and why?
    - Discuss partner influence in GFCS decisions; role of PAC; IBCS and role of PAC in it; evolution of PAC; who is engaged in PAC and who is not engaged and why.
4. What aspects of the PAC process have been challenging and why?
    - Discuss partner influence in GFCS decisions; role of PAC; IBCS and role of PAC in it; evolution of PAC, who is engaged in PAC and who is not engaged and why.
5. How has the GFCS evolved?
    - Discuss results of GFCS evolution; what has worked and not worked.
6. How has the landscape of climate services changed since the GFCS was formed?
    - Discuss if GFCS has kept up with this evolution and the reasons it has or it has not.
7. What have been the successes of the GFCS?
8. What elements of the GFCS could be improved and how could improvements be made?
    - Discuss the GFCS role in building regional and national capacities; communication
9. Discuss the role of the GFCS in effectively supporting climate services and the work of the interviewee and his/her organization.

WMO Representatives:

1. How do you interact with the GFCS?
2. What changes have you observed over time?
    - Discuss governance, leadership, impacts and sustainability
3. How do you view the GFCS?
4. What value does the GFCS bring to the WMO?
5. How does the GFCS benefit from being housed in the WMO?
6. What do you see as the future of the GFCS?
7. What recommendations or changes you would propose to how the GFCS functions?

GFCS Office Personnel:

1. What is the role of the GFCS office and how it has evolved over time?
2. What has the Framework accomplished; what is the value of the GFCS?
3. In what ways has the GFCS's activities and mission changed from its initial design, either by including more elements, or by deciding not to do others?
4. What was the process for selecting the demonstration projects?
5. How does the GFCS engage the partners (and discuss governance more broadly)?
    - Discuss aspects of the PAC process that have been effective and challenging; how the IBCS, the Management Committee, and the PAC work together; the level of engagement of partners and whether that has been sufficient to meet GFCS goals; early successes; and ways in which engagement process can be enhanced.
6. How does the GFCS communicate with its network; how can communication be improved?

GFCS Collaborators at National and Regional Levels:

1. How have National Frameworks for Climate Services engaged national and regional partners, stakeholders, and users engage?

- Discuss impact; accomplishments; challenges; ways to improve; national action plans for climate services; role of regional GFCS coordinator; contributions to Intended Nationally Determined Concentrations and other national development plans

2. How have GFCS projects engaged national and regional partners, stakeholders, and users?
   - Discuss accomplishments; challenges; competing interests between the global, regional and national interests; opportunities for GFCS office do to enhance benefits; role of regional GFCS coordinator
3. Are their gaps in climate services at the regional and the national levels?
4. How does interaction between users and providers occur?

11.3. Annex 3. Online Survey

Q0 The University of Arizona is conducting a review of the Global Framework for Climate Services (GFCS). Your knowledge will help identify the past GFCS accomplishments and challenges and provide guidance on areas for future emphasis of the GFCS. This survey may take up to 30 minutes. Your responses will be anonymous. This survey is written in English. We apologize to those who would like to contribute but who are unable due of the language. We are grateful for the time and perspectives you have provided to this review. - University of Arizona Research Team

Q1 Do you have sufficient knowledge of the Global Framework for Climate Services (GFCS) to assess the added value of GFCS activities and accomplishments relevant to your area of expertise?

- ❍ Yes
- ❍ No
- ❍ I Don't Know

Condition: if “Yes” Is Selected. Skip To: Q2.1; otherwise complete Q1.2-1.8 and end survey

Q1.2 What do you consider your principle expertise?

- ❍ Meteorology and climatology
- ❍ Hydrology and water management
- ❍ Evaluation
- ❍ Health
- ❍ Disaster risk
- ❍ Energy
- ❍ Agriculture
- ❍ Communications and information technology (IT)
- ❍ Project management and coordination
- ❍ Other

Q1.3 What is the primary scale or scales to which your climate service-related work focuses?

- ❑ National and sub-national
- ❑ Regional
- ❑ Global

Q1.4 In what region is your climate service-related work principally based?

- ❍ Africa
- ❍ Asia
- ❍ South America
- ❍ North America, Central America and the Caribbean
- ❍ South-West Pacific
- ❍ Europe

Q1.5 What is your current gender identity?

- ❍ Male
- ❍ Female
- ❍ Transgender
- ❍ Do not identify as female, male, or transgender

Q1.6 In your experience, how effective have the following challenges associated with climate services been addressed so far?

	Not Effective	Slightly Effective	Moderately Effective	Very Effective	Extremely Effective	I Don't Know
Accessibility of climate services	❍	❍	❍	❍	❍	❍
Quality of climate services	❍	❍	❍	❍	❍	❍
Capacity to anticipate and manage climate-related risks and opportunities	❍	❍	❍	❍	❍	❍
Data availability and quality of climate observations	❍	❍	❍	❍	❍	❍
Mechanisms to facilitate and enhance interactions between users and providers	❍	❍	❍	❍	❍	❍
Coordination of existing activities	❍	❍	❍	❍	❍	❍

Q1.7 In comparison to the past, which climate service activities require greater attention? Please rank your top 3; a "1" rank requires the greatest attention.

_____ Develop and implement new climate service-related projects
_____ Contribute to ongoing national and regional climate service-related projects
_____ Communicate lessons learned and best practices
_____ Coordinate and catalyze cooperation of existing activities, partners, and stakeholders at national, regional, and global levels
_____ Facilitate the development of policies and frameworks at national level to facilitate climate services activities
_____ Promote and increase awareness of climate services
_____ Other (please specify)

Q1.8 What motivates you to work on climate services?

Q2.1 What is the primary way you currently interact with the GFCS?

❍ Member of the GFCS Intergovernmental Board on Climate Services (IBCS)
❍ Member of the Partner Advisory Committee (PAC) and PAC-affiliated member
❍ Partner organization representative not part of the PAC
❍ National meteorological and hydrological services personnel
❍ Project implementing partner
❍ Donor
❍ Regional climate center representative
❍ Member of the climate services user community
❍ Other

Q2.2 What do you consider your principle expertise?

- ❍ Meteorology and climatology
- ❍ Hydrology and water management
- ❍ Evaluation
- ❍ Health
- ❍ Disaster risk
- ❍ Energy
- ❍ Agriculture
- ❍ Communications and information technology (IT)
- ❍ Project management and coordination
- ❍ Other

Q2.3 What is the primary scale or scales to which your climate service-related work focuses?

- ❍ National and sub-national
- ❍ Regional
- ❍ Global

Q2.4 In what region is your climate service-related work principally based?

- ❍ Africa
- ❍ Asia
- ❍ South America
- ❍ North America, Central America and the Caribbean
- ❍ South-West Pacific
- ❍ Europe

Q2.5 What is your current gender identity?

- ❍ Male
- ❍ Female
- ❍ Transgender
- ❍ Do not identify as female, male, or transgender

Q2.6 Have you participated directly in the development of a National Framework for Climate Services (NFCS)?

- ❍ Yes
- ❍ No

Condition: if “No” Is Selected. Skip To: Q2.10

Q2.7 What has been the main benefit or main benefits of the National Framework for Climate Services to date (NFCS)?

- ❑ Has increased collaboration between national meteorological services, national ministries, and other organizations
- ❑ Has led to the implementation of climate service projects
- ❑ Has helped identify roles and responsibilities of those working on climate services
- ❑ Has limited the duplication of efforts
- ❑ Has led to more efficient resource allocation
- ❑ Has increased information sharing among participating organizations
- ❑ Has improved the ability of national ministries to convene others part of the NFRCS development process
- ❑ Has elevated the importance of climate services and adaptation in national development agendas
- ❑ Has helped identify climate and weather information and service needs
- ❑ Has led to the development of new climate and weather information
- ❑ Has improved the credibility of information produced by the meteorological services
- ❑ Has contributed to National Adaptation Plans, other national development plans, and efforts to meet Nationally Determined Concentrations for greenhouse gas reductions
- ❑ Other (please specify) _____

Q2.8 What are the main obstacles in the development and implementation of the NFCS?

Q2.9 How can the GFCS help improve the development of the NFCS?

Q2.10 The GFCS set targets and milestones in the GFCS Implementation Plan. How successful has the GFCS been at accomplishing the following targets and milestones? For reference, these targets and milestone are stated beginning on page 35 of Implementation Plan [link].

	Very Low Success	Low Success	Moderate Success	High Success	Very High Success	I Don't Know
Implement the necessary governance, management and reporting frameworks	❍	❍	❍	❍	❍	❍
Create and deliver projects that demonstrate the value of climate services	❍	❍	❍	❍	❍	❍
Develop national capacities to enable climate service initiatives	❍	❍	❍	❍	❍	❍
Develop regional capacities to enable climate service initiatives	❍	❍	❍	❍	❍	❍
Develop technical guidance on the GFCS Pillars	❍	❍	❍	❍	❍	❍
Establish a communication strategy	❍	❍	❍	❍	❍	❍

Q2.11 If the GFCS has not met some of these milestones and targets, why do you think this has been the case?

Q2.12 In your opinion, how effective has the GFCS been at the following activities that are important for GFCS implementation?

	Not Effective	Slightly Effective	Moderately Effective	Very Effective	Extremely Effective	I Don't Know
Establishing strong leadership and management capability to advance the GFCS	❍	❍	❍	❍	❍	❍
Identifying objectives and activities to address limitations in climate services in the priority sectors	❍	❍	❍	❍	❍	❍
Encouraging GFCS partners to conduct activities to address knowledge gaps and/or climate service priorities	❍	❍	❍	❍	❍	❍
Facilitating the development of national frameworks for climate services	❍	❍	❍	❍	❍	❍
Increasing awareness about climate services	❍	❍	❍	❍	❍	❍
Developing greater access to, engagement with, and delivery of climate services to user communities	❍	❍	❍	❍	❍	❍
Contributing to major climate service, adaptation, and development agendas like the Sendai Framework, Paris Agreement and the Sustainable Development Goals	❍	❍	❍	❍	❍	❍

Q2.13 Are you a member of the GFCS Partners Advisory Committee (PAC), a member of the GFCS Intergovernmental Board on Climate Services (IBCS), or a member of the IBCS management committee?

- ❍ Yes, member of PAC
- ❍ Yes, Member of the IBCS Management Committee
- ❍ Yes, member of IBCS but not Management Committee
- ❍ No

Condition: if “No” Is Selected. Skip To: Q2.16

Q2.14 To what extent do you agree with the following statements?

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree	I Don't Know
The IBCS promotes effective communication between global, regional and national stakeholders	❍	❍	❍	❍	❍	❍
The IBCS promotes effective dialog between the PAC and IBCS members	❍	❍	❍	❍	❍	❍
The PAC effectively helps coordinate technical, advisory services, and planning support for initiatives at the national level	❍	❍	❍	❍	❍	❍
The PAC sufficiently informs the topics discussed in IBCS, the management committee, and the task teams	❍	❍	❍	❍	❍	❍
PAC members are better equipped to promote and implement climate services through their participation in the PAC	❍	❍	❍	❍	❍	❍
The GFCS governance is able to respond and adapt to changing circumstances	❍	❍	❍	❍	❍	❍
The WMO provides appropriate leadership and support to the GFCS	❍	❍	❍	❍	❍	❍
The governance of the GFCS adequately represents the various stakeholders that have been engaged in the GFCS	❍	❍	❍	❍	❍	❍

Q2.15 Do you have recommendations for changes to the GFCS governance (e.g. is the size and member representation appropriate)?

Q2.16 To what degree is progress being made to meet the following long-term User Interface Platform (UIP) targets?

	No Progress	Little Progress	Some Progress	Substantial Progress	I Don't Know
Effective dialogues between users and those responsible for observations, research and information development and dissemination have been built	❍	❍	❍	❍	❍
Climate literacy in the user community has been improved through a range of initiatives and training	❍	❍	❍	❍	❍
Optimal methods for obtaining feedback from user communities have been identified	❍	❍	❍	❍	❍
Measures for monitoring and evaluating improvements in climate services have been developed	❍	❍	❍	❍	❍

Q2.17 Based on your experience, what are the primary strengths of the GFCS?

Q2.18 Based on your experience, what are the primary weaknesses of the GFCS?

Q2.19 What activities should the GFCS office focus on?

Q2.20 In your experience, how effective has the GFCS been at addressing the following challenges associated with climate services?

	Not Effective	Slightly Effective	Moderately Effective	Very Effective	Extremely Effective	I Don't Know
Accessibility of climate services	❍	❍	❍	❍	❍	❍
Quality of climate services	❍	❍	❍	❍	❍	❍
Capacity to anticipate and manage climate-related risks and opportunities	❍	❍	❍	❍	❍	❍
Data availability and quality of climate observations	❍	❍	❍	❍	❍	❍
Mechanisms to facilitate and enhance interactions between users and providers	❍	❍	❍	❍	❍	❍
Coordination of existing activities	❍	❍	❍	❍	❍	❍

Q2.21 How do you rate the potential future value of the GFCS?

❍ Very High Potential
❍ High Potential
❍ Moderate Potential
❍ Low Potential
❍ Very Low Potential

Q2.22 What motivates you to work with the GFCS?

END

11.4. Annex 4. Figures and Tables

Figure A4.1. Online Survey Sample Characteristics. Sample sizes for A-D are, respectively, 128, 122, 119, 119, and 119.

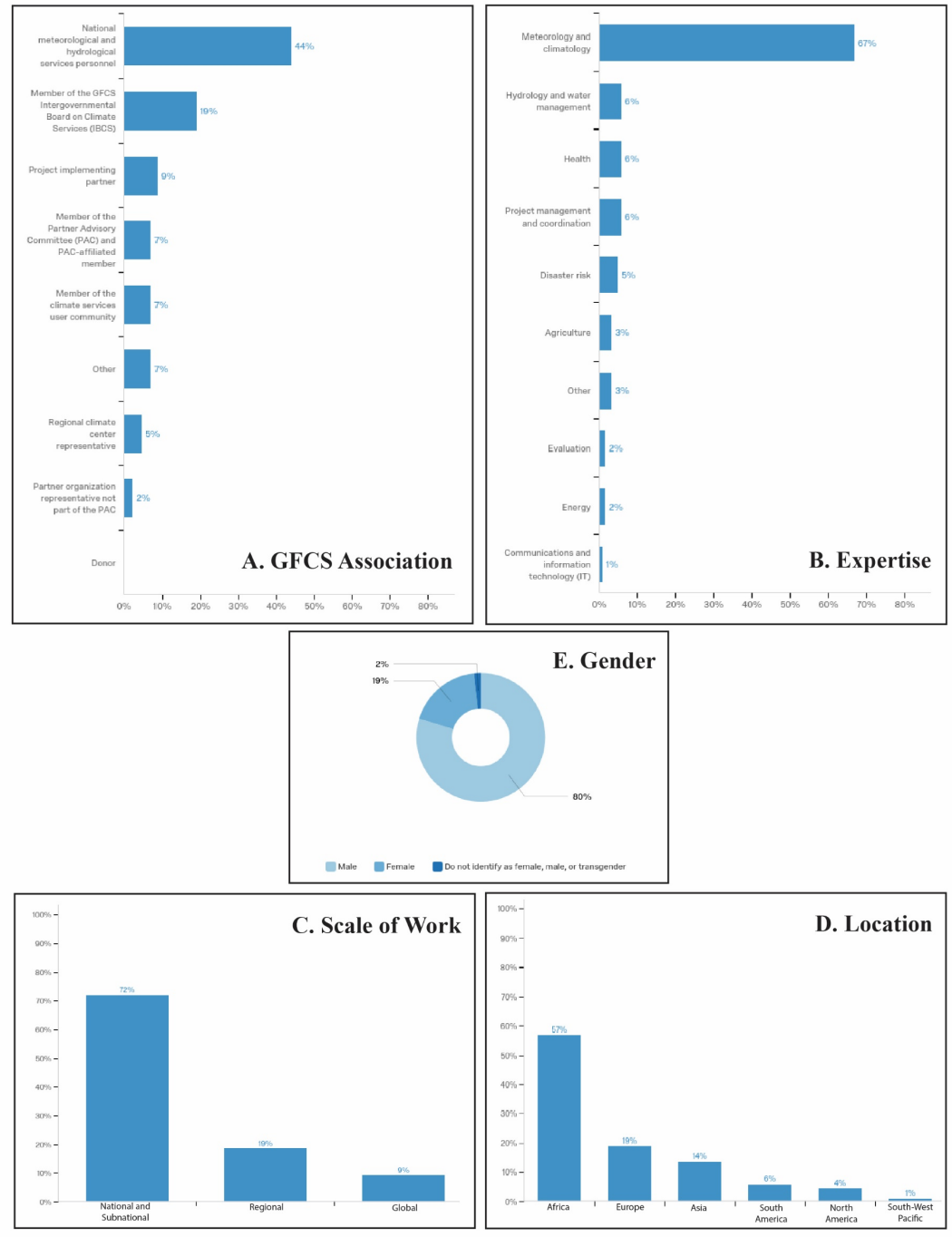

Figure A4.2. The primary strengths of the GFCS identified by 93 online survey respondents. Content analysis of open-ended responses to the survey question “Based on your experience, what are the primary strengths of the GFCS?”

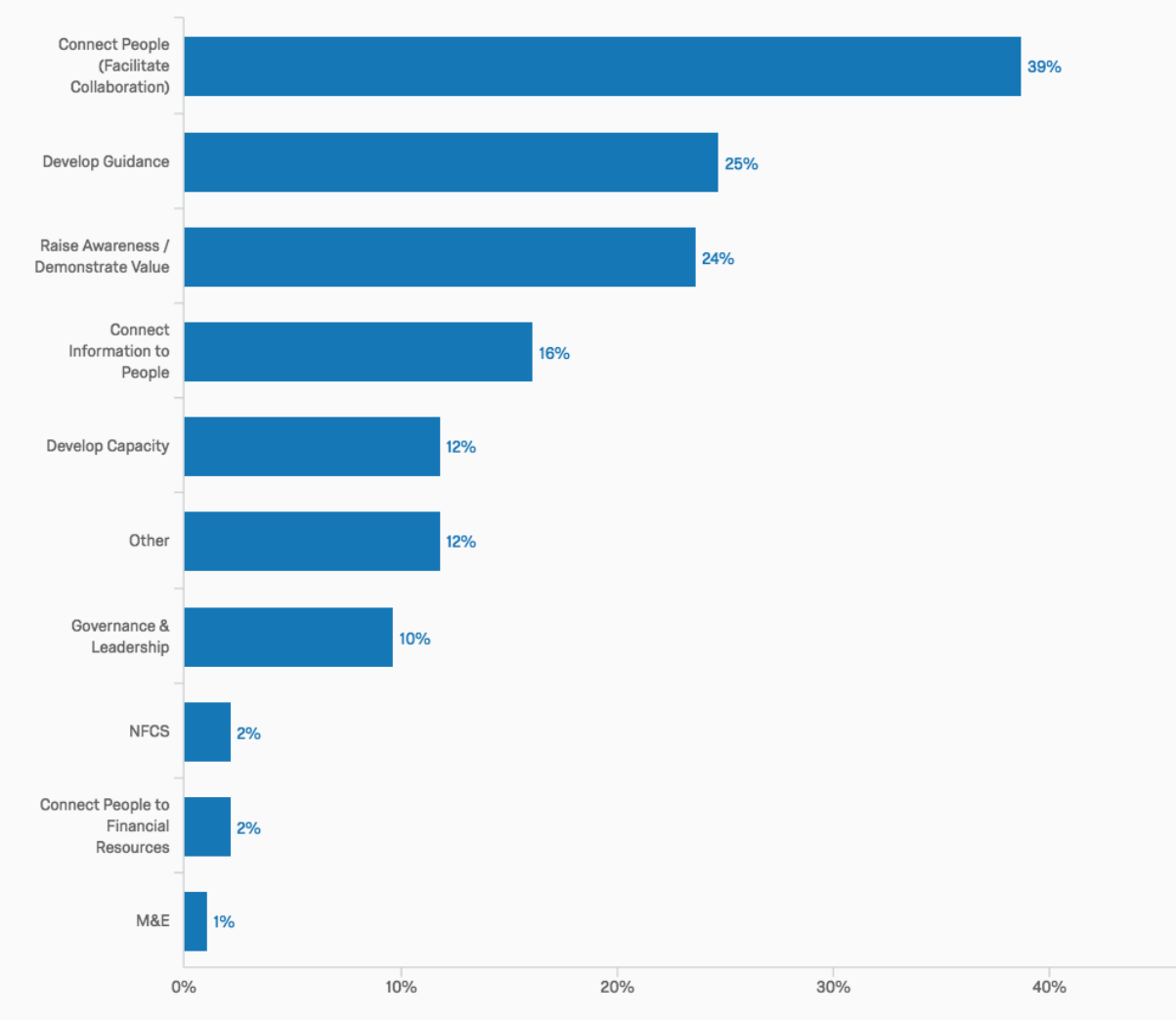

Figure A4.3. The primary weaknesses of the GFCS identified by 89 online survey respondents. Content analysis of open-ended responses to the survey question "Based on your experience, what are the primary weaknesses of the GFCS?"

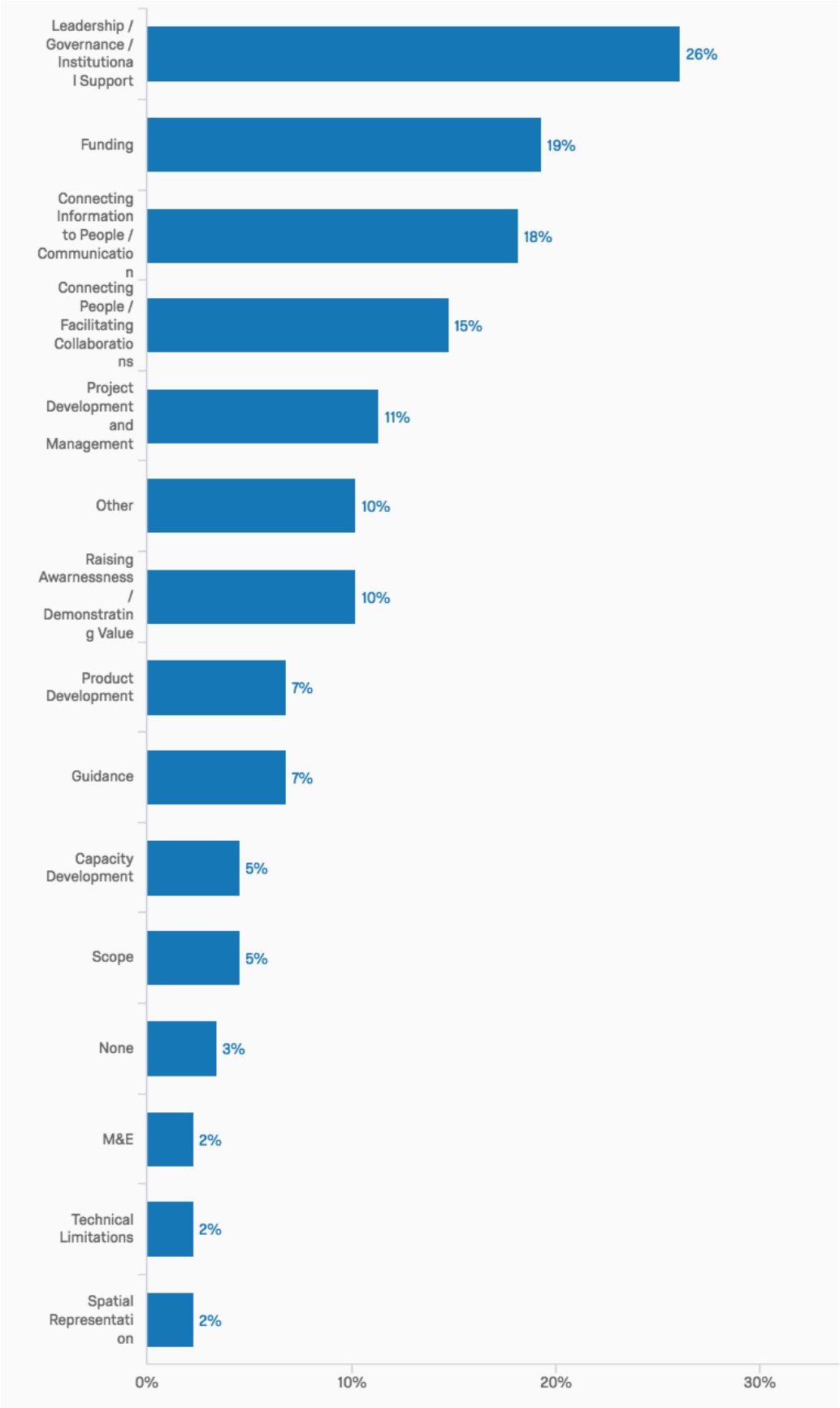

Table A4.1. PAC member participation. Meeting attendance does not include virtual participation. The attendance list for the first PAC meeting in October 2014 was not available on the GFCS website.

Organization	Meetings Attended	Partner Status[1]	PAC6	PAC5	PAC4	PAC3	PAC2
European Commission	5	Member	X	X	X	X	X
Food and Agriculture Organization of the UN	5	Member	X	X	X	X	X
World Meteorological Organization	5	Observer	X	X	X	X	X
The World Bank Group	5	Member	X	X	X	X	X
The World Health Organization	5	Observer	X	X	X	X	X
Norwegian Refugee Council	4	Member	X	X	X	X	
European Organization for the Exploitation of Meteorological Satellites	4	Member	X	X	X		X
International Federation of Red Cross and Red Crescent Societies	4	Member	X		X	X	X
International Union of Geodesy and Geophysics	4	Member	X		X	X	X
World Food Program	4	Observer		X	X	X	X
UN International Strategy for Disaster Reduction	4	Member		X	X	X	X
Norwegian Meteorological Institute	4	Observer	X	X	X		X
The UN Educational, Scientific and Cultural Organization	3	Member	X	X		X	
UN Development Programme	3	Observer		X	X	X	
Group on Earth Observations	3	Member			X	X	X
Global Water Partnership	3	Member			X	X	X
UN Institute for Training and Research	3	Member		X		X	X
European Centre for Medium-Range Weather Forecasts	2	Member	X	X			
Stockholm Environment Institute	2	Member	X	X			
World Business Council for Sustainable Development	2	Observer			X		X
Green Climate Fund	1	Member		X			
Disaster Risk Management Analyst Global Facility for Disaster Reduction and Recovery	1	Member			X		
International Energy Agency	1	Member		X			
Royal Netherlands Meteorological Institute	1	Observer		X			
International Renewable Energy Agency	1	Observer				X	
United Nations Environment Program	1	Member					X
United Nations Habitat	1	Observer					X
World Federation of Engineering Organization	1	Observer					X
Total Number of Participating Organizations			**13**	**18**	**17**	**16**	**18**

[1] Partner status at date of meeting

Table A4.2. Benefits to the NFCS expressed in the online survey. These fixed response questions were developed from our consultations in East and West Africa.

Response	%	Count
Has increased collaboration between national meteorological services, national ministries, and other organizations	81	66
Has increased information sharing among participating organizations	64	52
Has elevated the importance of climate services and adaptation in national development agendas	63	51
Has helped identify climate and weather information and service needs	58	47
Has led to the implementation of climate service projects	54	44
Has helped identify roles and responsibilities of those working on climate services	48	39
Has contributed to National Adaptation Plans, other national development plans, and efforts to meet Nationally Determined Concentrations for greenhouse gas reductions	48	39
Has improved the credibility of information produced by the meteorological services	47	38
Has led to the development of new climate and weather information	42	34
Has limited the duplication of efforts	19	15
Has improved the ability of national ministries to convene others partners of the NFCS development process	19	15
Other	14	11
Has led to more efficient resource allocation	10	8
Total	**-**	**81**

11.5. Annex 5. Individuals interviewed during visits to East and West Africa

Table A5.1. Individuals who participated in interviews or group discussions during visits to Senegal, Côte d'Ivoire, and Tanzania in June 2017.

Country	Name	Organization
Senegal	Mariane Diop Kane	National Civil Aviation and Meteorological Organization
Senegal	Arame Tall	Food and Agriculture Organization, World Meteorological Organization
Senegal	Alioune Badara Kaere	Food and Agriculture Organization, World Meteorological Organization
Senegal	Sadibou Ba	National Civil Aviation and Meteorological Organization
Senegal	Oumar Kaute	National Civil Aviation and Meteorological Organization
Senegal	Eisse Boubacar	Water Resource Department
Senegal	Faty Bakary	Water Resource Department
Senegal	M. Kader Diop	Department of Energy
Senegal	Bounama Diemye	Department of Agriculture
Ivory Coast	Douada Konate	Société d'Exploitation et de Développement Aéroportuaire, Aéronautique et Météoroligique
Ivory Coast	Cacov Sotloan	Energy Corporation of Côte d'Ivoire
Ivory Coast	Kindia Doni Narcisse	Société d'Exploitation et de Développement Aéroportuaire, Aéronautique et Météoroligique
Ivory Coast	Kanga Brou Isidore	Société d'Exploitation et de Développement Aéroportuaire, Aéronautique et Météoroligique
Ivory Coast	Koffi Rodrigue N'Guessan	Ministry of Agriculture
Ivory Coast	Adipoh Boni	Energy Corporation of Côte d'Ivoire
Ivory Coast	Kolotioloma Alama Coulibaly	Société d'Exploitation et de Développement Aéroportuaire, Aéronautique et Météoroligique
Ivory Coast	Diby Amany Aime	Energy Corporation of Côte d'Ivoire
Ivory Coast	Srohorou Bernard	Société d'Exploitation et de Développement Aéroportuaire, Aéronautique et Météoroligique
Ivory Coast	Atouble Paul Kaman	Ministry of Environment
Ivory Coast	Kouadio Ambroise Djaha	Energy Corporation of Côte d'Ivoire
Tanzania	Ladislaus Chang'a	Tanzania Meteorological Agency
Tanzania	Mecklina Merchades	Tanzania Meteorological Agency
Tanzania	Helen Msemo	Tanzania Meteorological Agency
Tanzania	Mathew Ndaki	Tanzania Meteorological Agency
Tanzania	Renatus K. Mkaruka	Tanzania Red Cross
Tanzania	Barthasari Rwlengera	World Health Organization
Tanzania	Juvenal Ksanga	World Food Program

11.6. Annex 6. List of documents used in the document analysis

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