



Annex to the Implementation Plan of the Global Framework for Climate Services – Capacity Development



World
Meteorological
Organization

Weather · Climate · Water



GFCS

GLOBAL FRAMEWORK FOR
CLIMATE SERVICES

© World Meteorological Organization, 2014

The right of publication in print, electronic and any other form and in any language is reserved by WMO. Short extracts from WMO publications may be reproduced without authorization, provided that the complete source is clearly indicated. Editorial correspondence and requests to publish, reproduce or translate this publication in part or in whole should be addressed to:

Chair, Publications Board
World Meteorological Organization (WMO)
7 bis, avenue de la Paix
P.O. Box 2300
CH-1211 Geneva 2, Switzerland

Tel.: +41 (0) 22 730 84 03
Fax: +41 (0) 22 730 80 40
E-mail: Publications@wmo.int

NOTE

The designations employed in WMO publications and the presentation of material in this publication do not imply the expression of any opinion whatsoever on the part of WMO concerning the legal status of any country, territory, city or area, or of its authorities, or concerning the delimitation of its frontiers or boundaries.

The mention of specific companies or products does not imply that they are endorsed or recommended by WMO in preference to others of a similar nature which are not mentioned or advertised.

The findings, interpretations and conclusions expressed in WMO publications with named authors are those of the authors alone and do not necessarily reflect those of WMO or its Members.

This publication has been issued without formal editing.

ANNEX

TO

THE IMPLEMENTATION PLAN OF THE GLOBAL FRAMEWORK FOR CLIMATE SERVICES -

CAPACITY DEVELOPMENT

TABLE OF CONTENTS

EXECUTIVE SUMMARY	iv
1 INTRODUCTION	1
1.1 Objective, scope and functions	1
1.1.1 <i>Goal of the Capacity Development Pillar</i>	1
1.2 Requirement for the Capacity Development Pillar	3
1.3 Inter-linkages with other Pillars	3
1.4 Relevant existing activities, and identification of gaps	4
Detailed information on gaps/opportunities is provided in Appendix II.	6
2 IMPLEMENTATION OF THE CAPACITY DEVELOPMENT ACTIVITIES	7
2.1 The conditions for Capacity Development to contribute to a successful Implementation of the GFCS	7
2.2 Engagement in the working mechanisms of potential partners at global, regional and national levels	8
2.3 Consideration of projects/activities at global, regional and national levels	8
2.4 Implementation of activities at global, regional and national levels	9
2.4.1 <i>Implementation activities at national level</i>	9
2.4.2 <i>Implementation activities at regional level</i>	9
2.4.3 <i>Activities to build capacity at global level</i>	10
2.4.3.1 Activities to improve mechanisms for data exchange between centres, countries and users	10
2.5 Initial Implementation activities/projects	11
2.6 Implementation approach (including operational and organizational aspects)	11
2.7 Monitoring and evaluation of the implementation of activities (including monitoring success)	12
2.8 Risk management in GFCS Capacity Development	12
3 ENABLING MECHANISMS	13
3.1 Synergy with existing activities	13
3.2 Building national, regional and global partnership	13
3.2.1 <i>Building National Partnership</i>	14
3.2.2 <i>Building regional and sub-regional partnership</i>	14
3.2.3 <i>Building global partnership</i>	14
3.3 Communication Strategy	15
4 RESOURCE MOBILIZATION	15
5 COSTED SUMMARY OF ACTIVITIES/PROJECTS	16
APPENDICES	17
APPENDIX I: EXISTING CAPACITY DEVELOPMENT ACTIVITIES IN THE GENERATION OF CLIMATE INFORMATION AND PRODUCTS	17
APPENDIX II: EXISTING ACTIVITIES FOR USERS OF CLIMATE SERVICES, INTERNATIONAL COLLABORATION AND IDENTIFICATION OF GAPS ON BOTH PROVIDERS AND USERS ...	22
APPENDIX III: PROGRAMMES, CO-SPONSORED PROGRAMMES AND CONSTITUENT BODIES	26

APPENDIX IV: ACTIVITIES TO BUILD CAPACITY TO INTERFACE WITH USERS	32
APPENDIX V: ACTIVITIES TO DEVELOP CAPACITY OF CLIMATE SERVICES AT NATIONAL LEVEL	33
APPENDIX VI: ACTIVITIES TO ESTABLISH NEW REGIONAL CLIMATE CENTRES	34
APPENDIX VII: ACTIVITIES TO STRENGTHEN EXISTING REGIONAL CLIMATE CENTRES.	35
APPENDIX VIII: ACTIVITIES TO BUILD CAPACITY OF GLOBAL OBSERVATION NETWORKS	36
APPENDIX IX: ACTIVITIES TO ENHANCE CAPACITY OF GLOBAL CLIMATE CENTRES	37
APPENDIX X: CD PROJECTS/STRATEGIC GOALS, KEY STRATEGIC INTERVENTIONS, EXPECTED RESULTS FOR THE GFSC IMPLEMENTATION PLAN	38
APPENDIX XI: ELABORATION ON THE ABOVE CD ACTIVITIES THAT COULD BE IMPLEMENTED THROUGH PROJECTS DURING THE IMPLEMENTATION OF THE GFCS...	45
APPENDIX XII: RESOURCE MOBILIZATION	49
<i>Resource mobilization at national level</i>	49
<i>Resource mobilization at regional level</i>	50
<i>Resource mobilization at global level</i>	50
APPENDIX XIII: POTENTIAL PARTNERS AND PROJECTS	51
Table 1 – Potential Partners	51
Table 2 -- Costed Summary of activities and projects	53
REFERENCES:	55
DEFINITIONS OF KEY WORDS:	56
ACRONMYS	57

ACKNOWLEDGEMENTS

The GFCS Secretariat gratefully acknowledges the many individual and institutional contributors to this report. In particular, it would like to thank the people from a wide range of institutions who have contributed to the production of this Capacity Development Annex including, but not limited to, Buruhani Nyenzi and Philbert Tibaijuka from Climate Consult (T) Limited in Tanzania, Laban Ogallo from IGAD Climate Prediction and Application Centre (ICPAC), Geoffrey Wilson and Robert Masters from the World Meteorological Organization (WMO). Acknowledgement is also extended to the many people who contributed to reviewing the draft document.

EXECUTIVE SUMMARY

The Global Framework for Climate Services (GFCS) aims to develop the capacity of countries to apply and generate climate information and products relevant to their particular concerns, thus all aspects of GFCS include capacity development. The World Climate Conference-3 recognized that many countries lacked policies and institutions or human resources with the right skills or practices to enable them to take advantage of new or existing climate data and products or create national user interface groups to establish national dialogue on these issues. The Capacity Development component of the GFCS Implementation Plan can be seen as a foundation that links and supports the four other pillars.

The Capacity Development component of the GFCS Implementation Plan thus tackles two separate but related activity areas: (i) the particular capacity development requirements identified in the other four pillars; and (ii) more broadly the basic requirements (national policies/legislation, institutions, infrastructure and personnel) to enable any GFCS related activities to occur. In the context of both activity areas capacity development actions under the Framework will facilitate and strengthen, not duplicate existing activities. The Capacity Development component of the GFCS Implementation Plan complements the wider capacity development plans being implemented by the GFCS partners and other agencies.

By necessity the GFCS Implementation Plan, to date, has been built top down using generalized capacities and assumptions to provide a first guess estimate of what is required, what can be implemented in a sustainable manner and how much it could cost. The implementation of specific projects at national or regional or sub-regional level will require that these generalized assumptions, capacities and costs are tested for the specific circumstances and projects, thus leading to a gap analysis or refinement for each project. This analysis will also need to determine the presence or absence of the underlying foundations for sustainable GFCS projects and what to do if the foundations do not exist. Key questions to be asked are:

- Does national legislation or regulation exist authorizing the collection, communication (nationally and internationally), archival and production of climate information (including data) and products?
- Are there institutions appointed to collect, communicate, create and archive climate information and products at a national level?
- Do the authorized institutions have the infrastructural facilities, procedures and sufficient personnel to carry out their tasks in a sustainable manner?
- Do the personnel have the appropriate skills and qualifications to undertake the required tasks as well as the specific GFCS capacity development requirements? and
- How can the RCCs and RCOFs mechanisms be advanced to best serve the goals of the GFCS?

The first two questions correspond primarily to Strategic Objective 2 of the CDS. The third and fourth questions relate to Strategic Objectives 1 and 6. The fifth question relates to Objective 4. The need for information on the capabilities of Members relates to Objective 3. Once the needed information is gathered, the results of the analysis will determine the institutional, infrastructural, human and procedural resources required to implement the GFCS related project on a sustainable basis and the collaboration and coordination mechanisms between various players such as the UN agencies and programmes, government institutions, NGOs and the private sector. In the longer term, incorporating operational climate services provision into the development agenda at national, regional and global levels can be expected to take on greater importance.

The results of the analysis will determine the financial, human and institutional resources required to implement the GFCS related project on a sustainable basis and the collaboration and coordination mechanisms between various players such as the UN agencies and programmes, government institutions, NGOs and the private sector.

A number of activities relevant to the priority areas of GFCS are already being implemented in different parts of the globe by different institutions, organizations and other entities. These activities (essentially capacity development activities) can be grouped into four main areas linked to the pillars: capacity for climate information users (UIP), developing capacity for the generation of climate information (CSIS), infrastructural capacity (elements of CSIS, OBS and M, and Research and P), and international collaboration and partnership in relevant capacity development activities.

Some projects that could be fast tracked in the implementation of the GFCS are identified in this Capacity Development component to GFCS Implementation Plan. These projects address the needs of the countries, especially Developing and Least Developed Countries (LDCs) and Small Island Developing States (SIDSs), and could be used as pilot projects to further refine the underlying assumptions used in the top down approach. The criteria for identifying these projects will be determined by the needs of the GFCS priority sectors (Disaster Risk Reduction, Health, Water resources, food and agriculture) in those countries. In addition to the development of pilot projects, and especially during the initial phase, attention will be given to further indentifying and elaborating specific elements and costs of these needs at global, regional and national levels. However, these costs are estimated to be approximately 300 million USD for GFCS capacity development activities in its initial phase (2013-2017) with a possibility for an additional similar amount in its last phase (2018-2023).

A number of UN Agencies and programmes are currently implementing Capacity Development activities that have relevance to the objectives of the GFCS's pillars. Partnerships will: be key in the implementation of the GFCS; help to ensure that GFCS specific activities complement and build upon other activities, not replicate them; and, also enhance ownership in GFCS. Mechanisms for agencies to work together and exchange relevant information on their activities will need to be refined or developed where they don't exist.

For the successful and sustainable implementation of the GFCS at all levels the beneficiary countries, with guidance from the GFCS Secretariat and other bodies, will need to target potential national, regional and global stakeholders who will be a possible source of financial, technical and guiding support. These include Governments, organizations, non-governmental organizations and the private sector. There are also foundations, bilateral and multilateral funding mechanisms, international agencies and regional entities/banks that provide funds in the countries. In most cases funding from such bodies comes through governments or regional organizations. Countries will be able to use GFCS as part of their rationale for applying for funding from an identified donor because successful implementation of GFCS at the national level will benefit the national economies.

1 INTRODUCTION

1.1 *Objective, scope and functions*

Capacity development for GFCS refers to investment in people, practices, policies and institutions to stimulate and systematically develop capacities in the Pillars of the GFCS namely: User-Interface Platform; Climate Services Information System; Climate observations and monitoring; and, Research, Modelling and Prediction. Capacity development actions under the Framework will facilitate and strengthen, not duplicate existing activities. They will also address needs from both the demand side and the supply side of climate services. These capacity development needs fall under the following four areas:

- **Human resource capacity** – equipping individuals with the knowledge, skills and training to enable them to generate, communicate and use decision-relevant climate information;
- **Infrastructural capacity** – enabling access to the resources that are needed to implement infrastructure to generate, archive, quality control, communicate, exchange and use climate data and decision-relevant information and products, including on the supply side instruments for observing networks, data management systems, computer hardware and software, internet access, communication tools, manuals and scientific literature, with similar things on the demand side but potentially much more diverse;
- **Procedural capacity** – defining, implementing and advancing best practices for generating and using climate information;
- **Institutional capacity** – on the supply side elaborating management structures such as defining the position and terms of reference of NHMSs for climate services, processes, policies and procedures that enable effective climate services, not only within organizations but also in managing relationships between the different organizations and sectors (public, private and community, including international collaboration) with similar requirements on the demand side but once again more diverse.

The outcome of capacity development actions within the above four areas are to support the other pillars so that GFCS, through its Pillars, is successfully implemented in initially addressing the four priority sectors of Agriculture, Water resources, Health and Disaster Risk Management and providing a solid basis for tackling other key thematic areas such as transport, energy, tourism etc.

1.1.1 **Goal of the Capacity Development Pillar**

The main objective of the Capacity Development Pillar is to facilitate the provision of improved climate services to those people who need it. In the first phase of GFCS this means that, for the four priority sectors: the gaps in climate service delivery will be better identified and quantified; the level of interactions between providers of climate services and users will be further developed; national policies and practices on climate services and data management will be strengthened; the number, type and quality of climate observations improved; and, new climate monitoring products and capacities for provision of seasonal climate outlooks enhanced.

Under the GFCS, countries with limited capacity need assistance to enable them to provide more products and information including climate prediction products and climate projections. Sometimes these products and information will come from new local capacity and sometimes from regional or global capacity but through the national climate service provider. Figure 1 illustrates the link between the typical climate service products currently envisaged and the four generic national climate service classifications used in this Implementation Plan. Figure 2 indicates the estimated maturity of national climate services providers in each category as of October 2010. The target for the first phase of GFCS is to increase the number of countries having access to Essential Climate Services by moving the peak from Basic to Essential. The report of the High-Level Taskforce (HLT), formed after World Climate Conference-3 (WCC-3), broadly estimated that this would globally require the recruitment or retraining of an additional 1000 staff at the cost of the order of USD 60 million.

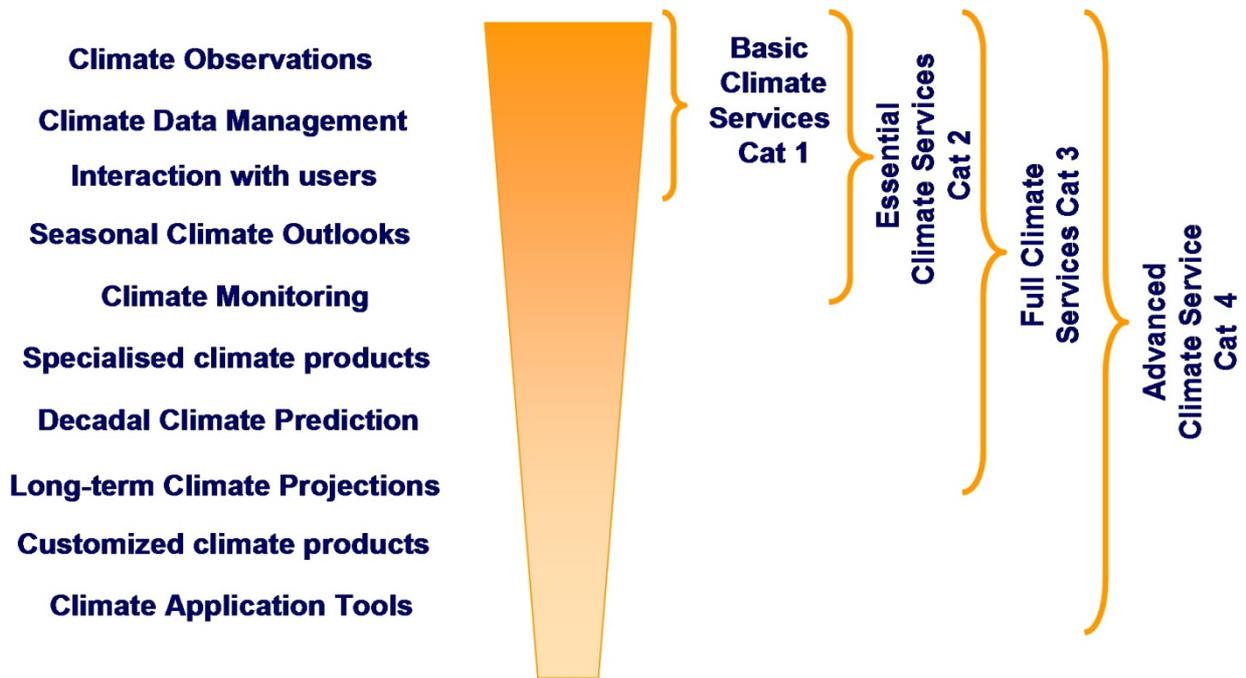


Figure1. Types of climate products and services by category of national climate service provider:

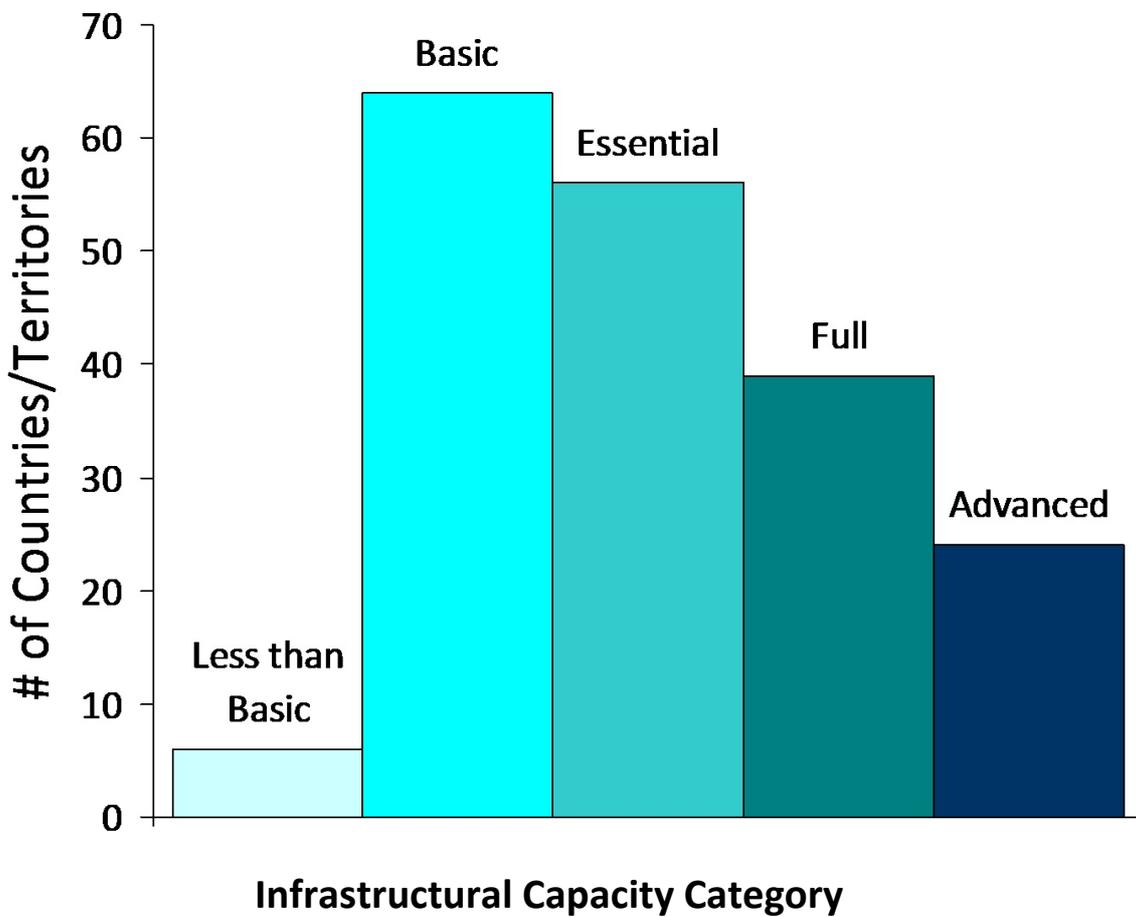


Figure 2. Profile of national climate service providers as a function of category, October 2010

1.2 Requirement for the Capacity Development Pillar

The main providers of climate services in many of the Least Developed Countries (LDCs), Small Island Developing States (SIDS) and Land Locked Developing Countries (LLDCs) lack the necessary mandate to interact with users and the capacity, to generate and provide the full range of climate services needed by users in an efficient, accurate and timely manner. These countries, which are most vulnerable and least capable, often have: no legal or institutional mandates for the provision climate services; inadequate observation networks for climate information; lack expertise in generating climate products and outlooks; and, insufficient facilities for easy dissemination of information to the various user communities in required format and capacities to undertake targeted research to improve the quality of the products. Users of climate services will also require capacity development for them to best use the existing data, products and information and be involved in the process of developing products and services.

Whilst the substance of these issues are addressed by the other pillars and key sectors' exemplars for the GFCS, the Capacity Development processes and activities outlined here will facilitate their inter-linkage and strength them with the necessary expertise, infrastructure and institutional frameworks so that the GFCS objectives and goals can be achieved. It is important to note that, the capacities and capabilities to facilitate implementation are fundamentally dependent on finances, which are required, at all levels, to support staff, operations, equipment and sustainability.

The HLT report indicated that there are gaps and challenges in the provision and use of climate services. However, most of the institutions/agencies providing climate services around the world are currently providing, at a minimum, raw data and some analysis of climate data and other information, but generally with limited or no capability to generate the climate outlooks or forecasts and assist users with their interpretation and use which are amongst the key outputs for a minimum GFCS implementation.

1.3 Inter-linkages with other Pillars

The Capacity Development interacts with all pillars (WMO, 2011c, d, e, f, and g) because they need to develop their capacities to fulfill the GFCS objectives. Beginning to address the capacity development requirements of the pillars' at an early stage is very important for a successful implementation of the GFCS. The key aspects of capacity development identified in the implementation plan for each of the pillars are summarized below.

User Interface Platform (UIP):

- To provide support in developing capacity of both the providers and users in ensuring that the information and products and messaging/communications are pertinent, applicable, actionable, timely, understandable for easy utilization;
- To address the role of the users in identifying and developing improved applications of climate information;
- To identify societal observations which would help understand the linkages between the climate system and socio-economic factors.

Research, Modelling and Prediction (RM&P):

- To support improvement of the total observation networks of both the physical and chemical components of the Earth system. Research on observing techniques, their development and deployment are vital for closing gaps in the observational coverage and expanding the range of observed climate variables;

- Education and training, as an essential part of traditional capacity building, will help to support the resource base for RM&P;
- To develop capacity of relevant human resources and provision of tools and software;
- To support research which would help understand the linkages between the climate system and socio-economic factors.

Observation and Monitoring (O&M):

- To support capacity development for provision of quality observation networks based on user requirements, so as to underpin development of user-targeted products for priority sectors in a country;
- To support capacity development on climate data observations and monitoring and procedural and practices;
- To provides improved mechanisms for and cooperation in data and product exchange and for the essential communications and transmissions of information and products;
- To support capacity development in remedying gaps and deficiencies in existing observational networks and systems, acquiring new types of observations, and processing and integrating the information;
- To address societal observations which would help understand the linkages between the climate system and socio-economic factors.

Climate Services Information System (CSIS):

- The development and sustained operation of formalized and interoperable structures and mechanisms at global, regional and national levels;
- A comprehensive catalogue has to be created at different hierarchical levels viz. Nations, Regional Associations and Global, of available and upcoming climate services;
- Enhancing the capacity of the national and regional elements of the CSIS, and also to enhance the effective use of global and regional inputs in national level CSIS operations.

1.4 Relevant existing activities, and identification of gaps

Activities which are relevant to capacity development in the key areas of climate services are being implemented in different parts of the globe by different institutions and organizations. The HLT Report provided detailed information on those activities which are being implemented at different level to address generation, provision and user advocacy of climate services. These activities are grouped into four main areas that include developing capacity for the generation of climate information, capacity for Climate Information Users, Infrastructural capacity, and International Collaboration in relevant capacity development activities. These activities are implemented at global, regional and national levels, depending on the mandate and capability of the implementing entity. The activities cover the following main areas:

- Human capacity in generation and use of climate information;
- Infrastructural capacity of climate information and products for providers and users;
- Institutional capacity of climate information and products for providers and users;
- Procedural capacities of climate information and products for providers and users.

A detailed description of current capacity development activities in the generation of climate services is provided in Appendix I.

There has been significant effort to develop capacities of institutions to facilitate improvement in the provision of climate services and their uptake by users, however there still exists major opportunities which the GFCS through its pillars will have to address especially in early phases of its implementation. These opportunities could include, among others: support to many NMHSs in developing countries to provide basic climate services; assist users of climate information with knowledge in using the information, data and products; address the lack of infrastructure for generation and dissemination of climate information and products; and improve coordination within UN System in the provision of climate services. The following are some of the gaps in capacity development which the GFCS through its pillars will have to address:

- High priority in the establishment and funding of Regional Climate Centres during the early implementation of the GFCS, as these will help address some of the needs of developing countries that are not yet capable of producing information and climate products themselves, while efforts are launched to build those national capabilities. WMO has initiated a process for establishment of RCCs in most regions, but many incipient RCCs will require financial support and even help with expertise to become operational designated centres with the least delay;
- Capacity development for climate information providers at national scale, especially in developing countries, needs to be enhanced because some of these countries still lack the necessary capacity to provide even the basic required climate information and products. Under the GFCS, it will be necessary to take stock of the status of national capacities to set a baseline, and then to identify which countries need to be supported so that they can improve their responsibilities to provide the required national climate services in a carefully staged approach (one step at a time);
- Lack of capacities and capabilities for the UIP to function at all levels. The capacities of many elements covered by the Framework's Pillars are currently inadequate and need improvement;
- Some users of climate information are still not confident with the climate information provided and therefore need, through all possible available arrangements, to be engaged by the providers on the quality, usefulness, and packaging of the information. Through such interaction users will be able to appreciate the climate information and products provided;
- Some users lack climate knowledge, and need help to better apply the information in effective decisions and therefore the need for awareness, outreach, interdisciplinary training, and interface mechanisms such as COFs, and interdisciplinary working groups and conferences, etc.;
- Necessary Infrastructure for the generation and the dissemination of climate information and products (hardware, software, manuals, literature, internet access, communications tools, etc.) are still lacking in some countries. The relevant activities of the GFCS working with global and regional entities will have to address these issues as they are the means of producing quality information and products, and then getting these to those who need it;
- Observation networks for most of the basic parameters are still poor especially in the tropics and in many remote areas of the world (e.g. mountainous areas, high latitudes and over, and in, the oceans). As a result some generated products are not very accurate. Through the GFCS CD activities this problem in the O&M pillar will be given high attention;
- Use of current and emerging technologies such as the internet and other forms of media is still a problem in some countries. CD activities related to CSIS and RMP could facilitate the wider use of some of these technologies. The GFCS will provide an opportunity for UN Agencies and other development partners to support countries in the provision of technologies that countries may require to enhance their capacities in provision of climate services;
- Coordination of UN Agencies, international institutions and programmes, NGOs and other players in both provision and use of climate information activities need to be strengthened. The GFCS Technical Committees will have to establish mechanisms whereby such coordination could be realized and achieved;

- Preparedness activities such as establishing early-warning systems to shift from crisis management to risk management for long term planning strategies to cope with climate extremes and climate change are urgently needed to improve the effectiveness of response and recovery;
- Significant efforts are still required to strengthen disaster risk reduction worldwide and meet the goals of the Hyogo Framework. The main areas for improvement are provided in the DRR exemplar;
- Procedural capacities for production and provision of climate services need to be developed for all levels including global, regional and national centres.

Detailed information on gaps/opportunities is provided in Appendix II.

A number of UN Agencies and programmes, through various activities including those of WMO technical commissions/groups, constituent bodies, co-sponsored programmes such as those of the World Climate Research Programme (WCRP) are currently implementing Capacity Development activities either through collaboration or individually that are relevant to the objectives of the GFCS and its pillars. Coordination and collaboration between agencies/institutions in implementing these activities save duplication and minimize expenses. Some of these activities are elaborated in Appendix III to this document.

2 IMPLEMENTATION OF THE CAPACITY DEVELOPMENT ACTIVITIES

2.1 The conditions for Capacity Development to contribute to a successful Implementation of the GFCS

In order for the GFCS to be implemented successfully and sustainably at the national or regional level it is important to identify the available capacity and then undertake an analysis against the user requirements as shown in Figure 2 above to identify any gaps. Selection of a small group of countries to participate in Phase 1 will allow sampling and analysis methods to be tested. In some cases the identified gap may be so great that it may be necessary to rescale the proposal to fit the anticipated sustainable resources.

The results of the gap analysis will identify the financial, human and institutional resources to implement the required capacity development activities and the collaboration and coordination mechanisms that are needed between various players including UN institutions, government institutions, Non-Governmental Organizations (NGOs) and the private sector. Therefore the necessary and sufficient conditions for a successful implementation of the GFCS are the following:

- Active National, Regional and Global User-Interface-Platforms are established;
- National Governments provide high priority in allocating resources to support all areas (human resources, infrastructural, procedural and institutional) of capacity development of national institutions such as NMHSs and others that are responsible for the provision and application/utilization of climate services;
- Strong national, regional and global collaboration and coordination mechanisms are established to support core GFCS Pillars' capacity development activities especially for the priority sectors.

Figure 3 below outlines one variation of the general capacity development process which is composed of eight steps. Each step could equate to a capacity development action for a country, a group of countries or GFCS as a whole. In addition to specifying each action, it would also be necessary to identify who is responsible for undertaking the action, by when and who is responsible for overseeing the process. It is important to note that activities under steps 1 to 3, in most case, some work has already been done and therefore there is already some information from which baseline and gap analysis information could be drawn from, even though the available information could be incomplete or imperfect. Implementation of step 4 in the Figure is the main issue that this Annex addresses so that the latter steps in the spiral can work. Experience shows that whilst this is the overall flow, at a high level, there is often need for cycling back and forth between succeeding steps as more information becomes available.

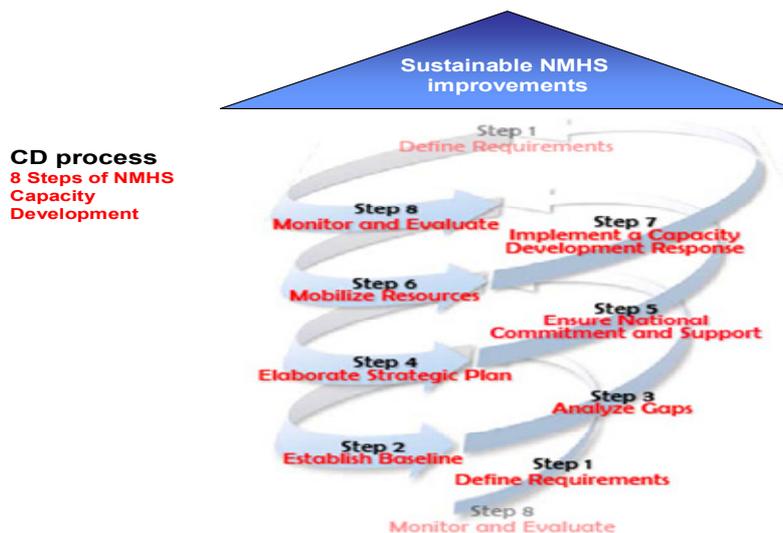


Figure 3: Outline of the general capacity development process (from WMO, 2013). Note that after step 4 feedback from relevant stakeholders could be important.

2.2 Engagement in the working mechanisms of potential partners at global, regional and national levels

The Capacity Development activities under the Framework will systematically develop the capacity of the national climate services and climate services stakeholders, such as the four priority sectors, to enable all countries to manage climate risk effectively through the use of climate services. These activities will typically strengthen existing capabilities in the areas of climate services governance, management, human resources development, leadership, partnership creation, science communication, service delivery, resource mobilization and infrastructure.

It will be necessary for the GFCS to establish mechanisms that facilitate partnerships to implement capacity development activities through co-sponsorship and joint implementation as guided by the partners' frameworks and systems. This spirit would include implementation of relevant GFCS activities for the supply and demand sides such as workshops/seminars, training and projects. Table 1 in Appendix XIII provides a few examples of the potential partners that have indicated interest in collaborating in GFCS.

2.3 Consideration of projects/activities at global, regional and national levels

The HLT report identified some potential projects that could be fast tracked in the implementation plan. These projects will need to address the HLT report priority areas. The main selection criteria proposed are role, relevance to the priority sectors and value of an activity for implementation of the GFCS at all levels, anticipated likelihood of its successful completion, demonstrated value and impact for the intended use, and cost effectiveness.

The following questions could be used to evaluate the priority given to projects and their associated activities:

- Does the project involve a developing or least developed country, a small island developing state, or a land locked country?
- Does the project build upon CD activities that already exists with some refocusing by expanding the area, locating in a new place, making it operational, or broadening its scope?
- Is the project achievable within the time frame and proposed budget? The project should have a high probability of success, and be able to deliver within the time-frame.
- Does the project speak to the Feedback, Dialogue, Monitoring and Evaluation or Literacy outcomes of the GFCS pillars?

- Does the project build upon existing partnerships among organizations and groups?
- Does the project take an approach that involves capacity development of climate information providers and users throughout?
- Does the activity contribute to the stated necessary and sufficient conditions for capacity development (Section 2.1)?
- Does the project result in contributing to the GFCS objectives that would have not been possible by individual entities?
- Does the project fill gaps and develop capabilities so that services are improved in quality, quantity and can reach all those in need?
- Does the project have a demonstrated value?
- Does the project have a sustainable positive impact for those who need it?
- Is it cost-effective?

2.4 Implementation of activities at global, regional and national levels

The implementation of the GFCS activities will follow the eight HLT governing principles (WMO, 2011a). In addition, the activities that will be implemented especially during the first six years of the implementation of the GFCS will address the four priority sectors of agriculture, water resources, health and disaster risk reduction. Although capacity development is a long-term activity it will be necessary for the GFCS to fast track implementation of some activities to raise the capability of all relevant institutions to at least a level of capability of providing basic to essential climate services (see Fig.1). In regions where there are many countries functioning at only basic climate services levels, the establishment of a regional climate institution could improve, through NMHSs and other relevant institutions, the capabilities of those countries considerably, while the national entities undergo other improvements. It is therefore important to address the GFCS Implementation Plan in accordance to the activities of the four components specified in section 1.1 above at national, regional and global levels.

2.4.1 Implementation activities at national level

The need for capacity development in provision of climate services at national level, especially in developing and least developed countries is very high. It is important to note that these countries are the source of almost all observational data and products for use within country and exchanging internationally. A detailed list of activities to be implemented at national level is given in Appendices IV and V. These include those activities that are meant to build capacity to interface with users of climate services (Appendix IV) and activities to develop capacity of national climate services (Appendix V) respectively.

2.4.2 Implementation activities at regional level

The HLT indicated that no single country could by itself develop all the required capabilities to provide advanced national climate services. They recommended efforts be made to establish regional climate centres. The Taskforce recognized the difficulties regional centers normally face; difficulties in reaching agreement on which country or institution in which to locate the centre; and, difficulties, especially in developing countries, in getting sustainable sources of funding to support their operations. The HLT therefore recommended that an effective network of regional centres be established by the end of 2021.

This target will require strengthening existing centres through their own voluntary effort as well as with assistance from governments and partners (Appendix VI). It will also be necessary to create new centers in new areas particularly in regions where there are clusters of highly vulnerable countries with low climate services capacity (Appendix VII). The roles and activities of these regional climate centres will vary according to the specific interests and needs of the region. Minimally, a regional climate centre would carry out operational activities that would, among others, include: capacity development of climate experts and users. within the region through workshops and other forums, generation of regional and sub-regional climate information and products (particularly for climate system monitoring and Long-Range Forecasting (LRF) and outlooks), interpreting and assessing relevant seasonal analysis, prediction and climate change scenario

products from global centres, and establishing historical reference climatology for the region and/or sub-regions, and preparing regional climate watch. The following are the typical capacity development activities that would be required for the regional centers to assist the national centres:

- Implement broadband high-speed internet access in support of climate research , modelling and prediction;
- Improve human technical capacities on expertise to generate appropriate climate information and products that are needed by users through strengthening research and operational capacities;
- Provide modern equipment with new technologies to support the operational activities of the centers;
- Organize workshops/training to enhance interaction with regional and national users.

2.4.3 Activities to build capacity at global level

There will be a need to implement certain climate services activities at global level that will have impact at regional and national level (Appendices VIII and IX). One example is the implementation of the Global Producing Centers (GPCs) of Long-Range Forecasts which produce global-scale climate products that are downscaled at regional and national levels (Appendix VIII). These GPCs are, however, implemented by developed countries that have a high level of technological and economic capacity, and may not require infrastructural, human resources and institutional capacity development through the implementation of GFCS but they may need capacity especially on issues like user interaction. Another example is the implementation of Global Climate Observing System (Appendix IX). A large number of improvements in observing systems at global scale are needed which translate to the needs at regional and national scales. The actions, for example, that are identified in the Implementation Plan for the Global Observing System for Climate in Support of the UNFCCC, are all in some way relevant to the GFCS especially in the implementation of its activities in the priority sectors of agriculture, health, water resources, and disaster risk reduction. The following are some of the activities for implementation at a global scale:

2.4.3.1 Activities to improve mechanisms for data exchange between centres, countries and users

The mechanisms and policy for the exchange of climate services data and products (meteorological, climatological, hydrological, environmental and societal) between providers of information, users and countries will be a key component of GFCS. For example, the WMO Information System (WIS) is a single coordinated global infrastructure responsible for the telecommunications and data management functions for WMO Members. WIS provides an integrated approach suitable for routine collection and automated dissemination of observed data and products, as well as data discovery, access and retrieval services for all weather, climate, water and related data produced by centres and WMO Member countries. WMO is offering WIS to the GFCS partners as a key part of the overall communications backbone integrating the diverse real-time and non-real-time high priority data sets, regardless of location. WIS is capable of storing and exchanging large data volumes, such as those from new ground and satellite based systems, for handling finer resolution data and products from numerical weather prediction models and climate models, and in their applications.

Consistent with the principle of building upon what is already in place rather than duplicating existing institutions and efforts, WMO Congress Session XVI expected that the WIS could serve as a key dissemination mechanism under GFCS. Indeed, the operations of WMO RCCs, key elements of CSIS implementation, and many NMHSs and other centres are already required to be WIS-compliant, and may also become WIS Data Collection or Production Centres (DCPCs).

Consistent with the above it will be necessary for the GFCS to have activities that will be promoting developing capacity in line with the implementation of WIS at regional and national level. These activities will include the following:

- Acquire new and replacement of the aging Automatic Message Switching Systems at national climate centres;
- Develop a policy for countries to support the establishment of appropriate networking for easy exchange of relevant data and products;
- Rehabilitate/modernize national centres telecommunication networks for data collection and transmission facilities along the WMO WIS/GTS guidelines;
- Implement broadband high-speed internet access;
- Upgrade/modernize media systems at the climate centres for information dissemination.

However, it must be noted that options for exchange of data used by other partners, other than the WMO WIS, should be examined and taken on board as appropriate during the implementation of the GFCS.

2.5 Initial Implementation activities/projects

The initial implementation activities and projects are elaborated in Appendices X and XI. These activities will be responding to some of the CD activities that are raised in the Annexes of O&M, UIP, and RMP and CSIS Pillars and the exemplars prepared for the four GFCS priority sectors. These would include the information given below, with the bracket information identifying the associated GFCS pillar(s):

- Organizing application pilot projects to enhance use of climate information and products (UIP pillar);
- Improvement of product generation and use, through collaboration with users and other stakeholders including use of the extensive national level planning and consultation that has been achieved under such activities as the National Adaptation Programme of Action (NAPA) in Least Developed Countries (LDC) (CSIS / UIP / RP&M pillars);
- Strengthening of the Observing Network in developing and least developed countries and Small Island Developing Countries (O&M pillar, UIP);
- Improvement of Meteorological Telecommunications and communication systems (O&M / RM&PM / CSIS pillars);
- Improvement of the level of technical capacities (resources, expertise to generate appropriate policy-relevant climate information and operational warning services for the priority sectors) including procedural issues (RM&P, CSIS pillars);
- Improved institutional capacity of national and regional centres to provide relevant, reliable and timely climate and weather services (CSIS pillar); and
- Strengthening research and operational capacities of the global, regional and national climate centres such as the GPCs, WMO RCCs and NMHSs to function as efficient network of coordination, development and dissemination centres (CSIS and RM&P pillars).

2.6 Implementation approach (including operational and organizational aspects)

The implementation approach is based upon the eight HLT principles and builds upon activities already underway by providers and users to improve the access to climate services of those countries that do not have capacity to produce climate services which their communities need. The first priority should be to building capacities of national institutions that are (or will be) providing climate services at national level. The second level of priority should be for regional institutions as these can help to solve problems associated with countries that do not have the financial and human resources to provide the needed services. The GFCS Implementation Plan proposes that the approach in implementing each activity will be influenced by whether it is dealt with at the global, regional or national level. Therefore the implementation approach should be undertaken to create efficiencies, delineate responsibilities, and maximize value at each level, for example:

- The development of international standards and products will be best developed through coordination at the global level;

- Regional access to information, development and delivery of products for regions, some aspects of training and capacity development and some aspects of establishment of relationships between producers and users will be best undertaken at the regional level;
- Development and delivery of products for the national and local scale, establishment of relationships between providers and users, training and capacity development will best be taken at the national level.

In developing capacities of national climate services the GFCS will need to implement activities given Appendices X and XI which, in most cases, address GFCS CD activities. The GFCS working with relevant UN Agencies, programmes, institutions, and other stakeholders will have to follow an approach with these steps:

- Develop, in-2013, an action plan on how the GFCS is to be implemented to address the priority sectors in the countries that need basic climate services; and Identify areas for initial implementation;
- Between mid-2013-2017, initial implementation of the activities as planned; and
- Between 2018-2022 Assess progress and expand implementation to new sectors and areas as necessary.

For example in implementing activity number 2 on training of personnel from climate services, it will be necessary for the GFCS to collaborate in planning and implementing the activity with all relevant stakeholders including the WMO and its co-sponsored programmes, academia and research institutions and other relevant programmes from other UN agencies. This will help in identification of the required activities to meet the demand of the countries and stakeholders that need support to establish or improve their climate services through enhanced capacity of human resources. Through this planning which involves all relevant partners, a strategy will be developed that will guide the implementation process of that particular activity. It is important to note that there may be need to organize a meeting for these people to come together during the planning or initial stage and follow up meetings during the implementation stage of the activity as necessary.

This strategic approach could be followed for the implementation of all the other proposed activities described in Appendix XI.

2.7 *Monitoring and evaluation of the implementation of activities (including monitoring success)*

The implementation of activities will need to be continuously monitored both at the implementation plan and project level to ensure that the process is moving in the right direction and to solve problems that may occur in the process. Whilst the overall governance will be a decision of the governing body and individual projects will be overseen primarily by the project's implementation partners, it will be necessary to develop a GFCS Monitoring and Evaluation (M&E) Plan approach to be able to evaluate progress. Most importantly, the M&E approach should assist the governing body to monitor and evaluate how the overall objectives of the Framework are being met, that is, how the use of quality climate information fares within the priority sectors of the GFCS.

2.8 *Risk management in GFCS Capacity Development*

The risks associated with the GFCS can be summarized as follows:

- Poor or incomplete information on the needs of service providers and end-users;
- Poor or incomplete definition or too wide a scope of the needs from the GFCS pillars;
- Inefficiencies or ineffectiveness of the processes and procedures for identifying and resourcing GFCS "approved" Capacity Development activities;
- Misusing or moving the funds to other areas;
- Implementation difficulties of the Capacity Development activities;
- Problems related to long term sustainability of the Capacity Development activities;
- Interests of stakeholders not converging into the stated objectives;

- Not involving the right people in particular activities that are being advanced and thus the cooperation and coordination expected are not achieved;
- Poor coordination of interdependent projects;
- Partners do not cooperate in defining the full requirement of the required information;
- Duplicating activities that are already being implemented by other stakeholders.

For a pillar like UIP most of the above risks can be addressed through clear, decisive leadership from the highest level of governments and other institutions, as risk stems from inherent defensiveness within bureaucracies at departmental/institutional or sectional level. Much too depends on how the interaction between the private and public sectors is established, which will vary between countries. Mobilizing and sustaining financial resources at global, regional, and national levels will also be important factor.

At an individual project level in the implementation of such a complex multi-national and multi-institutional structure there will always be risks involved which will somehow affect the implementation of the GFCS. Active project management should be able to identify and control such risks. In such cases the multi-partner and multi-national aspects of GFCS related projects suggest that the following risks need to be addressed:

- Falling short of funds before completion of the activities;
- Stakeholders not being wholly supportive to the activities;
- Poor leadership in implementing the various activities;
- Lack of transparency in the management of the implementation of the activity;
- The potential for inadequate implementation if human resources are not available.

To manage these risks it will be necessary to spend time at the early planning stage of implementation, to identify likely risks and their risk mitigation strategies that will need to be taken in order to rectify the situation.

3 ENABLING MECHANISMS

3.1 *Synergy with existing activities*

There are many activities on capacity development that are currently being implemented at global, regional and national levels which are similar to the GFCS's planned capacity development activities. The UN system through its different programmes is already carrying out many relevant capacity development activities such as those on developing human resource, infrastructure development, procedural issues and user capacity. FAO, WFP, IFAD, WHO, UNDP, World Bank, International Strategy for Disaster Reduction (ISDR), WMO through its various programmes, UNESCO with its Intergovernmental Oceanographic Commission (IOC), co-sponsored entities such as Global Ocean Observing Systems (GOOS), GCOS, WCRP and many others all have some capacity development activities which are similar to the GFCS's capacity development activities in those areas given above (see also Table 1). Similarly there are some regional and sub-regional entities that are either implementing or supporting these activities. It will therefore be important for GFCS, during its implementation stage, to partner with such entities that are implementing activities with objectives similar to its capacity development pillar and provide a mechanism for these agencies to exchange relevant information on their activities. This would reduce risk in duplicating activities thus saving resources that can be used in other areas of implementing the GFCS.

3.2 *Building national, regional and global partnership*

In order for the GFCS to successfully implement its activities for all its pillars it will be necessary to have strong partnership with various entities and stakeholders at national, regional and global levels. This would require infusion of highly-skilled human scientific talent via training and capacity building, especially through young scientists and, importantly, in the developing regions of the world. Developed countries must work with developing countries in transferring capacity, technology, education and computing facilities.

3.2.1 Building National Partnership

At national level, during the implementation of the GFCS, strong partnerships are needed with the national climate services providers which in many countries, especially the Developing and Least Developed Countries are the NMHSs. Partnership with these institutions is important because these are the institutions providing climate information and products to various users at the national level and work with entities such as Red Cross, NGOs and others that use the information to address issues at grassroots communities. The capacities range from human resources, infrastructure user interaction and others. In addition to the partnership with national provider institutions the GFCS will need to partner with other national stakeholders including research institutions, universities, private sector, government departments and others that address issues relevant to climate variability and change. Partnership with NMHSs will also be important in facilitating establishment of national framework for climate services which aim at linking together national providers and users of climate information. The working mechanisms of partnership and collaborations would conform to either existing national level arrangements or forge new relationships through the respective NMHSs.

Country assessments are needed to accurately determine the scope of required capacities and help formulate appropriate capacity development responses, as well as to better prioritize investments. Therefore under the GFCS strong partnerships will be necessary, between NMHSs and other national climate services providers through facilitating the following:

- Assist Member Countries to in identifying capacities needed to meet national priority-driven service requirements;
- Assist countries to engage grassroots agencies in using climate information and products;
- Assist countries in identifying deficiencies through role and operation of national climate services providers guidance material and country assessments. Expected role of national climate services providers in national and international contexts will be used to inform the process;
- Categorize climate services providers according to the level of services and use the categories to guide assistance given to achieve GFCS' addressing its priority areas. The categories will also be linked to the human, institutional, infrastructural and procedural capacities needed to provide the corresponding levels of service.

3.2.2 Building regional and sub-regional partnership

There are already a number of regional and sub-regional entities at regional level that are providing capacity development activities on climate services. These activities include modelling and climate prediction, packaging of information and supporting national climate services providers in the region. These institutions include such as those of ICPAC in Nairobi (Kenya), Centro Internacional para la Investigacion del Fenomeno de El Nino (CIIFEN) in Guayaquil (Ecuador), the African Centre for Meteorological Applications and Development (ACMAD) in Niamey (Niger), Beijing Climate Centre in Beijing (China), Tokyo Climate Centre in Tokyo (Japan) and others. There are also regional entities that provide resources to build capacities of regional institution working on climate issues. These include regional banks, Regional Economic Communities and others. Therefore The GFCS will have to partner with these regional institutions so that it can benefit from the experience they have gained so far.

3.2.3 Building global partnership

Partnership of the GFCS on capacity development with relevant global entities is necessary for its short- and long-term sustainability. At global level there are global centres that produce climate products which are received at regional level and are then downscaled at regional and sub-regional levels. There are also the UN Agencies and programmes which have good capacity development programmes which range from human resources through infrastructural tools and software. Details of some of these activities are elaborated in the other GFCS Annexes and Exemplars. The GFCS will have to partner with these entities to ensure that the products provided meet the demands/needs of the users.

3.3 Communication Strategy

The Framework being a multi-agency, multi-institutional and an intergovernmental body will need to establish a system of communication, both at global, regional and national levels, which will be responsible for issuing reports regularly on the activities of the Framework to all involved institutions and the general public. Therefore an overall Communications Strategy for the GFCS will need to be developed that will have a list of objectives and will identify ways of achieving them, involving a wide variety of communications methods and media.

Among the objectives of such an overall Communication Strategy will be to:

- Create and increase awareness of the need for, and benefits of, climate services in helping all of society adapt to climate variability and change;
- Engage support for the Framework from all stakeholders, including the user community, the service developers and providers, governments and donors by promoting the significant benefits the Framework will bring and how it will achieve them, and through dialogue, foster a sense of ownership among stakeholders to ensure the long-term viability and success of the Framework;
- Strengthen brand recognition of the Framework so that communications are spread outwards from the Framework by different stakeholders and actors in a dynamic and interactive fashion which gains its own momentum;
- Improve climate literacy in the user community through a range of public education initiatives and on-line training programmes. The Framework, through the UIP, will address the need for advocacy of climate services to the global, regional, and national level communities and the opportunities for sector-oriented training and related capacity development initiatives.

Information on the GFCS would be passed to all interested parties through various forms of media and a mailing list available within the responsible secretariat. The media, in all its forms (the printed media, the electronic media, internet and telephone) can be used for this purpose depending on who needs the information, effectiveness of the method and at what time. In this case the private sector, through its heavy involvement in all major forms of media content, is a critical intermediary in the consumption of climate services. Beyond this arrangement many other intermediaries could assist the flow of climate information to individual users at different level including communities. Many non-governmental organizations working in disaster and humanitarian relief are consumers of climate services and act as intermediaries passing on advices and warnings to local communities who are the end-users. Local and provincial governments, with planning and disaster management response responsibilities are consumers of climate services and can also act as intermediaries, passing on climate information to end-users.

Reports on the Framework's pillars' activities presented at various meetings, conferences and workshops/seminars will also help to communicate messages on the activities of the relevant pillars if not the Framework as a whole.

These efforts will help the GFCS pillars in:

- Contributing information that will strengthen the central, positive message about the value of climate services;
- Providing information on links with other activities and reporting on early success stories;
- Provision of information that shows its relevance to the activities of GFCS;
- Using its direct contacts with the user communities and with intermediaries to promote GFCS in appropriate ways.

4 RESOURCE MOBILIZATION

There are Foundations, Bilateral and Multilateral funding mechanisms, international agencies that provide funding in the countries but in most cases funding from these bodies comes through national governments. It is important to note that funding at national level depends very much on how the government prioritizes the sector. If meteorology is among the high priority sectors in the

country then it will be among the sectors to get government funding and also funding from bilateral and multilateral funding mechanisms, and international agencies as the priority for funding from these bodies is usually vetted by the government. It is noteworthy that in a number of countries, governments have experienced the catastrophic climate related disasters that impact their nations and have realized the need to adapt to these impacts and mitigate them. Therefore some governments have realized the need to invest in the meteorological sector and giving it high priority within their national budgets and provide support to the sector in getting funding from external entities. Funding from private sector and foundations is not yet a common thing especially in developing countries where priorities could be on other social issues not climate services. Therefore the GFCS, during its early part of implementation, need to work with climate services stakeholders to sensitize governments, through showing the economic value of the climate services, and thus the need to invest on them. Ways in which , GFCS will assist the climate services providers in their efforts to demonstrate the social and economic value and benefits of weather, climate and water products and services at national, regional and global levels are described in Appendix XII.

5 COSTED SUMMARY OF ACTIVITIES/PROJECTS

The successful implementation of GFCS will be a flagship activity and should assist all countries improve the security and safety of their citizens, minimize the risk of property and economic loss as a result of climate change and variability. Global collaboration, coordination and good-will are necessary for this to occur, in no other area more than capacity development. The summary of proposed activities and projects including estimated costs is given in the Table 2 in Appendix XIII. The cost estimates are for the implementation periods of 2012-2013 and that of 2014 to 2017. The cost for the activities between the period 2018 to 2023 will be determined at an appropriate time during the initial implementation period and its estimates, as per the HTF Report budget for capacity development activities, will be within the range of those considered for the period 2014 to 2017.

APPENDICES

APPENDIX I: EXISTING CAPACITY DEVELOPMENT ACTIVITIES IN THE GENERATION OF CLIMATE INFORMATION AND PRODUCTS.

1. A tiered approach

The HLT Report provided detailed information on those activities which are being implemented at national, regional and global levels to address generation, provision and user advocacy of climate services. These activities are grouped into four main areas that include developing; capacity for the generation of climate information; capacity for Climate Information Users; Infrastructural capacity; and, International Collaboration in relevant capacity development activities.

With respect to global and regional capacity development for provision of climate services, the United Nations (UN) Agencies and other partners have realized that it is not possible in the short term to build the capacity of each provider institution to the level of being able to support advanced climate services. Therefore with this understanding, WMO and partners are creating networks of global and regional operational centres to assist the World Meteorological Organization Members and their institutions including NMHSs to meet the climate –related needs of social and economic systems in their countries. This worldwide three-level structure includes (inter alia) National Meteorological and Hydrological Services acting on a national scale, WMO Regional Climate Centres (RCCs) providing sub-regional, continent-wide climate information and services as well as WMO Global Producing Centres (GPCs) of Long Range Forecasts (LRFs) that deliver global-scale information and services. The WMO initiative of establishing RCCs is the responsibility of its CCI and CBS and relevant programmes, and its constituent body, the Executive Council (EC), whereas at present, GPCs are designated through CBS and EC. These centres are being established in collaboration with the respective regional member countries, regional economic groups in some cases, and the WMO Regional Associations. GPCs and RCCs are established and operated as Centres of Excellence, and the criteria for their designation are within the WMO Technical Regulations.

The above initiatives ensure that all the global and regional entities that have been (or will be) developed and operated as designated entities of WMO, will abide by the relevant WMO and other partners standards, regulations and data policies. It is important to note that it is recognized and respected within the three level structure that services on a national and local scale (which is probably the most relevant to climate services) and most direct user-liaison should be provided by national institutions except where all parties agree otherwise.

Issues and concerns related to providing global and regional climate services vary by location and circumstances. In most cases global and regional centres operating in developed countries experience relatively fewer and less serious financial, human resources and infrastructural problems than those operating in developing countries. Centres operating in developing countries not only face a lack of sustainable financial resources to support the infrastructure and operations, but they also often lack qualified new recruits and insufficient funds for training of personnel and insufficient Internet and communications functionality.

The current infrastructural capabilities of national climate services providers can be gauged from the following classification: basic, essential, full and advanced capacities (see Fig. 1). For example, the NMHSs classified at present in basic and essential categories (i.e. minimum to average provision of climate services) are in many cases from developing and least developed countries (notably, several developing countries function at a strong level in climate services, and are technically advanced). In some countries with basic to essential only capability, some effort is currently made to improve their infrastructure of observation network, and product generation and communication facilities, and in training for seasonal prediction, data rescue for example in order to help them improve their capacities in provision of climate services. These efforts are in most cases not coordinated or systematic, and there is inadequate funding to address all gaps.

2. Human capacity in the generation of climate information

There are a number of UN Agencies such as WMO, UNEP and UNDP and other international organizations and institutions that have and still continue to build human capacities of climate information providers. The World Meteorological Organization, as a UN special Agency in weather, water and climate has played a leading role in coordinating the development of weather and climate scientist skills through promoting access to training programmes by providing fellowships, relevant technologies, manuals, guidance documents, technical papers and workshops and by development of the appropriate competencies for climate work that will affect education and recruitment of new staff for a range of climate activities that will be increasingly developed under GFCS. There are currently 23 World Meteorological Organization Regional Training Centres and a network of cooperating universities and advanced training institutions that contribute to the education and training effort in meteorology and hydrology as well as to establishing and developing specialized centres of excellence in various regions, especially, Developing and Least Developed Countries. The main focus of training activities in Regional Training Centres (RTCs) has been and currently still is, however, on training of weather forecasters and meteorological technicians for weather services, rather than on training climatologists and meteorologists for climate services.

While most of the focus has been and currently still is on training of weather forecasters and meteorological technicians rather than climatologists per se, there has been progress made in many parts of the world through World Meteorological Organization Climate Information and Prediction Services (CLIPS) training workshops (WMO, 2011h) which have helped to create some national capacity to develop and deliver climate information including seasonal outlooks. Furthermore considerable effort has been made by CCI in conducting training for meteorological personnel in climate activities for Data Rescue (DARE), in data management and the use of Climate Database Management Systems (CDMS), as well as in development of climate indices for climate change detection.

Since the late 1990s there has been progress made in many parts of the world in climate training, through the World Meteorological Organization Climate Information and Prediction Services (CLIPS) Project. CLIPS training workshops have helped to create national capacity in developing countries to operationally produce and deliver climate information including seasonal outlooks. CLIPS and other training programmes targeting the development of seasonal climate forecasting expertise have been held around the world, with support from centres such as the IGAD Climate Prediction and Application Centre (ICPAC) in Nairobi, Southern African Development Community (SADC) Climate Services Centre (CSC) in Botswana, Australian Bureau of Meteorology, the China Meteorological Administration, the United States-based International Research Institute (IRI) for Climate and Society, the Korea Meteorological Administration, the United Kingdom Met Office, Météo-France, Tokyo Climate Centre, the Climate Prediction Centre (CPC) of the United States National Oceanic and Atmospheric Administration (NOAA) and Ministry of Earth Sciences in India. Many of these programmes have been hosted by WMO Regional Climate Centres and other centres dealing with regional climate issues and have undertaken fairly regular capacity development activities linked to the Regional Climate Outlook Forums (RCOFs).

WMO hosts other climate-relevant training activities, including the Global Atmospheric Watch Training and Educational Centre (GAWTEC) training initiative of the GAW programme, which develops capacity in the specialized field of atmospheric composition monitoring, calibration standards and data quality control. As well, WMO Members such as USA (COMET) and UK provide comprehensive training in basic climatology and in climate statistics through online activities and workshops.

A number of academic institutions including universities and research centres in many parts of the world have continued to contribute in the training of experts in various aspects of climate and climate services, and in a number of Universities, climate has now become part of their curriculum, in addition to the more typical meteorology and geography degree programmes. For example in Africa, the University of Nairobi (Kenya) has been offering a Science Master's degree in Climate

Change. The contribution made by such institutions in developing capacities, especially human resources and research, in the area of climate services cannot be underestimated.

To accomplish its mission, the World Climate Research Programme (WCRP) in collaboration with other partners engages the international Earth/climate system science community and forges strategic partnership to ensure a vibrant workforce who will guide the Programme and support its goal and objectives. Therefore the WCRP long-term success depends on continued engagement of international science community, especially those from developing nations, through strategic partnerships with WCRP sponsors- the International Council for Science (ICSU), the Intergovernmental Oceanographic Commission (IOC) and WMO and sister organizations such as the Global Change System for Analysis, Research and Training (START), Asia-Pacific Network for Global Change Research (APN), International American Institute (IAI), and others. Through its activities and under the strategy for education training and capacity development WCRP is striving to respond to the current emerging needs from climate services providers and users through building climate research capacities and communicating science to the public worldwide and especially in developing regions. In this regard WCRP's significant contributions, through its various co-sponsored training activities, have been:

- To facilitate and coordinate climate research, modelling, analysis and prediction to provide the required science-based climate information to decision-makers;
- To assist the research community and institutions of higher learning in education, training and development of next generation of climate scientists;
- To provide greater opportunities for the early career scientists, especially those from developing regions, to become more active in global , regional and national climate research and application;
- To empower young generation of climate scientists to be more active and gain experience in analysis and interpretation of climate information to serve the needs of decision makers and experts who are pursuing climate adaptation and risk management planning;
- To establish an effective dialogue with decision makers, politicians and those responsible for socioeconomic development by finding a common language in using the latest knowledge based information.

The World Climate Research Programme, the Global Climate Observing System, the World Meteorological Organization and the Nairobi-based IGAD Climate Prediction and Applications Centre (ICPAC) joined together to implement a project to demonstrate key elements of an effective climate risk management strategy for the Greater Horn of Africa region (WCRP, 2011). This activity provided opportunity for providers and users to interact and build capacity of participants from IGAD countries. The organizers were greatly assisted by volunteers from the UK Met Office and the UNDP Africa Adaptation Programme.

There have been numerous programmes to train scientists in generating downscaled climate change scenarios. For example, the Abdus Salam International Centre for Theoretical Physics in Italy hosts regular workshops and online training opportunities for scientists from developing countries. Another active player has been the United Kingdom Met Office, which frequently holds workshops for its downscaling model that include discussions concerning data requirements for impact assessments. Also, in the cooperation programme conducted by the Conference of Directors of Iberoamerican NMHS, several workshops for generating regional climatic change scenarios have been carried out for the particular region.

Although there has been much effort in the aspect of capacity development of human resources through training to support providers to develop and deliver climate services, lack of resources and coordination have continued to be a major problems. Unfortunately, not enough experts from developing countries have been trained through these efforts, as many of these depend on financial support provided from developed countries. In addition, lack of resources and sustained commitment also prevents keeping skills of personnel that have had training up to date with new advances. A vision of continuous learning and improvement is needed in an ongoing operational GFCS.

3. Infrastructural capacity of climate information and products for providers

Some efforts have been going on in various countries to address institutional and infrastructural capacities for climate services, for example WMO through its Voluntary Cooperation Programme (VCP) and other funded projects such as those supported through bilateral arrangements from the WB and other regional banks, has made considerable effort to upgrade and provide new observations network, computing, communications and data management facilities, and training of personnel. Furthermore through these efforts there have been projects that have made systems such as the Climate Data Management Systems (CDMS), software, Internet access, communications mechanisms and others to be made available in some of the Developing and Least Developed Countries (LDCs) and SIDSs.

In terms of institutional infrastructure, some efforts have been made to support the strengthening of various NMHSs and other relevant institutions in developing countries to help them achieve capacities to provide the required information, products and services. Also, efforts have been made to strengthen and establish global and regional climate centres to enable them play their roles effectively, with a view to developing information and products that will enable some provision of climate services in all countries. However, despite of these efforts not nearly enough attention has been paid to the needs in developing countries for the observing system infrastructure needed to provide the density of climate observations needed for a full range of climate services at national scales for a broad spectrum of user needs.

Furthermore some effort has been going on by environmental space agencies to improve climate observations made from the space satellites. This information has been very useful in the climate modelling aspects. Some effort has also been made to improve and provide data and products receiving facilities, from these systems, in developing and Least Developed Countries

Unfortunately these processes sometimes have been implemented in a piecemeal and not a staged and well coordinated way, which is something that may need to be addressed by the GFCS through its pillars during its implementation stage. There also have been some efforts through programmes such as those of World Weather Watch (WWW) and Global Climate Observation System (GCOS) to repair, upgrade, and establish observation networks and installation of new sites.

In addition there have been problems for developing countries of lacking the necessary infrastructure to support high speed internet and communication links which are needed to support activities on exchange of data, information and products.

4. Institutional capacity of climate information and products for providers

The roles that various institutions should play in a national climate services matrix need to be defined so as to identify how authoritative information on climate services can be provided. Although in many countries the NMHSs are the institutions responsible for provision of climate services, this may not be the case for all countries. In some cases, other institutions are given this mandate. In a number of countries, currently effort is being made to define which institution is responsible for provision of the various climate services or how the provision should be structured so that the optimal benefit of all national efforts can be attained. This will require relevant national legislative and policy frameworks to be developed and be clearly defined. Though in some countries the NMHSs will play a key or a leadership role, in some countries improvements in their management structures and procedures and in their staff complements may need to be implemented first. Under the GFCS, through its Pillars especially the Capacity Development Pillar, this effort will be necessary in supporting countries to clearly defining the responsible structures with their terms of references for providing climate services in the countries. In line with this effort the optimal approach would be for countries to establish some national coordination mechanisms, where possible led by the NMHS, such as the proposed national framework for climate services if they decide to do so.

5. Procedural capacities of climate information and products for providers

In order to define and enable best practices relevant to various GFCS operations, agencies such as the WMO through its Technical Commissions including the Commission for Climatology (CCI), Commission for Basic Systems (CBS) and the Commission for Hydrology (CHy) has published Guides to Climatological, Observations and Hydrological Practices respectively which define standards for observations, data processing, basic statistical analyses along with presentation and interpretation of climatological information. In addition, the Commission for Atmospheric Sciences (CAS) has, through the GAW Programme, provided relevant guidance on the procedure applicable to atmospheric composition observations and data processing. While CBS has provided standards that have been specified and to a large degree implemented for producing seasonal forecast products from global models, no such standards yet exist for regional or national seasonal-scale forecasts based on statistical models or for model-based on downscaled forecasts. There is a range of software products that have been developed to assist countries in making downscaled and tailored forecast products for a range of timescales, and WMO RCCs also assist countries in their domains with downscaling. Downscaling techniques are supported by the research efforts of the WCRP and other partners. These efforts provide capacities to NMHSs and other relevant institutions for better provision of climate services.

APPENDIX II: EXISTING ACTIVITIES FOR USERS OF CLIMATE SERVICES, INTERNATIONAL COLLABORATION AND IDENTIFICATION OF GAPS ON BOTH PROVIDERS AND USERS

1. Human capacity for users of climate information

Effort has been made in developing human capacity of users of climate information and products both at regional and national levels. Through the Regional Climate Outlook Forums (RCOFs) that are held in various regions of the globe, often through the coordination of WMO RCCs and other regional climate centres, users from various sectors are invited to participate in these forums as part of understanding the interpretation of the products and how to apply them. This process is translated to the national level where in some countries National Climate Outlook Forums (NCOFs) are held between providers and users to interact on the interpretation of further downscaled versions of the regional forecasts to national and sub-national scales. The participation of users in these processes from various sectors helps to build their capacities in the application of the information, and to understand the processes and problems involved in developing climate products and information.

Even though RCOFs are very much valued by both providers and users as a means of interaction and engagement, the forums are, in most cases, only held either once or twice in a region in a year due to limited financial resources. While this may limit the face-to-face interaction between providers and users of climate services, some COFs are successfully continuing the liaison using electronic means at other times of the year. Whether through face-to-face forums or interactions supported more remotely, COFs at regional and national scale have proven to be invaluable sources of feedback from users to providers of the information and products.

Developing human capacity on application of climate information and products across disciplines to engage in such partnerships and to create competency in using climate information is also required. There have been numerous United Nations-supported human capacity development initiatives, for example START, the United Nations Educational, Scientific and Cultural Organization (UNESCO), and IAI for Global Change Research provide examples of initiatives that develop human capacity in the developing world for scientists, policy makers, technical experts and local communities to enhance resiliency to climate change. Their joint efforts in education, research and assessment, training, curriculum development and communication contribute to better-informed decision making about issues of global environmental change and development. Some specific capacity development programmes of some agencies being implemented globally include the following:

- UNESCO works on education and outreach on climate change and variability and natural disaster preparedness, targeting the general public, educational systems and youth in Small Island Developing States and Africa. Regular interactions between climate information providers and users are enabled through these Climate Change Fora. Its Natural Sciences sector implements major international science programmes while promoting national and regional science and technology policies and development. These programmes include the Intergovernmental Oceanographic Commission, the International Hydrological Programme, the Man and the Biosphere Programme, the International Geoscience Programme, and the Abdus Salam International Centre for Theoretical Physics, each of which has capacity development programmes;
- A number of capacity development programmes specifically for promoting dialogue between climate services provider and user communities are beginning to be developed such as those from WHO (WHO, 2011). Other examples include the Summer Institute on Climate and Health run by the International Research Institute on Climate and Society, the Center for International Earth Science Information Network and the Mailman School of Public Health bring climate scientists and health specialists together to impart a mutual understanding of the role climate plays in driving the infectious disease burden and public health outcomes as well as how to assimilate climate information to improve the decision making process in public health;

- In recent years, the Public Weather Services Programme of WMO helped establish and strengthen “*Climate and Health Working Groups*” in a number of countries in Africa. These involve service providers and users and promote interdisciplinary assessment of socio-economic benefits of meteorological and hydrological services. In particular, the working groups address the specific needs of the health sector, as a user community for climate and weather information. The Climate and Health Working Groups work to develop national capacity and key outcomes are elaborated in Box 5 of the UIP Annex;
- The UNDP - Global Environment Fund (GEF) unit (UNDP-GEF, 2011) supports developing countries to make low-emission, climate-resilient environmentally sustainable development not only possible, but also economically attractive. To achieve this, capacities are developed to put in place the right mix of regulatory and financial incentives, remove institutional and policy barriers, and create enabling environments that attract and drive private sector investment into green development. In doing this, UNDP/GEF assists partner countries to access, combine and sequence resources from a wide range of funds, and financial instruments and mechanisms. Over the past 18 years, UNDP has helped developing countries access more than \$3.3 billion in project financing from the GEF Trust Fund and associated Least Developed Countries Fund and Special Climate Change Fund through GEF-4, as well as leveraging an additional \$9.2 billion in co-financing. The GEF operates as a partnership between three Implementing Agencies — UNDP, UNEP and the World Bank — and seven Executing Agencies (Asian, African, and Inter-American Development Banks, the European Bank for Reconstruction and Development, FAO, IFAD and United Nations Industrial Development Organization (UNIDO), to integrate global environmental benefits into county-led development. UNDP-supported programmes and projects with GEF financing are normally developed and executed by national governments, although international agencies and Non-governmental Organizations (NGOs) are used on occasion. A wide range of public and private sector agencies and institutions, including local communities, are involved in project implementation. These programmes and projects are mainstreamed into overall UNDP operations and are primarily managed by UNDP’s network of over 140 country offices;
- UNDP supports developing countries and countries in transition with Climate Risk Management. For example, The Central Asian Multi-country Programme on Climate Risk Management (CA –CRM) is a four year programme to assist five Central Asian countries to adjust their national development processes to address risks posed by current climate variability and future climate change (one is Turkmenistan: http://www.undptkm.org/index.php?option=com_content&task=view&id=1067&Itemid=43);
- UNDP supports development of national communications for UNFCCC (see example at: <http://ncsp.undp.org/document/enabling-activities-preparation-ghanas-second-national-communications-unfccc>);
- The Food and Agriculture Organization works to raise levels of nutrition while improving agricultural productivity. National Forums and Farmer Field Schools are a good means of educating the agricultural users to the decision support tools and products available. Multi-agency meetings are used to engage stakeholders to assess their needs, prepare agro-advisories, and, re-evaluate the results of the products and services provided to the user communities. The WMO Agricultural Meteorology Programme has also conducted a very effective Roving Seminar Training series for over a decade on many operational agricultural meteorology applications. Through Farmer Field Schools, climate service information can reach the farming community. Non-Governmental Organizations have been instrumental in setting up telecentres in remote areas of Least Developed Countries;
- The WMO, WB, UNDP, UNISDR and bilateral funders such as the European Commission are collaborating on disaster risk reduction national and regional capacity development projects in South East Europe, the Caribbean, and Southern Asia. The projects involve regional and national institutional and operational mapping; user-driven assessment of gaps, needs, prioritization and requirements; strengthening of disaster risk reduction policies, institutional roles, partnerships and capacity development; and strengthening of regional specialized meteorological centres, regional climate centres and national meteorological and hydrological services to improve meteorological, hydrological and climate services;

- The WB has a number of relevant activities on capacity building in partnership with other entities/governments which addressing various aspects that are related to impacts of climate variability and change and the associated adaptation and mitigation measures.

2. Developing infrastructural and procedural capacities for users of climate information

There are efforts being carried out on building infrastructural and procedural capacities for users of climate services. These efforts, among others, include the following:

- The Intergovernmental Panel on Climate Change (IPCC) Assessment Reports that constitute the most obvious example of best practices for translating climate data into decision-relevant information through involving extensive collaboration between climate and sectoral scientists;
- There exist a number of United Nations-driven efforts to promote the engagement of producers and users through getting together beyond the scientific community and on regional, national and local levels. These efforts include those of the Food and Agricultural Organization and the World Meteorological Organization through their projects and meetings/workshops/seminars;
- There are effective examples taken from United Nations agencies such as UNDP, WHO and UNEP as well as from a number of countries and academia and research institutions to translate climate information into impact assessments and policy guidance including the insight gained from the annual production of the Greenhouse Bulletin by GAW;
- There are national examples from countries such as Kenya, Mali and others that illustrate application of climate information at seasonal scale into policy guidance;
- A few institutions from user communities have recognized the need to invest in raising awareness and translating climate information. One such example is the Red Cross/Red Crescent Climate Centre which interacts with groups including the National Meteorological Services through the World Meteorological Organization and the International Research Institute (IRI) for Climate and Society and other scientific research groups to develop information products tailored to the movement's specific needs. The Red Cross/Red Crescent Climate Centre provides an example of how to build communities that represent users of climate information and that are able to engage with the scientific community;
- In a number of countries (including Developing and Least Developed Countries) effort is being made to make arrangements with mobile phone providers to facilitate the provision of their climate information and products through mobile phones.

3. International collaboration to build capacity

In the past interaction on climate issues between centres and experts in developed and developing countries around the world has generally been weak or sporadic. However, since the late 1990s there has been significant improvement where experts from developed countries have partnered to work with scientists from developing countries. Experts from developed countries have participated and contributed in developing the RCOF products which in most cases to date have been developed for tropical countries (there is reasonable skill at seasonal scale in tropical regions, and considerable need for climate products due to high vulnerability). Students from developing countries pursuing studies in climate variability and change and other related areas have been admitted to study in North American and European institutions in countries like Norway, Great Britain, USA, Canada, France and others. Institutions such as the United Kingdom Meteorological Office, Japan Meteorological Agency (JMA), and IRI in USA have helped to build capacity of experts from developing countries especially from Africa, Asia, and South America by working with them. For example some very useful prediction tools and software that are being used by developing countries have been developed by government agencies and in institutions in academia from developed countries.

Support on infrastructural capacity development to developing countries has been given by developed countries and from multilateral funding mechanisms and international agencies. But some climate services provider institutions in these countries still lack the capacity to meet the needs of their clients because of a number of factors that may include: lack of available people to

be trained; the support provided is inadequate; and countries are slow in implementing some of the support they receive.

In some cases South–South cooperation has played a major role in building capacities of personnel, infrastructure and institutions between countries. For example countries from Africa have got support from countries in Asia and similarly countries within Africa have supported one another. Through GFCS these interactions will need to be maintained and enhanced. Another example is the cooperation programme between Iberoamerican NMHSs (including Spain and Portugal) through which several training activities have been conducted between Services and also the development of a common Database Management System of Hydrometeorological data, that was given to WMO to be used for interested NMHSs.

4. Identified gaps in developing capacities of providers and users of climate information

Despite the fact that there has been significant effort to develop capacities of institutions to facilitate improvement in the provision of climate services and their uptake by users, there still exist major gaps which the GFCS through its pillars, especially the CD Pillar, will have to address in its early part of the implementation. From a preliminary analysis carried out by HLT on the national capacities to provide climate services, it was found that about 70 countries (of the World Meteorological Organization's 189 Members) do not have the necessary capabilities for essential climate services at present and recommended that a high profile programme of fast-track projects be established to develop the capacities of these countries over the two four-year periods 2014–2017 and 2018–2021 after a two year planning and fast tracking phase (2012–2013). The results of the analysis showed that six countries have extremely limited national climate services capacity and that a further 64 countries, 36 small and 28 large, are in need of strengthening but nonetheless have a viable meteorological service already, with basic weather forecasting and climate services capabilities and a staff with relevant skills in forecasting, analysis and statistics. The proposed capacity development training will be coordinated in stages, starting with the needs for basic, essential and then full suite of services. This training schedule will elevate centres to increased functionality over a period of time. In addition, the HLT estimated that an additional 2500 staff around the world would need to be trained/recruited to produce the climate information and products required by users in a fully operational and effective GFCS. Hiring new staff would be needed to manage the increased workloads, and to bring on board new competencies that may not typically be found in small Institutions. This programme is focused on developing personnel and service delivery capabilities of the NMHSs and other national climate services providers.

APPENDIX III: PROGRAMMES, CO-SPONSORED PROGRAMMES AND CONSTITUENT BODIES

1. WMO Executive Council Working Group on Capacity Development

The WMO Executive Council Working Group on Capacity Development is mandated with a responsibility for a continued mechanism to review on a regular basis issues related to capacity development of WMO Members in respect of the eight Expected Results of the WMO Strategic Plan (2012-2015) (WMO, 2012), in particular Expected Result 6: Enhanced capabilities of National Meteorological and Hydrological Services in developing countries, particularly least developed countries, to fulfill their mandates. The Working Group recognized the need for better coordination of the WMO priorities: Disaster Risk Reduction (DRR), GFCS, Aeronautical Meteorology and WMO Information System (WIS)/ WMO Integrated Global Observing System (WIGOS) to be included in the WMO Capacity Development Strategy (CDS) which the group is currently developing. The Working Group has agreed that in order to capture capacity issues holistically, the WMO CDS needs to focus on the following four areas of capacity: Human Capacity, Infrastructural Capacity, Procedural Capacity and Institutional Capacity in national, regional and global contexts for all its programmes including the GFCS which will specifically be addressing issues related to climate services. The WMO CDS is expected, among others, to:

- Facilitate the transformation of NMHSs by developing upon existing capacities in national systems while ensuring strengthened capacities are an integral part of WMO's global and regional priorities, Technical Commissions as well as WMO co-sponsored programmes where applicable, and embedded in National Development Plans;
- Integrate and harmonize capacity development activities within WMO priority areas (GFCS, WIGOS/WIS, Quality Management System (QMS) in Aeronautical Meteorology and DRR), as well as capacity development activities of external organizations and partners of WMO with agendas to strengthen NMHSs of countries;
- Better mobilize and channel financial resources to leverage funds while reducing duplication;
- Enable coalition building of partners and stakeholders at national, regional and international levels and will involve identification and engagement for strategic partnerships and synergies and the sequencing of joint activities in a programmatic approach aligned to the WMO Strategic priority areas to ensure sustainability. Particular emphasis on internal national partnerships to secure ownership and commitment by national governments;
- Harmonize the monitoring and evaluation of activities at all levels of programming and optimize resulting knowledge and lessons learned by wide dissemination to inform decision making and programme improvement.

It may be important to note that there are many times a disjoint between training intervention and the career pathing of scientists that have benefited from these interventions. The human capacity develop is not about ad hoc interventions but a lifetime, structured intervention where the employers, universities and research institutions should work as a team on a common plan for the individual.

2. WMO Technical Commissions

WMO has eight Technical Commissions (see WMO-No. 15 (edition 2011), 2011b) with the purpose to study and make recommendations to Congress and the Executive Council on subjects within its terms of reference and in particularly on matters directly referred to a Commission by Congress and the Executive Council. For example the role of CCI is to stimulate, lead, implement, assess and coordinate international technical activities within WMO under the World Climate Programme and the Global Framework for Climate Services to obtain and apply climate information and knowledge in support of sustainable socio-economic development and environmental protection (WMO, 2010). It achieves its mandate through a network of experts who are serving the four panels on: climate data management, climate monitoring and assessment, climate products and

services and their delivery mechanisms, climate information for adaptation and risk management. The expert teams associated with these four panels are addressing issues that concern the generation, provision and user involvement activities on climate services. A number of activities under the World Climate Programme which CCI implements are involved with capacity development on climate services. These include the CLIPS Project, GPCs, RCCs, RCOFs, Climate Data Management Systems (CDMS) and the preparation of the Guide to Climatological Practices and others. Furthermore CCI established an Expert Team on Strategy for Capacity Building for Climate Services (ET-SCBCS). A tremendous network of climate experts is developed through the activities of these teams.

The GFCS will benefit from the activities of CBS and more specifically from WIGOS of the World Weather Watch, which is an all-encompassing approach to the improvement and evolution of WMO global observing systems. WIGOS will foster the orderly evolution of the present WMO global observing systems (mainly Global Observing Systems (GOS), GAW observing component (guided by the Commission for Atmospheric Science CAS), World Hydrological Cycle Observing System (WHYCOS) (guided by CHy), and the cross-cutting Global Cryosphere Watch (GCW)) into an integrated, comprehensive and coordinated system. It will satisfy, in a cost-effective and sustainable manner, the evolving observing requirements of WMO Members, while enhancing coordination of the WMO observing system with systems co-sponsored by international partners which includes GOOS, Global Terrestrial Observing System (GTOS) and the Global Climate Observing System (GCOS) (all coordinated by GCOS, not CBS) and the Global Earth Observation System of Systems (GEOSS) (which is not part of WMO or guided by any of our constituent bodies). WIGOS together with WIS will provide data and distribute these to feed into the production under CSIS of climate information and products and support improved service delivery within the GFCS (WMO, 2011c). CBS, in collaboration with other relevant entities in GFCS will support the improvement of the observing networks of WMO and partnering agencies, and the necessary communications facilities.

There are a growing number of joint initiatives between CAS and the climate research community in general and WCRP in particular. These include new initiatives on sub-seasonal to seasonal prediction research as well as prediction on both weather and climate timescales. The sub-seasonal to seasonal timescale provides a unique opportunity to capitalize on the expertise of the weather and climate research communities, and to bring them together to improve predictions on a timescale of particular relevance to the GFCS. From the end-user perspective, the sub-seasonal to seasonal time range is a very important one, as many management decisions in agriculture and food security, water, disaster risk reduction and health fall into this range. Improved weather-to-climate forecasts promise to be of significant social and economic value.

The GAW programme also has significant relevance to climate studies and services. It is important to realizing that it is primarily the changing atmospheric composition, especially atmospheric greenhouse gas concentrations, that is the driving force to the changing climate. Therefore the information obtained from GAW is not only a new climate service in its own right but a necessary component in prediction services relevant to the GFCS.

In all WMO Technical Commissions there are significant activities that address capacity development of human resources, infrastructural, procedural and institutional nature which contribute to the implementation of the GFCS. Therefore the GFCS, during its implementation, will need to work with these Commissions in order to benefit from their various relevant activities.

3. UN Agencies regional activities

The WMO has divided the globe into six regional associations which are Regional Association I (Africa), Regional Association II (Asia), Regional Association III (South America), Regional Association IV (Northern America, Central America and the Caribbean), Regional Association V (South-West Pacific), and Regional Association VI (Europe). The WMO Regional Associations have the mandate, among other issues, to develop plans and strategies for capacity development in the Region for Member States within the areas of responsibilities, and have assumed a key role

in the identification, establishment and operations of WMO RCCs. Other UN Agencies such as UNEP and UNDP have regional activities that have relevance to climate services. The structure of those regional activities may not be as those of the WMO Regional Associations but could be addressing activities relevant to GFCS. Therefore the GFCS will have to collaborate with these regional associations and those of other UN Agencies in developing their strategies for capacity development in all the areas that will support production and provision of climate services.

Scientific research is an effective means of capacity development through both mentorship and formal training. The deliverables of the Research, Modelling and Prediction pillar (RMP), and especially the significant increase in the availability of numerical climate predictions on global and regional scales, will enable wide, systematic, and successful capacity development programmes for developing countries. For example, the WCRP Coordinated Regional Climate Downscaling Experiment (CORDEX) is a project committed to develop the capacity for regional climate predictions through the exploitation of dynamical and statistical means of downscaling. The first focus area of CORDEX is Africa. In turn, education and training, as an essential part of traditional capacity development, will help to support the resource base for the RMP pillar of the GFCS. This work should be conducted in coordination with the CCI Expert Team on Capacity Development Strategy for Climate Services.

4. Co-sponsored and other programmes

Implementation of the GFCS will require full engagement in the programmes and working mechanisms of partners at global, regional, and national levels. In most of these programmes the issues of capacity development are addressed. For the observation and monitoring pillar at the global level these include a number of UN agencies, such as UNEP, UNDP, UNESCO and its IOC, UN-Water, ISDR, FAO, IFAD, WFP, UNFCCC, WMO and WHO, and also other systems that these organizations co-sponsor, such as GCOS, GOOS, GTOS, and WCRP activity. They also include initiatives fostering integration of different observing systems, such as WIGOS. Equally important at national and regional scales are the contributions that the NMHSs, national and regional space agencies (for example EUMETSAT), and national environmental agencies make in the aspects of observations.

The observations and monitoring and research, modelling and prediction components of the GFCS is expected to make significant contribution to its capacity development pillar. The representatives of climate research communities will be engaged in activities shaping the GFCS pillars in their various aspects. WCRP future Plans and Priorities are for promoting and supporting development of a vibrant international research network. In order to develop and maintain an effective capacity development thrust, WCRP plans to strengthen those efforts that have proven to be effective, based on the feedback from the participants and/or independent evaluation, as well as forge strategic partnership and alliances with the capacity development organizations with proven successful track records and established networks in developing regions of the world. These partnerships would include international scientific and technical unions, societies and other organizations towards the achieving of its education, training and capacity development objectives. The following are some of the areas identified by WCRP to promote greater involvement of developing-country scientists, early career professionals and students in climate science activities to be sponsored by WCRP:

- i) **Engaging regional experts in climate research, modelling and analysis through:** (1) promoting Regional analysis of global simulations within the Seasonal to inter-annual prediction project and the coupled model inter-comparison project CMIP5, through the regional panels; (2) Analysis of regional modelling outputs within Coordinated Regional Climate Downscaling Experiment (CORDEX) with the initial focus on Africa but later extended to Asia, South America etc.; (3) the monitoring of changes in extremes using the suite of climate indices that describe different aspects of temperature and precipitation extremes, including frequency, intensity and duration - developed by Expert Team on Climate Change Detection and Indices (ETCCDI); (4) support scientists working on climate change adaptation based on models and observations (and reanalysis products),

and the facilitate interactions with interdisciplinary groups from water resources, agriculture, marine sciences, etc. to train a critical mass of local scientists who can appropriately offer local knowledge and expert opinion to interpret climate change information and uncertainties for decision-makers;

- ii) **Scientific Exchange**, to promote visiting of scientists to foster collaboration of institutions and centres in the developed world with scientists and institutions in the developing countries thus developing the capacity of scientists from developing countries to a level at which they can actively participate in the exciting scientific research and generate predictions with comparable skill at national or regional centres;
- iii) **Train-the-Trainers**, to promote and support experts in selected areas of climate science from developed countries to spend several weeks in climate research institutions to provide training for targeted group of scientists based in developing nations. Such initiatives could be achieved through strategic partnership with WCRP sponsors (e.g. WMO, IOC and ICSU) and/or with international partner programmes/organizations such as START, IAI, APN, International Centre for Theoretical Physics (ICTP) and the World Bank;
- iv) **Special Topics Conferences and Workshops**, to promote greater representation of scientists from the developing countries and young scientists in all WCRP planning and coordination meetings, workshops and conferences. Provide global and regional fora for exchange of ideas and knowledge amongst climate researchers and students;
- v) **Summer Schools**, to explore the feasibility of summer schools for both specific WCRP disciplinary themes and interdisciplinary topics. This should be done in collaboration with institutions and projects that have a long experience in organizing such events, such as ICTP, National Centre for Atmospheric Research (NCAR), IRI and IAI. Such efforts should target mainly early career scientists worldwide, with greater emphasis on participation of young scientists from developing regions/nations;
- vi) **Fellowships and Scholarships**, to work closely with its international partners towards the development of a longer-term education programme aiming at supporting the training and education of next generation of climate experts. Activities should be targeted at helping these young scholars to be able to better analyze and interpret climate information products for adaptation planning and risk management.

In addition to WCRP, the research component of GFCS will involve the following main categories of stakeholders:

- WMO constituent bodies and co-sponsored programmes, including all WMO Technical Commissions and Programmes;
- IOC constituent bodies and co-sponsored programmes;
- ICSU constituent and interdisciplinary bodies and co-sponsored programmes;
- Activities and programmes of other UN agencies and programmes;
- National Meteorological and National Hydrological Services;
- Research affiliates of the World Climate Services Programme;
- Research communities affiliated with World Weather Research Programme (WWRP) and World Weather Watch and practitioners, particularly associated with the Global Data Processing and Forecasting System;
- Observing programmes: WIGOS, GCOS, GOOS, GTOS, the observation component of WMO GAW and its contributing networks, etc.;
- Possible “Future Earth” Initiative, the successor to Earth System Science Partnership (ESSP);
- Players in the market of providing value added climate services;
- Research funding agencies;
- Universities and research institutions.

Using these already available opportunities of research activities of these various programmes and institutions will help to facilitate the development of capacity in research for the GFCS for experts in Developing and Least Developed Countries and SIDS.

5. National Meteorological and Hydrological Services

NMHSs are a fundamental part of national infrastructure and play an important role in supporting vital functions of governments in defining development plans of countries on climate impacts adaptation activities. Their engagement with GFCS is essential in view of inadequate infrastructure and limited human resources in some NMHSs, especially in Developing and LDCs, are among the factors that limit their capacity to improve their services or to coordinate national efforts between partners relevant to climate services. The climate observations, research and climate data gathered by NMHSs are the foundation of their monitoring and climate prediction services. There is marked disparity in the observation networks and research activities, however, with developing and least developed countries having sparse networks, limited facilities to carry out research and disseminating climate information that do not adequately provide for the range of climate services that NMHSs can provide to users. The NMHSs also use telecommunications networks, which are vital for the timely exchange of climate data and products that enable them to fulfill their national mandates as climate services providers. Unfortunately the network including GTS and Internet connectivity used by some NMHSs for this purpose are inadequate and obsolete, and this hampers the efficient flow of observations and products. The GFCS will have to work with the NMHSs through WMO Programmes and other mechanisms to facilitate development of their capacities in all these aspects.

6. Global producing centres and regional climate centres

The importance of global producing institutions and regional climate institutions in the implantation of the GFCS cannot be underestimated because these produce climate information which is usually downscaled at national level. Some of these centres provide key services, for example centres like National Centres for Environmental Prediction (NCEP) and other GPCs provide important global meteorological monitoring datasets which are very useful in supporting work on climate services. In some cases they also provide direct services to some end-users with global/regional interests. For example, the WMO RCCs are likely to support the NMHSs and other national institutions in providing services, thus enhancing capacities of national institutions through training personnel and provision of tools and software that are needed for climate services. This is especially true when a regional climate centre is resourced and staffed by all Members within the region.

7. Non-Governmental Organizations, universities and research institutions and the private sector

Non-governmental stakeholders representing climate service user and provider communities in all four priority areas of the GFCS such as the International Federation of Red Cross and Red Crescent Societies, International Council for Science, International Union for the Conservation of Nature (IUCN), World Wildlife Fund (WWF), and international research institutions and the academia groups must be fully engaged in its implementation dialogue. Where there is a strong relevance of their work to that of the Framework, International Non-Governmental Organizations and research entities at all levels should be encouraged to join in the dialogues promoted by the CD pillar and other GFCS pillars. The implementation plan must include criteria for their participation and a process for encouraging the participation of those that meet these criteria.

In some countries other agencies and institutions such as universities, research institutions, departments of environment and agriculture may have roles in climate services nationally. Universities such as the University of Nairobi in Kenya and the North Carolina University of North Carolina in the USA have contributed significantly in training climate services providers in Africa and other developing countries. In the interest of developing strong national climate service capability it will be beneficial, in the implementation of the GFCS, to enhance this interaction

through increased exchange of scientists and increased number of admission and support of students from the developing world.

Developing capacity in climate services should look to strengthen existing capabilities, particularly in the area of partnerships. Furthermore capacity development activities should be driven by user requirements and should inform decision and policymaking processes directed at national goals for sustainable development. They should also support the specific service requirements of sectors and users. The private sector is one of the main users of climate services and is also involved in activities relevant to all pillars of the GFCS. Considerable capacity development is required to establish and manage these complex relationships in such a way that users have the ultimate benefit. It will be necessary for the Capacity Development component of the GFCS Implementation Plan to include results of dialogue from the private sector that may also be a major source of resources to support its implementation.

APPENDIX IV: ACTIVITIES TO BUILD CAPACITY TO INTERFACE WITH USERS

The Framework's User Interface Platform will be the mechanism through which potential users of climate services will be able to express their requirements and to provide feedback about the services they receive as well as make any changes in their requirements. It is also the platform through which the providers will get feedback from users. Users of the Framework's services will expect that their statements of requirements and views on service quality, relevance and reliability, are fed back to those responsible for managing each of the Framework's components (observations and monitoring, research and modelling and information systems). For example, the GFCS near-term priority actions for human health will include the activities of the health research community focused on their research agendas and building national capacity of both climate and health partners to conduct local research, and activities of the climate research community aimed at development of more appropriate climate data products for the sector.

The HLT proposed a number of pilot projects targeting the users in the priority areas of agriculture, water, disaster risk reduction and health for the period 2014-2017, broadening to other sectors on a needs basis in 2018-2021. Specifically some of the capacity development projects in the user interface platform would include the following projects:

- Implement pilot application projects at regional and national levels to demonstrate the economic benefits of climate services. This can be done through organizing workshops at regional and national climate institutions involving producers and users of climate information and products on their social economic benefits of these services;
- Conduct capacity development workshops involving all stakeholders of climate information on the best practices for effective use of climate information and products;
- Identify the optimal methods for obtaining feedback from priority sectors user communities;
- Build a dialogue between climate service users and those responsible for the observations and monitoring, research modelling and prediction and Climate Services Information System components of the Framework with the aim of developing metrics for the performance of the Framework as affected by the contributions of the components and also for communications, for getting feedback for continual product evaluation and improvements;
- Develop monitoring and evaluation measures for the Framework that are agreed between users and providers;
- Improve climate literacy in the user community through a range of public education initiatives (outreach and awareness) and on-line training programmes. Interdisciplinary training can be effective too – providers also need to understand the perspectives and issues of the users with respect to climate and other pressures they face;
- Support Regional and National Climate Outlook Forum (RCOF and NCOF) activities as part of facilitating interaction between providers and users to learn from each other;
- Support implementation of user-driven outlook forums with a sector focus such as the MALOF (Malaria Outlook Forum);
- Support development and application of sector-specific climate indices, involving climate and sector experts;
- Support the provider-user efforts to improve the outputs of COFs to better meet user requirements, including the necessary integration of sector information to create more decision-relevant products for decision-makers.

APPENDIX V: ACTIVITIES TO DEVELOP CAPACITY OF CLIMATE SERVICES AT NATIONAL LEVEL

The activities to be implemented at national level to address the existing weaknesses include the following:

- Establishing new/reviving silent climate related observation networks through new installations, upgrades and replacements;
- Rehabilitate/modernize national meteorological telecommunication networks for data collection and transmission facilities at NMHSs along WMO WIS/GTS guidelines;
- Implement broadband high-speed Internet access at all relevant centres that provide climate services centres;
- Upgrading or installation of necessary infrastructure that will support production of information and products. This will include equipment and tools (including hardware, software), Internet and any other new technological development in infrastructural aspects;
- The importance of global producing institutions and regional climate institutions in the implementation of the GFCS cannot be underestimated because these produce climate information which is usually downscaled at national level. Some of these centres provide key services for example a centre like National Centres for Environmental Prediction (NCEP) and other GPCs provide important global meteorological monitoring datasets long-range forecasts which are very useful in supporting work on climate services. In some cases they also provide direct services to some end-users with global/regional interests. For example the WMO RCCs are likely to support the NMHSs, and other national institutions in providing services as appropriate, thus enhancing capacities of national institutions through training personnel and provision of tools and software that are needed for climate services;
- Providers will have to be given better tools to produce better and more consistent products – they will need training in any of these advances in climate science, as well as training in access to and use of products from GPCs and RCCs;
- Strengthen institutions through promoting legal frameworks and establish new ones where necessary for provision of better climate services;
- Improve management, planning, operational and maintenance practices in the national climate centres to ensure efficient use of resources and quality services to customers;
- Improve funding base of the NMHSs through strengthening status of the organizations and financial management;
- Provide training on issues that need to improve interaction between providers and users.

APPENDIX VI: ACTIVITIES TO ESTABLISH NEW REGIONAL CLIMATE CENTRES

One of the main activities to be implemented within the early part of the GFCS, on a regional level, will be the establishment of new centres in the Regions or sub-regions that do not have one already established and which need the services of such a centre. It should be recognized that establishing a centre in a Region with many developing and least developed countries will require the mobilization of the resources needed to launch the centre, and perhaps to operate it for a period of time while the Region explores its options for financing. New regional centres/institutions will likely need to be established in areas such as Central and North Africa, parts of Asia, South America, Central America and the Caribbean and other areas, if so desired by the countries in these regions. The process for establishing such centres is enshrined in the respective UN bodies' regulations such as the WMO Technical Regulations, which works under the authority of the WMO CCI and CBS. The experience gained through designation of the already successfully established WMO RCCs is of great benefit to establishing the new ones. This could also mean using the successfully established institutions to train experts that will help set up the new regional centres.

APPENDIX VII: ACTIVITIES TO STRENGTHEN EXISTING REGIONAL CLIMATE CENTRES

There are regional climate centres which are basically already operational, for example, two RCCs were officially designated by WMO in June 2009 under the current regulations established jointly by CBS and CCI (RCC Beijing (China) and RCC Tokyo (Japan)), both in RA II (Asia). A demonstration phase has been underway for an RCC-Network for Europe (RA VI) for several years, and is now completed. The process of formal designation has been initiated through CCI and CBS. Four additional centres have begun demonstration phases, namely the North Eurasian Climate Centre (RA II), Mashad Climate Centre of Iran (RAII), the RCC-Africa hosted by the African Centre of Meteorological Applications for Development (ACMAD) in Niamey, Niger and the Intergovernmental Authority on Development (IGAD)-RCC hosted by IGAD Climate Prediction and Application Centre (ICPAC).

WMO RA III has agreed to implement three RCCs or RCC-networks, one of which will be operated by the Centro Internacional para la Investigación del Fenómeno de El Niño (CIIFEN) in Guayaquil, Ecuador. The others will be RCC-networks involving countries in southern and eastern South America. Regional Association IV has agreed to initiate a demonstration phase of an RCC for the Caribbean to be hosted by the Caribbean Institute for Meteorology and Hydrology (CIMH).

It should be noted that although the process of establishing RCCs as noted above has been launched with the support of their governments and some partners, it is likely that resource mobilization, including through the GFCS, will yet be needed to support some of these for rapid completion, particularly those in less well developed parts of the world.

There are a number of other well-established centres that play key roles in supporting the climate needs of National Meteorological and Hydrological Services and that take some part in engaging user communities. These include; Southern African Development Community Climate Services Centre (SADC CSC) in Gaborone, Botswana; the Agro-meteorology and Hydrology Regional Centre (AGRYMET) in Niamey, Niger; the Asia-Pacific Economic Cooperation Climate Centre (APECCE) in Busan, Republic of Korea and the ECO Regional Centre for Risk Management of Natural Disasters (ECO-RCRM) in west Asia that supports ECO member countries including Iran, Afghanistan, Turkmenistan, Tajikistan, Kyrgyzstan, Kazakhstan, Azerbaijan, Turkey, Pakistan, Uzbekistan. Headquarter of this centre is located in Iran (Mashad Climate Centre).

Some of these centres may eventually be proposed for RCC status. Additionally, there has been a need identified for RCCs to serve central Africa and northern Africa, and further proposals may yet be made in different regions, and to serve multiple regions (e.g. in the Arctic and Antarctic and the Mediterranean). Most of these potential initiatives will likely need considerable financial and technical support in developing and sustaining the RCC capacity. Currently for African region the African Development Bank (AfDB), through the ClimDev programme has provided some financial support to kick start some activities in the proposed RCCs.

As can be noted from above some of the centres are already operationally performing some roles of regional climate centres through the support of their governments and some partners. However, these centres need reliable sustainable financing support so that they become fully fledged operational regional climate centres. This will need reliable sources of financial support and the availability of people to be trained as part of human resource development, infrastructural, procedural and institutional as may be necessary.

APPENDIX VIII: ACTIVITIES TO BUILD CAPACITY OF GLOBAL OBSERVATION NETWORKS

It is clear that some climate services can be provided with the existing set of climate observations that are available globally. From a service perspective, the broad-scale global and regional products from the advanced centres may meet the need for climate products of some countries. However, in downscaling these broad scale products to meet national needs there is a requirement, inter alia, for local data to validate climate analyses and to assist in the interpolation of predictive products. Unfortunately, developing countries have poor and inefficient meteorological observing network – poor inputs to the global and regional models and analyses means greater uncertainty and less reliability on the downscaled products in that region. In addition to this, if a country has poor data (inadequate coverage in space and time, poor data quality, insufficient parameters observed, lack of digitization of the observations, etc.), it is very difficult to provide data-based analyses and climate diagnostics and predictions of any kind to meet national user's needs in a variety of sectors. Therefore developing national observation capacity for climate purposes in developing nations should be a high priority from the early to the latter part of the implementation of GFCS – this includes:

- Implementation of the WIGOS at global, regional and national scales as broadly as possible;
- Collection and processing of the climate data observed through partnering agencies;
- Implementing as many climate observing stations as possible at national scales;
- Ensuring that all stations (including those in the Global Climate Observing System surface and upper air networks) are fully functional.

Emphasis in initial activities is therefore placed on filling gaps and sustaining the comprehensive existing climate networks. Naturally, it will not be possible to do everything in the first few years of the GFCS, and therefore an early focus will be on:

- Rehabilitation and rejuvenation of silent stations and key stations in data poor areas, with a special focus on Global Surface Network (GSN) and Global Upper-Air Network (GUAN) stations;
- Fully implementing coordinated space-based observations in support of climate services;
- Expanding databases which will include making use of all of the relevant data that exist, and hence a concerted effort in capacity development in rescuing and archiving historical data.

There are still significant gaps related to GAW observations in some regions of the tropics and high latitudes that, if improved could result in a better understanding of process of relevance to radiative forcing in the atmosphere. Due to the complex chemical and physical interaction between atmospheric components the suite of measurements at some GAW stations could be extended to build further understanding. Due to the complex nature of the measurements and analyzing the data, capacity building remains a central priority.

APPENDIX IX: ACTIVITIES TO ENHANCE CAPACITY OF GLOBAL CLIMATE CENTRES

There are a number of activities performed by global centres that will need to be improved to meet the required standard of the products produced from GFCS. The global centres including the WMO GPCs and Global Climate Data and Monitoring Centres working with various research communities for the early part of the implementation of the GFCS need to work towards improving at all levels (global, regional and national) provision of skilful global and regional climate predictions for time scale from weeks to seasons. This will be necessary for the GFCS to demonstrate its effectiveness in provision of climate information and products, initially, to the priority sectors and thereafter to other sectors too.

The activities that will need to be implemented include, among others, the following:

- Improvement of forecasts and predictions to meet the needs of users at different scale;
- Improve human technical capacities and expertise to generate appropriate climate information and products that can be used by NMHSs and other national entities to meet user needs and demands;
- Enhance capacity for interacting with users from different levels.

APPENDIX X: CD PROJECTS/STRATEGIC GOALS, KEY STRATEGIC INTERVENTIONS, EXPECTED RESULTS FOR THE GFSC IMPLEMENTATION PLAN

These projects will address high priority areas such as:

- Strengthening observation network, telecommunication/communication infrastructure and data management systems (O&M Pillar);
- Launch of regional climate centres such as the WMO RCCs which would include development of training curriculum and establishing a training schedule to get category 1 countries to category 2, and category 2 to category 3, etc, in a phased approach (CSIS, RM&P, CD);
- Development of climate tool kit, and the manual for climate services that will provide consistency and harmonization of climate services activities (CD Pillar);
- Development of new methods and tools for decision-support products needed by users (UIP Pillar);
- Development and application of sector-specific climate indices (CD and UIP Pillars);
- Promotion of best practices in Climate Risk Management (CD Pillar and RM&P Pillar).

Projects/Strategic goals	Strategic direction/development	Expected Results	Areas addressed of the capacity development Pillar
1.Strengthening of the Observing Network in developing and least developed countries	1.1 Revive/establish rainfall and climate stations at national level to increase the network available for monitoring climate and have more data for applications and research.	1.1.1 Increased rainfall and climate data base for different parameters such as rainfall and temperature	Infrastructural
	1.2 Expand surface observing network in countries especially those with sparse networks including over the Indian Oceans and inland lakes.	1.2.1 Increased surface observational data from land and water bodies 1.2.2 Improved forecasts and warnings	
	1.3 Increase the number of the AMDAR aircraft reports.	1.3.1 Improved availability of upper air data 1.3.2 Improved aeronautical forecasts	
	1.4 Establish/Rehabilitate Automatic Weather Observing Stations (AWOSs) and Automatic Weather Stations (AWSs) in data sparse areas, within the manned stations, along the coast, over large lakes, and upgrade the existing stations.	1.4.1 Increased availability of real-time data 1.4.2 Improved quality of forecasts and warnings	
	1.5 Revive silent stations and upgrade outdated upper-air stations at various NMHSs.	1.5.1 Improved availability of upper-air data which is needed for research and modelling	
	1.6 Acquire and network weather radars in countries for monitoring real-time weather for and public safety and for the safety and efficiency of air transport, marine navigation among other weather dependent	1.6.1 Availability of radar data and information for now casting and short-range forecasting and warning	

	activities.	services 1.6.2 Improved monitoring and forecasting for severe weather events	
	1.7 Train staff at regional and national centres in management, operation and maintenance and calibration of observing instruments.	1.7.1 Availability of well trained staff at national and regional centres in instrument maintenance and calibration 1,7,2 Improved quality data from well maintained and calibrated instruments	
	1.8 Allocate adequate staff to the regional instrument calibration centres and avail necessary calibration instruments.	1.8.1 Enhanced capability for calibration of instruments at regional instruments calibration centres	
2. Improvement of Meteorological Telecommunications and communication systems for rapid data collection, exchange and dissemination of data and information	2.1 Acquire new and replace the aging Automatic Message Switching Systems at NMHSs.	2.1.1 Improved efficiency of data exchange between national centres and other centre through Global Telecommunication System (GTS)	Infrastructural
	2.2 Countries develop a policy to support the establishment of appropriate Networking for exchange of meteorological data and products.	2.2.2 Improved access and use of large volumes of data and products from global centres through internet by national and regional centers	
	2.3 Support national climate centres to rehabilitate/modernize National Meteorological Telecommunications Networks for data collection and transmission facilities at NMHSs along WMO WIS/GTS guidelines.	2.3.1 Increased quantity and timeliness of data collection and exchange between NMHSs and other related centres	

	2.4 Support relevant national and regional centres to implement broadband high-speed Internet access in support of NWP and Climate Modelling and prediction Services.	2.4.1 Enhanced accessibility of data and products	
	2.5 Upgrade/modernize NMHS's media systems for information dissemination.	2.5.1 Improved quality of Public Weather Services (PWS) products and timeliness of disseminated data to end-users	
3. Improvement of level of technical capacities (resources, expertise to generate appropriate policy-relevant climate information and operational warning services for the priority sectors) including procedural issues	3.1 National and regional centres develop new innovative products, through initiating pilot projects at regional and some national centres, replicating to others later on.	3.1.3 Improved availability of well packaged policy relevant and sector specific products	Human resources, infrastructural, and procedural
	3.2 Support training on new product development and packaging techniques involving regional centres in collaboration with national climate centres, research communities such as the WRCP activities and development Partners.		
	3.3 Support acquisition of relevant hardware and software for data analysis and generation of tailored products at regional and national climate centres.		
	3.4 Support upgrading of data base management and monitoring systems including Data Rescue.	3.4.1 Enhanced quantity and quality of data at regional and centres	

	3.5 Support upgrading and modernization of real-time data processing and forecasting, post-processing and service production systems at national and regional centres.	3.5.1 Improved quality and timeliness of predictions and products issued by national and regional centers	
	3.6 Strengthen the capacity of national and regional centres for Numerical Weather Prediction (NWP) and climate modelling including assessment of high resolution climate scenarios.	3.6.1 Improved accuracy and quality of NWP, Climate modelling products	
4. Improvement of products generation and use through collaboration with various users and other stakeholders	4.1 Implement pilot applications projects at regional and national level to demonstrate economic benefits of climate services.	4.1.1 Increased awareness of the economic benefits of climate services by stakeholders	Human resources and user interface
	4.2 Conduct capacity building workshops involving global, regional and national centres, stakeholders and users of climate information and products on best practices for generation and of effective use of climate products and information.	4.2.1 Improved capacity for generation of relevant user-friendly tailor made products 4.2.2 Availability of more sector tailored-made products	
	4.3 Support and strengthen the already ongoing providers and users interface activities such as RCOFs and NCOFs, Malaria Outlook Forums (MALOFs) etc.		
5. Improved institutional capacity of national and regional centres to provide relevant, reliable and timely	5.1 Develop policy and institutional framework for the climate services providers sector/institution at regional and national level.	5.1.1 Availability of policy framework for meteorology sector	Institutional and human resources

climate and weather services	5.2 Improve funding base of the national institution and centres through strengthened status of the organizations and financial management.	5.2.1 Enhanced efficiency and accountability of national centres	
	5.3 Improve human resources capacity in the national/regional climate centres to ensure improved quality services.	5.3.1 Smooth access of national and regional institutions	
	5.4. Facilitate development of Memorandums of Understanding (MOUs) to facilitate smooth operation of climate services between countries and institutions.		
6. Strengthening capacity of the global, regional and national climate centres such as the GPCs, WMO RCCs and NMHSs to function as efficient network of coordination, development and dissemination centres	6.1 Develop coordination and management mechanisms to ensure efficient regional coordination and cooperation between climate services institutions and stakeholders.	6.1.1 Improved coordination and cooperation between climate services provider institutions and stakeholders	Institutional and infrastructural
	6.2 Support Implementation of relevant regional events and networking.	6.2.1 Increased awareness and use of services by stakeholders	
	Improve funding base for the regional and national climate centres to ensure efficient functioning of the institutions.	6.3.1 Improved efficiency of functioning and quality of service delivery of institutions	

	6.4 Upgrade human resources and infrastructure of regional and national centres to ensure availability of requisite services.		
	6.5 Upgrade hardware and software infrastructure at regional and national climate services for CSIS operational duties.		

APPENDIX XI: ELABORATION ON THE ABOVE CD ACTIVITIES THAT COULD BE IMPLEMENTED THROUGH PROJECTS DURING THE IMPLEMENTATION OF THE GFCS

No	Activity	Deliverables	Indicators	Assessment measures	Timeline	Partners and stakeholders	Linkages with other activities	Cost US\$ x M	Potential risks
1	Initial planning for implementation of the pillar. Development of an action plan for the pillar's activities through involvement of all stakeholders	A plan action for implementation of the pillar			2012-2013	UN Agencies, International institutions, NHMSs	Linked to activities of all other pillars	2	Not meeting the deadline
2	Training of national climate centres personnel	Trained experts in climate modelling, prediction, downscaling, and products interpretation and packaging and other technical personnel to maintain equipment	Number of trained expert providers and technicians from developing and LDC and SIDS		Mainly for priority sectors 2014-2017 continue for other sectors in 2018-2023	WMO, WCRP, development partners, Universities, GPCs, RCCs, International institutions and agencies (e.g. COMET)	Links with RMP and CSIS activities	For the first phase 20	Lack of resources and people to train
3	Development of capacities of national climate centres' Infrastructure	Improved efficiency and quality of products	Increased quantity and quality of products		2014-2017	WMO, WRCP, International institutions, development partners	Links with RMP and CSIS and OBS	45	Lack of funding
4	Establish mechanisms to interface with users through pilot projects and	A number of ways in which providers are interfacing with users to provide	Identified communities of users that are using information and		2014-2017	UN Agencies such as FAO, ISDR, WHO, UNESCO, UNDP, WMO,	Links with UIP and CSIS activities	For the first phase 30	Lack of funding

	other existing mechanisms such as RCOFs, NCOFs, User COFs and interdisciplinary workshops on sector-specific climate indices	information and get feedback	products from providers		2018-2023	WFP, international and regional institutions and development partners, Private sector, NGOs			
5	During the early stage of the GFCS establishment there is a need as a priority for supporting the establishment of four new WMO Regional Climate Centres	Basic climate services received by countries that couldn't provide such information	Number of established new regional climate centres that have capacity of provide basic to essential climate services.		2014-2017	WMO, Regional banks, Development partners, Regional Economic Communities, and Governments,	Activities of CSIS and RMP and UIP	35	Inadequate staff resources to manage user relationships, generate services, and monitor user uptake and use Regional Centres are not close enough to users to understand user needs
6	Strengthen existing regional climate centres. There will be need to strengthen some already existing regional climate centres	Improved climate services to the levels of essential category 2 to full category 3	An increased number of centres that are able to provide enhanced quality of essential and full climate services		Initially between 2014-2017 Continue as necessary between 2018-2023	UN Agencies, Development Banks, Regional Economic Communities, Governments, and Development partners		For the first phase 30	Lack of funding
7	Enhancement of capacity of global	Increased observations of	7.1 Number of new stations		2014-2017	FAO, UNESCO,		75	Lack of funding

	observing network especially in developing and LDCs and SIDCs which have observation networks	climate data that can be used to produce improved climate services both at national and regional levels.	that have been established and those that have been rejuvenated 7.2 Increase in amount of and the quality of data available for national use and regional/ global exchange			WMO, Space Agencies			
8	Enhance capacity of global climate centres in addressing user needs and interface processes and level of absorption of the products from these centres	Climate information and products with improved skill, procedural capacity and level of interaction with users	8.1 Number of centres with improved climate prediction skill 8.2 Enhanced quality of output of global climate centres		2014-2017	WMO, WCRP, universities, international climate research institutions, GPCs		20	Regional Centres are not close enough to users to understand user needs
9	Improve mechanisms for data management and exchange in developing countries and LDCs and SIDCs through provision of new technological facilities	Data and products exchanged in a timely, easily, and efficient manner	Amount of information received at the centre or disseminated by the centre and also amount of information exchanged between providers and users		2014-2017	WMO, NMHSs, other relevant UN Agencies		20	Lack of resources
10	Strengthen regional tele-communication networks especially at	National and international data collected or transmitted at national level	Amount of data collected at the national climate centre and the amount of data		2014-2017	WMO, NMHSs, other UN Agencies		20	Lack of resources

	developing countries and LDCs		disseminated for regional and international exchange						
11	Support Institutional framework and policy capacity development of national climate services providers	Defined policy for national climate service providers and legal framework to support them	Number of national legalized institutions with mandate for provision of climate services supporting the framework defined		2014-2017	WMO and NMHSs		3	Lack of resources

APPENDIX XII: RESOURCE MOBILIZATION

To enhance the level of in-country and external support to climate services stakeholders it is imperative to advocate strongly the importance and value of climate services in support of the national development process. Activities to build this support through GFCS include:

- Undertaking feasibility studies with a socio-economic benefit assessment component;
- Standardizing methodologies for the evaluation and demonstration of the socio-economic benefits;
- Undertaking case studies, collecting “best practices” for wider use;
- Supporting strong advocacy programmes at the national and regional levels;
- Undertaking community consultation and information workshops in order to ensure full participation of communities in the planning process at the start of the implementation phase.

It is hoped that this exercise will help governments and attract private sector and Foundations to increase the level of funding to the relevant climate services providers.

Resource mobilization at national level

National ownership of any process is the foundation for the enabling environment needed to ensure sustainable development of that process at national level. The Engagement Strategy proposed in the WMO CDS will seek to create closer cooperation and partnerships between government ministries and departments that are responsible for institutions such as the NMHSs and those sections of government responsible for setting national priorities to secure political buy-in and goodwill in favour of climate services providers within countries. Expected results are that countries will recognize the national and international significance of investing in climate services providers as part of their national development priorities, and in essence, demonstrate ownership and commitment needed for sustainable development of these institutions under GFCS at national level. To realize this, the GFCS will have to:

- Prepare and support climate services providers as they engage with their governments to secure national ownership and buy-in based on requirements, benefits and deficiencies;
- It should also be noted that socio-economic benefit (SEB) analysis should not just be performed to convince senior decision-makers of value, rather it should be performed regularly to help climate service providers understand and prioritize societal needs for their business and investment planning;
- Assist climate services providers define and establish modalities for partners and stakeholder engagement at country and at regional levels. Coordination amongst partners will avoid duplication and foster the sharing of resources. This coordination will be needed to develop, mobilize and harmonize investments for the capacity development of national climate services institutions such as NMHSs of various countries;
- Take into account, the contribution of climate services activities to the achievement of the United Nations Millennium Development Goals, and national development plans and action plans of least developed countries and small island developing States;
- Take opportunity of the significant in-country financing opportunities that could exist through the national budgeting processes, overseas missions and embassies, the United Nations “One UN” country funds, the Global Environment Facility and other mechanisms. Resource mobilization will need a focus on assisting national climate services providers and other relevant institutions to avail of these in-country financing opportunities through training seminars and direct support;
- Find an alignment between the stated priorities of the donors and the priorities identified within regional strategies and national plans.

Resource mobilization at regional level

As already pointed out above, the GFCS will have to work with countries and regional stakeholders in order to find resources needed to strengthen the capacities of regional climate centres and to launch new potential ones for providing climate services within the region or sub-region. The GFCS should work with Regional Economic Communities (RECs) where they exist. This is important because in some cases funding to support the centres has to come through the respective RECs or other regional administrative blocks, for example the African Union (AU). Therefore the RECs need to understand the importance of climate services for the social economical development of the region. The GFCS, in working with the respective RECs and other stakeholders, should be able to solicit funding from regional funding bodies such as the regional development banks (for example in Africa, the African Development Bank and in Asia the Asia Development Bank, etc.) and funds channeled through UN agencies such as UNDP, UNEP, ISDR, WMO and others which are specifically earmarked to support activities within that respective region.

Resource mobilization at global level

At global level the GFCS will have to work with the UN agencies and programmes to get funding from them to support its activities that are relevant to their areas of responsibility. It will also work with them to solicit funding from their Members; for example WMO through its Voluntary Cooperation Programme (VCP) activity can help to get funds that can support developing capacity of a number of countries that need support through the GFCS CD Pillar.

The GFCS should approach bilateral and multilateral funding mechanisms such as those of the World Bank, European Union (EU), some developed countries (e.g. UK, USA, Germany, Norway, Canada and others), disaster relief agencies and international agencies for funds to support its activities. Most of these bodies and countries, through their multilateral activities, are very much aware of the need to address climate-related issues especially in developing and Least Developed Countries and SIDSs and understand the need to support capacity development of these countries in addressing climate related issues.

At global and regional level the GFCS will have to support mobilization of resources, among others ways, through:

- Identifying development needs at the regional and national levels in association with regional associations, Permanent Representatives and Regional Offices;
- Sensitizing development partners and national governments to the value of climate services and the economic benefits that building greater capacity of relevant institutions can bring to a variety of users;
- Developing a comprehensive understanding of the needs and operations of funding agencies and development partners, including their project cycles and priorities and transmitting this information to UN Agencies and programmes, Regional Offices and Permanent Representatives;
- Facilitating development of and source financial support for high-impact hydrometeorological infrastructure and service development projects by engaging with existing and potential development partners for establishment of multi-annual framework agreements and partnerships agreements for joint regional and national interventions;
- Engaging and establishing mutually beneficial relations with the private sector and establish private-public partnerships, as appropriate.

APPENDIX XIII: POTENTIAL PARTNERS AND PROJECTS

Table 1 – Potential Partners

The success of the GFCS CD activities will require the involvement of many partners. There are a number of UN agencies, international institutions, Non-Governmental Organizations (NGOs) and others who have activities relevant to capacity development that can contribute to the implementation of the GFCS. The following list below (Table 1) provides just a few of the potential partners, as addressed in other GFCS Implementation Plan Annexes and exemplars, that have already indicated interest in collaborating in this respect and that will be potential partners in the implementation of the GFCS:

Table 1: An example of a few potential partners with interest in the implementation of the GFCS

Organization/Institution	Engagement on CD activities contributing to the GFCS			
	Human Resources	Infrastructural	Institutional	Procedural
Global Climate Observing System (GCOS)	CD for Providers and users	GCOS climate observational network that includes equipment and instruments		Develops standards and practices
International Fund for Agricultural Development (IFAD)	CD for users on the use to the agriculture sector			
International Federation of Red Cross and Red Crescent Societies (IFRC)	CD for users in risk reduction and management			
International Strategy for Disaster Reduction (ISDR)	CD for users on risk reduction and management			
International Research Institute (IRI)	CD for users and providers			Develops standards and practices
United Nations Educational, Scientific and Cultural Organization (UNESCO)	CD for Providers and users			Develops standards and practices
United Nations Development Programme (UNDP)	CD for Users		Policies and frameworks	
United Nations Environmental Programme (UNEP)	CD for Users		Policies and frameworks	Develops standards and practices
Food and Agriculture Organization (FAO)	CD for Users			Develops standards and practices
World Food Programme (WFP)	CD for Users			Develops standards and practices
World Climate Research Programme (WCRP)	CD for Providers and users	equipment and software for climate modelling and generating climate predictions		Develops standards and practices

World Health Organization (WHO)	CD for providers and users through enhancement of capacity for assessing and monitoring health vulnerability, risks, and impacts due to climate variability and change			Develops standards and practices through developing appropriate training and CD materials
World Meteorological Organization (WMO)	CD for Providers and Users of climate information	Telecommunications, and Communications systems and instruments and equipment	Supports developments of institutional frameworks and policies	Develops Standards and practices through developing training and CD materials and technical references
Global Producing Centres (GPCs) for Long-range Forecasts and Regional Climate Centres (RCCs)	CD for providers			Develop standards and practices
African Development Bank (AfDB)	CD for both providers and users		Supports development of institutional frameworks and practices	Develops Standards and practices through developing training
World Bank (WB)	CD for both providers and users	Supports infrastructural development in developing countries	Supports development of institutional frameworks and practices	Develops Standards and practices through developing training

Table 2 - Costed Summary of activities and projects

ACTIVITIES		TIMELINE		
Activity Number	Activity	2012-2013 (Cost US\$ x M)	2014-2017 (Cost US\$ x M)	2018-2023 (Cost US\$ x M)
1	Initial planning for implementation of the GFCS. An action plan for the CD activities will be developed through the involvement of all relevant stakeholders and pillars.	2		
2	Training of national climate centres' technical personnel. This will involve the training of technical staff such as meteorologists and other support technical staff in areas such as climate modelling and down scaling of climate information thus enhancing provision of climate information and products for key sectors to facilitate activities such as national planning in areas like climate variability and change adaptation.	2	20	
3	Development of capacities of national climate centers' Infrastructure including computing facilities. National climate centres from developing, LDCs and SIDSs will need to be equipped with modern technological computing facilities that will enable them to cope with the needs raised from users on climate services.	2	45	
4	Establish mechanisms to enhance interface of climate services providers with users of the priority sectors through pilot projects and other activities such as Regional Climate Outlook Forums (RCOFs), MALOF and others as defined in the other GFCS Annexes and exemplars	2	30	
5	Establishing the four new planned WMO Regional Climate Centres through provision of new technological equipment, human resources, supporting development of relevant research through exchange programmes, and new services.	2	35	
6	Strengthen existing regional climate centres and establishing new ones, as the need arises, to meet the user needs. Available regional climate centres need to be strengthened and new ones to be developed according to the regional demands. Activities will include provision of new technological equipment, improving relevant research through exchange programmes, and new services	1	30.	
7	Enhancement of the capacity of global observing network. There is an urgent need to maintain and upgrade the global coverage of modern observing systems, especially by closing the gaps in observations in the tropics, polar and mountainous regions, increasing the density of observations in poorly sampled regions, and enhancing the	2	75	

	observations in the deep oceans and the upper part of the atmosphere. Intensification of surface observation systems such as radars will be required in addressing water resources related issues. Ensure standards for instrumentation and observational techniques as developed by international experts to meet international requirements.			
8	Enhance capacity of global climate centres through improving relevant research through exchange programmes, advanced technological systems and provision of new services.	1	20	
9	Improve mechanisms for data management and strengthening data recovery and digitization (data rescue) to support activities such as disaster loss accounting and cost-benefit analysis under the DRR and exchange at global, regional and national levels through provision of new technological facilities.		20	
10	Strengthen regional and national telecommunication networks especially in Developing Countries, LDCs and SIDSS	2	20	
11	Support institutional framework and policy capacity development of NMHSs and other national climate services providers and users, In the case of users, the Framework's principles include the involvement of all the stakeholders. The Framework can support risk governance and implement its inclusivity principle by ensuring that its priority implementation activities provide benefits at the local level.	1	3	
12	ESTIMATED TOTAL	16	298	

REFERENCES:

- UNDP-GEF 2011: Adapting to Climate Change, UNDP-GEF Initiatives Financed by the Least Developed Countries Fund, Special Climate Change Fund and Strategic Priority on adaptation.
- WCRP, 2011: Use of observations and regional models in climate risk management and adaptation planning- A recipe for success. A project jointly organized by WCRP, WMO, GCOS, ICPAC, The World Bank and GFDRR
- WHO, 2011: Improving Climate Services for the Health Sector, A background Report for the Inter-Agency Consultation Meeting on the Global Framework for Climate Services User Interface Platform (UIP) and Implementation Plan, November 2011, Geneva, Switzerland.
- WMO, 2010: Commission for Climatology Session XV Resolution 7 Capacity Building for Climate Services
- WMO, 2011: Climate Knowledge for Action. A Global Framework for Climate Services – Empowering the most vulnerable. The Report of the High-Level Taskforce for the Global Framework for Climate Services, WMO-No. 1065
- WMO, 2011: Basic Documents No.1. WMO Publication No.15.
- WMO, 2011: Final Report on the Workshop on Strategy for Implementation Climate Services Information System (CSIS), 5-7 April, 2011, Geneva, Switzerland.
- WMO, 2011: Final Report on the Inter–Agency Consultation Meeting on User Interface Platform – Agriculture, Food Security and Water Sectors of the Global Framework for Climate Services, FAO, 26-28 September, 2011, Rome, Italy.
- WMO, 2011: Final report on Consultation Workshop on NMHS Capacity Development Requirements for GFCS, 10-12 October, 2011, Geneva Switzerland
- WMO, 2011: Final Report of the First Meeting of the WMO Executive Council Working Group on Capacity Development, 13-15 December 2011, Geneva, Switzerland.
- WMO, 2011: Final Report on the Meeting on Sector Applications/Climate Observations Community Dialogue, 15 December 2011, Geneva Switzerland.
- WMO, 2011: Commission for Climatology, Task Team on CLIPS Evaluation, Draft Final Report.
- WMO, 2012: WMO Capacity Development Strategy
- WMO, 2013: Final Report of the Second Meeting of the WMO Executive Council Working Group on Capacity Development, 21-23 January 2013, Geneva, Switzerland
- WMO, 2013: Capacity Development Strategy Implementation Plan

DEFINITIONS OF KEY WORDS:

Climate Service: The provision of one or more climate products or advice in such a way as to assist decision-making by individuals or organizations.

Climate services providers: Institutions and entities that are providing climate services. At national level these institutions include the NMHSs.

National Climate Services (NCS): Those services that, through a collaborative network of entities that create and provide authoritative, credible, usable and dependable science-based climate information, products and advice that is of value to government institutions, socio-economic sectors and the broader community.

National climate centre: The national climate centre is the national provider of climate data and operational climate products that enable a national climate service to serve its users' needs. In most countries NHMSs are national climate centres.

Capacity development: The process of strengthening the abilities or capacities of individuals, organizations and societies to solve problems and meet their objectives on a sustainable basis which:

- Is an on-going continuous improvement process with feedback mechanisms rather than a short-term intervention;
- Aims to augment capacity in a manner conducive to sustained growth;
- Includes the activities, approaches, strategies, and methodologies which help organizations, groups and individuals improve their performance, and generate development benefits;
- Is an endogenous process driven by national mechanisms and facilitated by complementing external agencies; and
- Should be evaluated based on growth as a whole and over time.

Capacity Building: The process that tends to support the initial stages of building or creating capacities, based on an assumption that there are no existing capacities to start from. The approach can be relevant to crisis or immediate post-conflict situations but it is considered to be less comprehensive than capacity development.

Human resources capacity: as defined in section 1.1 above

Infrastructural capacity: As defined in section 1.1above

Procedural capacity: As defined in section 1.1above

Institutional capacity: As defined in section 1.1 above

ACRONMYS

ACMAD	African Centre for Meteorological Applications and Development
AfDB	African Development Bank
AGRHYMET	Agro-meteorology and Hydrology Regional Centre
APECCC	Asia-Pacific Economic Cooperation Climate Centre
APN	Asian-Pacific Network
AU	African Union
AWOSs	Automatic Weather Observing Stations
AWs	Automatic Weather Stations
CAS	Commission for Atmospheric Sciences
CBS	Commission for Basic Systems
CD	Capacity Development
CDMS	Climate Data Management System
CDS	Capacity Development Strategy
CCI	Commission for Climatology
CIIFEN	Centro Internacional para la Investigación del Fenómeno de El Niño
CIMH	Caribbean Institute for Meteorology and Hydrology
CHy	Commission for Hydrology
ClimDev (Africa)	Climate Development for Africa Programme
CLIPS	Climate Information and Prediction Services
COFs	Climate Outlook Forums
COMET	Cooperation Programme for Operational Meteorology Education and Training
CORDEX	Coordinated Regional Climate Downscaling Experiment
CSIS	Climate Services Information Systems
CPC	Climate Prediction Centre
DARE &D	Data Rescue and Digitization
DCPC	Data Collection or Production Centre
DRR	Disaster Risk Reduction
ESSP	Earth System Science Partnership
EC	Executive Council
ETCCDI	Expert Team on Climate Change Detection and Indices
ET-SCBCS	Expert Team on Strategy for Capacity Building for Climate Services
EU	European Union
EUMETSAT	European Organization for the Exploitation of Meteorological Satellites
FAO	Food and Agriculture Organization
GAW	Global Atmospheric Watch
GWATEC	GAW Training and Education Centre
GCW	Global Cryosphere Watch
GCOS	Global Climate Observing System
GDPFS	Global Data Processing and Forecasting System
GEF	Global Environment Fund
GEOSS	Global Earth Observation System of Systems
GFCS	Global Framework for Climate Services
GOS	Global Observing Systems
GOOS	Global Ocean Observing Systems
GPC	Global Prediction Centres
GSN	Global Surface Network
GTOS	Global Terrestrial Observing System
GTS	Global Telecommunications System
GUAN	GCOS Upper-Air Network
HLT	High-Level Taskforce
ICPAC	IGAD Climate Prediction and Applications Centre
ICTP	International Centre for Theoretical Physics
ICSU	International Council for Science
IFAD	International Fund for Agricultural Development
IFRC	International Federation of Red Cross and Red Crescent Societies
IGAD	Inter-Governmental Authority in Development
IOC	Intergovernmental Oceanographic Commission (of UNESCO)
IPCC	Intergovernmental Panel on Climate Change

IRI	International Research Institute (for Climate and Society)
ISDR	International Strategy for Disaster Reduction
IUCN	International Union for Conservation of Nature
JMA	Japan Meteorological Agency
JCOMM	Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology
LDCs	Least Developing Countries
LRF	Long Range Forecasting
MALOF	Malaria Outlook Forum
MEDARE	Mediterranean Data Rescue Initiative
M&E	Monitoring and Evaluation
MOU	Memorandum of Understanding
NAPA	National Adaptation Programme for Action
NCAR	National Centre for Atmospheric Research
NCEP	National Centres for Climate Prediction
NCOF	National Climate Outlook Forum
NGOs	Non-Governmental Organizations
NMHSs	National Meteorological and Hydrological Services
NWP	Numerical Weather Prediction
O&M	Observation and Monitoring Pillar
QMS	Quality Management System
RAs	Regional Associations
RECs	Regional Economic Communities
RCC	Regional Climate Centre
RCOFS	Regional Climate Outlook Forums
RM&P	Research, Modelling and Prediction Pillar
RTCs	Regional Training Centres
SADC	Southern African Development Community
SADC CSC	SADC Climate Services Centre
SARCOF	Southern Africa Regional Climate Outlook Forum
START	Global Change System for Analysis, Research and Training
SIDSs	Small Island Developing States
SOP	Strategic Operation Plan
UIP	User Interface Platform
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNEP	United Nations Environmental Programme
UNDP	United Nations Development Programme
UNIDO	United Nations Industrial Development Organization
UNISDR	United Nations International Strategy for Disaster Reduction
UNFCCC	United Nations Framework Convention on Climate Change
UK	United Kingdom of Great Britain and Northern Ireland
USA	United States of America
VCP	Voluntary Cooperation Programme
WB	World Bank
WCRP	World Climate Research Programme
WCC-3	World Climate Conference-3
WHYCOS	World Hydrological Cycle Observing System
WFP	World Food Programme
WIS	WMO Information System
WIGOS	WMO Integrated Global Observing System
WHO	World Health Organization
WMO	World Meteorological Organization
WWF	World Wildlife Fund
WWRP	World Weather Research Programme
WWW	World Weather Watch

For more information, please contact:

World Meteorological Organization

7 bis, avenue de la Paix – P.O. Box 2300 – CH 1211 Geneva 2 – Switzerland

Communications and Public Affairs Office

Tel.: +41 (0) 22 730 83 14 – Fax: +41 (0) 22 730 80 27

E-mail: cpa@wmo.int

Global Framework for Climate Services

Tel.: +41 (0) 22 730 85 79/82 36 – Fax: +41 (0) 22 730 80 37

E-mail: [gfcs@wmo.int](mailto:gfps@wmo.int)

www.wmo.int