WEATHER CLIMATE WATER

WORLD METEOROLOGICAL ORGANIZATION

GFCS GLOBAL FRAMEWORK FOR CLIMATE SERVICES

Priority Needs for the Operationalization of the Global Framework for Climate Services (2016–2018)





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Priority Needs for the Operationalization of the Global Framework for Climate Services (2016–2018)

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The Global Framework for Climate Services enables and accelerates the coordinated, technically and scientifically sound implementation of measures to improve climate-related outcomes at national, regional and global levels.

Executive summary

Guiding and supporting activities within climate-sensitive investment areas

The global community is rapidly putting in place measures to protect societies from adverse socioeconomic and environmental impacts caused by extreme weather-, climate- and water-related events, and also to take maximum advantage of any positive benefits of these changes that may exist. However, many projects are being undertaken in isolation, in the absence of mechanisms for alignment of the diverse efforts being made at project level, and without conforming to relevant international standards. This can result in duplication of efforts, which may prove unsustainable or ineffective in the long term. The Global Framework for Climate Services (GFCS) was established to provide a credible, integrative and unique platform for guiding and supporting activities implemented within climate-sensitive investment areas, notably agriculture, energy, disaster risk reduction, human health and water sectors in support of both climate adaptation and mitigation. As a partnership with broad participation and reach, GFCS serves as a voice for uniting many different parties, complementing the existing programmes and initiatives contributing to climate services, building on existing capacities and potentials, and providing momentum and tangible progress towards this fast-growing field. As such, it directly contributes towards the achievement of global and national goals identified in policy frameworks such as the Paris Agreement adopted under the United Nations Framework Convention on Climate Change in 2015, the Sendai Framework for Disaster Risk Reduction 2015–2030, and the United Nations 2030 Agenda for Sustainable Development.

The 2016–2018 plan for phase II of global framework for climate services implementation

Developing enabling mechanisms that provide technical advisory, planning and coordination services and that will help to better align and leverage current and future investment opportunities for climate services

The identification of priority needs for operationalization of GFCS in years 2016–2018 is based on the foundations and context of the 10-year GFCS Implementation Plan. The Plan identifies three phases for GFCS implementation (2-, 6-, and 10-year time frames):

- Phase I (2013–2014) focused on establishing the Framework's infrastructure and initiating and facilitating demonstration projects in the initial five GFCS priority areas;
- Phase II (2015–2018) is the development phase, focusing on developing and strengthening core regional and national mechanisms for climate services;
- Phase III (2019–2022) is the expansion and continuation phase, during which maintenance and sustainability of institutional mechanisms will be emphasized.

This publication builds on successful achievements during phase I and will serve as a strategic work plan to guide GFCS implementation in phase II.

The activities proposed in this publication are essential for mobilizing and developing the field of climate services and as such are those requiring immediate attention. These activities focus on (a) developing mechanisms that improve planning, content and coordination of climate services; (b) helping to better align and leverage current and future investment opportunities for climate services; (c) enabling the development of a "proof of concept" that will support upscaling and replicability for the context-sensitive application of good practices in other parts of the world. The proposed activities do not include all of those implemented under GFCS, which may be directly supported and implemented by individual countries or organizations other than WMO. Rather, the selection presents priorities for leveraging the broader community's resources and key opportunities to help partners complete their missions.

Without the implementation of these activities, projects will continue to be developed in an ad hoc and uncoordinated manner, with resources potentially not maximized to meet societal needs, and with increased risk of duplication and limited long-term sustainability. It will also be difficult to ensure that approaches are standardized, that the best available scientific information is available and utilized at national, regional and global levels, and that lessons are effectively documented, learned and transferred to inform new initiatives.

Global framework for climate services operationalization strategies for 2016–2018

Successful operationalization of GFCS requires attention to three separate but equally important and interrelated objectives. The activities described under these objectives are essential for enabling effective development and application of climate services in support of decision-making.

Objective 1: Priority applications

Result: Decision-making and investments in climate-sensitive sectors are improved through the co-development and use of climate services with user-interface platforms (UIPs).

Activities supporting this result will improve decision-making in climate-sensitive areas through the development and application of climate services for the five climate-sensitive GFCS priority areas. These priority areas are:

- Agriculture and food security
- Water resources
- Human health
- Disaster risk reduction
- Energy

These activities are directly related to the GFCS UIP pillar.

Potential implementation partners include the World Food Programme (WFP), the Food and Agriculture Organization of the United Nations (FAO), the United Nations Office for Disaster Risk Reduction (UNISDR), the International Energy Agency (IEA), the World Energy and Meteorology Council (WEMC), the World Business

Council for Sustainable Development (WBCSD), the International Renewable Energy Agency (IRENA), the World Health Organization (WHO), the Global Water Partnership (GWP), WMO, national ministries and agencies, academic communities and the private sector.

Objective 2: Building and sustaining bridges

Result: Sustained mechanisms are established or enhanced to support effective user-driven climate services at regional and national levels.

Activities supporting this result will connect user needs with climate services through mechanisms for sustained user engagement and services delivery. Particular attention will be placed on strengthening and sustaining national, regional and global coordination to improve the current delivery of services in order to foster effective user engagement and further response.

Potential implementation partners include United Nations country teams, national ministries, Regional Climate Centres (RCCs), WMO and regional institutions.

Objective 3: Foundational pillars

Result: Implementation of climate services is enhanced through targeted improvements in foundational technical and scientific capabilities.

Activities supporting this result will enhance core technical and scientific capabilities to support user-driven climate services. This objective aligns with the core foundational pillars of GFCS, and emphasizes the scientific and capacity needs required for the development and delivery of climate services. These activities include:

- Sustained observing and monitoring systems
- Cutting-edge research, modelling and prediction
- Effective climate services information systems
- Training on issues to augment capacity development

These activities involve coordination between different global research programmes with the regional and national scientific efforts, seeking for complementarities to connect the available research with the operational gaps at regional and national levels.

Potential implementation partners include WMO (technical commissions and programmes), the Global Climate Observing System (GCOS), the World Climate Research Programme (WCRP), the World Weather Research Programme (WWRP), RCCs, Global Producing Centres for Long-range Forecasts (GPCs), National Meteorological and Hydrological Services (NMHSs), regional institutions, specialized organizations and academic communities.

Resource requirements for 2016–2018

To maximize the benefit of financial investments made to support GFCS operationalization, existing resources allocated for the implementation of activities that contribute to the objectives have been identified. By themselves, these activities will not enable the needed alignment and integration that would allow delivery of the objectives. Core activities vital to achieve the objectives of GFCS remain unfunded and these funding requirements are summarized in Table ES-1. The funds required are essential to ensure integration of already planned activities and facilitate implementation of these core activities leading to successful implementation of the operational plan of GFCS.

Table ES-1. Summary of estimated resources (CHF) required to fully implement all 2016–2018 activities

Objective	Implementation costs	Funds available	Funds required
Priority applications	33 080 000	1 125 000	31 955 000
Building and sustaining bridges	11 100 000	3 520 000	7 580 000
Foundational pillars	17 655 000	1 270 000	16 385 000
Total	**61 835 000**	**5 915 000**	**55 920 000**

Part I. Implementation of the Global Framework for Climate Services

1.1 Relevance and background of the Global Framework for Climate Services

Every country in the world experiences adverse socioeconomic and environmental impacts from extreme weather-, climate- and water-related events such as floods, drought, heatwaves, wildfires and severe storms. Many of these events are projected to intensify or become more frequent in a warmer world (Intergovernmental Panel on Climate Change, *Climate Change 2013: The Physical Science Basis*, Working Group 1 contribution to the Fifth Assessment Report). This widespread influence of climate means that even small improvements in climate services can make communities, critical infrastructures, businesses and ecosystems more resilient to climate impacts, thus saving lives and improving livelihoods. A climate service is the provision of climate information in a way that assists decision-making by individuals and organizations. Climate services involve the production, translation, transfer and use of climate knowledge and information. They require established technical capacities and appropriate engagement to ensure the development of decision-relevant information and its dissemination through effective access mechanisms and enabling environments that empower end users to act on the information.

The rise of climate on the international agenda has fuelled an explosion of climate-related activities and financing that are only expected to increase in coming years. Developed and developing countries alike are moving rapidly to put in place measures to protect society, investments and development progress, as well as to take advantage of opportunities that can be enabled by climate services. GFCS was established by the international community in 2009 during World Climate Conference-3 in recognition of the increasingly important role of climate services for the international community. GFCS provides an important and unique platform for guiding and supporting activities implemented within climate-sensitive investment areas in support of both climate adaptation and mitigation. As such, it directly contributes towards the achievement of global and national goals identified in policy frameworks such as the Paris Agreement adopted under the United Nations Framework Convention on Climate Change in 2015, the Sendai Framework for Disaster Risk Reduction 2015–2030, and the United Nations 2030 Agenda for Sustainable Development.

GFCS vision: To enable better management of the risks of climate variability and change, and adaptation to climate change, through the development and incorporation of science-based climate information and prediction into planning, policy and practice on the global, regional and national scales.

GFCS is guided by eight principles:

1. High priority for the needs of climate-vulnerable developing countries;
2. Primary focus is better access and use of climate information by users;
3. The Framework will address needs at three spatial scales: global, regional and national;
4. Climate services must be operational and continuously updated;
5. Climate information is primarily an international public good and governments will have a central role in the Framework;
6. The Framework will encourage global, free and open exchange of climate-relevant data;
7. The Framework will facilitate and strengthen, not duplicate;
8. The Framework will be built through partnerships.

As a partnership, GFCS includes a Partners Advisory Committee (PAC) (see Annex 3), partners and member countries/territories along with their NMHSs. Its composition allows it to uniquely complement the many existing programmes and initiatives contributing to climate services, building on existing capacities and potentials, and providing momentum and tangible progress within this fast-growing field. The operational network and expertise available through GFCS partners allows technical support and guidance to be provided to regional entities and countries.

The purpose of GFCS is to provide a framework for action that enables and accelerates the coordinated, technically and scientifically sound implementation of measures to improve climate-related outcomes at national, regional and global levels. GFCS is neither a project nor an operational mechanism for project implementation. Rather, it fills an increasingly important need that is not being addressed by individual activities, for example, those occurring under funding mechanisms such as the Global Environment Facility, the Adaptation Fund, the Pilot Programme for Climate Resilience, the Green Climate Fund (GCF) and the Global Facility for Disaster Reduction and Recovery. Many projects are being undertaken in isolation, in the absence of any master plan for alignment of project-level efforts and that do not conform to relevant international standards. This can result in duplication of efforts, which may prove unsustainable or ineffective in the long term. In the absence of a robust and effective framework it will be difficult to ensure that lessons are learned and knowledge is transferred from these activities to inform new initiatives, that approaches are standardized, and that the best available scientific information is being utilized at national, regional and global levels. The activities proposed under GFCS will focus on developing enabling mechanisms that can provide advisory, planning and coordination services, and that will help to better align and leverage current and future investment opportunities for climate services. Implementation of these keystone actions will strengthen the ability of countries and partners alike to apply for and successfully implement larger-scale investments via mechanisms such as GCF, the Global Environment Facility and the Pilot Programme for Climate Resilience.

1.2 The three phases of Global Framework for Climate Services implementation

A 10-year GFCS Implementation Plan was approved in 2013 following several years of consultation within the global community. This current 2016–2018 strategy is based on the foundations and context of that Plan, which identifies three phases for GFCS implementation (2-, 6-, and 10-year time frames). The three phases are as follows:

Phase I (2013–2014): This two-year phase focused on establishing the Framework's infrastructure and initiating and facilitating demonstration projects in the priority areas that were initially four in number (agriculture and food security; disaster risk reduction; health; and water). In particular, this phase emphasized strengthening regional support networks and institutional capacities that are needed for the subsequent development of national climate services capacities. Key progress made in phase I includes:

- Regional and national capabilities were strengthened through targeted programmes, including demonstration projects in Africa;
- A governance, management and reporting framework was developed through the establishment of the Intergovernmental Board on Climate Services (IBCS) and its substructures that include a Management Committee and the PAC;
- Implementation coordination mechanisms were established in the form of the GFCS Office in WMO, a WHO–WMO Joint Office, and staff exchanges between WMO and other key partners.

The investments and accomplishments from these first two years resulted in a strong foundation for phase II.

Phase II (2015–2018): This phase is the development phase, during which the core regional and national building blocks of climate services must be developed or strengthened to fully demonstrate the GFCS vision. This phase will build on the structures and mechanisms put in place or tested in phase I, and fully engage the GFCS governance and partner mechanisms. Activities will focus on enhancing coordination and strategy-level implementation of the pillars and priority areas, and establishing sustainable mechanisms at global, regional and national levels to support climate services. The activities proposed in the present publication will contribute to phase II implementation by providing the coordination mechanisms between the large-scale projects being developed under the many global and regional funding mechanisms referred to in section 1.1.

During phase II, "proof-of-concept" projects in the priority areas and focus countries will be developed and replicated in other parts of the world at regional and national scales. These projects will provide lessons that inform further development and planning activities, allowing for measurable progress in realizing the Framework's goals by year six (2018). A mid-term review of GFCS during this period will include consideration of such progress. During phase II significant improvements are expected in national climate services provider capabilities and advancements in understanding national and subnational needs. As a result of the global and regional activities, mechanisms will be in place for supporting the development of national capacities to produce and use climate services.

Phase III (2019–2022): This is the expansion and continuation phase, during which maintenance and sustainability of institutional mechanisms will be emphasized. During phase III further advancements will be made in partnership-building and the development and use of demand-driven climate services. If these targets are met after 10 years of implementation, wide-reaching benefits from improved climate services will be evident; there will be improved services throughout the world, across all climate-sensitive sectors and across global, regional and national spatial scales. The improved provision of climate services will facilitate the reduction of society's vulnerability to climate-related hazards and advance progress on global development goals.

This publication is one of several key strategy documents that contribute to the overarching GFCS Implementation Plan and its supporting documentation (annexes, exemplars, compendium of projects). It identifies specific strategies and actions for phase II of GFCS implementation that are essential for mobilizing and developing the field of climate services. It does not include all activities implemented under the umbrella of GFCS, which may be directly supported and implemented by WMO Member countries/territories and other partners. Furthermore, the GFCS PAC Work Plan will complement this document by identifying additional activities – led by the partners – that will further advance progress towards the goals of the Framework set forth in the Implementation Plan. Additional contributions to the Framework not detailed in this publication include the various existing work plans and programmes related to GFCS pillars being implemented by various institutions (for example, GCOS, WCRP and the Group on Earth Observations (GEO), among others).

The GFCS 2016–2018 operational and resource plan is intended to:

(a) Communicate the strategic priorities for climate services development to governments, donors, academics, the public, and other interested parties;
(b) Guide necessary investment strategies and decisions to fund the prioritized activities needed for the Framework to meet its intended goals;

(c) Focus on key strategic priorities in order to ensure that earlier successes are built on and that meaningful and sustained progress is made towards the GFCS vision;
(d) Provide a basis to monitor and evaluate progress in key elements of the Framework.

1.3 The three strategic objectives for years 2016–2018 of phase II implementation

This identification of priority needs for GFCS operationalization is a vehicle for focusing support in years 2016–2018 towards the acceleration of climate services implementation. Activity areas identified are shown in Figure 1. The expected outcome of the GFCS activities proposed is that they will catalyse the development and application of climate services that support nations and communities to develop sustainably, reduce disaster risk and adapt to climate change. Phase II of the GFCS focuses on three synergistic objectives that help to build on the early outcomes of phase I, scale up implementation to address critical needs in the climate services landscape, and align with the overall goals of the Framework. The three objectives collectively support technical advisory, planning and coordination services that will enable activities and investments in climate services already undertaken by GFCS partners. The present publication further describes the relevant implementation partners, the results to be achieved, and the resources required for successful implementation of the activities. Activities can be supported either through the GFCS Office or through different funding mechanisms. Figure 1 provides a conceptual framing for the linkage between the three objectives. Efforts proposed will address specific gaps and needs associated with these three objectives that are not currently being addressed sufficiently elsewhere.

The "priority applications" objective is to improve decision-making in climate-sensitive areas through the development and application of climate services in the five climate-sensitive GFCS priority areas. These priority areas are agriculture and food security, water resources, human health, disaster risk reduction, and energy. Key implementing entities are the PAC and other partner organizations. Activities identified in this objective focus on the GFCS UIP pillar and build on priority needs identified in the GFCS exemplar documentation (see http://gfcs-climate.org/implementation-plan), and will contribute to the desired outcome where decision-making and investments in climate-sensitive sectors are improved through the co-development and use of climate services.

The "building and sustaining bridges" objective is to connect user needs with climate services through sustained engagement mechanisms to ensure user-driven services delivery. Particular attention will be placed on strengthening and sustaining national, regional and global coordination to improve the current delivery of services in order to foster effective user engagement and further response. Key implementing entities are the GFCS Office, regional- and national-level organizations, and partners that identify user needs and appropriate stakeholders at the national and subnational levels. Activities identified associated with this objective build on the priority needs identified in the GFCS UIP documentation and will contribute to the desired outcome where sustained mechanisms are established or enhanced to support effective user–driven, end-to-end climate services at regional and national levels.

The "foundational pillars" objective is to enhance core technical and scientific capabilities to support user-driven climate services. This objective aligns with the core foundational pillars of the GFCS and emphasizes the scientific and capacity needs required to ensure that the development and delivery of climate services are based on sustained observing systems, cutting-edge research and prediction systems, effective platforms for knowledge transfer, and capacity development for climate information providers. This implies a special effort on the coordination between different international research programmes with the regional and national scientific efforts, seeking for complementarities to connect the available research with the operational gaps (mostly related

to sub-seasonal to interannual prediction) at regional and national scales. Key implementing entities are WMO and its GFCS partners, WMO constituent bodies, WMO-accredited RCCs and NMHSs. Activities identified in this objective build on the priority needs identified in the GFCS annex documentation (see http://gfcs-climate.org/implementation-plan) and will contribute to the desired outcome where national needs are met through enhanced skills, processes, tools and technologies that enable and support climate services delivery.

While these objectives are presented as three separate areas, they are all complementary and interdependent. For example, user needs identified by activities undertaken in the priority applications objective are engaged through the mechanisms of the building and sustaining bridges objective and supported by the technical capabilities in the foundational pillars objective. The importance of this interconnectedness is being demonstrated through a proof-of-concept approach at the country level. In addition, capacity development is a critical and priority cross-cutting component of the GFCS, and elements have been integrated into each of the objectives. Linkages between the objectives and specific capacity-development components are further described for each activity in Appendix 1. Capacity-development efforts will also focus on developing guidance material and tools for both users and providers to improve the competencies of their personnel to ensure standardization of services quality and delivery.

Figure 1. Conceptual framework of the interlinkages between the objectives

Part II. Priority needs for the operationalization of the Global Framework for Climate Services (2016–2018)

This section describes specific priority activities under each of the three strategic objectives and provides an estimated budget to implement these activities. Table 1 provides a summary.

Table 1. Examples of potential activities and key implementation partners for the three objectives

2016–2018 objective	2016–2018 implementation strategies	Examples of implementation partners	Results
Priority applications: Improving decision-making in climate-sensitive areas with UIPs	**Agriculture and food security**. Inter-agency coordination team; scaling up climate services for food security	WFP, WMO, FAO	Decision-making and investments in climate-sensitive sectors are improved through the support of climate services
	Disaster risk reduction. Develop, implement and support disaster risk reduction strategies at regional and national levels	NMHSs; national disaster management agencies, ISDR/UNISDR	
	Energy. International support unit; resource mobilization; programme design; tools and services	WMO, IEA, WEMC, WBCSD, IRENA	
	Human health. Technical support unit and health user interface; national climate and health working groups; health mutli-hazard early warning systems	NMHSs, ministries of health, WHO, health academic and research institutions	
	Water resources. Help desks for flood and drought management; dialogs and mechanisms; preparing flood, drought and water resources management projects	WMO, GWP, NMHSs, water managers, UN-Water members, NMHS	
Building and sustaining bridges: Connecting user needs with climate services through sustained engagement mechanisms	**National.** Establishing and supporting national dialogues on climate services and frameworks for climate services	UN country teams, NMHSs, relevant ministries, user groups, donor community	Sustained mechanisms are established or enhanced to support effective user-driven climate services at regional and national levels
	Regional. Strengthening regional systems for climate service provision	RCCs, regional structures of partner agencies	
	Global. Coordinate GFCS implementation; communications and knowledge management; monitoring and evaluation	GFCS Office	
Foundational pillars: Enhancing technical and scientific capabilities to support user-driven climate services scientific capabilities	**Climate services information systems.** Climate services toolkits; regional partners and networks, coordination, climate data management systems, national CSIS capabilities,	WMO (CCl, others), IRI, NMHSs, RCCs, GPCs, organizations developing tools, regional institutions, UN agency regional bodies,	Implementation of climate services are enhanced through targeted improvements in foundational technical and scientific capabilities
	Observations and Monitoring. Observational systems; data recovery; improving networks for water cycle; climate system monitoring	GCOS, WMO (CCl, others), IEDRO, ACRE, NMHSs,	
	Research, modelling and prediction. Research on climate predictability at sub-seasonal, seasonal and decadal time scales; regional climate information	WCRP, WWRP, Global Atmosphere Watch	
	Capacity development. Competency frameworks for climate services	WMO and partner institutions, RCCs, academic partners	

Note: Definitions not otherwise provided in the text – ACRE: Atmospheric Circulation Reconstructions over the Earth; CCl: Commission for Climatology; IEDRO: International Environmental Data Rescue Organization.

2.1 Objective 1: Priority applications – improving decision-making in climate-sensitive areas

To strengthen human security and risk management to withstand the negative consequences of climate variability and change, and to take best advantage of the positive benefits of those changes, climate-sensitive sectors need to address a broad range of climate information priorities. Efforts to ensure that climate services "go the last mile" call for close collaboration with principal implementers and partners in the priority areas that can guide GFCS to best respond to user needs, realities and opportunities for collaboration. The Framework provides opportunities for the five priority areas to become better linked with climate services providers through national, regional and global mechanisms, and to develop the necessary relationships, experience and know-how to develop and apply effective, tailored climate services that respond to their needs. The strong interdependencies between climate-sensitive sectors should be recognized as an opportunity to maximize linkages between climate services and knowledge-sharing across sectors. The strategies developed to achieve outcomes for objective 1, summarized in Table 2, will enable GFCS to provide priority areas with adequate technical advisory, planning and coordination services in order to develop climate services and mainstream application of climate information. This objective represents the GFCS UIP pillar. The exemplars of the UIP pillar of the GFCS Implementation Plan provide more details on the needs of each sector. The location of sector-specific activities will be determined by the respective lead and partner agencies according to nationally identified needs.

Table 2. Summary of implementation activities and projected costs for the priority applications objective

Sector	Activity	Projected costs (CHF)
Agriculture and food security (CHF 7 880 000)	Climate Services, Agriculture and Food Security Inter-agency Coordination Team	1 880 000
	Strengthening/scaling up climate services for food security in selected countries	6 000 000
Disaster risk reduction (CHF 4 000 000)	Developing and implementing climate services to support risk analysis, risk reduction and financial protection at the national level	3 500 000
	Support for implementation of climate services at regional and country levels in line with regional, national and local disaster risk reduction strategies as called for by the Sendai Framework for Disaster Risk Reduction 2015–2030	500 000
Energy (CHF 6 850 000)	Energy Joint Office in support of the energy user interface for climate services	2 250 000
	Implementation of climate services for energy in selected countries	2 100 000
	Effective delivering of decision-support climate information for use in the energy sector	2 500 000
Health (CHF 7 400 000)	Technical Support Unit and health user interface for climate services: WHO–WMO Joint Office	3 350 000
	Climate and health working groups in selected countries	2 700 000
	Multi-hazard risk monitoring and early warning for health protection	1 350 000
Water (CHF 6 950 000)	Integrated flood and drought management help desks	1 950 000
	Dialogues and mechanisms for climate services in water-sensitive regions	3 000 000
	Preparation of flood, drought and water resources management projects	2 000 000
Subtotal CHF 33 080 000		

2.1.1 Agriculture and food security

Vulnerable communities and governments need weather and climate information to improve their food security and strengthen resilience to climate-related risks. The goal of activities in this area is to benefit agriculture and food security outcomes through the improved management of climate-related risks. Two key strategies have been identified under the GFCS to support this goal:

Agriculture and food security, activity 1: Climate Services, Agriculture and Food Security Inter-agency Coordination Team. **Gap:** There is a lack of coordination between sector partners. **Goals:** Enhance coordination among sector partners and develop joint pilot proposals. **Solutions:** Establish a user-led coordination team to (a) support greater communication between climate scientists, researchers and key stakeholders in the food security and agriculture sectors at national, regional and global levels; (b) implement and coordinate activities under the agriculture and food security priority area of GFCS. **Outputs:** (a) understanding of needs of users to inform the development of new climate products and services; (b) understanding of what is available and gaps in terms of products needed at different levels and by different actors; (c) identification of strategic priorities for strengthening climate services within the food security and agriculture sectors; (d) provision of technical advisory, planning and coordination services for the piloting and scaling up of different initiatives aimed at strengthening resilience and food security. **Estimated budget** for 2016–2018: CHF 1 880 000.

Agriculture and food security, activity 2: Strengthening and scaling up climate services for food security in selected countries. **Gap:** There is a lack of efficiency among similar activities and projects in this sector. **Goals:** Scale up and possibly combine existing activities in selected countries. **Solutions:** Strengthen and scale up innovations. This will include both initiatives that have already been piloted and have demonstrated their effectiveness, and innovative practices to be piloted in the field. Specific activities include the WFP R4 Rural Resilience Initiative and climate analysis, FAO farmer field schools, WMO Roving Seminars, and the WFP Food Security Climate Resilience Facility (FoodSECuRe) initiative, among others. **Outputs:** (a) strengthening of national early warning systems for food security; (b) integration of climate information into insurance, credit provision and crop monitoring; (c) support for context analysis at national level on food security, nutrition and climate change to inform planning; (d) development of new climate products tailored to the needs of vulnerable communities. **Estimated budget** for 2016–2018: CHF 6 000 000.

2.1.2 Disaster risk reduction

The goal of GFCS activities related to disaster risk reduction is to support countries at high risk from weather, climate and water hazards in implementing climate services that contribute to national and local efforts to reduce, manage and offset the risk of disasters. Key implementing partners that will lead and support activities towards this goal include UNISDR, WMO, WFP, and the International Federation of the Red Cross and Red Crescent Societies (IFRC).

Disaster risk reduction, activity 1: Developing and implementing climate services to support risk analysis, risk reduction and financial protection at the national level. **Gap:** There is a need to obtain the maximum benefit from actual and potential climate and weather services to reduce the disaster risk posed by hydrometeorological hazards. **Goals:** Develop an evidence base for risk management decision-making for risk reduction and transfer, resource allocation and preparedness. **Solutions**: (a) training in GFCS priority countries on application of climate services in risk analysis, risk reduction and financial protection; (b) development of climate information products and services for financial protection through

a multi-stakeholder United Nations, international finance institution and private sector initiative focused on improved government and private financial planning and investment, risk financing and transfer of disaster risk; (c) provision of inputs into GFCS sector-specific risk reduction projects being undertaken in the other GFCS priority areas of agriculture and food security, health, energy, and water resources. **Outputs:** (a) risk analysis reports available to decision-makers and the public; (b) better-informed climate services to meet local needs; (c) evidence-based disaster risk reduction strategies and action plans; (d) implementation of activities to address the causal factors of disasters. **Estimated budget** for 2016–2018: CHF 3 500 000.

Disaster risk reduction, activity 2: Support for implementation of climate services at regional and country level in line with regional, national and local disaster risk reduction strategies as called for by the Sendai Framework for Disaster Risk Reduction 2015–2030. Gap: The Sendai Framework calls for efforts to "substantially increase the availability and access to multi-hazard early warning systems and disaster risk information and assessments to the people by 2030" (Sendai Framework Seven Global Targets (g)). **Goals:** Substantially increase the availability of, and access to, multi-hazard early warning systems and disaster risk information and assessments for the communities involved. **Solutions**: Conduct a series of workshops and training sessions to inform disaster risk reduction stakeholders about GFCS and vice versa, and conduct basic capacity development and training activities, development of targeted promotional materials and consultations. **Outputs:** (a) development of advocacy and guidance materials on the relevance and applications of climate services; and consultations targeted at the global, regional and national disaster risk reduction platforms and mechanisms; (b) development of effective stakeholder interaction and partnerships in regional, national and local contexts, using mechanisms such as the Resilient Cities initiative and national and regional disaster risk reduction platforms or consultations, and regional intergovernmental processes emphasizing outreach through existing networks, as well as via the standing mechanisms of UNISDR and the International Strategy for Disaster Reduction. **Estimated budget** for 2016–2018: CHF 500 000.

2.1.3 Energy

Sustainable energy is a top priority in the context of the United Nations Sustainable Energy for All initiative and the Sustainable Development Goals. These activities support (a) improving the resilience of the energy industry while also contributing to the achievement of mitigation targets; (b) accelerating interactions between the climate and energy communities at global, regional and national levels; (c) providing high-priority technical advisory, planning and coordination services.

Energy, activity 1: Energy Joint Office in support of the energy user interface for climate services. Gap: Implementation of climate services for the energy sector requires coherent, comprehensive and coordinated support for a core set of partner organizations whose competences, mandates and manageable interests span the focus areas and activities described in the energy exemplar. **Goals:** Strengthen partnership mechanisms, increase energy stakeholders' awareness of available data, tools and policies, address gaps, foster knowledge transfer, and create communities of practice. **Solutions**: Develop an Energy Joint Office to monitor the needs and assess the demands through existing processes developed by the partners, define roles and responsibilities, engage with the energy private sector, mobilize and allocate resources (for example, initiatives related to GCF or to the Conference of the Parties to the United Nations Framework Convention on Climate Change), and define monitoring and evaluation methods and disseminate information. Activities will inform the energy sector on improving efficiency, sustainability and risk management practices through the adoption of science-based climate information. **Outputs:** (a) coordination among partners; (b) resource mobilization; (c) effective engagement with energy companies; (d) training courses, development of tools and methodologies. **Estimated budget** for 2016–2018: CHF 2 250 000.

Energy, activity 2: Implementation of climate services for energy in selected countries. **Gap:** Implementation of climate services for the energy sector requires coherent, comprehensive and coordinated support for a core set of partner organizations. **Goals:** Access resources for the development of climate services for the energy sector, as envisioned by GFCS and in support of the Paris Agreement. **Solutions**: Design and implement projects focusing on developing dedicated climate services in up to eight countries to support two overarching objectives: (a) improved climate-related energy outcomes at country level for mitigation, through facilitating the expansion of renewable energy, and adaptation, through enhancing climate resilience and efficiency; (b) the development of partnerships, tools, methods and processes for implementing climate services at the country level, compiled and consolidated in order to provide technical advisory, planning and coordination services for implementation in other countries. **Outputs:** Proposals and support documentation to be submitted to funding agencies and donors. **Estimated budget** for 2016–2018: CHF 2 100 000.

Energy, activity 3: Effective delivering of decision-support climate information for use in the energy sector. **Gap:** There is a lack of adequate coordination and mechanisms for knowledge transfer that is often a barrier to streamlining climate information. **Goals:** Facilitate the delivery and use of relevant climate information for the energy sector in support of renewable energy generation, transmission and distribution, and help the energy sector to anticipate significant changes in the demand and production at regional scale. **Solutions**: Implement activities to support the generation of custom-made products that fulfil the needs of the users including: (a) interannual forecasting for hydropower operations; (b) climate scenarios for energy mixes; (c) observing systems and climate predictions for solar and wind; (d) seasonal forecasting of energy demand with a focus on high-impact events; (e) multi-year climate projections for anticipating changes in future demand and disruptions in supply. **Outputs:** Products include gridded data for engineers, and charts, tables and diagrams that will assist political decision-makers, energy sector managers and other sectors of the economy (for example, farming and water management) in pursuing efficient energy and environmental planning. **Estimated budget** for 2016–2018: CHF 2 500 000.

2.1.4 Health

The health activities serve to enhance the management of climate-related risks to health in order to improve health outcomes. Under GFCS, WHO leads implementation of health activities and engages technical health partners at national, regional and global levels for implementation. The health exemplar outlines five areas of key needs for: climate and health outreach and communications; partnerships; evidence and research; capacity development; and mainstreaming climate information into decision-making. The proposed projects respond to these needs areas to help establish core technical and institutional capacities, which are required to scale up the delivery and use of climate information and services for health. Activities prioritize support to WHO member States, represented by ministries of health and their partners in climate-vulnerable contexts. Activities are aligned with WHO priorities for addressing climate change and health, environmental determinants of health, and emergency and disaster risk management.

Health, activity 1: Technical Support Unit and health user interface for climate services: WHO–WMO Joint Office. **Gap:** Implementation of health activities under GFCS requires operational and technical support for the development, coordination and use of climate services. No technical unit exists at either WHO or WMO to help coordinate and guide activities to scale up the development and use of health-tailored climate services. **Goals:** Enhance capacity development, technical support and coordination for climate and health practitioners and researchers to access and use climate information. **Solutions:** The WHO–WMO Joint Office provides support to the implementation of GFCS health activities, at global, regional and national levels. Staff and activities serve to (a) inform relevant WHO and WMO policy and programming; (b) provide coordination for

partners; (c) support development of existing and new programming; (d) provide communications and technical guidance to implementation, particularly at the national level; (e) inform WMO on the long-term needs and opportunities to respond to the climate services requirements of the health sector; (f) help WMO to more directly engage with a broad range of WHO and health-sector experts. **Outputs:** (a) increased demand for, and capacity of, health and meteorological professionals to collaborate through an online technical resource portal to make climate knowledge more readily accessible and increase opportunities for networking experts and users; (b) technical guidance documents, training events and educational products; (c) increased activity of climate services projects and partnerships, such as ClimHealthAfrica and the Global Heat Health Information Network. **Estimated budget** for 2016–2018: CHF 3 350 000.

Health, activity 2: Climate and health working groups in developing countries. **Gap:** There is an absence of effective national institutional arrangements and enabling environments to facilitate successful co-development and delivery of climate services hinders climate services collaboration. **Goals:** Improve coordination and capacity development of climate and health professionals by encouraging a structured working environment for developing and using health-tailored climate products and services. **Solutions:** Establish task-focused multisectoral climate and health national working groups whereby the research and operational sections of the climate sector can interact with health-actor clients to jointly build capacity to identify, implement and evaluate the use of climate information services for improved health protection. A modelled approach will help to create standard tools and references for scale-up in other countries and regions. **Outputs:** (a) national-scale joint projects and research; (b) technical training, improved data exchange and use, institutional agreements and working arrangements between NMHSs, ministries of health and other partners. **Estimated budget** for 2016–2018: CHF 2 700 000.

Health, activity 3: Multi-hazard risk monitoring and early warning for health protection. **Gap:** Health is a key element of the Sendai Framework for Disaster Risk Reduction, the Sustainable Development Goals and the Paris Agreement. Yet the global health community is not sufficiently benefiting from available information and technology for risk monitoring and early warning of the full spectrum of hazards with health consequences. This is in part due to gaps in existing multi-hazard early warning system models preventing the integration of a full range of hazards, including conflict, biological hazards such as epidemics and pandemics, hazardous air quality, and extreme temperatures. These are key areas for both climate and disaster risk management. **Goals:** Support researchers, decision-makers and practitioners to establish policies and practices that strengthen the use of accurate and timely data to inform early warning and response to hazards with health consequences; particularly extreme weather and climate events, and poor air quality in cities. **Solutions:** The proposed activities will help to improve the collection, management, analysis and dissemination of early warning data and related information products by the global public health community. **Outputs:** (a) support for the definition of an action plan for health early warning systems for biological and health threats within multi-hazard early warning system frameworks; (b) support for the design of an action plan to address climate-related health risks within emergency and disaster risk management programmes and Sendai Framework implementation; (c) development of a climate risk management toolkit, including needs-based guidelines and good practices for scientific consensus and tool development; (d) development of data-integration tools to enhance interoperability of core datasets for risk monitoring; (e) development and testing of integrated forecast and warning products. **Estimated budget** for 2016–2018: CHF 1 350 000.

2.1.5 Water

Water interconnects all priority areas of GFCS: water for irrigation is a basic resource for agriculture and food production; floods and droughts are major natural hazards; water is needed for cooling in energy

production and hydropower is an important source of clean energy; access to drinking water and sanitation has large implications for public health. Integrated Water Resources Management (IWRM) engages water managers and users from different sectors at local, national and regional (transboundary basin) levels. Efficient water resource management planning and decision-making must be informed with relevant and appropriate climate knowledge and information, including appropriate research, to adequately understand and account for the influence of weather and climate on water resources.

The main frameworks for the GFCS priority area on water are the various climate-related activities of the 31 Members (United Nations entities) and 37 partners (organizations outside the United Nations system) of UN-Water. In particular, with regards to water extremes, these are represented by the WMO–GWP-led Associated Programme on Flood Management (APFM) and Integrated Drought Management Programme (IDMP), which gather over 20 partners each to implement an integrated approach to manage such water hazards. GFCS priority actions for water mostly target National Hydrological Services (NHSs), supported by and involving multi-stakeholder platforms representing the national water communities at large. Actions respond to the need to establish and enhance core technical and institutional capacities at regional and national level to develop and deliver climate and hydrological services for improved water management.

Water, activity 1: Integrated flood and drought management help desks. Gap: Support is lacking to develop tailored climate services for water management, including water-related extremes (droughts and floods). **Goals:** Broaden the existing help-desk utility to form a global UIP for the climate and water communities to address climate services needs for the implementation of IWRM in the context of climate variability and change. **Solutions**: Strengthen the existing capacities in flood and drought management, building on the already established help-desk structure of the APFM and IDMP. The technical support units of the two programmes guide the implementation of GFCS water activities and the help desks will be the central tool to accomplish this. **Outputs:** (a) provide a platform for coordination for partners; (b) support development of existing and new national and regional projects and programmes; (c) develop technical guidance (guidelines and tools); (d) sustain a dialogue between the water and climate community through communication and linking up with existing initiatives active in the water–climate interface. **Estimated budget** for 2016–2018: CHF 1 950 000.

Water, activity 2: Dialogues and mechanisms for climate services in water-sensitive regions. Gap: Links between seasonal climate outlooks and hydrological forecasts for informed water management decision-making are missing. **Goals:** Link the output of a sub-seasonal to seasonal (S2S) climate outlook to long-term (a few days to 3 months) hydrological forecasting to advance water resources management for agriculture, household consumption, hydropower generation and emergency response planning. **Solutions**: Pilot projects to achieve the goals described will be developed in river basins in South Asia identified as vulnerable to climate variability and change, as well as for vulnerable groundwater reserves and surface waters, with an emphasis on snow or glacier melt and water scarcity or flooding. The approach includes mechanisms and dialogues between the hydrological and climatological communities. The pilot projects will provide guidance and assistance in the setting up of water UIPs at the national and/or regional levels and provide technical guidance and examples on practices and procedures for their replication and adaptation in other regions facing similar challenges. **Outputs:** (a) improved delivery and application of climate services for better water management; (b) improved food security, energy generation, public health, and disaster prevention. **Estimated budget** for 2016–2018: CHF 3 000 000.

Water, activity 3: Preparation of flood, drought and water resources management projects. Gap: Capacity is lacking for the development of "bankable" projects that address climate services needs for water management at the country and basin level. **Goals:** Prepare projects on water and climate services that can

leverage funding. **Solutions**: Provide technical support for project preparation towards the implementation of IWRM, including Integrated Flood Management and Integrated Drought Management. Activities include (a) instigation of projects that develop and apply tailored climate services accounting for the integrated water risk and vulnerabilities across other priority areas; (b) workshops to prepare flood and drought management projects that can attract funding to implement hard and soft measures with a focus on climate services; (c) development of training manuals and tools that allow for scaling up and application in other regions. **Outputs:** Funded projects on the development and application of climate services for water management. **Estimated budget** for 2016–2018: CHF 2 000 000.

2.2 Objective 2: Building and sustaining bridges – investing in mechanisms for user engagement and services delivery

To guide GFCS to effectively engage and meet user needs, the GFCS Implementation Plan through its UIP pillar promotes and creates structured means and mechanisms for users, user representatives, and climate services providers and researchers to interact. These mechanisms take diverse forms, but each should enact four principle functions for the Framework to effectively mediate, coordinate and guide user-driven climate services:

(a) Dialogue: Building dialogue between climate services users and providers;
(b) Feedback: Identifying the optimal methods for obtaining feedback from user communities;
(c) Outreach: Improving climate literacy in the user community, and literacy of the climate community in user needs;
(d) Evaluation: Developing monitoring and evaluation measures for GFCS that are agreed between users and providers.

Thus, structures and mechanisms are needed at global, regional and national levels to provide these functions. At the global level, the GFCS Office supports the UIP function for the overall implementation of GFCS, through coordination, governance, monitoring and evaluation. In phase II, GFCS will focus on activities to strengthen mechanisms at each of these levels, as summarized in Table 3, building sustainable foundations on which to deliver user-driven climate services.

Table 3. Summary of 2016–2018 implementation activities and projected costs for the building and sustaining bridges objective

Scale	Activity	Projected costs (CHF)
National (CHF 600 000)	Establishment and support of national dialogues on climate services and frameworks for climate services	600 000
Regional (CHF 4 500 000)	Establishment and strengthening of regional systems for providing climate services	4 500 000
Global (CHF 6 000 000)	Support for and strengthening of the GFCS Office to effectively coordinate GFCS implementation	5 300 000
	Communications and knowledge management for effective climate services	400 000
	Monitoring and evaluation of GFCS	300 000
Subtotal CHF 11 100 000		

2.2.1 National-level activities

National, activity 1: Establishment and support of national dialogues on climate services and frameworks for climate services. Gaps: There is a lack of interface or systematic dialogue between users and providers to facilitate addressing the demand for tailored climate services in climate-sensitive sectors; a significant gap exists between the supply of climate services and the needs of users; users' understanding of climate services is insufficient. **Goals:** Mainstream the use of climate information in decision-making and the long-term sustainability of climate services development and delivery mechanisms at national levels. **Solutions**: GFCS will facilitate the development of national frameworks (providers and public or private users), which could influence national legislation, and policy frameworks in every country implementing GFCS-related projects. Working in close collaboration with the United Nations country teams, country-specific frameworks will clarify the national requirements, roles and responsibilities, and lay the foundation for climate services ranging from the collection, quality control, archive and dissemination of climate observations to products and services. The process will include the following steps:

- Step 1: Conduct comprehensive national baseline capacity assessment for climate services;
- Step 2: Support the NMHS to engage in a national consultation process for climate services to identify gaps, needs and priorities for the development of a national action plan for climate services;
- Step 3: Establish a national framework for climate services (NFCS) as the coordination mechanism for addressing issues for the production and application of climate services, also serving as a platform for promoting effective collaboration and cooperation at national level;
- Step 4: Organize a national action-plan validation workshop to ensure that the plan is endorsed and owned by key stakeholders including the government and key partners. The validation exercise is also aimed at attracting the attention of partners to support the action plan;
- Step 5: Begin implementation of the national action plan activities, launch the NFCS and ensure rigorous monitoring and evaluation.

To develop a proof of concept, the activity will initially focus on the eight focus countries[1] as agreed by the PAC, with the intention that this will be replicated in other countries. The implementation of initial activities started in 2012 and has been ongoing. This activity will also seek to build on and enhance existing initiatives where possible, and run alongside other key activities, such as the National Climate Outlook Forums (NCOFs), to minimize costs and avoid duplication. **Outputs:** (a) guidance document on the establishment of an NFCS; (b) NCOFs and national climate forums serving as UIP mechanisms at national level; (c) collection of lessons learnt and knowledge transfer to share experiences with other countries. **Estimated budget** for 2016–2018: CHF 600 000.

2.2.2 Regional-level activities

Regional, activity 1: Establishment and strengthening of regional systems for providing climate services. Gap: Regional support and coordination are lacking to ensure optimal and consistent approaches to climate

[1] The eight PAC focus countries are Bhutan, Burkina Faso, Colombia, Dominica, Papua New Guinea, Peru, the Republic of Moldova and the United Republic of Tanzania.

services in countries. **Goals:** Improve existing and establish new mechanisms for collaboration, cooperation and knowledge exchange on climate services activities at the regional level, notably focused on enhancing the role of regional coordination mechanisms that will be supported technically through RCCs and other regional entities with established credentials to routinely provide and coordinate regionalized climate information and facilitate its uptake in climate-sensitive sectors. **Solutions**: This activity involves a systematic assessment of the existing regional capacities and identification of needs to develop, deliver and use climate services and facilitate regular feedback and dialogue mechanisms to continue exchanging views. A key focus is to facilitate engagement of regional entities in supporting country-level implementation of GFCS. It is also proposed to formalize and coordinate these actions in a consistent and sustainable manner, such as through frameworks at the regional level involving all relevant partners and taking into account the concerned region's specific needs and priorities. **Outputs:** (a) regional dialogues and consultations; (b) sustainable partnerships and long-term commitments; (c) enhanced Regional Climate Outlook Forum (RCOF) processes and climate services user forums including through a global regional outlook forum review; (d) regional frameworks for climate services; (e) identification of core regional requirements for climate services; (f) identification of roles and responsibilities as well as mandates of institutions responsible for regional support, including RCCs; (g) interim arrangements for national-level Climate Services Information System (CSIS) products to be supplied by regional institutions for countries in need. **Estimated budget** for 2016–2018: CHF 4 500 000.

2.2.3 Global-level activities

Global, activity 1: Support for and strengthening of the GFCS Office to effectively coordinate GFCS implementation. **Gap:** Successful implementation of the Framework requires coordination and support. **Goals:** Ensure that coordination and implementation of GFCS processes and procedures are being effectively coordinated and implemented. **Solutions:** The GFCS Office will play a pivotal coordination role towards the following: (a) supporting sessions of GFCS governance and advisory bodies; (b) making connections between the three objectives and associated activities; (c) assisting with coordination and implementation of processes and procedures, including direct support at national, regional and global levels; (d) identifying priority support needs through targeted engagement of technical expertise. **Outputs:** (a) efficient governance meetings; (b) identification of opportunities and efficiencies through coordination across the objectives; (c) strengthened activities through the identification and utilization of technical experts. **Estimated budget** for 2016–2018: CHF 5 300 000.

Global, activity 2: Communications and knowledge management for effective climate services. **Gap:** There is a clear need for knowledge transfer and management activities. Duplication of efforts at national level and uncoordinated actions of partners are still common practice. **Goals:** Facilitate partners and members to lead effective awareness-raising campaigns and ensure that activities in support of GFCS operationalization contribute to the global body of knowledge and experience of how to develop and deliver effective user-driven climate services. **Solutions:** The GFCS Office will provide support for national- and regional-level stakeholder mapping, and communication plans, and provide communications resources. This includes collating and sharing best practices, tools, documents and materials based on user needs, and utilizing other mechanisms with a proven benefit. **Outputs:** A GFCS help desk that will consist of a series of tools, including policy documents, case examples and a pool of support-base partners that are ready to contribute by answering or responding to specific questions and demands; outreach and communication materials that promote the scientific and operational understanding of climate services. **Estimated budget** for 2016–2018: CHF 400 000.

Global, activity 3: Monitoring and evaluation of GFCS. **Gap:** Tracking the implementation and progress of the GFCS is essential to ensure the vision of the Framework is achieved. **Goals:** Ensure GFCS monitoring

and evaluation methodology is carried out effectively for both the projects and the Framework itself. **Solutions:** A dedicated technical officer will implement the Monitoring and Evaluation Plan to ensure high standards of GFCS accountability, including by establishing and maintaining relevant monitoring tools and databases; providing guidance to implementing partners; supporting reporting activities, including coordination of the year five GFCS mid-term review; and coordinating with partners, consultants, donors and others as needed. The monitoring and evaluation methodology will be applied to the overarching GFCS Implementation Plan (including GFCS contributing projects and GFCS projects (see Annex 2 for project designation criteria) that will help achieve the GFCS vision) and will track progress and impacts of the activities specific to the 2016–2018 period. **Outputs:** A documented understanding of progress towards GFCS implementation. **Estimated budget** for 2016–2018: CHF 300 000.

2.3 Objective 3: Foundational pillars – enhancing core technical and scientific capabilities for user-driven climate services

The GFCS Implementation Plan identifies five essential components, or pillars, that are needed to effectively produce and deliver climate services. The previous section described the activities needed to support one of these pillars – UIPs for the five GFCS priority areas. This section outlines measures needed to support implementation in the other four pillars, which have a strong focus on the providers of climate information: observations and monitoring; CSIS; research, modelling and prediction; and capacity development. Summarized in Table 4, these activities are focused on ensuring that climate services projects and activities have access to, and are guided by, the best possible technical resources and expertise in the areas covered by each pillar. These activities will be informed by end-user engagement, identified in the previous objective. Activities under this objective will be implemented primarily by WMO programmes, including joint programmes, and through the work of WMO technical commissions and regional associations, RCCs and other partners. The cross-cutting nature of capacity needs is reflected in each of the pillar components.

Table 4. Summary of implementation activities and projected costs for the foundational pillars objective

Pillar	Activity	Projected cost (CHF)
CSIS (CHF 11 420 000)	Defining, building and making available a climate services toolkit at the regional and national levels	2 500 000
	Regional partnerships and networks for enhancing CSIS capacities	2 000 000
	Facilitating implementation coordination of the CSIS pillar	600 000
	Climate Data Management Systems (CDMSs)	3 320 000
	Development and demonstration of a national climate services concept including enhancement of national CSIS capacities	3 000 000
Observations and monitoring (CHF 4 250 000)	Identification of data needs and design of observational systems in data-poor regions	500 000 (per region)
	Large-scale data recovery and digitization	2 000 000
	Demonstration of efficient improvements to ground-based and space-based networks for measurement of changes in the water cycle in pilot area(s)	1 000 000 (per pilot region selected)
	Establishment of modern, timely climate system monitoring in support of multi-hazard early warning and disaster risk reduction	750 000

Pillar	Activity	Projected cost (CHF)
Research, modelling and prediction (CHF 1 625 000)	Research on climate predictability and improving prognostic skills: S2S timescales	160 000
	Research on climate predictability and improving prognostic skills: decadal timescales	480 000
	Development of specific focused interdisciplinary and international partner projects on regional climate information	840 000
	Underpinning research on regional climate services development: – Advancing flood early warning on S2S timescales in India with coupled hydrologic and atmospheric modelling; – Integrating water and energy management in South America using S2S forecasts;	 65 000 80 000
Capacity development (CHF 360 000)	Develop education and training resources for an international competency framework for climate services	360 000
Subtotal CHF 17 655 000		

2.3.1 Climate Service Information System

Effective delivery of climate information products and services will require appropriate operational institutional mechanisms to generate, exchange and disseminate information nationally, regionally and globally. This will be achieved through the implementation of a strategy hinging on a three-tiered structure of collaborating institutions (CSIS "entities") that will ensure that climate information and products are generated, exchanged and disseminated (a) globally through a range of advanced centres, designated GPCs; (b) regionally through the network of RCCs; (c) nationally and locally by NMHSs and, through national institutional arrangements, with partners.

CSIS, activity 1: Defining, building and making available a climate services toolkit at the regional and national levels. Gap: Many countries lack the technical capacity to produce and deliver climate products and services. **Goals:** Assess requirements, assemble and distribute a climate services toolkit to all WMO Members in need, and support deployment and training in the use of the toolkit. **Solutions:** Through the collection and enhancement of material and knowledge from many institutions, a climate services toolkit will be developed that will assist all countries, but particularly developing countries, to provide climate services. The toolkit will comprise knowledge products, software tools, public domain datasets and training materials that will enable the latest scientific and technological advances to be applied to the provision of climate services. The toolkit will make training workshops more focused and efficient in imparting operational skills, and will help ensure consistency and quality of products and services made available through CSIS that are targeted for sectoral applications. The activities will include (a) defining standard procedures and best practices; (b) reviewing existing tools and data; (c) toolkit production and logistics; (d) deployment of the toolkit together with training; (e) establishing a mechanism for maintenance and quality control. **Outputs:** (a) standard procedures and best practices for climate data management and mining, monitoring, prediction and projection; (b) a climate service toolkit ready for distribution, deployment of the toolkit and training workshops on its use. **Estimated budget** for 2016–2018: CHF 2 500 000.

CSIS, activity 2: Regional partnerships and networks for enhancing CSIS capacities. Gap: Many regions do not have sufficient partnerships and networks for CSIS implementation. **Goals:** Establish (where applicable), strengthen and sustain regional partnerships for enhancing the capacities of CSIS structures (especially

RCCs) and their linkages to NMHSs in their respective domains of responsibility. **Solutions:** This activity, through regional partnerships and networks, aims to establish forums for sharing expertise and experiences among professionals, including on how to improve communication and achieve a consistent approach in addressing climate-related hazards. The regional partnerships for capacity development will be built on and expanded from existing regional partnerships for severe weather-forecasting and warning services. The activities will also be aligned with the development of the future integrated and seamless WMO Global Data-processing and Forecasting System. **Outputs:** (a) regional frameworks for CSIS implementation; (b) RCC and Regional Specialized Meteorological Centre workshops; (c) climate watch systems; (d) regional management team meetings; (e) regional collaborative platforms; (f) stakeholder engagement. **Estimated budget** for 2016–2018: CHF 2 000 000. The budget is CHF 1 000 000 per region, with a focus on two regions in 2016–2018.

CSIS, activity 3: Facilitating implementation and coordination of the CSIS pillar. **Gap:** There is a lack of a systems approach for full implementation of CSIS; its implementation needs to be coordinated across all levels and its credibility and authenticity ensured. **Goals:** Elaborate core functions of CSIS; assure the networking of the WMO community of climate services providers; bring other partners into the CSIS framework; develop guidance on implementation of climate services at the national level; integrate the climate services toolkit into CSIS operations; develop best practices for tailoring of climate products. **Solutions:** The main component of this activity is to conduct an international workshop on "Defining Climate Service Information System architecture for effective climate service delivery" and prototype aspects of successful implementation in coordination with key stakeholders. The CCI Implementation Coordination Team on the CSIS is proposed to coordinate this workshop and its follow-up activities. **Outputs:** (a) organization of an international workshop; (b) a strategy for deployment of the climate services toolkit; (c) technical reference manuals on CSIS operations; (d) a guidance document on NFCSs. **Estimated budget** for 2016–2018: CHF 600 000.

CSIS, activity 4: CDMSs. **Gap:** There are insufficient basic climate data management capabilities in almost 80 member countries. **Goal:** Significantly improve data management to enhance climate services provision at national, regional and global levels. **Solutions:** CDMS implementation at country level; ensure basic maintenance and evolution of existing open-source CDMSs used by WMO Members and develop the architecture for a future single-reference open-source CDMS. **Outputs:** Consistent national, regional and global climate datasets and related data products and services. **Estimated budget** for 2016–2018: CHF 3 320 000.

CSIS, activity 5: Development and demonstration of a national climate services concept including enhancement of national CSIS capacities. **Gap:** The use of existing climate data, products and knowledge is suboptimal or even absent in many developing countries and there is a need to fast track implementation to achieve quick results. **Goals:** Develop a national climate services concept with a developing-country perspective and fast track its implementation by providing access to existing data and products and enabling less capable NMHSs to quickly attain the capacities to meet the needs of their user sectors through twinning arrangements with advanced NMHSs. **Solutions:** This activity involves the development of a national climate services concept with a major focus on the implementation of CSIS at national level and its linkages with the UIP, with a developing-country perspective and the demonstration of the implementation of this concept in a few pilot countries using the already available data and products through suitable twinning arrangements between advanced and less capable NMHSs. This activity will also address the provision of education and training opportunities to NMHS staff to support CSIS, and explore approaches to develop and deliver these opportunities on an ongoing basis. **Outputs:** (a) a template for a national climate services concept suitable for implementation in developing countries; (b) access to high-resolution climate data and products through twinning arrangements between advanced and less capable NMHSs; (c) deployment

of mentor scientists in developing countries; (d) exchange of experts and on-the-job training. **Estimated budget** for 2016–2018: CHF 3 000 000.

2.3.2 Observations and monitoring

In collaboration with WCRP, the Global Ocean Observing System and the WMO Integrated Global Observing System (WIGOS), GCOS has a mandate to identify climate observational needs and their requirements, and plan and coordinate improvements to the global climate observation system. As such, its coverage extends beyond the meteorological and hydrological observations considered by WMO to include ocean and terrestrial observations. GCOS aims to monitor the biosphere, carbon, water and energy cycles that are fundamental to climate services and so should be seen as a significant resource for GFCS. The activities proposed in this section focus on moving from global to local and national monitoring needed by users of many climate services. Additional benefits would arise from performing the activities in the same region. While focusing on priority areas such as health (air quality), water and food security, it is important to note that, often, observations can contribute to services for many different issues; there is no one-to-one relationship between observations and sectors. Particular emphasis will be placed on the observing networks in developing and least developed countries (LDCs) and small island developing States (SIDS).

Observations and monitoring, activity 1: Identification of data needs and design of observational systems in data-poor regions. **Gap:** To enable the overall observing system to meet observing requirements for the priority GFCS sectors across all geographical scales, local circumstances, capabilities and needs at regional and local levels should be considered. **Goals:** Design the required observational networks and produce implementation plans. **Solutions:** Identify data needs and design observational systems in data-poor regions (for example, selected regions in Africa, SIDS, LDCs, South-East Asia and South America). For each region selected, the state of the existing observing networks will be assessed against GCOS requirements, the GCOS implementation plan, and WIGOS network design principles and observational requirements. Local needs should also be evaluated with the locally specific risks identified along with the required climate services that would allow observational requirements to be identified – these may be traditional meteorological parameters such as precipitation, ocean variables such as sea-level change, or terrestrial parameters such as above-ground biomass. A plan will be developed on how best to meet these needs, including upgrading existing networks and providing capacity development where needed. Priority will be given to those stations from which data are needed to meet observational requirements derived from the five priority areas. The networks must respect standard observing practices and must be managed according to agreed quality management systems and the GCOS climate monitoring principles to ensure that data are suitable for climate assessment purposes. **Outputs:** Detailed data requirements and plans to deliver these needs. **Estimated budget** for 2016–2018: CHF 500 000 (per region).

Observations and monitoring, activity 2: Large-scale data recovery and digitization. **Gap:** Invaluable data to underpin robust climate services is lost if not rescued from paper and managed properly. **Goals:** Enable access to and use of high-quality long-term climate and hydrological data with daily time resolution, to reconstitute and assess the changing behaviour of climate- and water-related extremes affecting water management, agriculture and health, and provide adequate databases on climate- and water-related hazards to support disaster risk reduction. **Solutions:** The project will provide support to data rescue, digitization, quality control and homogenization initiatives, and develop new initiatives as required. The target initiatives are those using modern techniques, procedures and tools to safeguard climate records at the risk of damage or loss, and to recover, digitize and properly manage them. The project will promote the use of these techniques in developing countries and LDCs, including through provision of training,

software, an online supporting information resource facility and, when needed, equipment. The target beneficiaries are NMHSs and other organizations working in climate data collection. Ensuring appropriate CDMS capabilities to integrate rescued data into the national climate record is an integral part of the activity. **Outputs:** Consolidated paper archives and high-quality computer-readable datasets from rescued data. **Estimated budget** for 2016–2018: CHF 2 000 000.

Observations and monitoring, activity 3: Demonstration of efficient improvements to ground-based and space-based networks for measurement of changes in the water cycle in pilot area(s). **Gap:** There is a lack of integrated monitoring of climate for covering multiple risk factors. **Goals:** Demonstrate the benefits of integrated observations of the impacts of changes to the water cycle to the delivery of climate services. **Solutions:** Measurement across the water cycle – for example, soil moisture, precipitation, lakes, groundwater, river flow and sea-level change – will be improved by filling gaps and enhancing surface-based networks and combining them with satellite products in a pilot catchment area. Measurements of other relevant factors such as land-use change together with socioeconomic data (for example, population, industry, and the like) will also be needed. The impact of these improvements, together with the density of measurements needed to monitor changes in water availability and impacts of changes on the water cycle, will be evaluated in order to respond to users' needs, including those expressed in the exemplars. In addition to filling gaps by establishing new stations, this work will leverage the important objective of WIGOS to integrate observing systems from a multitude of partners that operate separate networks with similar or identical observing capabilities for related purposes. **Outputs:** Operational water-cycle monitoring in selected catchment areas. **Estimated budget** for 2016–2018: CHF 1 000 000 (per pilot region selected).

Observations and monitoring, activity 4: Establishment of modern, timely climate system monitoring in support of multi-hazard early warning and disaster risk reduction. **Gap:** There is a suboptimal user- and sector-oriented aggregation of available observational data. **Goals:** Increase capacities in climate services provision to sectors by making available and exchanging a new generation of climate products that will inform in a consistent way on observed climate anomalies and extremes at country level. **Solutions:** The establishment of databases on high-impact hydrometeorological extremes and hazards at regional and national levels is an integral part of this activity. The products will be generated by NMHSs and aggregated and integrated at regional and global levels. This work will be based on optimal use of recent and historical records from observations, gridded datasets and model outputs. Capacity development will be provided by assisting developing countries and LDCs with provision of suitable software, training and guidelines for computing, and analysing and using standards for quasi-real time exchange of these products. The activity contributes to the risk communication initiative of the disaster risk reduction exemplar and adaptation measures, and enhances user awareness of ongoing or foreseeable climate anomalies, along with their associated health consequences, as highlighted by the health exemplar. National products will be disseminated using standard templates and exchange protocols that will enable rapid aggregation of information on regional and global scales. **Outputs:** (a) development and provision of software, guidelines and training for climate monitoring, including analysis of extremes; (b) climate assessment reports and reviews (for example, climate statements, state-of-the-climate reports and reviews, reports and advisories on extreme weather and climate events) that have improved content and coverage with a reduced time delay. **Estimated budget** for 2016–2018: CHF 750 000.

2.3.3 Research, modelling and prediction

In collaboration with GCOS and WWRP, WCRP takes, as its mandate, services and support to a very large research community whose interests and needs extend beyond the WMO purview in areas that include

oceans, ice, stratosphere, air quality and carbon cycles, among others. Because almost all of these WCRP-coordinated research activities on climate have relevance and often direct connection to national and regional climate services, the WCRP programmes can and should also represent a substantial resource for GFCS. In the activities proposed below we demonstrate the potential to create a positive feedback between the fundamental climate community services role of WCRP and the climate services needs represented by GFCS.

Research, modelling and prediction, activity 1: Research on climate predictability and improving prognostic skills: sub-seasonal to seasonal timescales. **Gap:** There is increased demand for predictions at timescales relevant to the risk of extreme weather, including tropical cyclones, droughts, floods, heatwaves and the waxing and waning of monsoon precipitation. **Goals:** Improve forecast skill and understanding on S2S timescales and promote S2S product uptake by operational centres and exploitation by the applications community. **Solutions:** WCRP, in close partnership with WWRP, established the S2S Prediction project to improve forecast skill and understanding on S2S timescales and to promote product uptake by operational centres and exploitation by the applications community. Specific attention in this area will be paid to the risk of extreme weather, including tropical cyclones, droughts, floods, heatwaves and the waxing and waning of monsoon precipitation. As a fundamental step towards these goals, S2S advocates the establishment and maintenance of an extensive database of sub-seasonal (up to 60 days) forecasts and reforecasts (sometimes known as hindcasts). Developing this database will require collaborative research and experimentation on how to produce these forecasts (start dates, length of the forecasts, averaging periods, update frequency of the forecasts). An extensive reforecast set spanning several years will allow calculation of model bias and evaluation of model skill. The S2S Prediction project will also address calibration and combination of ensembles of forecasts from different models into a larger ensemble that can potentially provide higher skill than a forecast from any single model. Extensive multi-model reforecast sets will also be used to build statistical models that can be used to tailor climate forecasts for use in sector-specific applications on the seasonal scale. **Outputs:** (a) increased utilization of improved forecast products and understanding of their uncertainty estimates by the applications community; (b) demonstration projects based on recent extreme events and their impacts, often in conjunction with WCRP Frontiers of Climate Information projects (see activity 3). **Estimated budget** for 2016–2018: CHF 160 000.

Research, modelling and prediction, activity 2: Research on climate predictability and improving prognostic skills: decadal timescales. **Gap:** World climate modelling centres have been seeking to harness global coupled climate models to explore the potential of initialized, multi-year to decadal climate prediction. **Goals:** Stimulate research and development to improve multi-year to decadal climate predictions and the utility of the associated information, and develop organizational and technical processes to underpin the future routine provision of scientifically sound prediction services that can assist stakeholders and decision-makers. **Solutions:** This activity will contribute to the new WCRP Grand Challenge on Near-term Climate Prediction. This includes a synthesis of real-time prediction information from multiple existing, initialized prediction systems, an assessment of the confidence the scientific community has in the information, and the development of criteria that would allow WMO to implement climate services to use the operational prototype services developed through the Grand Challenge. Specific activities include the following: (a) improve the quality of initialized decadal climate information and prediction, (b) collect, collate and synthesize the prediction output and tailor information to form the basis of a service that addresses stakeholders' needs; (c) develop processes to assess and communicate the degree of confidence and uncertainty in the predictions. **Outputs:** The Grand Challenge on Near-term Climate Prediction expects to initiate and issue a real-time Global Decadal Climate Outlook once each year (2016 onwards, with two years of dry running before issue) following the template of the Global Seasonal Climate Update for seasonal predictions. This Grand Challenge on Near-term Climate Prediction thus fills an important gap in the provision of seamless climate information, complemented by seasonal-to-interannual climate predictions on the one hand, and

multi-decadal and longer-term climate change projections on the other. This Grand Challenge will represent an important contribution to the provision of seamless climate services. **Estimated budget** for 2016–2018: CHF 480 000.

Research, modelling and prediction, activity 3: Development of specific focused interdisciplinary and international partner projects on regional climate information. **Gap:** There is a need for fundamental information on climate dynamics to inform regional decision-making at a useful scale. **Goals:** Identify and co-develop foundational research on relevant climate processes needed for robust, scale-relevant information for regional decision-making. **Solutions:** In conjunction with GFCS and other partners, WCRP will develop and implement a series of Frontiers of Climate Information projects. These projects will pursue "information for regions", as distinct from "regional information". The concept of "information for regions" infers consideration of scales of processes ranging from local to global that enhance understanding of regional climate dynamics and the local response to climate forcing. Each Frontiers of Climate Information project seeks to engage with the inherent research challenge presented by multiple threads of information available from a range of observational global climate models, regional climate models, and empirical statistical downscaled data. **Outputs:** Research deliverables leading to the development of tailored climate information for the urban scale as a mechanism to promote urban-focused climate services. **Estimated budget** for 2016–2018: CHF 840 000.

Research, modelling and prediction, activity 4.1: Underpinning research on regional climate services development: Advancing flood early warning on S2S timescales in India with coupled hydrologic and atmospheric modelling. **Gap:** Improving water-forecasting services and especially early flood-warning systems is a permanent challenge and motivation for the protection of billions of people all over the world. **Goals:** Accelerate improvements in prediction and services through an inclusive approach to Earth-system sciences, requiring a suite of diagnostic and prediction models integrated over all spatial and temporal scales; support India's improvement of its water-cycle forecasts through a demonstration research project to extend the water-cycle forecast range to the sub-seasonal scale and evaluate the benefits of the early warning system. **Solutions:** To develop a seamless coupled hydrology atmospheric modelling platform for South Asia and extend the hydrologic forecast range to 30 days, the WCRP–WWRP S2S Prediction project may support research to improve the Indian water-cycle forecast system through the use of S2S forecast information from the project's multi-model ensemble database of reforecasts. By improving the forecast system it is expected that long-term events, such as monsoon, can be integrated into water management and thus the impacts, strength and frequency of flood events affecting the population may be reduced. **Outputs:** Increased utilization of improved coupled forecast products and applications to water management, of forecast products and of the understanding of their uncertainty estimates by the applications community. The following catchments could be considered for improved modelling outputs: basin 1 – Tungabhadra river–Krishna river; basin 2 – Godavari river; basin 3 – Ganges–Brahmaputra. The development of this "ready-set-go" system (see activity 4.2, below, for more details) for early warning and early action to mitigate flood events can then be used to inform related efforts in other countries or regions. **Estimated budget** for 2016–2018: CHF 65 000.

Research, modelling and prediction, activity 4.2: Underpinning research on regional climate services development: Using S2S forecasts to integrate water and energy management in South America. **Gap:** The implications of weather and climate for the water–energy–food nexus are particularly important for the countries of the Plata Basin of South America, including northern Argentina, the Plurinational State of Bolivia, southern Brazil, Paraguay and Uruguay, and there is a need to develop advanced climate services for the region. Hydropower is the largest energy source across this agriculturally important river basin and food production is highly vulnerable to climate variability and change. **Goals:** Develop S2S integrated climate

services for the water and energy sectors over south-east South America, based on recent developments in S2S forecasting, with the goal of reducing vulnerability of populations to weather–climate variability and change, and reducing carbon emissions. The project will build scientific capacity in S2S forecasting in the region, build bridges between strong existing institutions in the public and private sectors, and co-develop targeted climate services products for reservoir management and hydropower generation and dispatching. **Solutions:** The project will be led by scientists at the Universidad de la Republica, Uruguay, in partnership with the Regional Centre for Climate of Southern South America (http://www.crc.sas.org), the Administrator of the Electric Energy Market in Uruguay (ADME), and scientists from the international S2S research project (see section 2.3.3). The approach is conceived around the "ready-set-go" concept developed by the International Research Institute for Climate and Society of Columbia University (IRI), and humanitarian aid managers from IFRC, in which seasonal planning is informed by seasonal forecasts (the "ready" step), with sub-seasonal ones providing weekly updates ("set"), and daily weather forecasts helping to inform the "go" in preparing action for humanitarian aid emergencies. **Outputs:** The proposed Uruguay demonstration research project will provide an important prototype of the applicability of S2S forecast-informed energy and water management for both public and private sectors, which will be relevant to energy-sector GFCS development in other parts of South America, as well as other regions. **Estimated budget** for 2016–2018: CHF 80 000.

2.3.4 Capacity development

One aim of GFCS is to develop the capacity of countries to apply and generate climate information and products relevant to their particular concerns; thus, all aspects of the Framework include capacity development. Capacity development is therefore integrated into most of the 2016–2018 activities. This includes training on thematic issues to augment capacity development initiatives. In addition, there is a need to build a foundation that links and supports the four other pillars and five priority areas so that there are high standards and consistency in how climate information is interpreted and utilized. Key to the development of effective climate services is the implementation of a competence framework for provision of climate services that ensures standardization of services quality and delivery, as approved by the sixty-eighth session of the WMO Executive Council under Resolution 5 (EC-68) – Competences for provision of climate services. This would require identifying and developing education and training resources and institutions to support the climate services competence framework.

Capacity development, activity 1: Develop education and training resources for an international competency framework for climate services. **Gap:** GFCS partners, including funding and implementing agencies (for example, the World Bank Consultation Group, which includes government aid departments), the United Nations Development Programme (UNDP) and NMHSs would benefit from having the confidence that organizations designing and implementing GFCS projects have the necessary competencies and experience to deliver effective and sustainable outcomes. **Goals:** Establish a mechanism for effective implementation of the competency framework for climate services and ongoing monitoring and evaluation of the framework, including through the feedback function. **Solutions:** (a) identify the key skills and competencies required to design and implement GFCS projects at national and regional levels; (b) facilitate the development of guidance material and tools for providers to improve the competencies of their personnel in the provision of quality climate services. **Outputs:** Experts with the appropriate competencies providing technical support for implementation carried out by various entities in a strategic and targeted manner. **Estimated budget** for 2016–2018: CHF 360 000.

Part III. Resource requirements for 2016–2018

The current level of support identified for GFCS operationalization activities, and current funding gaps to be filled for the full and successful implementation of the associated activities are summarized in Table 5. GFCS partners associated with relevant projects will each be responsible for coordinating and contributing to efforts to identify and pursue new funding. Possible sources of future support include the new GCF, to which proposals for some activities are already underway; targeted funding mechanisms such as the Climate Risk Early Warning System Initiative; focused climate services portfolios such as the Weather and Climate Information Services for Africa (supported by the United Kingdom of Great Britain and Northern Ireland); and other traditional bilateral development donors. Other steps are being taken to leverage existing resources, such as WMO-led moves to secure memorandums of understanding with UNDP and the World Bank to help harmonize investment plans in alignment with GFCS. Initiatives such as the European Union Copernicus will help accelerate meeting GFCS objectives by making data and products freely available to partners.

Table 5. Summary of estimated resources (CHF) required to fully implement activities identified as priority needs for the operationalization of GFCS in 2016–2018

Objective	Sector	Implementation cost	Funds available	Funds required
Priority applications: Improving decision-making in climate-sensitive areas	Agriculture and food security	7 880 000	300 000	7 580 000
	Disaster risk reduction	4 000 000	NA	4 000 000
	Energy	6 850 000	0	6 850 000
	Health	7 400 000	650 000	6 750 000
	Water	6 950 000	175 000	6 775 000
	Subtotal	**33 080 000**	**1 125 000**	**31 955 000**
Objective	**Sector**	**Implementation cost**	**Funds available**	**Funds required**
Building and sustaining bridges: Investing in mechanisms for user engagement and services delivery	National	600 000	In kind	600 000
	Regional	4 500 000	300 000	4 200 000
	Global	6 000 000	3 220 000	2 780 000
	Subtotal	**11 100 000**	**3 520 000**	**7 580 000**
Objective	**Sector**	**Implementation cost**	**Funds available**	**Funds required**
Foundational pillars: Enhancing core technical and scientific capabilities for user-driven climate services	CSIS	11 420 000	500 000	10 920 000
	Observations and monitoring	4 250 000	430 000	3 820 000
	Research, modelling and prediction	1 625 000	250 000	1 375 000
	Capacity development	360 000	90 000	270 000
	Subtotal	**17 655 000**	**1 270 000**	**16 385 000**
	Total	**61 835 000**	**5 915 000**	**55 920 000**

Annex 1. Glossary of terms

- **Priority needs for the operationalization of GFCS for 2016–2018:** A strategic work plan and budget for phase II of GFCS implementation. Proposed project activities have been developed based on the GFCS Implementation Plan, and further refined and prioritized by the Operational and Resource Plan Task Team established by the IBCS Management Committee in response to Resolution 6 (IBCS-2) – The Global Framework for Climate Services budget for 2015 and operational and resource plan for the period 2016–2018, adopted by IBCS at its second meeting in November 2014 (*Abridged Final Report with Resolutions of the Second Session of the Intergovernmental Board on Climate Services*, WMO-No. 1149). The budget reflects needs associated with implementing the priority activities and mechanisms.

- **GFCS Monitoring and Evaluation Plan:** A monitoring and evaluation mechanism to foster adequate oversight for monitoring the overall progress of projects and activities, checking progress of activities implemented under GFCS and assessing their effectiveness to ensure that the Framework promotes effective decision-making about climate-related issues that need to be established and maintained as a continuous process. Oversight of the Monitoring and Evaluation Plan and further development on this issue was tasked to the IBCS Management Committee under Resolution 5 (IBCS-2) – Monitoring and evaluating implementation of the Global Framework for Climate Services.

- **GFCS Implementation Plan:** This is the primary guidance document for GFCS implementation, adopted by the World Meteorological Congress at its extraordinary session in 2012 (Resolution 1 (Cg-Ext.(2012)) – Implementation Plan of the Global Framework for Climate Services, *Abridged Final Report with Resolutions of the Extraordinary Session of the World Meteorological Congress*, WMO-No. 1102). The GFCS Implementation Plan (Annex 1 to Resolution 1 (Cg-Ext.(2012) has a structure comprised of five components, presented in the annexes to the Plan: UIP; CSIS; observations and monitoring; research, modelling and prediction; and capacity development. The UIP contains four parts, which represent the four initial priority areas and are named "exemplars".

- **GFCS projects:** These projects will be funded by the GFCS Trust Fund or from other funding mechanisms provided by members and partners. Projects must meet a set of nine criteria as outlined in the *Abridged Final Report of the First Session of the Management Committee of the Intergovernmental Board on Climate Services* (WMO-No. 1144), Annex 1 to Annex II.

- **GFCS contributing projects:** These projects will be designated by partners and members as contributing projects and will be aligned with the Framework's goals and principles. These projects will be funded by implementing entities and are not intended to be funded by the GFCS Trust Fund. Projects must meet a set of five criteria as outlined in Annex 3 to Annex II of the above cited WMO-No. 1144.

- **GFCS compendium of projects:** A 2012 compilation of initial priority activities and projects identified in the GFCS Implementation Plan, annexes and exemplars.

- **Flagship projects**. Projects initiated in countries with direct funding from GFCS.

Annex 2. Criteria for Global Framework for Climate Services projects and contributing projects

As detailed in the *Abridged Final Report of the First Session of the Management Committee of the Intergovernmental Board on Climate Services* (WMO-No. 1144), two sets of criteria have been approved for GFCS projects and GFCS contributing projects.

For projects to be designated as GFCS projects, a set of nine criteria (Annex 1 to Annex II of WMO-No. 1144) must be met. These projects will be funded by GFCS or from other funding mechanisms provided by members and partners. For a project to be identified as a GFCS project, it must meet all of the criteria below, which are designed to ensure that the project is (a) relevant, with a clear climate focus, strong user engagement and services delivery; (b) aligned with the Framework's priority areas and principles; (c) achievable, with realistic objectives and sufficient funding and resources. (Annex 2 to Annex II of WMO-No. 1144 provides a template for assessing whether the criteria for GFCS projects are fulfilled.) The nine criteria are:

1. **Are aligned with at least one of the Framework's priority areas.** The initial priority areas are disaster risk reduction, water resources management, agriculture and food security, and health [energy being added by Resolution 63 (Cg-17)];

2. **Have a strong climate service focus, with operational services as a core element**. While it is important to coordinate weather and climate service activities, projects that are primarily focusing on weather capabilities and services with little or no climate service element are out of scope. Projects that address scientific or technical research priorities alone are of great value, but are also out of scope.

3. **Ensure that their outcomes will address the needs of decision-makers and users of climate services, and therefore build the User Interface platform**. The project should ensure close engagement between users, developers and providers and include all relevant stakeholders; and address the gaps that have been identified in the Implementation Plan, since these have been identified as the gaps that need to be filled to meet user needs.

4. **Develop national or regional capacities.** Countries and regions with limited capacity and capability need assistance to enable them to provide improved quality products and services. Ultimately the need is to develop sufficient capabilities in all countries – in some cases this may be best done at the national level, and in others it may be best done at the regional level to support the national level. The project must therefore either upgrade the national climate service providers, particularly the NMHSs, which currently have basic climate service capabilities, or develop regional capacities to assist national capacities;

5. **Ensure that the project strengthens and supports existing activities and doesn't duplicate.** Note that some projects will undertake new activities and this criterion is intended to avoid duplication, or conflict with, existing activities where relevant;

6. **Involve, or contribute to activities in, LDCs, SIDSs, landlocked developing countries or other regions or countries highly vulnerable and sensitive to climate-related risks.** The project should reduce the vulnerability of society to climate-related hazards (Goal number 1 of the Framework), particularly poor and vulnerable groups;

7. **Have strong prospects for successful delivery.** The project needs to be well conceived and described, ensure that the required resources (including financial, human, technological where appropriate) will be available, represent good value for money, be likely to make a significant impact and be sustainable beyond the project duration;

8. **Ensure the country or region in which the project is being implemented has (or, through capacity development activities, will rapidly have) demonstrated interest and commitment for successful delivery, will build connections across institutes and disciplines, and involve institution(s) with a record of achievement and financial probity.** The institutions must take on a level of ownership of the project to ensure the outcomes, benefits, infrastructure and operations are sustained. Ensuring the engagement of users is essential;

9. **Are implemented at the national, regional or global domain.**

For projects to be designated as contributing projects they must meet all of five criteria (Annex 3 to Annex II of WMO-No. 1144), based on a subset of the nine criteria detailed above but less restrictive. Contributing projects will be designated by partners and members and will be aligned with the Framework's goals and principles. These projects will be funded by implementing entities and are not intended to be funded by GFCS. (Annex 4 to Annex II of WMO-No. 1144 provides a template for assessing whether the criteria for contributing projects are fulfilled.) The five criteria are:

1. **Have a climate service focus, with operational services as a target at least**. While it is important to coordinate weather and climate service activities, projects that are primarily focussing on weather capabilities and services with little or no climate service element are out of scope. Projects that address scientific or technical research priorities alone are of great value, but are also out of scope.

2. **Ensure that the outcomes will address the needs of decision-makers and users of climate services.** This would typically, but not necessarily, involve building the user interface platform. The project should relate to gaps that have been identified in the Implementation Plan.

3. **Ensure that the project strengthens and supports existing activities and doesn't contradict or duplicate.** Note that projects can undertake new activities and this criterion is intended to avoid duplicating, or conflicting with, existing activities.

4. **Involve, or contribute to activities in, LDCs, SIDSs, landlocked developing countries or other regions or countries highly vulnerable and sensitive to climate-related risks**. The project should reduce the vulnerability of society to climate-related hazards (Goal number 1 of the Framework), particularly poor and vulnerable groups.

5. **Ensure the country or region in which the project is being implemented has, or will have, demonstrated interest and commitment to ensure successful delivery, and will build connections across institutes and disciplines.** These institutes should take on a level of ownership of the project to ensure the outcomes, benefits, infrastructure and operations are sustained. Ensuring the engagement of users is essential.

Annex 3. Roles, responsibilities and expectations of Global Framework for Climate Services implementing partners

Successful implementation of activities detailed in *Priority Needs for the Operationalization of the Global Framework for Climate Services (2016–2018*) (the main part of the present publication) will require engagement and support from a wide variety of GFCS implementing partners. The specific role for each partner will vary depending upon the nature of the activity. For example, the GFCS Office supports activities related to coordination and knowledge transfer. An instrumental role will be played by WMO and other technical organizations in activities related to strengthening core technical capabilities around several of the GFCS pillars. User-focused partner organizations, including the GFCS PAC, will take greater responsibility for integrating activities related to GFCS priority areas. Member States can have multiple roles as donors and implementers for national-level activities. For many activities, multiple implementation partners will be working together. A summary of expected roles for the various implementation partners are as follows:

GFCS Office: The GFCS Office is located in the WMO Secretariat. The Office supports the work of IBCS and its substructures, including the IBCS Management Committee and the PAC, and services the meetings of these three structures. In the context of implementation of the activities detailed in the main part of the present publication, the GFCS Office will carry out further coordination and provide support to members and partners in implementing GFCS-related activities;

National governments: National governments have a lead and essential role in developing, implementing and sustaining activities at the national level. IBCS, which serves as the GFCS governance body that provides guidance and direction for the Framework as a whole, is composed of WMO Member representatives – who are typically representatives from an NMHS. Members can support GFCS implementation in several ways: as donors to the GFCS Trust Fund; in support of GFCS projects or the GFCS Office; in providing secondments, junior professional officers, interns and other relevant staff to the GFCS Office to strengthen activities detailed in the main part of the present publication; or in supporting GFCS contributing projects. Most importantly, Members can support capacity development of less capable NMHSs through mechanisms such as twinning and expert exchanges;

WMO Secretariat: The main role of WMO is to strengthen the capacities of NMHSs to develop and deliver climate information and services. The WMO Secretariat, through its technical departments and regional offices, can therefore assume the responsibility of a leading agency for resource mobilization for GFCS activities in which the primary emphasis is on climate observations and monitoring, information systems, research, and capacity development, in particular for those in direct support of NMHSs capacities. This includes matters of observing networks, research into climate predictability, data management and archiving, and dissemination of products. The eight WMO technical commissions, responsible for studying meteorological and hydrological operational systems, applications and research; and the six regional associations responsible for the coordination of meteorological, hydrological and related activities in their geographic jurisdictions, serve as an important source of lessons learned and national knowledge. They therefore represent principle expert resources for the development of guidelines, standards, training curricula and other necessary material to advance the quality of climate services. Their active involvement in national and regional activities will strongly advance the development of climate services. The WMO Secretariat will make recommendations concerning which experts may be most useful to support the activities under any of the objectives, in particular for those under objective 3. The WMO Secretariat can, under specific circumstances, mobilize resources that include support to the understanding of climate information and

services by the user community or even for all three objectives, in which case it manages and distributes funding to GFCS partners that implement a project financed from an extrabudgetary contribution.

Members of the PAC: PAC members are primary stakeholders, particularly for activities in objective 2, which focus on supporting climate services for decision-making in GFCS priority areas. PAC members also develop and distribute their own climate products and information, and build capacity of their constituencies to define requirements, uptake and use, and validate climate information and services. Members of the PAC will help mobilize resources through identification of funding opportunities, facilitation of integration of major resource needs of GFCS into broader investments, and establishment of partnerships or consortia for the development of joint bids.[2] Members of the PAC include the European Centre for Medium-range Weather Forecasts (ECMWF), the European Commission, the European Organization for the Exploitation of Meteorological Satellites, FAO, GWP, IFRC, the International Union of Geodesy and Geophysics, IRENA, the Norwegian Refugee Council (NRC), UNDP, UNISDR, the United Nations Educational, Scientific and Cultural Organization, the United Nations Environment Programme, the United Nations Institute for Training and Research, WBCSD, WFP, WMO and the World Bank Group. GEO participates in the PAC as an observer. Members of the PAC have agreed to focus their activities in eight countries to demonstrate the value of collaboration and working together in the delivery of climate services (Bhutan, Burkina Faso, Colombia, Dominica, Papua New Guinea, Peru, the Republic of Moldova and the United Republic of Tanzania).

Non-PAC members: Non-PAC members are all institutions interested in climate services and implementing relevant activities but that are not currently members of the PAC.[3] These institutions range from academic institutions (for example, IRI), to communities of practice (for example, the Climate Services Partnership). Non-PAC members can have their activities recognized as contributing projects to the overarching vision of GFCS by submitting them through an online portal. However, these activities are neither reflected as among the priority needs for the operationalization of GFCS, nor directly linked to the financial management of the Framework. Non-PAC-member activities are recognized as extremely important, particularly for national-level activities.

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2 "Resources mobilization through identification of funding opportunities, facilitation of integration of major resource needs of the GFCS into broader investments and the establishment of partnerships or consortia for the development of joint bids. The partners for each bid will depend on the nature of the call for proposals." (*Abridged Final Report with Resolutions of the Second Session of the Intergovernmental Board on Climate Services* (WMO-No. 1149), 4.1.8 (e)).

3 Resolution 7 (IBCS-1) – Establishment of a stakeholder engagement mechanism and participation of GFCS stakeholders in the work of the Intergovernmental Board on Climate Services (*Abridged Final Report with Resolutions of the First Session of the Intergovernmental Board on Climate Services* (WMO-No. 1124).

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