WORLD CLIMATE PROGRAMME

WORLD CLIMATE APPLICATIONS AND SERVICES PROGRAMME

Establishment and Designation of WMO Regional Climate Centres (RCCs)

Updated Interim Guidance
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World Climate Applications and Services Division
Climate Prediction and Adaptation Branch
Climate and Water Department

WORLD METEOROLOGICAL ORGANIZATION
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Introduction

Following the release of the IPCC 4th Assessment report in 2007, there has arisen an unprecedented commitment amongst people, societies, agencies and governments to take appropriate steps – to cope with climate variability, and to be ready to adapt to climate change. As such, there is an increasing demand for climate information of all kinds for decision-support systems and climate risk management in all socio-economic sectors.

The World Meteorological Organization, consisting of its 188 Members represented by their **National Meteorological and Hydrological Services (NMHSs)**, works in close collaboration with research communities, universities, the private sector, other government agencies and various space agencies as well, to systematically observe the climate system. The information collected is archived and managed in climate databases such as those in the NMHSs of WMO's Members. These data, critical to our understanding of the climate system, feed dynamical and statistical computer models, to predict and project future states, and to develop useful information, products and services for decision-makers in all walks of life.

All countries, to serve their public and users whose activities are climate-sensitive, need to understand and to provide for their climate-related needs. This will require climate observations, management and transmission of data, various data services, climate system monitoring, practical applications and services for different user groups, forecasts on monthly, seasonal and interannual time scales, climate projections, through to policy-relevant assessments of climate variability and change, and the research that makes all of this possible. Many countries, especially those in developing and Least Developed Countries do not have sufficient individual capacity to cope with this on their own. The situation is exacerbated by the reality that some of these countries are severely affected by climate extremes and climate change, and societal and economic vulnerability is at the highest levels. WMO Members have recognized the need. WMO's technical experts in climatology, regional cooperation, service delivery and product development and transmission are working with the Secretariat to establish mechanisms to improve our institutional capacity for climate around the world.

One recent accomplishment, following years of research and development, is that WMO has designated (in 2007) a number of **Global Producing Centres for Long-range Forecasts (GPCs)**, after a careful assessment of needs, capabilities and optimal designation criteria. The products developed and shared by these centres are extremely valuable global-scale information. The spatial scale at which these global products are provided is currently approximately 200 km by 200 km resolution. Some national and local applications would benefit from products at smaller spatial scales (e.g. 50 km by 50 km). Appropriate strategies are required to develop and implement downscaling of the global products for such applications. To address this, and other information needs for adaptation to climate variability and change, WMO Members have additionally proposed development of **Regional Climate Centres (RCCs)** to help fulfill the need for more regionally focused climate services. While most Members understand the potential benefits of RCCs in their regions, there is, however, still a great deal of uncertainty on the details of RCC establishment, functions, structures, and on consistency between centres, and between regions.

A meeting on the Organization and Implementation of Regional Climate Centres, held in Geneva, Switzerland in November 2003 led to development of 'Guidelines on establishment of RCCs', (ref: WMO-TD No. 1198, WCASP – No. 62), and this guidance was a very good tool to reduce that uncertainty and to underpin the launch of a number of pilot projects. Since that time, the Commission for Climatology (CCl) and the Commission for Basic Systems (CBS) have developed the mechanism for formal WMO designation of RCCs, which will be introduced into the Manual on the Global Data Processing and Forecasting System (GDPFS), Vol. I (Global Aspects), and will become part of the WMO technical regulations. The technical amendment to the Manual on the GDPFS is expected to be recommended by CBS/XIV (tentatively March 2009) for formal approval by WMO at Executive Council LXI, in June 2009.

In the process of development of the technical amendment to the Manual on the GDPFs, some aspects of the earlier Guidance (2003) have been clarified or changed. This present document provides the most up-to-date information derived from this process.

Purpose and structure of the document

This document is meant for the use of any centre or organization that might consider becoming a WMO Regional Climate Centre. It contains information on:

1. The current status of development of the concept of and mechanisms for designation of RCCs,

2. The Manual on the Global Data Processing and Forecasting System (GDPFS), Vol. I (Global Aspects),

3. The RCC concept, definitions and terms,

4. Recommended steps a candidate centre would follow to become a designated RCC, and

5. References.

In addition, a number of Annexes will contain:

1. Background on development of the RCC Concept

2. Relevant components of the proposed amendments to the Manual on the GDPFS, Vol 1 (Global Aspects), for designation of WMO RCCs, including:
   - definitions
   - mandatory RCC functions (requirements that would have to be met in order for the candidate to be designated by WMO as an RCC),
   - additional 'highly recommended' functions any RCC should provide, and
   - the criteria for each mandatory function for designation.

3. A draft Survey, recommended for scoping regional needs for and capabilities to perform RCC functions.

4. A template for application by a WMO Member to the president of a Regional Association for consideration to enter a pilot phase for becoming an RCC, and

5. A template for the president of a Regional Association to nominate a centre for WMO designation as an RCC.

Looking forward

Some regions have, as of May 2008, conducted surveys to assess regional needs and capabilities, and have launched, or are planning a pilot RCC project (e.g. in Asia (2004) and Europe (2008)). Efforts are underway to evaluate capacity to provide RCC services in other regions. WMO's vision is to achieve full global coverage by RCCs as soon as possible, as part of its thrust on meeting the world's needs for adaptation to climate variability and change.

All Members are urged to collaborate with their regional associations to determine requirements, and to identify countries and agencies willing to show leadership in this initiative.

Establishment and Designation of WMO Regional Climate Centres (RCCs)

1. Status of development of the concept of and mechanisms for designation of RCCs

WMO has been working to develop the concept of Regional Climate Centres (RCCs) since the thirteenth World Meteorological Congress (Cg-XIII, May 1999) (see **Annex 1** for background information). Based on the successful conduct of surveys in Asia and Europe to determine requirements for and capacity to host RCCs, and the launch of pilot RCC projects in 2004 and 2008 respectively, Members have indicated a very clear interest in, need for and commitment to establishment of RCCs.

To support and implement this goal, the Commission for Climatology Implementation Coordination Team (CCl ICT), in conjunction with representatives of the Commission for Basic Systems (October 2007), have developed a mechanism for formal WMO designation of RCCs. The process of creating the intercommission mechanism for RCC designation included discussion of regional needs and priorities, differing regional characteristics, the need for some flexibility, and the need that RCCs be created with some consistency, from one centre to the next, or from one region to the next, and that RCCs be held to technical standards. It has been decided therefore that RCCs will be modelled along the lines of Regional Specialized Meteorological Centres (RSMCs) of the GDPFS.

The designation process for RCCs will thus be written into the Manual on the Global Data Processing and Forecasting System (GDPFS), Vol. I (Global Aspects), and will become part of the WMO technical regulations. A draft amendment to the Manual on the GDPFS, developed by CCl and CBS experts at the October 2007 meeting, was further refined by the CCl/CBS Intercommission Technical Meeting on Designation of Regional Climate Centres (January 2008), and has now been reviewed and endorsed by the CBS Expert Team on Extended and Long-Range Forecasting (Beijing, China, April 2008). The technical amendment to the Manual on the GDPFS is expected to be recommended by CBS/XIV (March 2009) for formal approval by WMO at Executive Council LXI, in June 2009.

2. WMO Manual on the Global Data Processing and Forecasting System, Vol. I (Global Aspects)

2.1 Purpose and structure

2.1.1 The Manual on the Global Data Processing and Forecasting System is designed: to facilitate cooperation in data-processing and forecasting among Members; to specify obligations of Members in the implementation of the World Weather Watch (WWW) Global Data Processing and Forecasting System (GDPFS); and to ensure adequate uniformity and standardization in the practices and procedures employed in achieving these goals. The Manual consists of Volumes I and II, which deal with global and regional aspects, respectively. Volume I of the Manual (Global Aspects) consists of Part I (Organization and functions of the GDPFS), Part II (Data-processing and forecasting aspects) and Part III (Data management aspects), which contain regulatory material for the global aspects of the WWW Global Data Processing and Forecasting System. The regulatory material stems from recommendations of the Commission for Basic Systems (CBS) as well as from decisions taken by Congress and the Executive Council.

2.1.2 The Volume I of the Manual on the GDPFS – Global Aspects (WMO No. 485) forms part of the WMO Technical Regulations and is referred to as Annex IV to the Technical Regulations. It is part of the Rules and Regulations to which the WMO Members have to abide, particularly when they are requesting special recognition due to their performed functions to the larger benefit of WMO. In that context the rules, regulations and list of functions expressed in the Manual are written in a specific, concise, accurate and clear manner so that the all Members understand how a

designated centre has confirmed its commitment of functions and services (e,g, operational products). Regulatory texts to be incorporated into the Manual should, as much as possible, stand the test of time, with little or no future modification anticipated. This is to avoid confusion in the Members' understanding of the commitments.

2.2 Process for updating and maintenance of the manual

The WMO Secretariat DPFS Division is responsible for the process of maintenance of this manual. Proposals requiring amendments and updates can come from countries or regions or from technical bodies of the CBS such as the Expert Team on LRF or the CBS ICT on DPFS. When an amendment is proposed, the Secretariat ensures it is discussed by an appropriate CBS body. This body submits the proposal to CBS for decision. A decision in favour of the amendment is then recommended and submitted to WMO Executive Council for approval, after which the amendment is incorporated into the Manual and the revised version (a new supplement) is published and shared with Members.

2.3 Recent modifications of the GDPFS Manual on Global Producing Centres

WMO Members, at Cg-XV (May 2007) and EC-LIX (June 2007), approved the establishment of nine Global Producing Centres (GPCs) along with the definitions of GPCs, description of their roles and a minimum set of products, for amendment to the Manual on the Global Data Processing and Forecasting System (GDPFS) (Vol. I). Subsequently, WMO No. 485 was updated as of November 2007, to include this information, the identification of the nine newly designated GPCs, and of the WMO Lead Centre for Standardized Verification System (SVS) for Long-Range Forecasts (LRF) SVSLRF.

2.4 Existing CBS designation process (e.g. for RSMCs)

The process for designation of new RSMCs by CBS is described in Appendix I-2 of the Manual on the GDPFS. Basically, it is required to produce a statement of requirements, identify capabilities of the proposed centre, state the formal commitment to voluntarily host the centre, demonstrate capability to CBS, and finally with the agreement of CBS, acceptance (approval) by WMO Congress or Executive Council.

2.5 Mechanism to amend the Manual for designation of RCCs

As agreed by CCl and CBS at the meeting of the CCl ICT in October 2007, the WMO Division on DPFS is working with the Secretariat Divisions responsible to the CCl and with experts from CBS and the CCl to finalize the CCl submission to CBS, for amendments to the Manual on the GDPFS (Vol. I, Global Aspects) for designation of RCCs. Following a coordinated effort of these groups including several CCl and CBS reviews, the president of the CCl will send the proposed amendment to the president of CBS for consideration at the next session of the CBS. Through the steps outlined above, there will be implicit agreement between CCl and CBS on the content of the amendment before the final version is submitted for consideration of CBS at its next session (2008). Following its approval, CBS will recommend the amendment to EC-LXI (2009) for its final approval for implementation.

3. The RCC concept, definitions and terms

3.1 RCCs will be Centres of Excellence that assist WMO Members in a given region to deliver better climate services and products including regional long-range forecasts, and to strengthen their capacity to meet national climate information needs. RCCs should all have certain characteristics in common:

- RCCs are regional entities established to develop high-quality regional-scale climate products to assist countries in the region, or a sub-region

- The primary 'clients' of an RCC are NMHSs and other RCCs in the region and in neighbouring areas
- RCC responsibilities should be regional in nature and not duplicate or replace those produced by NMHSs (it is important to note that NMHSs retain the mandate and authority to provide the liaison with national user groups, and to issue advisories and warnings)
- An RCC or an RCC-Network will be considered, in the Manual on the GDPFS, as a type of Regional Specialized Meteorological Centre (RSMC).
- RCCs and RCC-Networks will be 'centres in a cooperative effort', a concept already defined in the Manual on the GDPFS. *NB: GPCs are also considered as types of RSMCs in the Manual on the GDPFS.*
- All RCCs should always adhere to the principles of WMO Resolution 40 concerning the exchange of data and products.

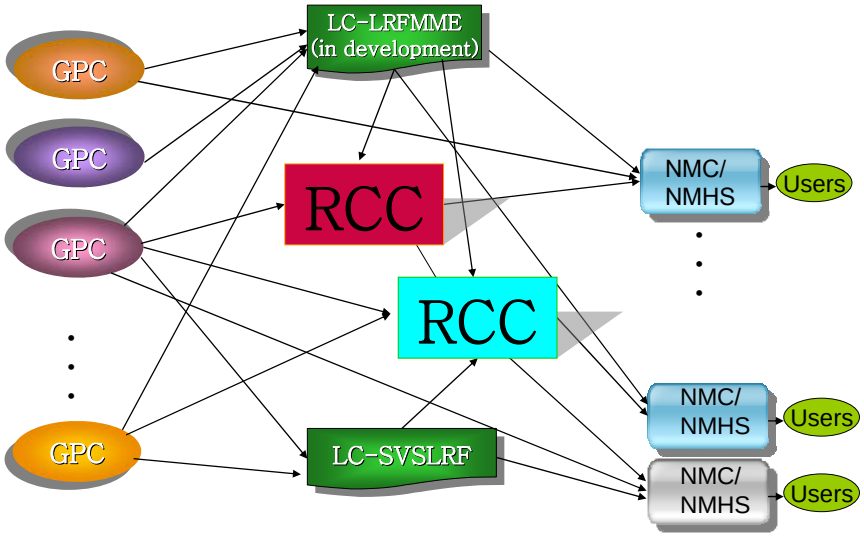
3.2 RCCs can differ from one another is certain ways. For example, the RCC structure within a region may vary from one region to the next. RCC functions for a region may be undertaken within a single (multifunctional) centre, or may be distributed amongst various centres, or nodes, in a Regional Climate Centre Network (See definitions, section 3.5). While some flexibility is necessary, it is strongly advised that a region select one structure or another, and not mix several types in the same region.

3.3 The complete suite of products and services of RCCs can vary from one region to another, based on the priorities established by the regional association. However, there will be certain essential functions all WMO designated RCCs must perform to established criteria, thus ensuring a certain uniformity of service around the globe in RCC mandatory functions. **Annex 2**, the proposed amendment to the Manual on the GDPFS for RCC designation, provides a list of mandatory functions for WMO designation as an RCC, the criteria for these functions, and a list of additional 'highly recommended' functions of RCCs, which are greatly encouraged, but will not be required for WMO designation at this time.

3.4 The following diagram describes the framework for RCC activities. Information will be acquired from reliable sources including GPCs, the Lead Centre for Standard Verification System of LRF (LC-SVSLRF) and perhaps Lead Centres for Long-range Forecast of Multi-model Ensemble (LC-LRFMME) (in development). Information and products will be shared with other RCCs and with NMHSs in regions and sub-regions. Feedback is required in all parts of the process, for continual improvements to the system.

FRAMEWORK FOR RCC ACTIVITIES

(A network of Centres)



3.5. Definitions relevant to RCCs include the following:

- **Regional Climate Centre (RCC):**

A multifunctional centre that fulfils all the required functions of an RCC for the entire region, or for a sub-region to be defined by the Regional Association may be designated by WMO as a 'WMO Regional Climate Centre' (WMO RCC).

- **Regional Climate Centre Network (RCC-Network):**

A group of centres performing climate-related activities that collectively fulfil all the required functions of an RCC may be designated by WMO as a 'WMO Regional Climate Centre Network' (WMO RCC-Network).

- **Node:**

Each centre in a designated WMO RCC-Network will be referred to as a 'Node'. A Node will perform, for the region or sub-region defined by the Regional Association, one or several of the mandatory RCC activities (e.g. long-range forecasting (LRF), climate monitoring, climate data services, training). *See note iii below*

- **RCC Users:**

Recipients of RCC products and services will be NMHSs, other RCCs and international institutions recognized by the Regional Association and will be referred to as 'RCC Users'.

NB:

*i) **Only** centres or groups of centres designated by WMO will carry the title 'WMO RCC' or 'WMO RCC-Network' respectively.*

ii) WMO RCCs and RCC-Networks shall follow Guidance published by the Commission for Climatology on technical, climate-related matters.

iii) Within an RCC-Network, one of the nodes should be identified as the 'point of contact' for the RCC-network, for communications, coordination of reporting, etc.

iv) In document, and in the Manual on the GDPFS, the term 'designation' refers to the formal WMO process to identify an RCC as a centre of excellence, under decisions of various technical commissions (CCl and CBS, principally), and of the Members, through either WMO Executive Council or the World Meteorological Congress.

v) It is possible to establish a centre to deal with climate issues, at the instigation of the region in question, under Volume 2 of the Manual on the GDPFS (regional aspects), without formal designation, but such centres not be titled RCCs, or referred to as such.

4. Recommended steps for designation of a WMO RCC or RCC-Network

4.1 It is highly recommended that each regional association conduct a survey on regional needs for and capacity to deliver RCC services (see **Annex 3** for a draft survey, based on the functions required for RCC designation and on proposed highly recommended functions). The results of the survey will support and underpin decisions related to applications from candidates for RCC status.

4.2 When a Member or organization wishes to become a designated WMO RCC or to join a designated WMO RCC-Network, the following steps are recommended*:

1) The Member or organization will contact the president of the Regional Association (P/RA), noting that a non-NMHS must do this through, or with the endorsement of, a WMO member, expressing intent. (see **Annex 4** for a template)

2) P/RA will inform P/CCl and P/CBS of the intent expressed by the candidate, and will, in consultation with the CCl and perhaps also with the Working Group on Climate-related Matters (WGCRM) for the region, consider the criteria for designation (as per the manual on the GDPFS, Vol 1, Global Aspects) and the pilot or existing RCCs or RCC-Network(s) in the region against regional requirements, and may agree to support the proposal. If needed, the P/RA will provide information on regional needs (see item 4.1) and WMO designation criteria.

3) The candidate RCC or RCC node will work with (or maintain contact with) the regional WGCRM if it exists, the CCl, with other experts nominated by the P/RA, and with other existing RCCs or RCC-networks in the region during its preparations for designation.

4) When the candidate, its peer RCCs and RCC-Ns, the WGCRM and/or other experts, other members in the RA (and possibly the existing GPCs) are satisfied that the candidate is ready and able to fulfil the requirements, P/RA will contact provide information/documentation on the process followed, and an assessment of the capability to meet requirements, to P/CCl.

5) If P/CCl agrees that all appropriate steps have been followed, and that the candidate meets the WMO and regional requirements, P/RA will contact the Secretary-General of WMO to request formal designation for the candidate (see **Annex 5** for a template).

6) WMO SG will forward the request to CBS for action (to inform the CBS ET on ELRF and the CBS OPAG on DPFS, to submit the proposal to CBS and to arrange for demonstration/presentation at the next session of the CBS; and will copy this correspondence to P/CCl for information.

7) The CBS ET on ELRF and the OPAG on DPFS will review the submission and will take up any concerns with the RA. The proposal may be resubmitted with all required clarifications addressed.

8) When appropriate, the proposal will be tabled by the Member(s) in question (in the form of an amendment to the Manual) at a session of CBS for decision. The WMO Secretariat in DPFS and CLPA will assist in development of the proposed amendment.

9) With CBS approval, the amendment to the Manual will be sent to WMO Congress or to Executive Council for approval.

10) With this WMO approval, the manual will be revised and the Regional Association and the candidate will be advised in writing.

*This recommended process was developed at the CCl/CBS Intercommission Technical Meeting on Designation of Regional Climate Centres (January 2008).

5. References to the evolution of the RCC concept and designation mechanism

- Abridged Final Report with Resolutions of the Thirteenth World Meteorological Congress (WMO-No. 902, section 3.2.5…(May 1999)
- General Summary of the session of the Inter-Commission Task Team on Regional Climate Centres (WMO-TD No. 1070, WCASP-No. 52) (May 2001)
- Report of the Second Session of the Inter-Commission Task Team on Regional Climate Centres (WMO-TD No. 1107, WCASP No. 54)(March 2002)
- Abridged Final Report with Resolutions of the Fourteenth World Meteorological Congress (WMO-No. 960, sections 3.1.3, 3.2.0, 3.2.5 and Resolution 11(Cg-XIV) (May 2003)
- Proceedings of the Meeting on Organization and Implementation of Regional Climate Centres (WMO-TD No. 1198, WCASP – No. 62) (November 2003)
- Proceedings of the Meeting of the RA-II Working Group on Climate-Related Matters including CLIPS (WMO-TD No. 1261) (October 2004)
- Review of Activities to Implement a Regional Climate Centre (RCC) for Regional Association IV (RA IV), during the RA IV Hurricane Committee meeting, Miami, USA, 1 May 2004
- Report of the meeting of the WMO RA V Working Group on Climate Matters (February 2006)
- Final Report of the Joint Expert Teams on Long-Range Forecasting (infrastructure and Verification), CBS OPAG on Data Processing and Forecasting Systems (April 2006)
- Report of the RA III Working Group on Climate Matters, (Montevideo, Uruguay, 15-17 May 2006)
- Report of the Working Group on Climate-Related Matters of RA VI (October 2006)
- Report of the RA I Working Group on Climate Matters (WMO-TD No. 1351, WCDMP NO. 59) (October 2006)
- Abridged Final Report of CBS-Ext.(06), Seoul, November 2006
- Report of the Meeting of the Working Group on Climate-Related Matters for Regional Association II (WMO-TD No. 1382) (April 2007)
- Report of the RA VI training seminar on capacity building in climate related matters (WMO-TD No. 1386, WCDMP No. 63) (May 2007)
- Abridged Final Report with Resolutions of the Fifteenth World Meteorological Congress (WMO-No. 1026, (May 2007)
- Report of WMO/KMA Workshop of global producing centres on lead centre for long-range forecast multi-model ensemble prediction; Busan, Republic of Korea, (September 2007) (*http://www.wmo.ch/pages/prog/www/CBS-Reports/DPFS-index.html*
- Report of the CCl Implementation Coordination Team first session (October 2007)
- Manual on the Global Data -Processing and Forecasting System (GDPFS), Vol. I (Global Aspects) (WMO – No. 485)
- Report of the CCl/CBS Intercommission Technical Meeting on Designation of Regional Climate Centres (January 2008)
- Report of the Meeting of the CBS Expert Team on Extended and Long-range Forecasting (Infrastructure and Verification) (April 2008)

Annex 1

BACKGROUND ON DEVELOPMENT OF THE CONCEPT OF AND MECHANISMS TO DESIGNATE WMO RCCS

The Intercommission Task Team on Regional Climate Centres

WMO has formally sought to define and establish RCCs since the thirteenth World Meteorological Congress (Cg-XIII, May 1999). During Cg-XIII, Members were urged to define the requirements for, and objectives and responsibilities of regional and global centres to support operational national climate services; to define the use of existing regional structures and institutions; and to involve regional associations and other partners in the development of the concept of Regional Climate Centres (RCCs). An Inter-Commission Task Team on Regional Climate Centres (ICTT-RCC) was set up (Res. 2/EC-LII, 2000) with members from the Technical Commissions for Climatology (CCl), Agricultural Meteorology (CAgM) and Basic Systems (CBS) and several other members including regional representatives. The second iteration of the ICTT included representatives as well from the Commission for Atmospheric Sciences (CAS) and the Commission for Hydrology (CHy). The results of their efforts were documented in WCASP No. 52, May 2001, and WCASP No. 54, March 2002 and presented at WMO EC sessions and at the Fourteenth World Meteorological Congress in May 2003. These sessions noted that RCC responsibilities should not duplicate or replace those of NMHSs; that establishment of RCCs should follow the steps set up for designation of Regional Specialized Meteorological Centres (RSMCs); and that the procedures for designation of RCCs needed to be defined. The range of Regional Climate Centre Functions developed by the ICTT-RCC was published in WCASP No. 52.

2003 Guidelines

A meeting on the organization and implementation of RCCs (Geneva, 27-28 November 2003), developed Guidelines for the Establishment of RCCs. These Guidelines (published in WCASP No.62) covered, amongst other things, determination of requirements for an RCC; possible structures, the designation procedure as per the CBS Manual on the Global Data Processing and Forecasting System (Vol. I, Global Aspects), and establishment of centres by regional associations without formal WMO designation. The Guidance recognized that the requirements of NMHSs for RCC functions may vary from region to region, and that RCC functions for a region may be undertaken within a single centre, or may be distributed amongst various centres, or nodes, in a Regional Climate Centre Network. ***Some aspects of the Guidelines published in 2003 are out of date, and are replaced by the information in this present publication***.

Advent of Global Producing Centres of Long-range Forecasts

In May 2007, the fifteenth World Meteorological Congress (Cg-XV) approved the establishment of nine Global Producing Centres (GPCs) along with the definitions of GPCs, description of their roles and a minimum set of products, for amendment to the Manual on the Global Data Processing and Forecasting System (GDPFS) (Vol. I). Cg-XV requested that the global LRF products be made available to as many RCCs and NMCs as possible for purpose of enabling them to perform their tasks, and further requested that CBS and CCl collaborate to develop the minimum set of functions and services required of RCCs, in order to support their official designation and inclusion in the Manual on the GDPFS (Vol. I). Cg-XV noted that ongoing coordination would be required to ensure that operational products from the GPCs meet the requirements for seasonal forecasting services provided by RCCs and NMHSs, and that RCCs would need assistance for training users, and requested that GPCs identify and provide suitable experts for interpretation and use of GPC LRF products, verification techniques (e.g. local verification of RCC-generated products) and applications.

Given the anticipated improvements in skill of LRF by using a multi-model ensembles (MME) approach, Congress XV agreed that some GPCs of LRF could serve as collectors of global LRF data to build MMEs, and requested standards for MME products be developed. Congress noted that ECMWF was already disseminating MME products based on Met Office, Météo-France and

ECMWF LRF model output (EURO SIP) and that GPC Seoul and GPC Washington have agreed to explore the use of MME for LRF with a view to implement a joint Lead Centre for LRF MME.

Commission for Climatology Implementation Coordination Team

The Commission for Climatology Implementation Coordination Team (CCl ICT) met 9-11 October 2007 in Geneva, Switzerland, with representation from the six regional Working Groups on climate-related matters and of the WMO World Weather Watch and the CBS. This group agreed on definitions of RCCs and RCC-Networks, and also agreed that the terms RCC and RCC-network would be exclusively used for centres designated by WMO under the Manual on the Global Data Processing and Forecasting System (Vol. I, Global Aspects) (the 'GDPFS Manual'). Roles and responsibilities of RCCs and RCC-Networks were identified in two categories: mandatory functions that would be common to all designated RCCs or RCC-Networks, and highly desirable functions. It was decided that RCCs and RCC-Networks will be considered, in the GDPFS manual, as a type of Regional Specialized Meteorological Centre (RSMC), and will be 'centres in a cooperative effort', a concept already defined in the GDPFS manual. These decisions underpin the concept that RCCs and RCC-Networks will be centres of excellence, with uniformity of service around the globe in their mandatory functions. The CCl ICT established a technical expert group, with CCl and CBS representation, to address and resolve remaining issues, and to develop the amendments required for the GDPFS manual to support formal WMO designation of RCCs or RCC-Networks, and established a workplan for this activity.

In discussion it was noted that user requirements are prone to frequent changes, so these should not be specified in the manual on the GDPFS. It was also noted that a standardized verification system (SVS) for long-range forecast (LRF) was already part of the GDPFS Manual (December 2007 version, attachment II.8, including the role of the SVSLRF Lead Centre). It was agreed that performance should be monitored and evaluated accordingly, and that regular assessments of the users of the products should be made. This will be conducted as part of performance measurement and evaluation of the diverse aspects of the overall WMO Operating Plan. Because tools and methods for socio-economic evaluation of products and services are in development stage, it was agreed that reference to socio-economic value of RCCs would be made only under Research and Development, in 'Highly recommended' RCC functions.

CCl/CBS Intercommission Technical Meeting on Designation of Regional Climate Centres (January 2008)

The CCl-CBS Intercommission Technical Meeting on Designation of Regional Climate Centres (RCCs) was held in Geneva, Switzerland, at WMO headquarters, on 21-22 January 2008. The WMO Information System (WIS), including information on designation of Data Collection or Production Centres **(**DCPCs), was discussed and it was noted that in the WIS concept, RCCs would act as data centres for climate activities within each WMO region, and that RCCs would therefore be considered as DCPCs under WIS. It was noted that WIS is being designed to respect WMO's data policies, and that users will know what information is available, but WIS will not give access to that information. The custodians of the data will retain full command over access, and their data security. It was further noted that, while it is not yet possible to identify exactly what an RCC or RCC-Network node will have to do to become recognized as a WIS DCPC (this is a work in progress), all candidate RCCs and RCC-networks must be aware that WIS compliance will eventually be required. It was agreed that working towards WIS compliance and DCPC designation would be listed as a 'highly recommended' function for RCCs and RCC-Networks in the category of 'non-operational data services'.

The participants reviewed and revised the first draft set of amendments developed by the ICT on October 2003, and endorsed the workplan and its deadlines, recognising the importance of adherence to the timeframe identified in order to support the wishes of the Members to have the first RCCs designated at EC-LXI in 2009. In addition, the expert group reviewed the recommended steps for establishment of an RCC in the earlier (2003) Guidelines, and revised the

recommendations, to be consistent with the current concepts developed for the manual on the GDPFS. The recommended steps are presented in section 4 of this Guidance document.

Meeting of the CBS Expert Team on Extended and Long-range Forecasting (Infrastructure and Verification) (April 2008)

In accordance with the workplan developed by the CCl ICT (October 2007), the CBS Expert Team on Extended and Long-range Forecasting met in Beijing, China, from 7-10 April, 2008. The ET reviewed the proposed amendment to the manual on the GDPFS, and proposed one change, to include the possibility that RCCs will obtain some of the global LRF products from Lead Centres for LRFMME (in development), in addition to GPCs. With that suggestion made, the ET approved the content of the amendment.

The ET, in addition, was informed of current status and planned activities of several centres considering recognition as future RCCs, namely the Beijing Climate Centre, the Tokyo Climate Centre, the North Eurasia Regional Climate Centre, and the India National Climate Centre, Pune.

RELEVANT COMPONENTS (A, B AND C) OF THE PROPOSED AMENDMENTS TO THE MANUAL ON THE GDPFS, VOL 1 (GLOBAL ASPECTS), FOR DESIGNATION OF WMO RCCS

A) In Part II, add new APPENDIX II-10 as follows:

DESIGNATION AND MANDATORY FUNCTIONS OF REGIONAL CLIMATE CENTRES (RCCs) AND RCC-NETWORKS

1. A multifunctional centre that fulfils all the required functions of an RCC for the entire region, or for a sub-region to be defined by the Regional Association may be designated by WMO as a 'WMO Regional Climate Centre' (WMO RCC). A group of centres performing climate-related activities that collectively fulfil all the required functions of an RCC may be designated by WMO as a 'WMO Regional Climate Centre Network' (WMO RCC-Network). Each centre in a designated WMO RCC-Network will be referred to as a 'Node'. A Node will perform, for the region or sub-region defined by the Regional Association, one or several of the mandatory RCC activities (e.g. long-range forecasting (LRF), climate monitoring, climate data services, training). Only centres or groups of centres designated by WMO will carry the title 'WMO RCC' or 'WMO RCC-Network' respectively. Recipients of RCC products and services will be NMHSs, other RCCs and international institutions recognized by the Regional Association and will be referred to as 'RCC Users'. WMO RCCs and RCC-Networks shall follow Guidance published by the Commission for Climatology on technical, climate-related matters.

2. Designated Regional Climate Centres and RCC-Networks are as follows:

…(to be completed before EC-LXI, June 2009)……..

3. In order for a centre or a group of centres in a cooperative effort to be officially recognized as a WMO RCC (Regional Climate Centre), or a WMO RCC-Network, it shall perform the following minimum* set of functions, criteria and products for which are defined in Appendix II-11:

- **Operational Activities for LRF*:**
  - Interpret and assess relevant LRF products from Global Producing Centres (GPCs) (some of which can be obtained through the Lead Centres for LRFMME - see Attachment II-12), make use of Lead Centre for Standard Verification System on LRF (see Attachment II-8), distribute relevant information to RCC Users; and provide feedback to GPCs
  - Generate regional and sub-regional tailored products, relevant to RCC User needs, including seasonal outlooks etc.;
  - Perform verification of RCC quantitative LRF products, including the exchange of basic forecasts and hindcast data;
  - Generate 'consensus' statement on regional or sub-regional forecasts (see Appendix II-11 for details).
  - Provide on-line access to RCC products/services to RCC Users;
  - Assess use of RCC products and services through feedback from RCC Users.

Note: * Both dynamical and statistical, within the range of 1 month to 2 year timescale, based on regional needs.

- **Operational Activities for Climate Monitoring:**
  - Perform climate diagnostics including analysis of climate variability and extremes, at regional and sub-regional scales;
  - Establish an historical reference climatology for the region and/or sub-regions;
  - Implement a regional Climate Watch.

- **Operational Data Services, to support operational LRF and climate monitoring:**
  - Develop regional climate datasets, gridded where applicable;
  - Provide climate database and archiving services, at the request of NMHSs;

- **Training in the use of operational RCC products and services**
  - Provide information on methodologies and product specifications for mandatory RCC products, and provide guidance on their use
  - Coordinate training for RCC Users in interpretation and use of mandatory RCC products.

Notes: *

- Additional requirements for RCC functions may vary in detail from Region to Region**.** A list of 'highly recommended', but not mandatory, functions is given in Attachment II-10.
- An RCC is not necessarily an NMHS, but a non-NMHS candidate for RCC designation must be nominated by the Permanent Representative of the concerned country.

Annex 2, part B

RELEVANT COMPONENTS (A, B AND C) OF THE PROPOSED AMENDMENTS TO THE MANUAL ON THE GDPFS, VOL 1 (GLOBAL ASPECTS), FOR DESIGNATION OF WMO RCCS

B) In Part II, add new **ATTACHMENT II-10** as follows:

ADDITIONAL 'HIGHLY RECOMMENDED' FUNCTIONS OF DESIGNATED WMO RCCs OR WMO RCC-NETWORKS:

- **Climate Prediction and Climate Projection (beyond 2 years timeframe)**
  - Assist RCC Users in the access and use of WCRP-CMIP climate model simulations
  - Perform downscaling of climate change scenarios
  - Provide information to RCC Users for use in development of climate adaptation strategies
  - Generate, along with warnings of caution on accuracy, seasonal forecasts for specific parameters where relevant, such as:
    - onset, intensity and cessation of rainy season;
    - tropical cyclone frequency and intensity
  - Perform verification on consensus statements for forecasts;
  - Perform assessment of other GPC products such as SSTs, winds, etc.

- **Non-operational data services**
  - Keep abreast of activities and documentation related to WMO WIS, and work towards WIS compliance and DCPC designation;
  - Assist NMHSs in the rescue of climate data from outmoded storage media;
  - Assist NMHSs to develop and maintain historical climate datasets;
  - Assist RCC Users in the development and maintenance of software modules for standard applications;
  - Advise RCC Users on data quality management;
  - Conduct data homogenization, and advise RCC Users on homogeneity assessment and development and use of homogeneous data sets;
  - Develop and manage databases, and generate indices, of climate extremes;
  - Perform Quality Assurance/Quality Control on national datasets, on request of an NMHS;
  - Provide expertise on interpolation techniques;
  - Facilitate data/metadata exchange amongst NMHSs, including on-line access, through an agreed regional mechanism;
  - Perform Quality Assurance/Quality Control on regional datasets.

- **Coordination Functions**
  - Strengthen collaboration between NMHSs on related observing, communication and computing networks including data collection and exchange;
  - Develop systems to facilitate harmonisation and assistance in the use of LRF products and other climate services;
  - Assist NMHSs in user liaison, including the organisation of climate and of multidisciplinary workshops and other forums on user needs;
  - Assist NMHSs in the development of a media and public awareness strategy on climate services.

- **Training and Capacity building**
  - Assist NMHSs in the training of users on the application and on implications of LRF products on users;
  - Assist in the introduction of appropriate decision models for end-users, especially as related to probability forecasts;
  - Promote technical capacity building on NMHS level (e.g. acquisition of hardware, software, etc.), as required for implementation of climate services.

- Assist in professional capacity building (training) of climate experts for generating user-targeted products.

- **Research and Development**
  - Develop a climate Research and Development agenda and coordinate it with other relevant RCCs;
  - Promote studies of regional climate variability and change, predictability and impact in the Region;
  - Develop consensus practices to handle divergent climate information for the Region;
  - Develop and validate regional models, methods of downscaling and interpretation of global output products;
  - Promote the use of proxy climate data in long-term analyses of climate variability and change;
  - Promote application research, and assist in the specification and development of sector specific products;
  - Promote studies of the economic value of climate information.

RELEVANT COMPONENTS (A, B AND C) OF THE PROPOSED AMENDMENTS TO THE MANUAL ON THE GDPFS, VOL 1 (GLOBAL ASPECTS), FOR DESIGNATION OF WMO RCCS

C) In Part II, add new **APPENDIX II-11** as follows**:**

DETAILED CRITERIA FOR RCC MANDATORY FUNCTIONS

Functions	Activities	Criteria
Operational Activities for LRF (both dynamical and statistical, within the range of 1 month to 2 year timescale, based on regional needs)	Interpret and assess relevant LRF products from Global Producing Centres (GPCs), distribute relevant information to RCC Users; and provide feedback to GPCs (see Attachment II-14)	***Product:*** assessment of the reliability and outcomes of GPCs or LCs-LRFMME products including the reasoning (making use of LC SVSLRF), for the region of interest, in the form of texts, tables, figures, etc. ***Element:*** 2-m mean temperature, total precipitation ***Update frequency:*** monthly or at least quarterly
	Generate regional and sub-regional tailored products, relevant to RCC User needs, including seasonal outlooks etc.	***Product:*** probabilities for tercile (or appropriate quantile) categories for the region or sub-region ***Element:*** 2-m mean temperature, total precipitation ***Output type:*** *rendered images (maps, charts), text, tables, digital data* ***Forecast period*****:** one month up to 6 months ***Update frequency:*** 10 days to one month
	Generate consensus* statement on regional or sub-regional forecasts. **NB: A collaborative process involves discussion with experts in the region (e.g. through Regional Climate Outlook Forums (RCOFs), teleconferencing, etc.).* *Consensus is both the agreed process, and its joint conclusion, and can be that there is limited skill in the prediction for a region or sub-region*	***Product:*** *consensus statement on regional or sub-regional forecast.* ***Element:*** *2-m mean temperature, total precipitation* ***Output type:*** *report* F***orecast period*****:** *a climatologically significant period (from one month to one year)* ***Update frequency:*** *at least once per year (to be defined by the region)*
	Perform verification of RCC quantitative LRF products, including the exchange of basic forecasts and hindcast data.	***Products:*** verification datasets (e.g. SVS LRF scores, Brier Skill Score; ROC; Hit Rate Skill Score) ***Element:*** 2-m mean temperature, total precipitation
	Provide on-line access to RCC products/services to RCC Users.	***Product:*** an on-line data/information portal
	Assess use of RCC products and services through feedback from RCC Users.	***Product:*** analysis of feedback (which is made available using a template) ***Update frequency:*** annually, as part of a regular reporting of RCCs to WMO RAs

Operational Activities for Climate Monitoring	Perform climate diagnostics including analysis of climate variability and extremes, at regional and sub-regional scales	***Products:*** climate diagnostics bulletin including tables, maps and related products ***Element:*** Mean, Max and Min temperatures, Total precipitation; other elements (esp. GCOS essential climate variables) to be determined by the region, ***Update frequency:*** monthly
	Establish an historical reference climatology for the region and/or sub-regions	***Product:*** database of climatological means for various reference periods (e.g. 1931-60; 1951-80; 1961-90; 1971-2000; etc) ***Spatial resolution:*** *by station* ***Temporal resolution:*** *monthly at a minimum* ***Elements:*** Mean, Max and Min temperatures, Total precipitation; other elements (esp. GCOS essential climate variables) to be determined by the region, ***Update frequency:*** at least 30 years, preferably 10 years
	Implement a Regional Climate Watch	***Products:*** climate advisories and information for RCC Users ***Update:*** whenever required, based on the forecast of significant regional climate anomalies.
Operational Data Services, to support operational LRF and climate monitoring	Develop quality controlled regional climate datasets, gridded where applicable	***Products:*** regional, quality controlled climate datasets, gridded where applicable, following CCl guidance on QA/QC procedures ***Elements:*** Mean, Max and Min Temperature, and Precipitation, at a minimum ***Temporal resolution:*** *daily* ***Update:*** monthly
	Provide climate database and archiving services, at the request of NMHSs	***Products:*** national databases with metadata, accessible to the NMHS in question (backup service, development site, etc). ***Elements:*** as determined by the NMHS ***Update:*** at the request of the NMHS
Training in the use of operational RCC products and services	Provide information on methodologies and product specifications for mandatory RCC products, and provide guidance on their use	***Products:*** *Manuals, guidance documents and information notes*. ***Update frequency:*** when methods/products are revised or introduced or discontinued
	Coordinate training for RCC Users in interpretation and use of mandatory RCC products	***Products:*** survey and analysis of regional training needs, and proposals for training activities.

NOTE: an RCC is expected to perform certain functions (e.g. for homogeneity testing; database management; metadata management, statistical evaluation of climate data, etc.) using procedures proposed in the WMO Guide to Climatological Practices and in other official Commission for Climatology Guidance documents.

Annex 3

DRAFT SURVEY, RECOMMENDED FOR SCOPING REGIONAL NEEDS FOR AND CAPABILITIES TO PERFORM RCC FUNCTIONS

As noted in section 4 of this document, it is highly recommended that each regional association conduct a survey on regional needs for and capacity to deliver RCC services. The results of the survey will support and underpin decisions related to applications from candidates for RCC status. The following draft survey, based on the functions required for RCC designation and on proposed highly recommended functions, may be of use to the regional associations. Conduct and analysis of the survey could be facilitated by regional CCl and CBS experts, the Working Group on Climate-related matters, and experts in already existing regional centres dealing with climate matters. Analysis of the survey could be useful for generation of a regional plan for a suitable RCC structure and pilot projects, and for identification of any remedial actions that would be necessary for compliance with the minimum set of mandatory functions for WMO designation.

QUESTIONNAIRE TO DETERMINE REQUIREMENTS FOR THE ESTABLISHMENT OF A REGIONAL CLIMATE CENTRE

PART A: Functions that will be **mandatory** for WMO designation as RCC or RCC-Network

	Is your NMHS able to perform this activity to fulfil national needs? (Scale of 10 to 0)*	***Is your NMHS able to perform this activity on behalf of the Region? (scale of 10 to 0)****	***Do you require this activity to be performed by n RCC? (Y/N)***	***Remedial support required to perform this mandatory RCC function***
Operational Activities for LRF:				
Interpret and assess relevant LRF products from Global Producing Centres (GPCs), distribute relevant information to RCC Users; and provide feedback to GPCs				
Generate regional and sub-regional tailored products, relevant to RCC User needs, including seasonal outlooks etc.				
Generate consensus* statement on regional or sub-regional forecasts				
Perform verification of RCC quantitative LRF products, including the exchange of basic forecasts and hindcast data				
Provide on-line access to RCC products/services to RCC Users				
Assess use of RCC products and services through feedback from RCC Users				
Operational Activities for Climate Monitoring				
Perform climate diagnostics including analysis of climate variability and extremes, at regional and sub-regional scales				
Establish an historical reference climatology for the region and/or sub-regions				
Implement a Regional Climate Watch				
Operational Data Services, to support operational LRF and climate monitoring				
Develop quality controlled regional climate datasets, gridded where applicable				
Provide climate database and archiving services, at the request of NMHSs				
Training in the use of operational RCC products and services				
Provide information on methodologies and product specifications for mandatory RCC products, and provide guidance on their use				
Coordinate training for RCC Users in interpretation and use of mandatory RCC products				

NOTE: Reflect true capacity to deliver the function, in consideration of the required human resources, computing and telecommunications capacities including equipment, power, hardware, software, etc., and other infrastructure requirements, and also mandate of the organization.

Scale of 10 to 0: The number 10 reflects high capability, no issues, while the number 0 reflects no capability to perform this function.

PART B: **Highly recommended** functions of RCCs and RCC-Networks

	Is your NMHS able to perform this activity to fulfil national needs? (Scale of 10 to 0)*	***Is your NMHS able to perform this activity on behalf of the Region? (scale of 10 to 0)****	***Do you require this activity to be performed by an RCC? (Y/N)***	***Prioritize the activity as HIGH, MEDIUM or LOW***
Climate Prediction and Climate Projection				
Assist RCC Users in the access and use of WCRP-CMIP climate model simulations				
Perform downscaling of climate change scenarios				
Provide information to RCC Users for use in development of climate adaptation strategies				
Generate, along with warnings of caution on accuracy, seasonal forecasts for specific parameters where relevant, such as: onset, intensity and cessation of rainy season; tropical cyclone frequency and intensity				
Perform verification on consensus statements for forecasts;				
Perform assessment of other GPC products such as SSTs, winds, etc				
Non-operational data services				
Keep abreast of activities and documentation related to WMO WIS, and work towards WIS compliance and DCPC designation;				
Assist NMHSs in the rescue of climate data from outmoded storage media;				
Assist NMHSs to develop and maintain historical climate datasets;				
Assist RCC Users in the development and maintenance of software modules for standard applications;				
Advise RCC Users on data quality management;				
Conduct data homogenization, and advise RCC Users on homogeneity assessment and development and use of homogeneous data sets;				
Develop and manage databases, and generate indices, of climate extremes;				
Perform Quality Assurance/Quality Control on national datasets, on request of an NMHS;				
Provide expertise on interpolation techniques;				
Facilitate data/metadata exchange amongst NMHSs, including on-line access, through an agreed regional mechanism;				
Perform Quality Assurance, Quality Control on regional datasets				
Coordination Functions				
Strengthen collaboration between NMHSs on related observing, communication and computing networks including data collection and exchange;				
Develop systems to facilitate harmonisation and assistance in the use				

of LRF products and other climate services;				
Assist NMHSs in user liaison, including the organisation of climate and of multidisciplinary workshops and other forums on user needs;				
Assist NMHSs in the development of a media and public awareness strategy on climate service				
Training and Capacity building				
Assist NMHSs in the training of users on the application and on implications of LRF products on users;				
Assist in the introduction of appropriate decision models for end-users, especially as related to probability forecasts;				
Promote technical capacity building on NMHS level (e.g. acquisition of hardware, software, etc.), as required for implementation of climate services.				
Assist in professional capacity building (training) of climate experts for generating user-targeted products				
Research and Development				
Develop a climate Research and Development agenda and coordinate it with other relevant RCCs;				
Promote studies of regional climate variability and change, predictability and impact in the Region;				
Develop consensus practices to handle divergent climate information for the Region				
Develop and validate regional models, methods of downscaling and interpretation of global output products;				
Promote the use of proxy climate data in long-term analyses of climate variability and change;				
Promote application research, and assist in the specification and development of sector specific products;				
Promote studies of the economic value of climate information				

NOTE: Reflect true capacity to deliver the function, in consideration of the required human resources, computing and telecommunications capacities including equipment, power, hardware, software, etc., and other infrastructure requirements, and also mandate of the organization.

Scale of 10 to 0: The number 10 reflects high capability, no issues, while the number 0 reflects no capability to perform this function.

Annex 4

TEMPLATE FOR APPLICATION BY A WMO MEMBER TO THE PRESIDENT OF A REGIONAL ASSOCIATION FOR CONSIDERATION TO ENTER A PILOT PHASE FOR BECOMING AN RCC

An agency or organization that wishes to be considered for WMO designation as an RCC will make this known to the president of the regional association in writing. It is highly recommended that the candidate include the following information with the letter of intent to engage in a pilot or demonstration process:

1. Name of the centre
2. Focal point for RCC communications
3. Affiliation (host, sponsors, stakeholders, partnering agencies, etc) at global, regional and national levels, and by sector
4. Full address (or addresses, if a group of entities will collectively be the candidate)
5. Date of establishment of the centre
6. Mandate (mission, vision) of the centre for climate activities
7. Websites relevant to the centres climate activities
8. Current operational climate products
9. User profiles (sectors served, specific tailored products for clients) – current and future
10. Staff compliment (technical and administrative categories)
11. Description of current and planned facilities including computing and communications profiles, modelling capacity, statistical capacity, data, data management, archiving profile, etc.

Attachments (documentation) should include:

1. letter of endorsement from the PR of the host country
2. completed survey, along with additional detail that would aid decision-making by P/RA

Annex 5

TEMPLATE FOR THE PRESIDENT OF A REGIONAL ASSOCIATION TO NOMINATE A CENTRE FOR WMO DESIGNATION AS AN RCC

The president of the regional association, once satisfied that the candidate can and can continue to perform the mandatory functions for WMO designation as an RCC will nominate that centre to the Secretary-General of WMO. In this communication, the president of the regional association will include:

1. A description of the process followed to demonstrate capability to fulfil the stated requirements and identification of those consulted
2. An assessment of the results and outcomes of the pilot/demonstration phase, developed by the Working Group on Climate-related matters or other expert advisor(s)
3. A description of any remedial actions already taken to ensure capacity, and identification of any challenges related to sustainability that may recur
4. A list of activities performed during the pilot phase, and an evaluation of these (also from user perspective)
5. All appropriate endorsements and stakeholder commitments.