

How to establish and run a WMO Regional Climate Centre (RCC)

This brochure provides information for any climate-centred organization that considers becoming a WMO RCC, or a node in a WMO RCC-Network. Where not explicitly specified, the term 'WMO RCC' refers to both full-fledged multifunctional WMO RCCs and distributed-function WMO RCC-Networks.

Concept	WMO RCCs are centres of excellence that create regional climate products including long-range forecasts in support of regional and national climate activities and thereby strengthen capacity of WMO Members in a given region to deliver better climate services to national users.
Scope	WMO RCC responsibilities shall be regional in nature and shall not duplicate or replace national responsibilities.
Functions	WMO RCC services span a set of mandatory and additional highly recommended functions defined and specified in the Manual on the GDPFS with criteria for designation, and might cover further functions beyond as required by the region. Mandatory functions must be fulfilled in order to obtain WMO's designation as WMO RCC. WMO RCCs shall follow guidance published by the WMO Commission for Climatology on technical, climate-related matters and by the WMO Commission for Basic Systems on operational issues.
Users	The primary clients of WMO RCCs are NMSs and other WMO RCCs in the region and in neighbouring areas as well as international institutions recognized by the WMO Regional Association (RA).
Organizational models	WMO RCCs can be structured in one of two ways: RCC functions for a region may be undertaken within a single (multi-functional) centre, or may be distributed amongst various centres, or nodes, in a WMO RCC-Network. WMO Regional Associations define the region for which respective RCC functions are carried out. It is recommended to agree on the appropriate WMO RA's RCC structure <i>first</i> before implementing WMO RCCs. Furthermore, it is strongly advised not to mix the two types in the same region. <i>Note: WMO is currently exploring ways to provide RCC services in climate sensitive areas, which belong to either several WMO RAs (e.g. Arctic or Mediterranean regions) or to none (Antarctica). A separate concept note is under development in this regard.</i>
WIS compliance	RCC operations must be consistent with WIS standards. WMO RCCs may also become WMO WIS DCPCs.
Data policy	WMO RCCs should always adhere to the WMO principles on the exchange of data and products.
Information Sources	WMO RCCs and RCC Networks will acquire information from reliable sources including Global Producing Centres for Long-range Forecasts (GPCs) and associated Lead Centres as well as scientifically recognised external sources. Additional main sources of reliable information for WMO RCCs are the respective NMSs they serve.

Definitions

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

Node: Each centre in a designated 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).

A WMO RCC must not necessarily belong to an NMS, but a non-NMS candidate for RCC designation must be nominated by the Permanent Representative of the concerned Member country.

Within an WMO RCC-Network, one of the nodes should be identified as 'point of contact' for the RCC-Network, for communications, co-ordination of reporting etc. as well as for a certain level of network coordination.



Detailed criteria for WMO RCC mandatory functions

Function: Operational activities for long-range forecasting

Activities	Criteria
Interpret and assess relevant LRF products from Global Producing Centres (GPCs), distribute relevant information to RCC users, and provide feedback to GPCs	Product: assessment of the reliability and outcomes of GPC or LC-LRFMME products including the reasoning (make use of LC-SVSLRF), for the region of interest Output type: 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, incl. 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 six months Update frequency: 10 days to one month
Generate consensus statement on regional or sub-regional forecasts	Product: consensus statement on regional or sub-regional forecast Element: 2-m mean temperature, total precipitation Output type: report Forecast 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 forecast and hindcast data	Product: 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

Function: Operational activities for climate monitoring

Activities	Criteria
Perform climate diagnostics incl. analysis of climate variability and extremes, at regional and sub-regional scales	Product: climate diagnostics bulletin incl. 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 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	Product: climate advisories and information for RCC users Update frequency: whenever required, based on the forecast of significant regional climate anomalies

Function: Operational data services, to support operational LRF and climate monitoring

Activities	Criteria
Develop quality controlled regional climate datasets, gridded where applicable	Product: regional, quality controlled climate datasets, gridded where applicable, following CCI guidance on QA/QC procedures Temporal resolution: daily Elements: Mean, Max and Min temperatures and total precipitation, at a minimum Update frequency: monthly
Provide climate database and archiving services, at the request of NMSs	Product: national databases with metadata, accessible to the NMS in question (backup service, development site etc.) Elements: as determined by the NMS Update frequency: at the request of the NMS

Function: Training in the use of operational RCC products and services

Activities	Criteria
Provide information on methodologies and product specifications for mandatory RCC products, and provide guidance on their use	Product: 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	Product: survey and analysis of regional training needs, and proposals for training activities

Note: A set of additional 'highly recommended' RCC functions in the domains of 'climate prediction and climate projection', 'non-operational data services', 'coordination', 'training and capacity building' and 'Research and Development' is listed and specified in the Manual on the GDPFS. WMO RCCs and WMO RCC-Networks are encouraged to deliver as much 'highly recommended' functions as possible, based on related regional requirements.

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

When a climate-centred entity wishes to be designated by WMO as a WMO RCC, or if a group of entities wishes to be designated as WMO RCC-Network, the following steps are recommended:

- Step 0** Regional Associations (RAs) are strongly encouraged to conduct a survey of Members on regional needs for and capacity to deliver RCC services, to underpin decisions related to candidate entities seeking WMO RCC status. A draft survey template*, based on the mandatory functions required for RCC designation as well as the associated highly recommended functions, is available through the WMO Secretariat, and can be modified based on regional requirements.
- Note: Ideally, the RA adopts a resolution formally committing itself to the establishment of RCCs, including the operation of a pilot phase, during one of its regular sessions. This resolution should be based on a related survey on regional needs for and capacity to deliver RCC services and should mandate a Working Group, Task Team or an appropriate body reporting to the President of the concerned RA (P/RA) to elaborate a WMO RCC implementation plan based on mutual consensus among the relevant stakeholders.*
- Step 1** The RCC candidate(s) will contact* P/RA through, and with the endorsement of, the Permanent Representative of the country in which it is situated, expressing its intent to be designated as a WMO RCC, and to begin a pilot phase.
- Notes:*
- (1) *It is highly recommended that RCC candidates take part in a pilot phase during which they (i) build their capacity to perform the mandatory RCC functions, (ii) undertake any other functions of high priority in the region, and (iii) prepare to demonstrate that they meet the requirements laid down in the Manual on the GDPFS. Pilot programmes will be organized through the RAs, at the discretion of the RA Members. The duration of a pilot phase will be determined as needed on a case-by case basis. The official title of WMO RCC, however, is only granted following the complete WMO designation process.*
 - (2) *If a group of centres would like to collectively fulfil all the required functions of a WMO RCC (termed as WMO RCC-Network), P/RA might mandate any relevant coordination group of the RA dealing with climate related matters to provide the required coordinating assistance throughout the entire designation process.*
- Step 2** P/RA will inform P/CCI, with copy to P/CBS and the SG, of the intent expressed by the candidate(s). In consultation with the CCI, the appropriate coordination group of the RA dealing with climate related matters and WMO Secretariat, P/RA will consider the criteria for designation (as per the Manual on the GDPFS, Vol 1, Global Aspects), respective regional requirements and any existing pilot or existing WMO RCC(s) in the region. If needed, P/RA will provide information on regional needs and fulfilment of WMO designation criteria.
- Step 3** The candidate(s) will work in contact with the relevant coordination group of the RA dealing with climate related matters, the CCI, other experts nominated by the P/RA, other existing WMO RCCs in the region if any, WMO Secretariat and possibly the existing WMO GPCs during its preparations for designation.
- Step 4** Upon successful conduct of the pilot phase and based on the respective positive assessment of the mandated (climate) coordination group of the RA, P/RA will contact the SG with a request for formal designation of the candidate(s) as WMO RCC, providing information/documentation on the process followed, and an assessment of the capability to meet requirements of the designation criteria.
- Step 5** WMO SG will arrange for appropriate consultations with P/CCI and will take up any concerns with P/RA.
- Step 6** When advised by P/CCI on satisfactory compliance with the designation criteria, SG will forward the request for formal designation to P/CBS for further action with copy to P/CCI and P/RA for information.
- Step 7** CBS, through its relevant bodies, will review the submission and will discuss any concern with the RA and CCI through WMO Secretariat. The proposal may need to be resubmitted with all required clarifications addressed.
- Step 8** When appropriate, the candidate(s) will be invited by CBS to present the proposal (in the form of an amendment to the Manual on the GDPFS) at one of its sessions for decision. The presentation of the proposal shall be complemented by the respective demonstration of capabilities, through documentation as well as oral presentation. WMO Secretariat will assist in the development of the proposed amendment to the Manual on the GDPFS.
- Step 9** With the approval of the Members of CBS, the amendment to the Manual will be put up to WMO Congress or to WMO Executive Council for approval.
- Step 10** With this final WMO approval, the Manual on the GDPFS will be revised and the RA and the candidate(s) will be advised in writing on the designation of the respective WMO RCC or WMO RCC-Network.

*relevant templates are available at: <http://www.wmo.int/pages/prog/wcp/wcasp/RCCs.html>.

Note: Issues to be considered by a candidate before applying for WMO designation

In order to conduct RCC functions to the standards as set out in the Manual on the GDPFS in pilot or designated form, a centre or group of centres will need the following:

i) Clear internal mandates, and clear mandates from the host country and the relevant WMO Regional Association to undertake and to sustain high-quality, consistent climate activities for the benefit of a region or sub-region;

ii) Appropriate resources to set up and run the centre in a sustained way, including physical infrastructure (computers, offices, hardware, operating supplies, etc.), communication systems (Internet, phones, faxes, satellite data receiving equipment, etc.), the necessary basics (power, water, lighting, heating, cooling, etc.) and human resources including, inter alia, administration staff, technical support staff, climate data specialists, analysts, forecasters and service specialists. The amount and nature of resources required to set up and run a WMO RCC will depend on a number of factors, including the extent of the programme to be undertaken and the extent of the region to be served.

Two examples of WMO RCC arrangements (as of mid 2010)**Regional Association II**

RA II decided to establish multifunctional centres and/or specialized centres. CBS-XIV, and subsequently EC-LXI, formally designated the Beijing Climate Centre (BCC), China and the Tokyo Climate Centre (TCC), Japan as (multifunctional) WMO RCCs in 2009 (RCC Beijing and RCC Tokyo respectively, cf. www.rccra2.org). Meanwhile, India, Iran, Russian Federation and Saudi-Arabia have also expressed their intent to seek formal designation as WMO RCCs in Region II.

Regional Association VI

RA VI decided to establish a WMO RCC-Network, starting with 3 nodes on climate data, climate monitoring and long-range forecasting. The nodes are collectively run by consortia under the coordination of a lead institute. The current structure in pilot mode is as follows:

RCC node on climate data: KNMI/The Netherlands (lead), Météo-France/France, OMSZ/Hungary, met.no/Norway, RHMS/Serbia, SMHI/Sweden, TSMS/Turkey

RCC node on climate monitoring: DWD/Germany (lead), Armstatehydromet/Armenia, Météo-France/France, KNMI/The Netherlands, RHMS/Serbia, TSMS/Turkey

RCC node on LRF: Météo-France/France and ROSHYDROMET/Russian Federation (joint lead), met.no/Norway, RHMS/Serbia, TSMS/Turkey

Currently, DWD/Germany acts as the overall RA VI Pilot RCC Network Focal Point.

Note: According to the decisions of CBS-XIV, the reflection of a WMO RCC-Network in Volume I 'Global Aspects' of the Manual on the GDPFS is defined as follows: RCC-Network (Region) 'Cityname' Node 1, 'Cityname' Node 2, ... 'Cityname' Node X. The 'Cityname' refers to the node leads only. A more comprehensive description of WMO RCC-Networks including specific reference to all formal consortium members shall be given in Volume II 'Regional Aspects' of the Manual on the GDPFS.

References:

Manual on the GDPFS, Guide to Climatological Practices and reports of RA II-XIV, CBS-XIV, EC-LXI and RA VI-XV

Abbreviations:

CBS: WMO Commission for Basic Systems	NMS: National Meteorological Service
CCI: WMO Commission for Climatology	LRF: Long-range forecasting (forecast range of 1 month to 2 years)
Cg: World Meteorological Congress	P: <i>here</i> : President
DCPC: (WIS) Data Collection or Production Centre	QA/QC: Quality assurance/quality control
GCOS: Global Climate Observing System	RA: WMO Regional Association
GDPFS: WMO's Global Data Processing and Forecasting System	RCC: WMO Regional Climate Centre
GPC: WMO Global Producing Centres for long-range forecasts	SG: <i>here</i> : WMO Secretary-General
LC: <i>here</i> : WMO Lead Centres on LRFMME and on SVSLRF, associated with GPCs	SVS: WMO's Standard Verification Scheme
MME: Multi-model ensembles	WIS: WMO Information System

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