

WORLD METEOROLOGICAL ORGANIZATION

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COMMISSION FOR BASIC SYSTEMS
OPEN PROGRAMME AREA GROUP ON
INTEGRATED OBSERVING SYSTEMS

ITEM: 6.1

**INTER PROGRAMME EXPERT TEAM ON
OBSERVING SYSTEM DESIGN AND EVOLUTION
(IPET-OSDE)
*First Session***

Original: ENGLISH

GENEVA, SWITZERLAND, 31 MARCH – 3 APRIL 2014

REVIEW OF OTHER ACTIVITIES RELATED TO IPET-OSDE AND OPAG-IOS

UPDATE ON GCW ACTIVITIES

(Submitted by the Secretariat)

SUMMARY AND PURPOSE OF DOCUMENT

The document provides information on recent activities related to the WMO's Global Cryosphere Watch (GCW) initiative.

ACTION PROPOSED

The Meeting is invited to note the information contained in this document when discussing how it organises its work and formulates its recommendations.

Appendix A: Terms of reference of the GCW steering group and the GCW task teams

Appendix B: GCW Partner criteria

DISCUSSION

1. BACKGROUND

1.1 The cryosphere, its changes, and its impacts have received increased attention in recent years. Today it receives constant coverage by the media, creating a demand for authoritative information on the state of the world's snow and ice resources from polar ice to tropical glaciers, based on data from the paleoclimate record, current observations, and future projections. WMO, with the co-operation of other national and international bodies and organizations, and using its global observing and telecommunication capability, is in a position to provide an integrated, authoritative, continuing assessment of the cryosphere – a Global Cryosphere Watch (GCW).

1.2 GCW will provide, directly or indirectly, data, information, products and analyses that will help Members and partners provide needed services to the wider user community. GCW will help us understand, assess, predict, mitigate, and adapt to climate variability and change and improve weather forecasting and hazard warnings, thus helping reduce the risk of loss of life and property from natural and human-induced disasters. It will contribute to improved management of energy and water resources, including flood forecasting and hydropower production, help support sustainable agriculture, and improve our ability to monitor and conserve biodiversity. Cryosphere information is required for infrastructure design in cold climates, improved management and protection of terrestrial, coastal and marine ecosystems, and an improved understanding of environmental factors affecting human health and well being. The cryosphere impacts all nations, their people and their economy.

2. GCW FRAMEWORK

2.1 The GCW working structure is composed of the GCW Steering Group (GSG) and six Task Teams (TT) as follows (those with an asterisk have been activated):

- The GCW CryoNet Team (*)
- The GCW Infrastructure and Practices Team
- The GCW Requirements and Capabilities Team (*)
- The GCW Products Team (*)
- The GCW Portal and Website Team (*)
- The GCW Outreach Team

2.2 The GCW Steering Group will provide high-level guidance on GCW development and implementation and will steer the activities of its Task Teams. The GSG currently reports to the WMO Executive Council through the Panel of Experts on Polar Observations, Research and Services (EC-PORS) and provides recommendations for GCW development and implementation for consideration by the WMO Executive Council and the WMO Congress. Task Teams are responsible for implementing the tasks identified in the implementation plan, in workshop reports, and by sponsors, partners, the scientific community, and users of GCW products and information. Regional groups are formed where it fosters multi-national collaboration between Members with interests in the same region, e.g., in Asia for Third Pole issues and for the pan-Arctic for high latitude northern issues.

2.3 Some teams have groups, e.g., the *Snow Watch Group* and the *Terminology Group* of the *Products Team*. The Asia CryoNet meeting participants (see below) discussed the benefits of having a Regional Group. It is not anticipated that every WMO region will have a GCW Regional Group. The Regions themselves will decide if they would benefit from such an activity.

3. GCW IMPLEMENTATION PLAN (IP)

3.1 The [GCW Implementation Plan](#) (GCW-IP) includes key implementation tasks and activities to be performed by various teams. GCW-IP will be a living document and will be updated regularly by the GSG. The need to develop metrics of success was recognized as an important element in developing GCW, CryoNet, and its other activities. GCW is being developed to build on what exists currently by engaging other communities and by adding value through a standardized (best practices) approach to monitoring and presentation of “authoritative” products to users. It is not assuming the mandate of others.

4. GCW SURFACE OBSERVING NETWORK - CRYONET

4.1 One of the immediate priorities in GCW development and implementation is to establish the core network of GCW surface measurement sites – CryoNet. CryoNet is one part of the whole GCW observing system, which is, in turn, a component observing system of the WMO Integrated Global Observing System (WIGOS). CryoNet covers all components of the cryosphere (glaciers, ice shelves, ice sheets, snow, permafrost, sea ice, river/lake ice) through an extensive approach of in-situ observations. CryoNet will initially be comprised of existing stations/sites, rather than creating new sites.

4.2 CryoNet Implementation

4.4.1 With respect to the GCW Implementation Plan, the CryoNet aims for the following main developments:

- Extensive monitoring of cryosphere through harmonized measurements,
- Providing cryospheric-data for improved process understanding and modelling,
- Providing calibration and validation data for satellite data,
- Linking cryospheric ground truth observations to cryospheric models,
- Training for cryospheric observations,
- Standardized guidelines for cryospheric observations.

4.2.2 Based on its general objectives, three highly interlinked core tasks of activity are relevant for CryoNet:

- (i) Observations: Providing essential cryospheric variables from existing cryospheric observational networks (such as GTN-P, national networks (PROMICE, GC-Net ...)) and potential new networks in standardized and traceable format for the GCW data portal which will be the link to the various users of CryoNet data,
- (ii) Coordination and capacity building: Cooperation and communication with existing cryospheric networks and with national WMO representatives in order to provide a common and sustainable CryoNet of cryospheric observations. Financial coverage of costs for monitoring networks is a key issue generally relevant for all networks. Though GCW through WMO is not

able to directly fund monitoring activities, it has a high potential for promoting the relevance of cryospheric monitoring through its existing international networks,

- (iii) Service: To support the CryoNet community with relevant observational guidelines, training, harmonisation activities, standardization documents and technical know-how in order to provide cryospheric observations at the highest level of quality possible.

4.2.3 To meet different user-needs and because of the spatially distributed nature of different components of the cryosphere, the CryoNet network of in-situ observations is structured into three different classes of sites e.g. Baseline, Reference and Integrated sites (Figure 1). All classes of sites make measurements according to standardized methods and best practices.

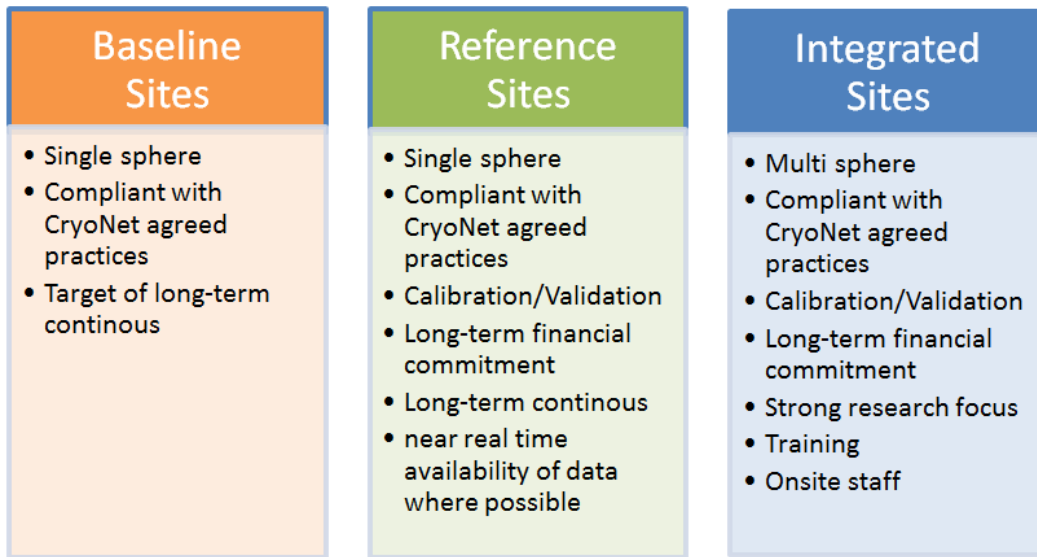


Figure 1: Structure of CryoNet

4.3 Observational requirements

4.3.1 While inventory of measurement methods and practices currently in used has been initiated (see: <http://globalcryospherewatch.org/cryonet/methods.html>), the development and documentation of the GCW agreed practices will, however, take some more time. Development of practices related to CryoNet will be developed by the CryoNet Team complemented by best practices to be developed by Infrastructure and Practices Team to be offered for implementation in other GCW networks.

4.3.2 GCW observational requirements are being formulated. They will draw from various sets of existing user requirements and will be vetted by the scientific community. They will become part of the WMO Rolling Review of Requirements (RRR) and will be accessible through the Observing Systems Capability Analysis and Review Tool (OSCAR¹), the official source for WMO requirements, which has a cryosphere theme².

1 <http://www.wmo.int/oscar>

2 <http://www.wmo-sat.info/oscar/themes/view/5>

The IGOS Cryosphere Theme Report³ contains the most comprehensive set of observational capabilities and requirements for the cryosphere. The GCW Requirements and Capabilities Team will ensure the coordination with the OSCAR database. See the GCW website⁴ for a compilation of IGOS Cryosphere Theme and OSCAR observational requirements.

4.4 Principles for a design of CryoNet

4.4.1 A CryoNet design has to be developed in order to define all specific elements of the network (e.g. a site should be defined by a polygon which could include either a baseline or an integrated station; density of stations; spatial distribution (X, Y and Z) etc.). Those specifications will be identified and compiled in a technical document (e.g. Principles of Design for CryoNet). CryoNet should be composed not only of operational observation sites but also include experimental observation sites with specific information on the experiment conducted. Data policy should also be included in the site inclusion requirements. A design feature for reference and integrated sites should be developed to allow calibration and validation studies.

5. RECENT ACTIVITIES

5.1 Asia CryoNet Meeting

GCW held its First Asia CryoNet meeting in Beijing, China, 2-5 December 2013, hosted by the China Meteorological Administration (CMA). CryoNet is the surface-based network of WMO's Global Cryosphere Watch (GCW) initiative. The focus of this meeting was snow and ice measurements in the "Third Pole" (Himalaya) region. Participants were from China, Pakistan, India, Japan, Russia, Kyrgyzstan, Kazakhstan, Tajikistan, Uzbekistan, USA, Canada, Austria, Italy, and Switzerland. The U.S. Department of State (through WMO) and CMA provided funding for the meeting.

5.2 Steering Group Meeting

The first meeting of the GCW Steering Group (GSG) was held in Reykjavik, Iceland from 23 to 24 January 2014. The GSG elected Dr Árni Snorrason as GSG Chair and Dr Barry Goodison as Vice-Chair. The GSG has developed Terms of Reference of all Teams, including GSG as well as GCW Partnership criteria (Appendix A and B). There is a strong consortium building with contributions from the European Space Agency (ESA) through the Satellite Snow Products intercomparison and Evaluation Exercise (SnowPEX) project complementing the existing GlobSnow activity. GCW is seen as a key contributor to two of WMO's highest priorities – GFCS and WIGOS.

5.3 CryoNet Team Meeting

GCW held a "CryoNet" Team meeting in Reykjavik, Iceland, 20-22 January 2013. The meeting was hosted by the Icelandic Met Office. Participants were from Iceland, Finland, Norway, Denmark, France, Austria, the Netherlands, U.S., Canada, Japan, China, and Australia. CryoNet can only be successful in close collaboration with all organizations,

3 http://globalcryospherewatch.org/reference/documents/files/igos_cryosphere_report.pdf

4 http://globalcryospherewatch.org/reference/obs_requirements.php

agencies, groupings and entities active in the cryospheric monitoring. It strongly relies on WMO and its experience in standardization of practices, but partnership is critical.

5.4 Portal and Website development

The GCW website (<http://globalcryospherewatch.org/>) has grown significantly over the past year. The website differs from the GCW Portal in that the website contains more dynamic information, such as news, products on the state of the cryosphere, highlights, calendar, as well as detailed background and basic documents and outreach material on the WMO GCW. The main purposes of the GCW Portal and Data Catalogue are (a) to provide an overview of datasets relevant to GCW (b) to provide access to datasets wherever possible (e.g. real time data streams, archive access), (c) to connect GCW with WMO Information System (WIS) and (d) to provide distributed Data Management (e.g. metadata driven, currently not hosting data). The GCW Portal is now “pre-operational” and available at <http://gcw.met.no>.

5.5 Forthcoming meetings

5.5.1 Joint CryoNet and Portal Teams meeting

A Joint CryoNet and Portal Teams meeting is being planned for June 2014 in Davos, Switzerland. The emphasis for this meeting is to have the CryoNet questionnaire available via the portal/website of GCW and to address several aspects of data management. A case study of one CryoNet station (or a few stations) will be performed during the meeting. This requires both the CryoNet and the Portal teams to work together. Compared to earlier GCW meetings, this would be a more technical meeting.

5.5.2 South America CryoNet meeting

A South America CryoNet meeting is being planned for fall 2014 in Chile, involving regional operational and research organizations, institutes and agencies.

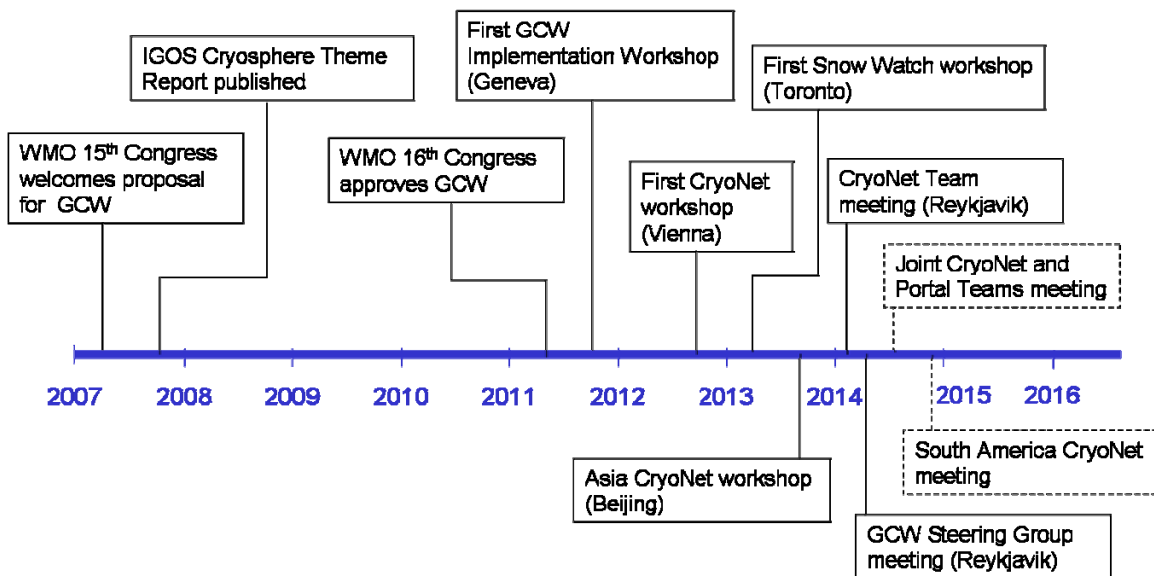


Figure 2: GCW Timeline and Implementation Meetings

APPENDIX A

TERMS OF REFERENCE OF THE GCW STEERING GROUP AND THE GCW TASK TEAMS

(Tasks Teams marked by asterisk (*) are proposed for immediate activation)

(Draft Approved by the GCW Steering Group, First session
Reykjavik, Iceland, 20-22 January 2014)

I. Terms of Reference of the GCW Steering Group

Under the general guidance of the Cg and EC, the GCW Steering Group (GSG) will provide high-level guidance on GCW development and implementation and will steer the activities of its Task Teams. Especially it will:

- 1) Provide high level guidance and general direction on GCW implementation and its further development;
- 2) Liaise with the WMO's GCW focal points nominated by the Permanent Representatives, as well as representatives of partner organizations and entities in GCW implementation;
- 3) Coordinate GCW activities with the WMO Technical Commissions, Regional Associations and Programmes, and with the relevant partner organizations, groupings and related international programmes,
- 4) Establish GCW Task Teams and provide guidance on their TOR and Work Plans;
- 5) Provide oversight and management of the GCW Task Teams;
- 6) Consider the development of a WMO GCW programme in collaboration with the WMO Technical Commission, Regional Associations and Partners for consideration by EC-PORS
- 7) Provide guidance on the conduct of GCW Pilot and Demonstration Projects;
- 8) Report annually to EC-PORS, including recommendations for GCW development and implementation for consideration by the WMO Executive Council and the WMO Congress;
- 9) Provide annual reports to all stakeholders, as appropriate through GCW website and/or Newsletter.

II. Terms of Reference of the GCW CryoNet Team (*)

Under the general guidance of the GCW Steering Group (GSG), the *CryoNet Team* will be responsible for the establishment and subsequent operations of the core surface-based observational network called CryoNet. Especially, it will:

- 1) Develop practices for CryoNet design and evolution;
- 2) Identify, in coordination with the GCW focal points of WMO Members and those of partners, suitable observing sites for CryoNet surface-based observational network;
- 3) Submit the initial list of stations of CryoNet for consideration by GCW Steering Group (GSG) and EC-PORS;

- 4) Regularly review and update the list of CryoNet stations;
- 5) Review available observing practices currently used in cryospheric measurement;
- 6) Propose and/or develop best practices for CryoNet stations for consideration by GSG and EC-PORS;
- 7) Develop relevant CryoNet sections to be included in the WMO Technical Regulations and in the WIGOS Manual;
- 8) Develop data policy and identify data management practices, including archiving, data sharing and data exchange and interoperability arrangements, for consideration by GSG and EC-PORS;
- 9) Liaise with managers of CryoNet stations on aspects related to the CryoNet work programme at their stations;
- 10) Organize implementation and training workshops to supervise the development of CryoNet;
- 11) Report annually to GSG, including recommendations for CryoNet operation and development;
- 12) Provide annual reports to all stakeholders, as appropriate through GCW website and/or Newsletter.

III. Terms of Reference of the GCW Infrastructure and Practices Team

Under the general guidance of the GCW Steering Group (GSG), the *Infrastructure and Practices Team* will conduct an inventory of measurement methods and infrastructure at sites that measure components of the cryosphere. It will propose GCW best practices for cryospheric observations, facilitate instrument intercomparisons, and promote interaction and collaboration between the scientific and operational communities. Especially, it will:

- 1) Review existing instrument and observing methods practices for cryospheric observations used by WMO and its partners;
- 2) In coordination with all stakeholders, identify and/or develop best practices and guidelines to be used in cryospheric measurements;
- 3) Document agreed practices in the existing regulatory material of WMO and/or partner organizations/entities;
- 4) Review results of past and ongoing instrument intercomparisons, such as the WMO Solid Precipitation Intercomparison (including snowfall & snow depth) and identify the need for GCW-related intercomparisons;
- 5) Conduct, in coordination with the WMO Commission on Instruments and Methods of Observation (CIMO), formal instrument intercomparisons to determine and intercompare performance characteristics of instruments used for cryospheric measurements under field or laboratory conditions;
- 6) Report annually to GSG, including recommendations regarding GCW observing networks;
- 7) Provide annual reports to all stakeholders, as appropriate through GCW website and/or Newsletter.

IV. Terms of Reference of the GCW Requirements and Capabilities Team (*)

Under the general guidance of the GCW Steering Group (GSG), the *Requirements and Capabilities Team* will assess user needs, periodically review and update observing system requirements and capabilities and contribute to the WMO Rolling Review of Requirements database and liaise with the Polar Space Task Group PSTG. Especially, it will:

- 1) Engage with the user communities to determine requirements for cryospheric observations and document them in the in the WMO Observing Systems Capability Analysis and Review Tool (OSCAR/Requirements);
- 2) Engage with the user communities to assess the capabilities of GCW observing systems and document them in the WMO Observing Systems Capability Analysis and Review Tool (OSCAR/Capabilities)
- 3) Periodically review and update GCW observational requirements and capabilities;
- 4) Promote the use of Observing System Experiments (OSEs) and Observing System Simulation Experiments (OSSEs) to evaluate gaps in the spatial distribution of GCW measurement sites;
- 5) Report annually to GSG, including recommendations regarding GCW requirements and capabilities;
- 6) Provide annual reports to all stakeholders, as appropriate thorough GCW website and/or Newsletter.

V. Terms of Reference of the GCW Products Team (*)

Under the general guidance of the GCW Steering Group (GSG), The *Products Team* will identify key GCW datasets through an inventory of candidate *in situ* and satellite products, harmonization of products, product intercomparisons. The Team will oversee development of data policies for GCW. Especially, it will:

- 1) Liaise with the cryospheric community and the Polar Space Task Group of EC-PORS in developing an inventory of candidate *in situ* and satellite products for GCW;
- 2) Identify key (authoritative) GCW datasets and products;
- 3) Facilitate conduct of cryosphere product intercomparisons to assess quality and to ensure the authoritative basis for products; provide scientific and technical reports of results.
- 4) Provide link to key (authoritative) products through the GCW Portal and/or GCW Website;
- 5) Collate and share detailed documentation for use of the GCW (authoritative) products;
- 6) In consultation with other GCW Teams oversee development of data policy for GCW and provide a draft to GSG and EC-PORS for consideration;
- 7) Establish sub-teams, as appropriate, such as *the Snow Watch Group* and *the Terminology Group* and define the TOR of those groups;
- 8) Report annually to GSG, including recommendations regarding GCW products;

- 9) Provide annual reports to all stakeholders, as appropriate through GCW website and/or Newsletter.
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VI. Terms of Reference of the GCW Portal and Website Team (*)

Under the general guidance of the GCW Steering Group (GSG), the *Portal Team* will oversee a development of the GCW Portal and GCW Website to facilitate exchange of GCW data and products. Especially, it will:

- 1) Oversee the development and operation of the GCW Portal;
 - 2) Oversee the development and operation of the GCW information website;
 - 3) Coordinate with the *Infrastructure and Practices Teams* on the inclusion of GCW data/metadata into the GCW Portal;
 - 4) Coordinate with the *Product Team* on which products should be included into the GCW catalogue and/or GCW Website;
 - 5) Ensure that no data will be hosted by GCW without an agreement with the data producer;
 - 6) Collaborate with the respective WIGOS metadata team on the format of GCW metadata;
 - 7) In coordination with the CBS Inter-Programme Expert Team on Metadata and Data Representation Development (IPET-MDRD), define format for real time/near-real time GCW data exchange;
 - 8) Report annually to GSG, including recommendations regarding GCW portal and website;
 - 9) Provide annual reports to all stakeholders, as appropriate through GCW website and/or Newsletter.
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VII. Terms of Reference of the GCW Outreach Team

Under the general guidance of the GCW Steering Group (GSG), the *Outreach Team* will be an authoritative voice on cryosphere issues, provide guidance for outreach products, facilitate training of students and early career scientists, work with social media (blogs, Facebook, Twitter), and issue semi-annual or annual newsletters. Especially, it will:

- 1) Establish an effective communication, outreach and education and training strategy in collaboration with WMO Members, Programmes, RAs, TCs, co-sponsors and partners;
 - 2) Ensure that the GCW website provides relevant information on communication, outreach and capacity building, aimed at complementing, not duplicating, others' efforts;
 - 3) Work with other GCW Task Teams in outreach activities;
 - 4) Develop outreach materials to educate the general public, stakeholders, funding agencies, and policy-makers on the cryosphere and its importance to society;
 - 5) Report annually to GSG, including recommendations regarding GCW outreach;
 - 6) Provide annual reports to all stakeholders, as appropriate through GCW website and/or Newsletter.
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APPENDIX B

GCW PARTNER CRITERIA

International Partners:

1. Any international organization, professional union, association or data centre that is actively involved in cryosphere activities, that has a willingness to contribute tangibly to the implementation of the WMO GCW initiative, and that is active internationally in structure and membership, is invited and encouraged to become an “International Partner” of GCW.

2. A formal statement of intent to be a GCW International Partner should be sent to the WMO GCW Secretariat for consideration by the WMO GCW Steering Group. The statement should address how the organization will contribute to GCW implementation and to GCW Team activities. Requests are reviewed and endorsed formally. In accepting Partner status, special attention will be given to the following criteria:

a. Extensive global networks of members or partners or a high global presence or visibility, through regional or country offices, on measurement, research, product generation, or data archival and distribution activities;

b. Specific expertise with a strong emphasis on cryosphere issues in their organizational mandate;

3. The Partner organization should appoint one focal point and one alternate as principal contact persons for GCW. The full contact information of the focal point and the alternate should be provided to the WMO GCW Secretariat. The focal point (or alternate of the Partner) is eligible to participate in GCW Steering Committee meetings.

4. After clearance through the GCW Secretariat, each Partner may display GCW visual identifier(s) and link to the GCW website on its own website. Each Partner will have their logo on the GCW website with a link to the Partner’s website. Partners will have an opportunity to display information on the GCW webpage, but only if it is directly related to activities that are part of the agreed GCW Implementation Plan and Task Team activities.

5. A Partner may only use the GCW visual identifier(s) in relation to activities that are part of the GCW activities.

6. Each Partner should provide to the GCW on an annual basis a short assessment on their Partner status with the Global Cryosphere Watch and how they are engaged in activities with the GCW.

7. Any Partner may at any time withdraw from the Partner status with the GCW by giving notice to that effect to GCW Secretariat.

8. Partnerships will be re-evaluated every four years. Ineffective partnerships will be terminated.

National and Regional Partners:

9. International Partner status will not be granted to organizations dominated by single-issue advocacy or single country focus. Instead, organizations with a single country or regional cryosphere focus will be considered for “National Partner” or “Regional Partner” status and be considered to be part of GCW. Requirements for this status is as outlined for an international partner, but at the national or regional level.

11. Partner status will not normally be granted to any state or government agency.

12. NMHSs and their national collaborators in cryosphere initiatives who make tangible or in-kind contributions to the development, implementation, and operation of GCW contribute to GCW as a Member of WMO and will be considered “contributors” rather than partners.
