Report 45

GRDC Report Series

Eleventh Meeting of the GRDC Steering Committee

10 – 12 June 2013, Koblenz, Germany

Global Runoff Data Centre

GRDC operates under the auspices of the World Meteorological Organization (WMO) with the support of the Federal Republic of Germany within the Federal Institute of Hydrology (BfG)

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March 2015

DOI: 10.5675/GRDC_Report_45

URL: http://doi.bafg.de/BfG/2015/GRDC_Report_45.pdf

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Report of the 11th GRDC Steering Committee Meeting

10 – 12 June 2013, Koblenz, Germany

Executive Summary

The biennial Global Runoff Data Centre (GRDC) Steering Committee Meeting was held in Koblenz, Germany from 10 to 12 June 2013.

The objective of the Steering Committee Meeting was to discuss progress and status of the various projects and activities of the GRDC made over the past two years. This was also a chance to fully inform the steering committee on potential future plans and at the same time the Steering Committee had to give advice, comment and sanction planned actions.

During the reporting period the following progress was made:

Since the previous Steering Committee Meeting data have been received from 28 countries and more than half of the stations in the GRDC database could be updated. In the first months of 2013 new data have been received from Australia, United Kingdom, Namibia, South Africa, Slovenia, Switzerland and France. The overall number of stations in the GRDB has increased by 1065 to 8862.

The number of data requests for river discharge data has increased again by 30% compared to 2011 and the requests for GIS layers have increased by 90%. The sharp increase in requests for GIS layers it the fact that the GRDC is now offering shape files for the drainage basins associated with the gauging stations. Overall data and information requests have increased from 280 to 370.

Since the appointment of the Head of the GRDC as a co-chair of the WMO/OGC Hydrology Domain Working Group in 2009, substantial time has been invested by GRDC staff in activities of the Hydrology Domain Working Group. In the HDWG representatives from numerous countries, administrations, scientific organisations and private vendors are engaged in developing standards for hydrological data exchange and conceptual models which support standardisation and domain specific metadata models. The activities within the HDWG have been presented and discussed and the GRDC has been tasked to continue with these activities and feedback the information to the WMO Information System and the WMO Commission for Hydrology.

The BfG and GRDC are partners in an EU funded project GEOWOW, which aims to provide data from domains weather, ocean and water in a standardised way to the GEOSS Common Infrastructure. The involvement of the BfG and GRDC in this project should support and enhance the activities on standardisation that have been started in the Hydrology Domain Working Group. In the framework of this project the GRDC started negotiations with several data providers to make their contributed data to the GTN-R network freely available to the GEOSS data core.

The European Water Archive (EWA), a specialised database for the EURO-FRIEND-Water community is operating successfully and both data updates and requests for data have shown an increase.

Recommendations, based on the presentations and discussions during the Steering Committee have been summarised in tabular form in a work plan and are listed in Chapter 15.

Introduction

The GRDC was established at the Federal Institute of Hydrology (BfG), Koblenz, Germany in 1988 under the auspices of the World Meteorological Organization (WMO). It is a contribution of the Federal Republic of Germany to the World Climate Programme and the Hydrology and Water Resources Programme of the WMO. The WMO mandates and directly supports GRDC by its Resolutions 21 (Cg XII, 1995: Request to the member states to provide GRDC with river discharge data) and 25 (Cg XIII, 1999: Free and unrestricted exchange of hydrological data), which both have been confirmed by WMO Congress XVI held in May/June 2011 in Geneva.

An International Steering Committee is guiding and directing the activities of the GRDC. This Steering Committee convenes every two years to review past developments of the GRDC and related international organisations, programmes and projects. At the same time the GRDC informs the Steering Committee on planned future projects and activities and is obtaining guidance from the Steering Committee.

1. Welcome and Opening of the 11th GRDC Steering Committee Meeting

The 11th GRDC Steering Committee meeting was opened on 12 June 2013 at 10:00 by Mr Moser, on behalf of Mr Behrendt, Director- General of the Federal Institute of Hydrology, who gave apologies because he had to attend and brief a Ministerial meeting on the flood situation in German rivers.
A minute of silence was observed in remembrance of Mr Konrad Vielhauer, former representative of the Global Water System Project.
Mr Moser, Head of the Division Quantitative Hydrology and Chair of the GRDC SC welcomed the representatives from WMO, UNESCO, UNEP, the IAHS, the European Environmental Agency, the JRC, the international FRIEND-Water programme and representatives from participating partner data centres and all other participants and observers.

2. Introduction of participants and adoption of the agenda

Mr Moser gave all persons present an opportunity to introduce her or himself, stating name, organisation and linkages to the GRDC.
The list of the participants is included in Annex II.
After a short discussion the agenda was adopted with the following amendment to the agenda due to the prevailing floods in many German rivers at the time of the meeting:

> 12 June: Presentations and information on the Hydro-meteorological background and extent of the May/June 2013 floods in Central Europe by Mr P. Krahe and Mr J. Belz

3. Briefing on GRDC personnel resources, budget and infrastructure

For more than 24 years the Federal Institute of Hydrology has hosted and supported the GRDC and Mr Moser ensured the meeting that this support has been secured for the future, even under difficult budgetary conditions. He informed the meeting on the continuing sup-

port to the GRDC by the German Government. This was highly appreciated by the participants as it ensures long-term stability for the operation of the GRDC.
Furthermore Mr Moser informed the meeting that discussions are being held to add two more posts to the GRDC staff component, most likely on a temporary basis. These posts should be used to improve international networking and the evaluation of fresh water fluxes as an element of an overall world water balance.

Mr Moser informed the meeting that Mr Cullmann, Head of the IHP Secretariat is currently meeting with representatives from the Foreign Office in Berlin to have the German IHP secretariat established as a UNESCO Category II centre. This would also have positive effects for the GRDC with additional incentives for the WMO members' states.

The German Government is serious about climate change issues. This can be seen by the funding of the KLIWAS Programme "Impacts of climate change on waterways and navigation in Germany" which already has generated inputs into the WMO Global Framework for Climate Services (GFCS) and also to the Extraordinary Session of the WMO Congress in October 2012.

On bilateral level negotiations are ongoing with China to adopt KLIWAS results in a pilot study in the Yangtze River. The Mekong River Commission has also indicated their interest in the KLIWAS study results.

4. WMO-Briefing on outcomes of the sessions, meetings and developments relevant to GRDC

Mr Grabs informed the meeting about the Extraordinary Session of the WMO Congress held in October 2012 and the 14th Session of the Commission for Hydrology (CHy) held in November 2012. In addition he outlined the results of the CHy Advisory Working Group Session which has been held in February/March 2013. He presented an overview of the outcomes of these sessions which have a direct or indirect impact on GRDC activities.

The following key issues have been identified by the WMO which are of relevance to the GRDC:

- Strengthening institutional and technical conditions for the exchange of hydrological data and information;
- Integration of hydrological data and information in the wider context of Integrated Observing Systems and Information Systems
- Cooperation with institutions that generate and utilize hydrological data and information

At the same time these challenges have been recognised, which need to be overcome:

- Widespread reluctance of services to share hydrological data and information;
- Inadequate hydrological networks, data quality and data management in many hydrological services world-wide

In Resolution 1 (Cg-Ext. (2012)), the "IMPLEMENTATION PLAN OF THE GLOBAL FRAMEWORK FOR CLIMATE SERVICES" adopted by the Extraordinary Session, the WMO Congress urges Governments:

- To develop new data policies that address data gaps, data accessibility issues, ownership, and data protection, confidentiality, exchange, applications and usage for the im-

plementation of the Framework, noting internationally agreed data exchange policies such as the WMO Resolution 40 (Cg-XII) – WMO policy and practice for the exchange of meteorological and related data and products including guidelines on relationships in commercial meteorological activities, and Resolution 25 (Cg-XIII) – Exchange of hydrological data and products, and the relevant provisions of the Group on Earth Observations;

- To strengthen national, regional and global capabilities to collect, rescue and exchange data and products, to generate climate information and products, and to provide climate services to enhance decision-making through implementation of a framework for climate services at national level;

At the 14th Session of the Commission for Hydrology, from 6 – 14 November 2012 in Geneva, the following main themes for the period 2012 – 2016 have been adopted

- Quality Management Framework – Hydrology (QMF-H);
- Water Resources Assessment;
- Hydrological Forecasting and Prediction;
- Water, Climate and Risk Management;
- Data Operations and Management.
- *New opportunity: Inclusion of satellite-based hydrological data such as from altimetry*

During the 14th Session of the CHy the following considerations and recommendations relevant to GRDC emerged:

- Significant progress had been made with the WMO Integrated Global Observing System (WIGOS) and WMO Information System (WIS).
- Many Members have identified their NHSs as National Centres. Data Collection or Production Centres (DCPCs) are sponsored by WMO Programmes and either collect regional or programmatic information for international exchange (such as GRDC), or produce information of regional or global relevance (such as ECMWF and NOAA NESDIS).
- The Commission recalled the recommendation in Resolution 6 (CHy-XIII) that the GRDC should undertake the development of the metadata profile, in collaboration with interested parties, under the overall guidance of WIS/WMO Integrated Global Observing System (WIGOS) to form part of the WMO Core Profile of the International Organization for Standardization (ISO) Metadata Standard.
- In October 2012, GRDC submitted a summary document of the Hydrology Metadata. The Commission urged the GRDC to finalize this review and make the report available to its members.
- Considerable work has being undertaken internationally with respect to the development and agreement on standards for the transfer of hydrologic data between data servers (databases) and users. In particular, the Commission was pleased to note that the work of the WMO/OGC HDWG has resulted in "WaterML 2.0 Part 1 Time Series" being adopted as an OGC Standard.
- The Commission noted the importance of standards to improve service delivery of key CHy programmes including WHYCOS and the WMO Flood Forecasting Initiative.
- The Commission took note of the work being undertaken by the WMO/OGC HDWG with respect to the Hydrologic Feature Model (HY_Features). It noted that the OGC Discussion Paper is available.
- Need to consider the idea of identifying and engaging with institutions with specialization in specific areas of Hydrology and Water Resources that could be designated as

collaborating institutions through a Memorandum of Understanding along the lines of the GRDC.

At the CHy-Advisory Working Group Session from 25 February – 1 March 2013 in Geneva, the following conclusions are relevant to the overall activities of the GRDC and need to be considered:

- The CHy Advisory Working Group (AWG) should consider mechanisms for clarifying the realm of hydrological observations wherein WHYCOS can be more clearly understood as the capacity building component and that there be a new emphasis given to actual hydrological observations such as those held at GRDC.
- Desirability of establishing a portal facilitating access to already available on-line real-time and historical data, drawing from the water information systems of countries around the world that make their data freely and openly available. This portal may encourage the countries, participating in existing HYCOS components, to share some of their data, help in developing tools for data retrieval and display that may be reused for regional Hydrological Information Systems (HIS) in other components, and promote the implementation of Res. 25 (Cg-XIII).
- GRDC web site already provides some basic elements of this portal; the President of CHy was invited to discuss with GRDC the possible development of this idea.
- The AWG agreed that the topic could also be discussed at the next GRDC Steering Committee meeting to be held at the Federal Institute of Hydrology, Koblenz, Germany from 10 to 12 June 2013.

Furthermore the CHy AWG Thematic Area "Data Operations and Management" which is closely related to the activities of the GRDC should:

- Monitor and report on new developments dealing with data management issues, such as observations, data exchange and protocols, data transfer formats, data information, WIS and WIGOS.
- Provide guidance to member countries regarding data management principles for hydrological services.
- Promote use and uptake of appropriate technology for hydrological data management, such as MCH open source software.
- Prepare benefits statement for WaterML 2.0 and HY_Features and a glossary of terms for non-specialists.
- Encourage adoption of HY_Features and promote its implementation, testing and use
- Review report on the ISO 19115 Metadata Profile developed by GRDC.
- Survey hydrological advisors of WMO members to establish their progress with respect to resolution 25 regarding the free and open exchange of hydrological data and provision using web-based services.

Mr Boston, member of the CHy AWG and responsible for the Thematic Area "Data Operations and Management" informed the meeting on the contents of the Resolution 3 (CHy 14) (Session Number 7/1) and the work plan of the AWG Thematic Area "Data Operations and Management".

Resolution 3 (CHy-14) PROPOSED ADOPTION OF WATER ML 2.0 AS A STANDARD

CHy recognises the importance of improved access to hydrological data and the work of the WMO/OGC HDWG (including representation from CHy) which has resulted in WaterML 2.0 being adopted as an OGC Standard. Therefore Resolution 3 (Chy-14) has been adopted

which requests the WMO "Secretariat to take the necessary actions, under the direction of the AWG, to commence a process, including testing, that could potentially see WaterML 2.0 become a WMO standard for information exchange managed by WMO (supported by the WMO/OGC MOU) and to register this standard as a joint WMO/ISO standard".
The same resolution requests WMO member countries "to actively participate in testing and applying WaterML 2.0 in pilot projects and operational applications and to report their experiences and suggestions to the WMO/OGC Hydrology Domain Working Group".

The work plan of the "Data Operations and Management" Thematic Area of the CHy AWG is closely related with Resolution 3 (CHy-14) and a detailed breakdown was presented to the meeting. In many areas these activities are strongly supported by the GRDC:

- Implementation of Resolution 3 (CHy-14)
    - WaterML 2.0 - pilot projects in WMO member countries
    - WaterML 2.0 - WMO/ISO standardisation

- Establish Coordination Group
    - CHy Basic Systems OPACHE members
    - Broad representation, e.g. NHSs, vendors, HDWG, Regional Associations, etc.
    - Main focus – pilot projects especially in developing countries and WMO/ISO standardisation
- Communication and Adoption
    - Guidance material for WMO member countries regarding hydrological data management
    - Promote appropriate systems, tools and services to allow NHSs to participate in federated global water data exchange
    - Explanatory material on WaterML 2.0 and HY_Features
    - Hydrological metadata profile for ISO 19115
    - Survey WMO members on their progress with resolution 25

- Capacity building
    - Develop strategies and plans on how to deploy technologies and standards for hydrological data exchange within developing countries
    - Pilot use of standards such as WaterML 2.0 in developing countries
    - Develop best practice guidance material on deployment options

- OGC Hydrology Domain Working Group (HDWG)
    - WaterML 2.0 Part 1: Time Series
    - WaterML 2.0 Part 2: Ratings, gaugings and cross-sections – In development

- GEOSS AIP-6 (Global Earth Observation System of Systems Architecture Implementation Pilot-6)
    - Testing CUAHSI, commercial solutions in developing countries

Mr Boston concluded his presentation with the remarks that he is currently busy with a survey to find out to what extent NHSs are adopting new standards to be able to exchange data according to WMO Resolution 25 (Cg XIII-1999). The requested the involvement of the GRDC in the survey and that a questionnaire should also be completed.

5. Objectives and expected outcomes of the meeting

Mr Cullmann briefed the participants on the objectives and the expected outcomes of the meeting.
He identified the following objectives and outcomes:

Objectives:

- Feedback to the Steering Committee on status of core activities (database and data dissemination status, product and services status)

- Feedback to the SC on activities and involvement of GRDC staff (e.g. WMO/OGC Hydro Domain Working Group and associated activities, support to WMO CHy and WIS/WIGOS)

- Obtaining information relevant to GRDC activities and operations from patrons, supporting organisations and partner data centres and programmes

- Guidance by the Steering Committee on GRDC future activities.

Outcomes:

- Recognition that GRDC core activities have the highest priority before additional requirements can be addressed. Core activities are:
    - Global data acquisition
    - Data maintenance
    - Data provision to the global research community
    - Metadata collection and provision
    - Quality assurance

  Products
    - Data
    - GIS Products
    - Standardisation, metadata profile, HY_Features Model
    - Collaboration with partners to implement data solutions

- New technologies are emerging such as web services and data portals. Technical solution need to be adopted for the GRDC to comply with these developments. Ideas need to be formulated how to implement these technologies in the GRDC environment.

- Carefully balancing additional work with existing workload taking current GRDC staffing situation into consideration.

In the ensuing discussion Mr Demuth raised the concern that aspects of science, referral to UN agencies and the capacity to promote the GRDC should be included in the GRDC core activities. Mr Fernandez said that a prioritisation is required, considering the available resources at the GRDC.

6. Status report: 10th GRDC Steering Committee Meeting Action List

Mr Looser used the Action List decided at the 10th GRDC SC Meeting in June 2011 to give an overview on progress and status of individual actions.

Task	Action by	Due date	Status June 2013
UNESCO related activities			
IRD to develop FRIEND portal for station metadata. GRDC to contribute EWA metadata on a regular basis once portal is completed	GRDC, UNESCO, FRIEND, IRD	End 2011	Done FRIEND Portal not ready yet, once ready, metadata will be provided again
Develop SA-FRIEND database and integrate data into GRDC database structure similar to EWA. Prepare SA FRIEND Website and provide SA FRIEND data according to GRDC data policy	GRDC	Jun 2012	Done Data are provided according to GRDC data policy
ETN-R			
ETN-R – Comply with contractual obligations	GRDC	Dec 2011	Contract completed 31-12-2011
ETN-R –Negotiations to continue with the ETN-R NRT data collection and dissemination in 2012 and 2013. Tender to be issued by JRC in July 2011.	GRDC/ BfG/ JRC	Sep 2011	Done BfG responded to tender but has not been awarded the contract
Information sheet on ETN-R for WIAG Meeting (lesson learned and experiences)	GRDC	Dec 2011	Cancelled
GTN-R			
GTN-R – Contact NHSs again to obtain cooperation in the GTN-R project	WMO, GRDC	Jul 2011	WMO sent request letter in July 2011 to 66 countries
GTN-R – Finalise design of network	GRDC	Depends on Feedback received	Ongoing discussions with several countries, starting with those whose cooperation is certain

Task	Action by	Due date	Status June 2013
GTN-R – NRT data monitor, prepare statement on current status considering ETN-R system and latest technological developments	GRDC	Dec 2011	ETN-R System not suitable for GTN-R, Technology has moved on, request letter sent to JRC in Oct 2011
Investigate to utilise the EFAS data monitor for GTN-R	GRDC, JRC	Dec 2011	ETN-R System not suitable for GTN-R, Technology has moved on
GTN-R linkage to HARON, Provide data acquisition and data management functions. Run-off data originating from the HARON project must be incorporated into the GRDC database	GEO, GRDC	Update at next GRDC SC Jun 2013	HARON funding not materialised
WMO/OGC/HDW activities			
GRDC activities within WMO/OGC/HDWG	GRDC	Ongoing	Close involvement of GRDC in HDWG activities
Represent WMO CHy position and continue with role of Co-Chair at WMO/OGC HDWG	Head GRDC, WMO, CHy	Ongoing	Continuous representation
Develop conceptual hydrologic metadata profile and related components within the WMO/OGC/HDWG	GRDC, WMO/OGC/HDWG, WMO, CHy	Ongoing	OGC discussion paper
Continue within the WMO/OGC/HDWG for incorporation of HDWG developments into WMO standards Break down into individual components e.g. WaterML 2.0, Common Hydrologic Feature Model etc. Mark progress status of individual components	GRDC, BfG, WMO/OGC/HDWG	Depends on progress within HDWG	Ongoing GRDC involvement and feedback to WMO on participation in HDWG activities. Enhanced GRDC involvement in WMO WIS and WIGOS
Introduce Hydrologic Feature Model (OGC discussion document) to WIS and CHy AWG	GRDC	Nov 2011	Presentation to CHy XIV, with task to CHy AWG to supervise process
Development of Web Services for exchange of data and information	GRDC, WMO/OGC/HDWG	Depends on progress within HDWG	Related activities in GEOWOW project with plans to utilise results

Task	Action by	Due date	Status June 2013
Pristine Basins (Climate Sensitive Stations)			
Pristine Basins – compilation of available data and metadata into GRDC database flagged as Pristine Basins subset	GRDC	Ongoing	Ongoing and included in Data acquisition activities
Provide scientific statement on use of data from pristine basins (Braunschweig declaration, ERB info, Paul Whitfield paper, Data Archives paper)	UNESCO-ERB, EURO-FRIEND V, WMO		Not done yet
Data Products			
In cooperation with GTN-H develop concept brief on joint products (GRDC, GPCC, GEMS/Water, IGRAC)	GTN-H, GRDC, GPCC, GEMS/Water, IGRAC, GEO, WMO	Dec 2011	Ongoing
Investigate joint information products prepared by the research institutions with datasets from GRDC and partner data centres (e.g. Hydrological Normals, within Framework of WMO Climate Services: Methodological assessment of world water resources – use of GRDC data, products useful for policy issues)	GRDC Partner Data Centres, IHP/HWRP Sec., others…	Ongoing	Ongoing
Update GRDC freshwater flux method and product and publish on the GRDC website	GRDC	Depends on GEOWOW progress	Depends on GEOWOW progress, expected 2014
Miscellaneous			
Schedule of reporting on progress to SC and President of CHy	GRDC	Once a year	Done in September 2012, Used as input to CHy Session
Provide GRDC database back-up copy in ASCII format to WMO on regular intervals	GRDC	Once a year	Done
Regular update GEMS/Water flux stations	GRDC	Every 6 months	Done
Investigate GRanD data for transfer to HYDROLARE	GRDC	July 2011	Done: Information given to HYDROLARE

Task	Action by	Due date	Status June 2013
Inform on the status of ARDB at the Arctic-HYCOS Meeting	GRDC	Oct 2011	Done: Arctic-HYCOS meetings held in Mar and Nov 2012, Canada takes lead, GRDC to host data
Investigate with GWSP hosting of the Digital Water Atlas	GWSP, IHP Sec, GRDC		Not done: Digital Water Atlas to be hosted by GTN-H
Geo-reference WHYCOS Stations in Google Earth	WMO,GRDC	Dec 2011	Not done: No station metadata received from WMO
Public Relations			
Promote GRDC through publications and PR activities	GRDC	Ongoing	Ongoing: Scientific papers, newspaper articles, TV interview, newsletters etc.

The discussion on the Action list items will be done either in the relevant Special Focus Session or after the presentations on the Status of the GRDC database, user and acquisition activities and the report on GRDC products and services.

7. Status report on GRDC Databases, User and Acquisition Activities

Mr Looser presented the status of the Global Runoff Database, the Special Datasets, Data Acquisition and Public Relations as well as an overview on Database and Information Requests to the GRDC:

- Summary statistics on the status of the Global Runoff Database including the development of stations in the database over time and the spatial distribution of the stations were presented. Since the previous GRDC SC meeting in 2011 more than 1065 stations have been added to the database. Now river discharge data for 8862 stations are available, adding up to approximately 360000 station years with an average time-series length of 41 years per station. In the first half of 2011 updates have been received for the following countries: Australia, France, Namibia, Slovenia, South Africa, Switzerland and the United Kingdom.

- An overview on the status of the special databases operated by the GRDC was given and included the
    - Arctic Runoff Database (ARDB)
    - European Water Archive (EWA)
    - Southern Africa FRIEND database,
    - Climate Sensitive Stations Dataset
    - GRDC reference dataset
    - Global Terrestrial Network for River Discharge (GTN-R) a GTN-H and GCOS baseline monitoring network

Some of the datasets are subsets of the main GRDC database and are captured in a special project to represent the required network. Important additions to the special databases of the GRDC are the hosting of the Southern African FRIEND database, which became operational in 2012. Secondly the addition of the AdaptAlp dataset, a project related dataset consisting of 171 stations covering the Alps in 6 European countries (Austria, France, Germany, Italy, Slovenia and Switzerland).

- The efforts to promote the GRDC have been given in a brief summary indicating the number of presentations at various workshops, conferences etc. (~40), published papers co-authored by GRDC staff (5), articles in newsletters, newspapers, web blogs and related activities. As a special highlight the GRDC GIS layers on global rivers have been used to illustrate the special map edition of the WHYMAP "River and Groundwater Basins of the World" published for the 6th World Water Forum in Marseille in March 2012.

- Statistics on data dissemination activities have been presented. The need for global monitoring information can be clearly deducted from an increase of 30% for data related to projects on a global scale. But also information requests for the African and European continents have increased markedly. The requests for global GIS layers increased by 90% and general information requests showed a positive trend with a 30% increase. In total GRDC has handled ~ 370 data and information requests successfully during 2012.

- The hit rate on the GRDC website increased by almost 30% to an average of approximately 3800 hits per month.

8. Report on GRDC Products and Services

In a further presentation Mr Looser gave an overview of the services and data products that are being offered by the GRDC. The most important aspects are summarised here:

- The GRDC is offering a number of data services to enable the users to select the stations suitable for their studies. These services include the provision of station catalogues and kmz files to filter desirable stations and visualize their spatial position in Google Earth. Furthermore the GRDC data services include the provision of requested data and products via Email and/or FTP. It is planned to provide the data in future via Sensor Observation Services (SOS).

- The three main GRDC data products were presented, namely Long-Term Monthly Means for more than 3800 stations, the GIS layers of the Major River Basins of the World and the 2009 calculated Freshwater Fluxes to the World Oceans.

- GIS Shapefiles of more than 7000 GRDC stations are available since 2011 and were presented as an additional GRDC product called "Watershed boundaries of GRDC stations". The delineation is based on the *HydroSHEDS* drainage network (Lehner et al., 2008) and has been done by Bernhard Lehner and his team (McGill University, Canada). The methodology used is published as Report 41 in the GRDC Report Series and the GRDC Data Policy applies, stating non-commercial use only and citation of GRDC

as the source. This product is well received by the GRDC user community, as can be witnessed by the substantial increase in requests for GIS products.

- In early 2012 the GRDC website was subject to a major makeover. The overall appearance has been newly designed and functionality has been improved. Now the website features amongst others quick links via a "Themes" box, an improved "News" section and a new section called "Our Clients" featuring monthly listings of data use and publications based on GRDC data.

9. Activities within the WMO/OGC Hydrology Domain Working Group

Ms Dornblut, Deputy Head of the GRDC informed the meeting on GRDC's involvement in the WMO/Open Geospatial Consortium Hydrology Domain Working Group (WMO/OGC HDWG). Here the GRDC has two major responsibilities namely the:

- Coordination and integration work (the WMO CHy President has nominated the Head of the GRDC as a co-chair to the HDWG to represent WMO interests) to:
    - make OGC and its "technical" work more visible to WMO
    - make the "guiding principles" of WMO more reasonable for OGC
    - ensure communication and feedback in both directions
    - organise and chair or co-chair HDWG meetings (5 since last GRDC SC Meeting)

  These activities have advanced the establishment of a new thematic area in the CHy, namely "Data Operations and Management".

- Collaboration in the development of hydrology domain specific standards for data transfer and the conceptual development of a hydrologic feature model and ontologies ultimately supporting the WMO Core Metadata Profile. GRDC is leading developments and making contributions to the:
    - Conceptual specification work (semantics) to match observational data to identified hydrologic features
    - agreed observation model applied to hydrologic observations
    - agreed hydrologic feature model (identifying their relationships)
    - description of hydrologic data sets (hydrologic metadata)

The timelines for some major achievements are given here:

- WaterML2.0 Part 1 – encoding time series
    - Sept 2009: OGC Discussion Paper "Harmonising Standards for Water Observation Data" prepared and discussed within the HDWG
    - 2010-2012: specification work and interoperability experiments
    - Sept 2012: OGC Standard "OGC® WaterML 2.0: Part 1- Timeseries", based on ISO19156: Observations and Measurement,
    - Nov 2012: Presentation of WML 2.0: Part 1 to WMO Chy-14 resulting in Resolution 3 (CHy-14) which requests the WMO "Secretariat to take the necessary actions, under the direction of the AWG, to commence a process, including testing, that could potentially see WaterML 2.0 become a WMO standard for information exchange managed by WMO (supported by the WMO/OGC MOU) and to register this standard as a joint WMO/ISO standard".

- 2013: test implementation at the AU-BoM
- June 2013: OGC Discussion Paper "WaterML2.0 Part 2 - Ratings, Gaugings, Sections" prepared
- June 2013: ongoing discussion, specification work to Part 2
- 2012/13: application of WaterML 2.0 Part 1 to Groundwater data resulting in a second Groundwater Interoperability Experiment (GWML-IE2)

- HY_Features – describing hydrologic features
  - Dec 2008 (CHy-13): In the context of the special session on the "GRDC Hydrologic Metadata" the concept to link data set description with observational information was presented
  - 2009-2011: review and separation of concerns in the WMO/OGC HDWG resulting in a conceptual UML model
  - March 2012 (OGC/TC Austin): release of the "HY_Features: a Common Hydrologic Feature Model" Discussion Paper (DP OGC 11-039r2)
  - 2012-2013: ongoing discussion, testing (e.g. within the AU-GeoFabric) and specification work
  - Nov 2012 (CHy-14): presentation of the reviewed "GRDC Hydrologic Metadata" reflecting the developments of the WMO/OGC HDWG such as WaterML 2.0: Part 1 and HY_Features and presentation of basic concepts of HY_Features
  - 2013: validation, consolidation of concepts and envisaged completion of report to the WMO.

The following activates are planned for the upcoming WMO/OGC HDWG meetings:

- 17 - 21 June 2013 WMO/OGC HDWG Workshop in Quebec City, Canada
  - *WaterML2 P2: Ratings, Gaugings, Sections* – Discussion Paper
  - HY_Features – consolidate concepts of catchment/basin
  - Hydrologic Metadata – outline basic concept to HDWG
  - RiverML, a markup for describing stream geometry (Discussion Paper)

- Sep 2013, OGC/TC Meeting in Frascati, Italy
  - …
  - discuss metadata concept with OGC Metadata DWG
  - ....

10. Activities within WMO WIS/WIGOS representing CHy

As a result of the responsibilities within the framework of the WMO/OGC HDWG, several tasks to represent CHy interests within the WMO WIS/WIGOS implementation activities have been entrusted to GRDC staff.
The first meeting of the WMO Task Team on the WIGOS MetaData (TT-WMD) was held from 11 – 15 March 2013 in Geneva, Switzerland. In accordance with guidance and recommendations of Cg-XVI, EC and ICG-WIGOS-1 (Inter-Commission Coordination Group on the WMO Integrated Global Observing System) the TT-WMD was requested to identify the information that is needed to allow the majority of users to use WIGOS observations in appropriate contexts and in a defensible way. For this to happen the creation of a WIGOS core metadata standard is required, that allows the essential information to be exchanged

unambiguously. Furthermore mechanisms for the implantation of the WIGOS Core Metadata Standard and its maintenance need to be defined.
The Head of the GRDC attended the meeting on behalf of Tony Boston, the CHy AWG member responsible for the "Data Operations and Management" theme. From the perspective of the Commission for Hydrology he outlined the specifics of hydrologic data collections and the requirements to describe hydrologic data as result of observation. He pointed to the use of existing/evolving standards in the domain of hydrology, particularly to those developed in the framework of the WMO/OGC HDWG, namely:

- WaterML2.0 Part1: Time Series (OGC Standard, 2012), an encoding of hydrological observation data (time series) which according to Resolution 3 (CHy-14) should be considered for adoption as a WMO Standard.
- *HY_Features*, a common hydrologic feature model (released as an OGC Discussion Paper), which identifies hydrologic objects and their fundamental relationships, provides stable references to hydrologic objects, independent of scale and provides capabilities for integration of hydrologic data at national, regional, and global scales.
- *(GRDC) Hydrologic Metadata*, which provides semantics for description of data sets generated from observation, exemplarily for data sets generated by the GRDC based on primary data and fully supports WIS and WIGOS metadata concepts.

The meeting resulted in a work plan to achieve the set objectives in time for WMO-Cg-17 in 2015.

The President of the CHy nominated the Head of the GRDC to serve as an associate member on the CBS Inter Programme Expert Team on WIGOS Framework Implementation (IPET-WIFI) to represent the interests of the CHy. Again existing and evolving standards in the hydrology domain are serving as input into these activities.

11. GRDC/BfG partner in the FP7 Project GEOWOW

Since September 2011 the BfG/GRDC is engaged in the three year EU FP7 project “GEOSS interoperability for Weather, Ocean and Water” (GEOWOW) in response to the call ENV.2011.4.1.3-1 “Interoperable integration of shared Earth Observations in the Global Context”. Together with the partners University of Bonn, 52°North and Kisters the main focus is on the work package “Water”. The reason for responding to the call was to support and enhance the standardisation efforts for hydrological data exchange.
Mr Andres, the BfG/GRDC GEOWOW Project Manager informed the Steering Committee on the background of the overall GEOWOW project coordinated by ESA, and the activities and status of the work within the “Water” work package.
The overall objectives of the GEOWOW project are to evolve the Global Earth Observation System of Systems (GEOSS) in general and the GEOSS Common Infrastructure (GCI) in particular in terms of interoperability, standardisation and functionality, to provide users with improved discovery, access and usability of Earth Observation data and services.
Within the “Water” work package the focus is put on the following tasks:

- Collecting requirements from appropriate user communities and data providers
- Standardisation of exchange of hydrological data
- Overcoming obstacles of cross domain data exchange

- Development and deployment of software components for interoperable hydrological data integration
- Increasing the volume of data which are made available.

Efforts within the "Water" work package on the standardisation of hydrological data exchange are contributing to the activities of OGC within the WMO/OGC HDWG. The elaboration of the Sensor Observation Service 2.0 Hydrological Profile serves as an example.

The GRDC at the same time can utilise the progress in standardisation by testing and assessing software components from GEOWOW partners for their usefulness for GRDC purposes so that the data provision of GRDC data can happen via a standardised Sensor Observation Service using WaterML 2.0 Part 1.

To extend the hydrological data and products made available by the GRDC to the GCI, a new semi-automated workflow will be developed and implemented within the framework of GEOWOW, to allow for the regular calculations of updated "Freshwater Fluxes to the World's Oceans".

12. Session on Data Policy and emerging EU data requirements

Background

In the recent past the GRDC has been approached by the EEA to provide substantial parts of its data holdings of European countries to the EEA for environmental reporting purposes and policy development. Access to the data was denied by the GRDC, based on the data policy governing GRDC data provision.

This triggered a series of letters exchanged between the EU (DG ENV)/EEA/JRC and the WMO. In the latest letter from the WMO to the EU the WMO Secretary-General proposed that the GRDC invites representatives of the EU (DG ENV)/EEA/JRC to the GRDC Steering Committee Meeting in June 2013 for further discussions.

An invitation letter has been sent by the GRDC to the EU/EEA/JRC to send representatives of their choice to the GRDC Steering Committee Meeting.

The following persons representing EU/EEA/JRC attended the discussions on the EU/EEA/JRC data requirements and the implications for the GRDC in a 90-minute special session on Tuesday morning, 11 June 2013:
Mr Tim Haigh, EEA
Mr Rasmus Dilling, EEA
Ms Agnieszka Romanowicz, EEA
Mr Ad de Roo, JRC

After the opening of the special session, Ulrich Looser presented a brief overview of the GRDC data policy and explained that GRDC data policy is strictly based on the WMO data exchange policies, in particular Resolution 25 from Congress XIII in 1999 dealing with the "Exchange of hydrological data and products".

Tim Haigh introduced his presentation on the European Copernicus Programme (formerly GMES) including space-based and in situ data requirements for the Copernicus operational services and especially the in-situ data requirements for the GISC project (GMES in-situ coordination).

Rasmus Dilling focussed in his presentation on the current data situation and the use of the EIONET (European Environment Information and Observation Network) to obtain data coverage for 32 EEA members and 7 cooperating countries. He emphasised the potential for synergies and benefits in data exchange and sketched a way forward on how to come to an agreement between WMO, EU, GRDC and Federal Institute of Hydrology (BfG) on cooperation and access to hydrological data. His suggested way forward has been used as a guideline for the discussion on the way forward.

Agnieszka Romanowicz briefly sketched the particular data requirements for the scientific use by the JRC and the use by the DG ENV/EEA in water balances/accounts calculation, analysis of water scarcity and droughts and Copernicus Services requirements.

Wolfgang Grabs and Tim Haigh mentioned that the scope of cooperation needs to be clearly identified and that the processes should be kept transparent and should adhere to existing policies.

In the ensuing discussion after the presentations in principle no obstacles in finding a pragmatic solution of cooperation between WMO, GRDC/BfG and EEA were identified. Suggestions on organisations and groups that need to be involved, such as the WMO RA VI Management Group and relevant European Working Groups dealing with Implementation Strategies (Water Framework Directive and Floods Directive), have been made.

The chairman of the GRDC-SC, Mr Hans Moser summarised the discussions. He noted that the GRDC Steering Committee members and observers as well as the invited representatives from the EEA and JRC present at the meeting welcomed the presentations and the proposed approach. He also noted that there is an evident need for further discussions to decide on the next steps.
Based on the presentations and discussions, the chair suggested that:

A Working Group needs to be established in line with the communication between WMO and EEA to discuss conceptual and practical aspects of data exchange between GRDC and EEA.
WMO should convene the first meeting of the Working Group and invite EEA, GRDC and BfG representatives. (Tentative date, second half of August).
In the course of the process UN Organisations could be invited as observers to gain knowledge that can be used for institutional capacity building in other parts of the world.
Regional Association VI (Europe) should be involved.
Milestones for the Working Group need to be established.
Initially, reporting from the Working Group to the following parties is suggested:

- WMO Secretariat
- Regional Association VI (Europe)
- CHy
- GRDC SC Members

- DG Environment
- EEA
- JRC

The meeting agreed to these suggestions.

13. Session on status of collaborating UN Specialised Agencies and Programmes, Initiatives and Partner Data Centres

13.1. UNESCO

Mr Demuth from the Hydrological Systems and Global Change Section of the Division of Water Sciences, UNESCO gave an overview of the UNESCO activities related to the International Hydrological Programme (IHP). The IHP has evolved since its inception in 1965 from purely hydrological sciences to integrated science, policy and society. Phase VIII of the IHP will primarily focus on Water Security. He gave some facts why there is such a strong need to shift the focus on Water Security. They are amongst others:

- 85% of the world's human population live in the drier half of the Earth
- 0.8 Billion people are without access to safe water and nearly 2.5 billion are without access to adequate sanitation
- 6 to 8 million human beings are killed each year by water-related disasters and diseases with climate change aggravating this situation
- Almost 85% of the world's total wastewater is discharged without adequate or any treatment
- 145 nations have territories within at least one trans-boundary river basin.

A three-pronged approach to address Water Security within Phase VIII is planned:

- Mobilising international cooperation to improve knowledge and innovation to address water security challenges
- Developing institutional and human capacities for water sustainability innovation
- Enhancing policy advice to reach water security at local, national, regional and global levels

The following themes of Water Security will be addressed within Phase VIII

- Water-related Disasters and Hydrological Change
- Groundwater in a changing environment
- Water Scarcity and Quality
- Water and human settlements of the future
- Eco-Hydrology, engineering harmony for a sustainable world
- Water education, key for water security

Apart from the new alignment of the IHP towards Phase VIII there are also thirteen cross-cutting Programmes and initiatives. Here the GRDC is strongly involved in maintaining the databases for the **FRIEND-Water** community (Flow Regimes from International Experimental and Network Data) and is contributing the drainage network of the major basin of the world as a GIS layer to the **WHYMAP (**World Hydrogeological Map) initiative.

For the implementation of the IHP Phase VIII "Water Security" a detailed consultation process with UNESCO Member States has been embarked on and final approval is expected at the 37th Session of the UNESCO General Conference in November 2013.

13.2. UNESCO FRIEND - Water

Mr Henny van Lanen, Chairman of the FRIEND InterGroup Coordination Committee (FIGCC) provided feedback on the FRIEND-Water activities. FRIEND-Water is IHP's longest running programme. It was established in 1985 and the key objectives of the FRIEND-Water global hydrological research programme are:

- A better understanding of hydrological regimes across time and space in different geographical regions
- The development of analytical tools to improve water resource management and mitigation & adaption of hydro-hazards (e.g. droughts, floods)
- To collect data, and share data, knowledge and techniques (trans-boundary)
- Capacity building: PhD, MSc, training courses, textbooks and manuals
- Dissemination: conferences, technical workshops and expert meetings

As a cross-cutting programme of the IHP, FRIEND-Water will interact with all themes of IHP Phase VIII. Eleven different FRIEND-Water Programmes cover almost the whole world and each of the Programmes is focussing on regionally relevant research questions. Major research questions for the EURO-FRIEND-Water Programme have been identified as:

- How can droughts in stream flow be predicted from weather data and soil moisture conditions?
- Are global hydrological models able to capture observed spatial and temporal changes in hydrological regimes and extremes?
- How can experimental river catchment studies enhance our understanding of hydrological processes at different scales?

For the Southern African FRIEND-Water Programme the major research questions have been defined as:

- How do groundwater bodies interact with ephemeral streams to manage conjunctive use of water resources
- How do we train a future generation of decision makers for water resources management in Africa

The collection of hydrological data within FRIEND databases is part of the programmes core business. The GRDC is hosting the European Water Archive for the EURO-FRIEND Water group. Since 2012 the hydrological data from the Southern Africa FRIEND have been included in the GRDC main database and are available for research and scientific applications according to GRDC data policy.
The FRIEND data hosted by the GRDC have been used to answer a number of research questions such as:

- Is drought a growing problem in Europe today and what about the future?
- How can observation based off-line model estimates be used as reference datasets for comparison with GCM simulations?
- Have large-scale hydrological models added value?

The FRIEND-Water Programme has established a reporting mechanism by providing a Global Progress Report and IAHS Red Book Proceedings every four years, normally in conjunction with the Global FRIEND-Water Conferences with the next one scheduled for February 2014 in Hanoi, Vietnam.

13.3. IAHS

Mr Christophe Cudennec, Secretary General of the International Association of Hydrological Sciences (IAHS) informed the meeting on the latest developments within IAHS and the potential impacts on hydrological sciences.
The IAHS initiative "The Prediction in Ungauged Basins (PUB)", launched in 2003 had been concluded in October 2012 after a decade of research that set out to shift the scientific culture of hydrology towards improved scientific understanding of hydrological processes. However, a new scientific decade starting in 2013 has been launched by IAHS, entitled "Panta Rhei – Everything Flows". This scientific decade will be dedicated to research activities on change in hydrology and society.
Furthermore the meeting was informed about the IAHS publication services, the awarding of international prices in hydrology for outstanding hydrological research, the upcoming scientific Assembly conducted jointly with two further scientific associations under the umbrella of IUGG (International Union of Geodesy and Geophysics) in July in Gothenburg, Sweden. At that meeting Mr Hubert Savenije from the Technical University Delft will be succeeding Mr Gordon Young as the new President.

13.4. GCOS

Ms Jessica Holterhof from the Global Climate Observing System Secretariat (GCOS) presented the GCOS status and activities, especially those that are impacting on the GRDC or where the GRDC is/will be involved.
GCOS reports to the UNFCCC on the status of observing systems for climate. In order to do so, GCOS assesses the progress and requirements of identified observing systems and advises on its implementation. GRDC is a network partner of the GCOS/WCRP Terrestrial Observation Panel for Climate (TOPC) and thus actively contributing to the GCOS continuous improvement and assessment cycle. GRDC was requested to contribute to the planned Third Report on the Adequacy of Climate Observations in support of the UNFCCC in 2015 and the new 2016 GCOS Implementation Plan. The action tasks for the GRDC set out in the 2010 Update of the GCOS Implementation Plan have been completed or are ongoing, and therefore GRDC has been asked to identify new and future actions and goals regarding river discharge monitoring, technical requirements for products, adaptation to climate variability and for the provision of climate services. A strong engagement of the GRDC on delivering ECV requirements will benefit the GCOS in the long run.
GCOS has a possibility to provide assistance with the implementation of monitoring infrastructure through the GCOS Cooperation Mechanism (GCM). GRDC was asked to identify suitable candidates who would qualify for the GCM so that the overall GTN-R could benefit.

13.5. GPCC

Mr Andreas Becker from the Global Precipitation Climatology Centre (GPCC) informed the meeting on the current composition of the GPCC team, the involvement with international projects and programmes including GEO and the latest product development, which focuses to provide a "First Guess Daily" and a "GPCC drought index" product. Additional new products are under development. This has been made possible as the majority of current data now arrives in daily resolution. Furthermore he informed everybody about the fact that all new GPCC analysis products are now issued with Digital Object Identifier (DOI) References.

13.6. IGRAC

Ms Nienke Ansems from the International Groundwater Resources Assessment Centre (IGRAC), now based at the UNESCO IHE in Delft, informed the meeting about the latest activities and she particularly focussed on the operations of "The Global Groundwater Monitoring Network" (GGMN), a web-based software tool which enables users to enter groundwater information directly into the Ground Water Information System. This allows users to have full control over the quality and extent of the data captured. After software updates to the GGMN and the development of cooperation agreements with regional organisations and institutions, the main focus was on the hosting of regional workshops to train regional experts in the use of the GGMN tools. During 2012 workshops were held in the IGAD and SADC Regions.

13.7. GEMS/Water

Mr Norberto Fernandez, the UNEP – GEMS/Water coordinator, informed the meeting on the history, recent activities and future challenges regarding GEMS/Water, the international water quality data centre. The most critical fact is that the current arrangement with Environment Canada, which funded GEMS/Water for more than 3 decades, will end in March 2014. Several UNEP Governing Council decisions called for furthering the development and strengthening of GEMS/Water and now new governance and business models are being developed and negotiations have started with potential new hosting organisations for GEMS/Water.
The GEMStat Software which was developed over a number of years allows users to obtain global water quality data and statistics. Furthermore GEMS/Water engages in numerous capacity building activities in developing countries to improve the water quality monitoring services and the data flows to GEMS/Water.

13.8. HYDROLARE

Ms Sophie Bazanova presented the activities of the International Data Centre on Hydrology of Lakes and Reservoirs (HYDROLARE). The main activities are currently focussing on data collection, database maintenance, data analysis and processing. In a review process the GTN-L list of lakes for monitoring climate change in support of the GCOS programme is being corrected and updated.

HYDROLARE has strengthened the cooperation with the Laboratory of Study of Geophysics and Oceanography from Space (LEGOS) at the National Centre for Space Research (CNES, France), which regularly monitors lake and reservoir levels based on satellite derived information. Furthermore HYDROLARE has reached an agreement with the executives of ILEC to organise a special session on "Hydrological monitoring of the world's large lakes and reservoirs" at the 15th World Lake Conference to be held in September 2014 in Perugia, Italy.

13.9. CNES/LEGOS

Mr Jean-François Crétaux from the Laboratoire d'Etudes en Géophysique et Océanographie Spatiales (LEGOS) at the Centre National d'Etudes Spatiales (CNES) gave a presentation on the planned SWOT (Surface Water Ocean Topography) satellite mission (NASA and CNES) with the launch date in 2020. Radar altimetry will be used for direct measurements of water levels, including rivers. As there are many regions of the world where no discharge measurements are openly available or available at all, a global assessment of river discharge is currently impossible. SWOT will provide estimates of discharge based on multiple SWOT measurements (stage, slope, width), and the observation of river dynamics over the SWOT lifetime with complimentary, but not required, in situ data. Stream gauges in France and the US have already been identified that will be used for signal calibration and validation. Furthermore data and information from the GRDC could serve as another source of data to determine systematic errors in the measurements.
The hydrologic science objectives of the SWOT mission are to measure storage changes in lakes, reservoirs, and wetlands larger than 250m by 250m and to estimate discharge in rivers wider than 100 m. The temporal sampling frequency will be with a 22 day return period. The geographical coverage will be extending up to 78 degrees north.

14. GRDC Strategy Discussion

The GRDC Strategy discussion focused on the development of a work plan and the determination of milestones for the 2013 - 2015 period.

The GRDC was requested to investigate the preparation of data products together with partner data centres and the IHP/HWRP Secretariat. Further discussions are planned during the 6th Session of the GTN-H Coordination Panel to be held from 12 – 14 June in Koblenz.
It was realised that the GRDC involvement in the activities related to the HDWG are time consuming and that resource constraints are a limiting factor.

The following topics were addressed:

- Differences between EWA FRIEND and GRDC data policies have been discussed again. For the time being no solution is in sight, as some of the EWA data have been obtained from providers specifically under EWA data policy conditions. At this stage the GRDC can still handle the EWA requests separately with a limited amount of extra effort.

- At the First WMO RA VI Hydrology Forum, held in May 2012 in Koblenz, the GRDC was tasked to develop data sharing procedures between NHSs and data centres. The

proposed procedures have been accepted by the NHSs of WMO RA VI and now the GRDC is structuring its global data acquisition activities as suggested in the procedures and first positive results have been achieved for a number of European countries contributing discharge data to the GRDC.

- In the framework of the GEOWOW project the GRDC started negotiations with several data providers to make their contributed data freely available to the GTN-R network and to the GEOSS data core. Several countries have responded already positively and the GRDC makes already time series data from selected stations freely available for tests within the GEOWOW project and for the GEOSS data core. Negotiations with numerous countries are ongoing and the development of the GTN-R network is benefiting from these efforts.

- GRDC will continue to promote its activities using various means (posters, flyers, papers, presentations, articles in news letters, GRDC website and last but not least an efficient service) as it has a relative good idea on the data user community. More effort will be done to address different audiences according to their specific needs.

15. Adoption of key recommendations and action list

Based on the running activities at the GRDC and the emerging trends as discussed by the GRDC SC the following tasks and activities have been considered. Taking note of the resource constraints of the GRDC, the following action list was recommended by the 11th GRDC Steering Committee Meeting.

GRDC action list as recommended at the 11th GRDC Steering Committee Meeting, June 2013

Task	Action by	Due date
GRDC Core Activities		
Data acquisition, management and distribution	GRDC	Ongoing
Maintenance of current GRDC data and GIS products	GRDC	Ongoing
Website maintenance	GRDC	Ongoing
UNESCO related activities		
AP FRIEND	GRDC, AP-FRIEND	Feb. 2014
Revitalise Met- FRIEND, EWA, LAC data co-operation activities and harmonisation	IRD, GRDC, UNESCO, FRIEND-Water	Discuss in Hanoi Feb. 2014
GCOS / GTN-H / GTN-R		
GCOS support letter to GTN-R member states	GRDC, GCOS Sec.	Dec 2013
Inputs to GCOS IP	GRDC & GCOS Partners	On demand
Inputs to AR 3	GRDC & GCOS Partners	On demand
Links to GOSIC	GOSIC, GRDC	2014
GTN-R data acquisition part of core business, as good as possible	GRDC	Ongoing
WMO CHy / WIS / WIGOS related activities		
WMO/OGC HDWG activities, both coordination (co-chair responsibilities) and conceptual work for HY-Features and Metadata Profile	GRDC	Ongoing
Task Team WIGOS Metadata (TT-WMD)	GRDC	On demand
IPET-WIFI	GRDC	On demand
Agreement of concepts, test and expand feature models to other hydro-domains,	Partner data centres	
Climate sensitive stations		
Scientific reasoning for collecting the information (paper Steve Greb)	GRDC, UNESCO, WMO	
Joint Data Products with Partner data centres		
Discussion at GTN-H		
Identify joint stations with GEMS/Water	GEMS/Water, GRDC	
EU Data requirements		
Establish working group, WMO invited by SC to convene a working group meeting Aim: Prepare for an agreement for access to hydro data and cooperation based on WMO policies plus member consent, data exchange mechanisms	WMO, EEA/EU, BfG/GRDC, RA VI Management Group, Observers from UN Organisations	Aug 2013

Task	Action by	Due date
Miscellaneous		
Submit data to GEMS/Water	GRDC/GEMSWater	6 monthly
Promote data requirements of partner data centres	Partner data centres	Ongoing

16. Information session on the hydro-meteorological background and extent of the May/June 2013 floods in Central Europe

The GRDC Steering Committee Meeting was held towards the end of an extreme flood event, which affected communities in central Europe since mid-May, especially those living along the major transboundary rivers Elbe, Danube and to a lesser extent the Rhine.

Peter Krahe informed the meeting on the hydro-meteorological conditions, which resulted in the extensive flooding, and Jörg Belz presented the first hydrological assessments and impacts.

Both presenters were thanked for comprehensively informing the meeting at short notice.

17. Any other business

Mr Moser suggested that a colloquium on "The Global Water Balance" should be held back to back with the next GRDC Steering Committee Meeting in June 2015. This suggestion was supported by the meeting.

18. Date and Venue of next GRDC SC Meeting

The interval of the GRDC SC meetings was reviewed and it was decided to stick to the bi-ennial meeting cycle. The tentative date for the next GRDC SC meeting was set for June 2015 after the 17th WMO Congress and the 67th Session of the WMO Executive Council. Koblenz as the venue was accepted by the SC Meeting.

19. Closure of the meeting

At the closing of the meeting Mr Grabs informed everybody that the work of the GRDC is well recognised by the WMO, especially the Commission for Hydrology.

Furthermore he expressed the gratitude of the WMO towards the German Government and in particular to the Federal Institute of Hydrology for their continued support by hosting the GRDC.

The Steering Committee members and observers where thanked for their constructive and positive contributions and willingness to support the GRDC.

While wishing everybody a safe journey back home, Mr Moser and Mr Grabs closed the 11th GRDC Steering Committee Meeting at 12:30.

ANNEX I Agenda

Monday, 10 June 2013

09:30 – 10:00 Registration

10:00 – 17:00 (12:30 – 13:30, Afternoon Coffee Break 15:00 – 15:30)

- **Opening of the 11th GRDC Steering Committee Meeting (Moser)**
- **Introduction of participants and adoption of the agenda (Moser)**
- **Briefing on GRDC personnel resources, budget and infrastructure (Moser)**
- **WMO-Briefing on outcomes of the Extraordinary Session of the Congress in October 2012, the 14th Session of the Commission for Hydrology in November 2012, the CHy Advisory Working Group Session 1 in Feb-Mar 2013 and other developments relevant to GRDC (Grabs, Boston)**
- **Objectives and expected outcomes of the meeting (Cullmann, GRDC, All)**
- **Feedback: 10th GRDC Steering Committee Action List (Looser)**
- **GRDC Status Report and discussion (Looser, All)**
- **Activities within the WMO/OGC Hydrology Domain Working Group (Dornblut)**
- **Activities within WMO WIS/WGOS representing CHy (Dornblut, All)**
- **GRDC/BfG partner in the FP7 Project GEOWOW (Andres, All)**

17:30 – 22:00 Social event

Tuesday, 11 June 2013

09:00 – 17:00 (Coffee Break 10:30 – 11:00, Lunch 12:30 – 13:30, Coffee Break 15:00 – 15:30)

- **Session on Data Policy and emerging EU data requirements (Looser, EU/EEA/JRC, All)**
- **Reports of collaborating UN Special Agencies and Programmes, Initiatives and Partner Data Centres Presentations and Discussion)**

Wednesday, 12 June 2013

09:00 – 12:30 (Coffee Break 10:30 – 11:00, Lunch 12:30 – 13:30)

- **GRDC Strategy Discussion**
- **Adoption of key recommendations and work plan for 2013 – 2015**

- **The May/June 2013 floods in Central Europe** **(Krahe, Belz)**
- **Any other business** **(All)**
- **Date and Venue of next GRDC SC Meeting** **(All)**
- **Closure of the meeting** **(Moser/Grabs)**

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ANNEX III Composition of the GRDC Steering Committee

Chairman:

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Secretariat:

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Members:

- WMO: World Meteorological Organization
- CHy: Commission for Hydrology of WMO
- CWD: Climate and Water Department of WMO
- HWRP: Hydrology and Water Resources Programme of WMO
- UNESCO: United Nations Educational, Scientific and Cultural Organization
- UNESCO Water: UNESCO Water Programmes
- UNEP DEWA: UNEP Division of Early Warning and Assessment
- ICSU: International Council for Science / IAHS: International Association of Hydrological Sciences
- BfG: Federal Institute of Hydrology
- GPCC: Global Precipitation Climatology Centre
- GWPO: UN GEMS/Water Programme Office of UNEP/DEWA
- IGRAC: International Groundwater Resources Assessment Centre
- HYDROLARE Data Centre for the Hydrology of Lakes and Reservoirs
- FRIEND: Flow Regimes from International Experimental and Network Data
- WCRP: World Climate Research Programme sponsored by IOC, WMO, ICSU
- Government of Japan, represented by the River Bureau of the Ministry of Land, Infrastructure and Transport of Japan (MLIT)

Observers:

- IHP/HWRP German Secretariat of the IHP of UNESCO and the HWRP of WMO
- GCOS: Global Climate Observing System sponsored by IOC, WMO, ICSU and UNEP
- GEO: Secretariat of the Group on Earth Observation
- GWSP: Global Water System Project, International Project Office
- WWAP: World Water Assessment Programme

ANNEX IV Acronyms

AIP	Architecture Implementation Pilot
AP – FRIEND	Asian Pacific Flow Regimes from International and Experimental Network Data
ARDB	Arctic Runoff Data Base
ASCII	American Standard Code for Information Interchange
AU-BoM	Australian Bureau of Meteorology
AWG	CHy Advisory Working Group
BfG	Bundesanstalt für Gewässerkunde (Federal Institute of Hydrology)
CBS	WMO Commission for Basic systems
Cg	WMO Congress
CHy	Commission for Hydrology (WMO)
CNES	Centre National d'Etudes Spatiales (National Centre for Space Research)
CUAHSI	Consortium of Universities for the Advancement of the Hydrologic Sciences, Inc.
DCPC	Data Collection or Production Centre
DG – ENV	European Commission Directorate-General for the Environment
DOI	Digital object identifier
DP	Discussion Paper
DWD	Deutscher Wetterdienst
EC	WMO Executive Council
ECV	Essential Climate Variable
ECMWF	European Centre for Medium-Range Weather Forecasts
EEA	European Environment Agency
EFAS	European Flood Alert System
EIONET	European Environment Information and Observation Network
ENSO	El Niño/La Niña-Southern Oscillation
EO	Earth Observation
ERB	European Representative Basins (UNESCO – FRIEND)
ESA	European Space Agency
ETN-R	European Terrestrial Network for River Discharge
EU	European Union
EURO-FRIEND	European Flow Regimes from International Experimental and Network Data Sets
EWA	European Water Archive
FIGCC	FRIEND InterGroup Coordination Committee
FP7	European Union Seventh Framework Programme for research and technological development
FRIEND	Flow Regimes from International Experimental and Network Data Sets
FTP	File Transfer Protocol
GCI	GEOSS Common Infrastructure
GCM	GCOS Cooperation Mechanism
GCM	General Circulation Model
GCOS	Global Climate Observing System

GEMStat	Global Water Quality Database of GEMS/Water
GEMS/Water	Global Environmental Monitoring System for Water
GEO	Group on Earth Observations
GEOSS	Global Earth Observation System of Systems
GEOWOW	GEOSS interoperability for Weather, Ocean and Water
GEWEX	Global Energy and Water Cycle Experiment
GEWEX CEOP	GEWEX Coordinated Energy and Water Cycle Observation Project
GEWEX GHP	GEWEX Hydroclimatology Panel
GFCS	Global Framework for Climate Services
GGMN	Global Groundwater Monitoring Network
GIS	Geographic Information System
GMES	Global Monitoring for Environment and Security
GOSIC	Global Observing Systems Information Center
GPCC	Global Precipitation Climatology Centre
GRanD	Global Reservoir and Dam Database
GRDB	Global Runoff Database
GRDC	Global Runoff Data Centre
GTN-H	Global Terrestrial Network – Hydrology
GTN-L	Global Terrestrial Network – Lakes
GTN-R	Global Terrestrial Network for Rivers
GWML – IE2	Second Groundwater Interoperability Experiment applying WaterML 2.0
GWPO	UN GEMS/Water Programme office
GWSP	Global Water System Project
HARON	Hydrological Applications and Run-Off Network
HDWG	Hydrology Domain Working Group within the OGC
HIS	Hydrological Information System
HWRP	Hydrology and Water Resources Programme (WMO)
HYCOS	Hydrological Cycle Observing System
HYDROLARE	International Data Centre on the Hydrology of Lakes and Reservoirs
HydroSHEDS	Hydrological data and maps based on Shuttle Elevation Derivatives at multiple Scales
IAHS	International Association of Hydrological Sciences
ICG-WIGOS	Inter-Commission Coordination Group on the WMO Integrated Global Observing System
ICSU	International Council for Science
IGAD	Intergovernmental Authority on Development (Djibouti, Eritrea, Ethiopia, Kenya, Sudan, Uganda)
IGAD-HYCOS	Intergovernmental Authority on Development (Djibouti, Eritrea, Ethiopia, Kenya, Sudan, Uganda) Hydrological Cycle Observing System
IGRAC	International Groundwater Resources Assessment Centre
IHP	International Hydrological Programme
ILEC	The International Lake Environment Committee Foundation
IPET – WIFI	Inter Programme Expert Team on WIGOS Framework Implementation
IRD	L'Institut de recherche pour le développement
ISO	International Organization for Standardization
IUGG	International Union of Geodesy and Geophysics

JRC	Joint Research Centre
KLIWAS	Auswirkungen des Klimawandels auf Wasserstraßen und Schifffahrt – Entwicklung von Anpassungsoptionen (Impacts of climate change on waterways and navigation - Searching for options of adaptation)
KMZ	Keyhole Markup Language
LEGOS	Laboratoire d'Etudes en Géophysique et Océanographie Spatiales (Laboratory of Study of Geophysics and Oceanography from Space)
MCH	Meteorological, Climatological and Hydrological data base management system
MoU	Memorandum of Understanding
NASA	National Aeronautics and Space Administration
NESDIS	National Environmental Satellite, Data and Information Service
NHS	National Hydrological Service
NOAA	The National Oceanic and Atmospheric Administration
NRT	Near real time
OGC	Open Geospatial Consortium, Inc.®
PR	Public Relations
PUB	IAHS Decade on Predictions in Ungauged Basins (PUB), 2003–2012
QFM –H	Quality Management Framework - Hydrology
Res.	Resolution
SADC-HYCOS	South African Development Community Hydrological Cycle Observing System
SA – FRIEND	Southern Africa FRIEND
SC	Steering Committee
SOS	Sensor Observation Services
SWOT	Surface Water Ocean Topography Mission
TC	OGC Technical and Planning Committee Meeting
TT – WMD	Task Team on WIGOS Metadata
TOPC	Terrestrial Observation Panel for Climate
UML	Unified Modeling Language
UN	United Nations
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
WCP	World Climate Programme (WMO)
WCRP	World Climate Research Programme
WHYCOS	World Hydrological Cycle Observation System
WHYMAP	World-wide Hydrogeological Mapping and Assessment Programme
WIAG	WHYCOS International Advisory Group
WIGOS	WMO Integrated Observing System
WIS	WMO Information System
WML 2.0	Water Markup Language 2.0
WMO	World Meteorological Organization
WMO RA-VI	WMO Regional Association VI (Europe)
WWAP	World Water Assessment Programme

GRDC Report Series

Report No. 1 (May 1993)	Second Workshop on the Global Runoff Data Centre, Koblenz, Germany, 15 - 17 June, 1992.	
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Report No. 11 (Apr 1996)	GRDC - Status Report 1995.	
		(16 pp, annex 45 pp)
Report No. 12 (Jun 1996)	Second Interim Report on the Arctic River Database for the Arctic Climate System Study (ACSYS).	
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Report No. 13 (Feb 1997)	GRDC Status Report 1996.	
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		(18 pp, annex 34 pp)

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	(33 pp, annex 34 pp)
Report No. 44 (Aug 2014)	Global Freshwater Fluxes into the World Oceans: Technical Report prepared for the GRDC / K. Wilkinson, M. von Zabern, J. Scherzer (UDATA, Germany). - DOI: 10.5675/GRDC_Report_44
	(9 pp)
Report No. 45 (Mar 2015)	Report of the Eleventh Meeting of the GRDC Steering Committee, Koblenz, Germany, 10 - 12 June 2013. - DOI: 10.5675/GRDC_Report_45
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