WORLD METEOROLOGICAL ORGANIZATION
REGIONAL ASSOCIATION VI (EUROPE)

RA VI
WIS IMPLEMENTATION PLAN

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December 2012

Foreword

I am pleased to present to your attention the RA VI WIS Implementation Plan, which should guide the activities of the RA VI Members towards a successful implementation of the WMO Information System (WIS). As it has been well established in RA VI (Europe), the Regional Association is a major factor in the implementation of the WMO programmes and initiatives by coordinating the activities of its Members in such a way that the implementation is carried out in a synchronized and harmonized manner. Thus, this plan is intended to ensure that all RA VI Members are committed to implement WIS in accordance with a well coordinated regional plan providing the basis for their actions at national level, i.e., plan and set up elements of WIS (national centres (NC), data collection or production centres, global information system centres (GISC)) that satisfy the national, regional and global needs for meteorological, climatological and hydrological data and products.

As you are aware, the XVI WMO Congress (2011) became a turning point for intensive global, regional and national planning for the implementation of WIS. The Congress emphasized that, although the implementation of the new functionality of WIS had been advanced in a few core centres, many Members were yet to begin their implementation. Cg-16 expected that the full implementation of WIS by all Members will take at least the whole of the 2012-2015 financial period.

The RA VI Management Group decided that the implementation of WIS and WIGOS in Region VI will be a major priority since these systems are the backbone of all activities carried out in our professional field. A close coordination and cooperation with the CBS has been established and concrete action has been undertaken to ensure the engagement of all Members in this process. I firmly believe that most of RA VI Members will be able to complete their work on implementation of WIS by the end of 2013 and thus will be able to benefit all advantages of using the new facilities and functions of the system. One of the purposes of the Regional Implementation Plan is to identify at an early stage of the implementation process what kind of assistance would be necessary to the less resourced Members to acquire the necessary capacity for the WIS implementation and use. I am very happy that three of the four planned GISCs in RA VI are already operational and the fourth one will be also operational in 2013. Thus, these centres will be able to assist the NCs in their respective areas of responsibility and advance the implementation in the Region as a whole.

I would like to use this opportunity and express my gratitude to the RA VI Task Team on WIS Development and Implementation (TT-WIS/DI) and its Chair, Prof. Geerd-Rüdiger Hoffmann, who drafted this Plan, and to the WMO Secretariat for preparing it for my approval and publication. Special thanks to the TT member Roar Skalin from the Norwegian Meteorological Institute for writing the very useful "WIS in a nutshell" material. I am also very grateful to Dr Jochen Dibbern from DWD, Chair of the RA VI Working Group on Technology Development and Implementation (WG-TDI) for his support, in particular, for providing resources for monitoring the WIS implementation in RA VI. I would like to express my compliments to Dr Georgi Kortchev, Director-General of the National Institute of Meteorology and Hydrology of Bulgaria for the excellent organization of the RA VI WIS Implementation Workshop in Sofia in November 2011. Last but not least, my sincere thanks to Dr Fred Branski, president of CBS, who provided valuable support throughout the preparation of this Plan.

I am pleased to announce that the RA VI WIS Implementation Plan has been approved and I look forward to working closely with all Members for its successful execution.

Zagreb, Croatia   Ivan Cacic
19 December 2012   President of RA VI

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8.8   Performance Monitoring

Appendices:

1. Executive summary

The XV Session of RA VI (Brussels, 2009) stated that the Association should rapidly advance the implementation of the WMO Information System (WIS). As a consequence, the Task Team on WIS Development and Implementation (TT/WIS-DI) was established under the Working Group on Technology Development and Implementation (WG-TDI). In 2011, the WMO Congress reaffirmed the important role of regional associations in WIS development as a crucial factor to ensure both a successful implementation and a shared ownership of the system. Noting the directives given by Congress, the RA VI Management Group assigned highest priority to the implementation of WIS in Region VI (Europe) and arranged for a Workshop on the Implementation of WIS[1] (Sofia, November 2011) to be organized by the TT/WIS-DI. The main objective of the Workshop was to foster the WIS implementation by RA VI Members and contribute to the development of a coordinated regional WIS implementation plan.

Since the beginning of the year 2012, the RA VI WIS Implementation Plan has been developed and discussed in meetings with the relevant bodies in RA VI: WG-TDI, TT/WIS-DI, and the RA VI Management Group. In addition, the WMO Secretariat was involved in many aspects of the evolving plan.

The plan focuses on the Members of RA VI to set up National Centres (NC) connected to one of the four designated Global Information System Centres (GISC) in the Region. Plans of RA VI Members to establish Data Collection or Production Centres (DCPC) are presented briefly. Their implementation is not covered in detail by this document, because implementation procedures for DCPCs are covered by the Manual on WIS[2] and WIS Demonstration Process "Procedures and Guidelines,"[3] .

After describing the features of WIS and highlighting the benefits for Members to be connected to WIS, the current status of WIS in RA VI and the telecommunication network used for meteorological data and products are delineated. The role of RMDCN is highlighted, in particular in view of its ability to support WIS structures by allowing any-to-any connectivity. The list of countries in RA VI together with their proposed principal GISC (either chosen by the country itself in response to a letter by the Secretary-General of WMO in February 2012 or by the Secretariat based on the GTS connectivity) provides an overview of the structure of WIS after its regional implementation. The steps an NMHS has to take to become a WIS NC are described in detail. The initial steps to establish a DCPC are mentioned as well, in particular, for the existing RTHs, which as components of the GTS still have crucial roles to play, including providing GTS connectivity to centres not on the RMDCN. Sample step-by-step implementation approach for these two cases are provided in the Appendices.

Furthermore, risks for the success of the plan are assessed together with possible remedies. The future activities to implement the plan are listed with the goal that most of the RA VI Members will be WIS enabled by the end of 2013.

Finally, the responsibilities of the GISCs and DCPCs in the WIS implementation monitoring are described with their importance for the successful implementation of the plan. The participation and cooperation of the national WIS Focal Points is stressed.

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[1] Materials of the Workshop are available at: http://www-newdev.wmo.int/pages/prog/dra/eur/RA6_WIS_Workshop.php
[2] Manual on the WMO Information System (WMO No 1060) - ftp://ftp.wmo.int/Documents/MediaPublic/Publications/Manual%20on%20WMO%20Information%20System_WMO_No_1060/1060_Manual_on_WIS_en.pdf
[3] WIS Demonstration Process Guidelines - http://www-db.wmo.int/WIS/centres/guidance.doc

2. Introduction

In 2003, the World Meteorological Congress (Cg-14) stated that an overarching approach for solving the data management problems for all WMO and related international programmes, a single coordinated global infrastructure was required. This solution was named the WMO Information System (WIS) with the following features:

- WIS would be used for the collection and sharing of information for all WMO and related international programmes;
- WIS would provide a flexible and extensible structure allowing the participating centres to enhance their capabilities as their national and international responsibilities grow;
- Implementation of WIS should build upon the most successful components of existing WMO information systems in an evolutionary process;
- WIS development should pay special attention to a smooth and coordinated transition;
- The basis for the core communication network should be the communication links used within the World Weather Watch (WWW) for the high priority real-time data;
- WIS should utilise international industry standards for protocols, hardware and software.

Between Cg-14 (2003) and Cg-15 (2007), good progress was made in demonstrating the technological solutions for WIS through pilots and prototypes projects.

Cg-15 agreed that the WMO Information System should provide three fundamental types of services to meet the different requirements, as follows:

a. Routine collection and dissemination service for time-critical and operation-critical data and products;
b. Data discovery, access and retrieval service;
c. Timely delivery service for data and products.

Cg-15 also emphasized that the WIS implementation should build upon existing WMO information systems in a smooth and evolutionary process. It agreed that the WIS implementation plan should have two parts that would be developed in parallel:

- **Part A:** the continued consolidation and further improvements of the GTS for time-critical and operation-critical data, including its extension to meet operational requirements of WMO Programmes in addition to the World Weather Watch (including improved management of services);

- **Part B:** an extension of the information services through flexible data discovery, access and retrieval services to authorized users, as well as flexible timely delivery services.

Cg-15 further emphasized that the support and involvement of all NMHSs, including regional associations and technical commissions in the WIS development was a crucial factor for ensuring a successful implementation and a shared ownership of the system.

During the period 2007 – 2011, between Cg-15 and Cg-16, under the leadership of the CBS, the development of WIS progressed both in terms of technological solutions and preparation of regulatory and guidance material for its implementation. Thus, Cg-16 (2011) noted the significant progress achieved by Members in implementing WIS with 18 Members/organizations that have entered into the first round of the demonstration process for a total of 13 GISCs and 56 DCPCs (some of these centres had been in pre-operational mode since May 2010). Congress accepted the recommendation by CBS on the designation of the initial set of WIS centres. Congress requested that after the initial designation of WIS centres, further designations will be performed by EC in accordance with the Manual on WIS.

Cg-16 stated that WIS had moved from a development stage into an operational stage and advised Members and relevant international organizations that WIS activities in 2012-2015 should focus on:

a. complete WIS implementation across all WMO Centres;
b. capacity building to ensure support of all WMO Members;
c. leverage WIS advantages for all WMO Programmes; and
d. take advantage of WIS in all WMO Data Management.

Cg-16 became a turning point for intensive global, regional and national planning for the implementation of WIS and emphasized that although the implementation of the new functionality of WIS had been advanced in a few core centres, many Members were yet to begin their implementation. Cg-16 expected that the full implementation of WIS by all Members will take at least the whole of the 2012-2015 financial period.

Congress set-up the following major activities and implementation target dates, urging all Members and the Secretary-General to identify the necessary resources for reaching the objectives:

a. Improving the knowledge and capabilities of Members to benefit from WIS functionality, in particular least developed countries, developing countries and small island states through regional workshops and information sessions: 2012-2013;
b. Implementation of WIS at all NMHS national centres (NCs): 2012-2015;
c. Implementation of remaining candidate GISCs: 2012-2013;
d. Implementation of more DCPCs, i.e. WIS interfaces at WMO Programmes' centres: 2012-2015;
e. Amendments to the Manual on WIS for enhanced operational arrangements of WIS centres, especially GISCs: 2014.

The planning of the regional components of WIS has been discussed by the Regional Association VI, in particular during its XV session (Brussels, 2009), which concluded that the Association should rapidly advance the implementation of the WIS.

The Management Group of RA VI therefore decided that the implementation of WIS would be one of the main priorities for the Region for the period 2012 – 2015. In order to ensure a harmonized and synchronized implementation of all components of WIS from national to global level, the MG emphasized on the need for regional coordination of the WIS-related activities of RA VI Members. A Task Team on WIS Development and Implementation (TT/WIS-DI) was established by the MG under the Working Group on Technology Development and Implementation (WG-TDI). TT/WIS-DI has been tasked, inter alia, to coordinate the development of the draft RA VI WIS Implementation Plan; in order to do this, the task team had to review all implementation aspects and coordinate with relevant CBS subsidiary bodies and survey the WIS-oriented actions planned by RA VI Members and partner organizations.

The first major step towards the regionally coordinated WIS Implementation in RA VI was the regional Workshop held in Sofia, Bulgaria, 1 to 3 November 2011. The workshop addressed:

- the regional WIS structure – designation and operation of the Global Information System Centres (GISC), Data Collection and Production Centres (DCPC) and National Centres (NC);
- functional and technical capabilities to be developed by Members in accordance with their role in the WIS infrastructure;
- benefits for the NMHSs from the WIS functionalities;
- capacity building needs for the implementation of WIS at sub-regional and national level.

The WIS Workshop established the basic outline of a RA VI WIS Implementation Plan that will ensure timely and harmonized implementation of the WIS infrastructure by all RA VI Members.

It was envisaged that most of this infrastructure and the WIS functionalities at national and regional level could be achieved before the end of 2013. This target could only be achieved if there is a strong cooperation between the RA VI Members, in particular, a great capacity building effort on the side of the GISCs towards the Members in their respective area of responsibility.

In conclusion, the RA VI-WIS Implementation Plan is an all inclusive guiding document for RA VI Members to follow in building an effective and efficient WIS infrastructure, in line with the guidance given by Cg-16 for a fast transition from development to implementation phase of the WIS.

3. Scope and purpose of RA VI WIS Implementation Plan

As with most WMO systems, the WIS implementation has three dimensions/layers: global, regional and national. A global WIS Implementation Plan has been developed and is available online[4]. This plan outlined major phases in the development of the WIS. The national plans will be focused on the identification and registration of relevant centres by each Member and partner international organizations, as well as on the capacity development for meeting the WIS requirements, defined in the related WMO technical regulations, and for making the full use of the WIS functionalities.

The regional dimension of the implementation process is very important because it should facilitate a synchronized and harmonized implementation by all Members and partner organizations concerned in the Region. Thus, the benefits of the WIS would become evident to both developed and less developed Members. The existing capacity gaps, both technical and human resource related, could be addressed through the cooperation and assistance mechanisms of the Regional Association, which would accelerate the implementation and bring the expected benefits to all Members.

In view of the foregoing, the RA VI WIS Implementation Plan is aimed at assisting RA VI Members to implement WIS functionality in their identified centres and become effective WIS users in a timely and harmonized manner. Therefore, it concentrates on the access to WIS by NMHSs as National Centres (NC). The requirements and procedures for other types of centres, like Global Information System Centres (GISC) or Data Production or Collection Centres (DCPC), are described in detail in the Manual on WIS[5] and WIS Demonstration Guidelines, and therefore only briefly mentioned in this paper. However, in implementing and supporting WIS in RA VI and monitoring its performance, GISCs will have to take on certain responsibilities described below. Information about the implementation of GISCs and DCPCs by RA VI Members and international organizations is included in the Plan monitoring process in order to provide "one stop shop" with regard to the overall WIS implementation in Region VI (Europe).

The Plan also provides practical guidance and a step-by-step approach towards the WIS implementation by Members in their National Centres. A primary task for the NMHSs is ensuring compliance with the WIS requirements established by the WMO regulatory material *WMO Technical Regulations, Volume I (WNO-No. 49)* and its *Annex VII, Manual on the WMO Information System (WMO-No. 1060).* In order to facilitate the implementation process, the GISCs should establish close contacts with the NCs in their areas of responsibility and act as "help desks" when assistance is needed. In particular, GISCs should plan for providing assistance to build the capacity of the NCs to handle the required discovery metadata.

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[4] WIS Project and Implementation Plan – (http://www.wmo.int/pages/prog/www/WIS/documents/WIS-ProjectPlan-v1-2-1.doc)
[5] Manual on the WMO Information System (WMO-No. 1060)

4. Description of WIS

WIS is the global infrastructure for managing and making available weather, water and climate information. WIS meets the requirements for routine collection and automated dissemination of observed data and products, as well as data discovery, access and retrieval services for all weather, climate, water and related data and products provided by centres and Member countries in the framework of all WMO Programmes.

4.1 WIS Services

While WIS builds on and extends the GTS, it is also a new approach to data discovery and data provision in the meteorological community. WIS goes far beyond providing telecommunication services, and offers new and modern data management services to its users. These are essentially the possibility to discover all data and products of the wider WMO community, as well as the means and information on how to obtain the data. For this purpose, all information within WIS is described by discovery metadata in accordance to the WMO Metadata Core Profile. It is assumed that WIS by including the GTS and the Internet will have sufficient bandwidth/link capacity available to fulfill future user needs. To this end, WIS provides three types of services:

a. **Routine collection and dissemination service for time-critical and operation-critical data and products:** This service is an extension of the current GTS. It is based on subscription to real-time "push and forward" distribution systems, including multicast and broadcast, and implemented mostly through dedicated telecommunication means providing a guaranteed quality of service. An important component of this service will be the "all hazards warning network" facilitating warnings to be distributed from one point in WIS to all other points within 2 minutes.

b. **Service for the timely delivery of non time-critical, operationally critical or voluminous data and products:** This is a new service which allows users to subscribe to data that would not otherwise have been available through the GTS because it is too voluminous or because the delivery is not so critically time- or operationally- dependent. Thus, the delivery method for these data does not need to use the capacity of the GTS. It is also suitable for those users not connected to the GTS. The service is focused on a "push" mechanism and implemented mostly via public data-communication networks, such as the Internet. As with the time and operationally critical service (1), users may use the discovery service (3) to search for the information they would like to access or subscribe to.

c. **Data Discovery, Access and Retrieval (DAR) service:** This is a new service where the user can use a variety of discovery services to search for data, products or other information registered within the WIS. Depending on the access policy for the data, the user may also access and download the data. The service is based on a request/reply "pull" mechanism and is to be implemented mainly through the Internet, but the user may also subscribe to receive data or products via the GTS or any other delivery mechanism available between the information provider and the user (for example via e-mail, SMS, facsimile, courier or postal services). In this way, WIS users can potentially discover and access all WMO data and products without having an extensive knowledge of the information practices and procedures of the WMO Programme responsible for the data or product. Note that if a user has an account at a GISC, then, depending on the data policy, it may be able to access information directly from the GISC, all of which hold information that is available for global exchange for at least 24 hours.

4.2 The structure of WIS

The WIS services described above are realized by WMO Members and associated centres through three types of WIS centres as well as the WIS data communication network. WIS centres need to be endorsed by WMO in accordance with the regulations described in the WMO Technical Regulations (WMO No. 49) and the Manual on WIS (WMO No. 1060).

The concept of interoperability guarantees that the overall functionality of WIS is realized by each WIS centre through implementing the specifications required for this type of centre. The four core components are:

- Global Information System Centres (GISC)
- Data Collection or Production Centres (DCPC)
- National Centres (NC)
- Data networks

4.3 WIS Centres

GISCs collect and distribute information for routine global dissemination, such as GTS data. They serve as collection and distribution centres in their areas of responsibility and they provide access points for any request for data held within the WIS. A WIS user accessing the web portal of any GISC will be able to browse any data catalogue of information available in WIS.

DCPCs are connected to the GISCs and are responsible for the collection or generation of specialized sets of data, forecast products, processed or value-added information beyond the scope of NCs, and/or for providing archiving services.

NCs collect and distribute data on a national basis and coordinate or authorize the use of the WIS by national users, normally under a policy established by the respective Permanent Representative with WMO.

The terms NC, DCPC and GISC are used for describing the necessary functions, not actual organizational entities. There may be organizations, such as NMHSs, which combine all three functions within their structure. There may be several GISCs in a Regional Association (RA). NCs and DCPCs can be associated with several GISC but have to choose one of the GISCs as their principal GISC for the purposes of uploading and managing discovery metadata. The following diagram provides an overview of the various components:
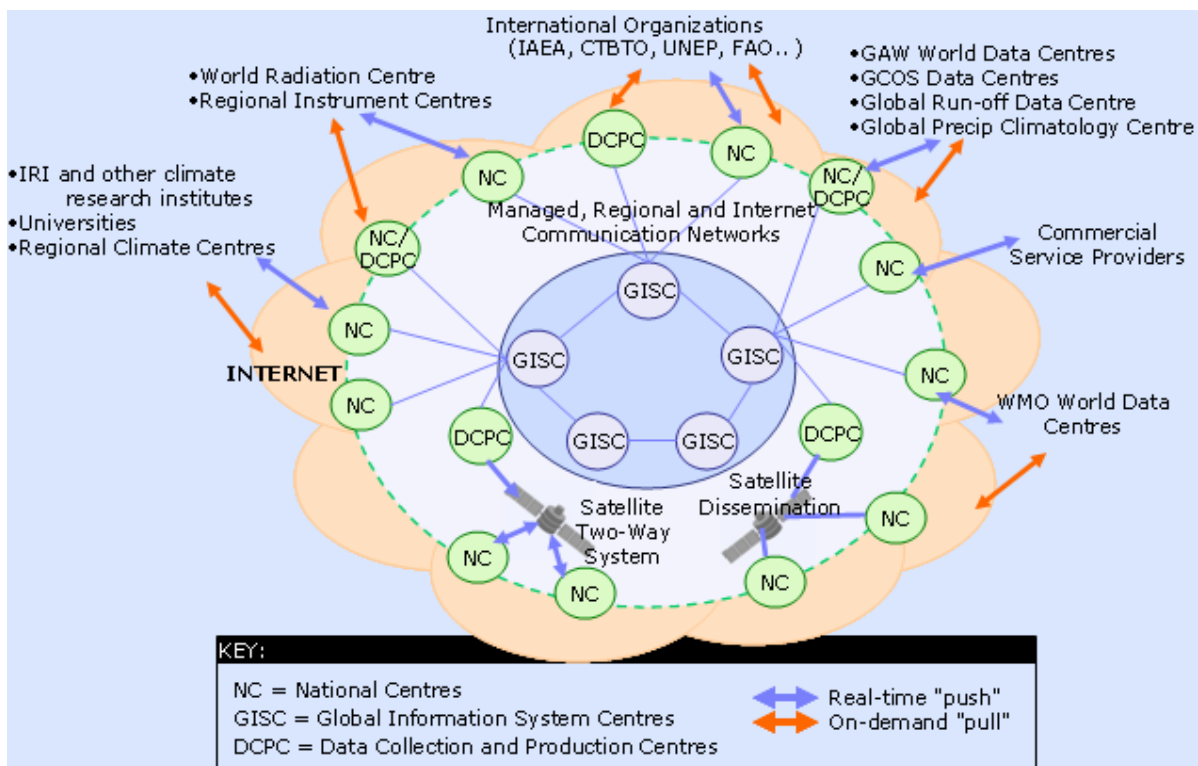
Figure 1: WIS core components and Information Exchange

4.4 WIS data networks

The WIS network structure consists of a WIS Core Network connecting all GISCs to each other. Each GISC has an Area Meteorological Data Communication Networks (AMDCN) connecting them to NCs and DCPCs in their area of responsibility. This is illustrated in Figure 2. An NC or DCPC may be in multiple AMDCNs. The AMDCNs incorporate GTS infrastructure and may involve single, partial or multiple regional meteorological telecommunication networks.

The data communication networks that can be used in WIS include:

- The Main Telecommunication Network (MTN) of the GTS forms the WIS Core Network.
- GISCs are also connected by the Internet, which presently is being used for discovery metadata synchronization.
- The GTS (MTN and RMTN) provides the dedicated network component of the AMDCNs, especially for meeting real-time exchange requirements and the all hazards network. Note that the GTS includes extensive use of Internet through Virtual Private Networks (VPN) in many areas where no alternatives exist.
- Satellite distribution systems such as those described by the Integrated Global Data Dissemination Service (IGDDS) form an essential part of the GTS and therefore the WIS, especially for the support of remote areas where terrestrial communication systems do not effectively meet the need. This includes data collection systems for remote platforms as well as for distribution of data and products related to the WMO Space Programme.
- Terrestrial links or managed data network services.
- The Internet, either open or utilising VPN, which will be used in the AMDCNs to increase bandwidth capacity to many centres as well as providing connectivity for non-GTS centres and for individual users accessing WIS.
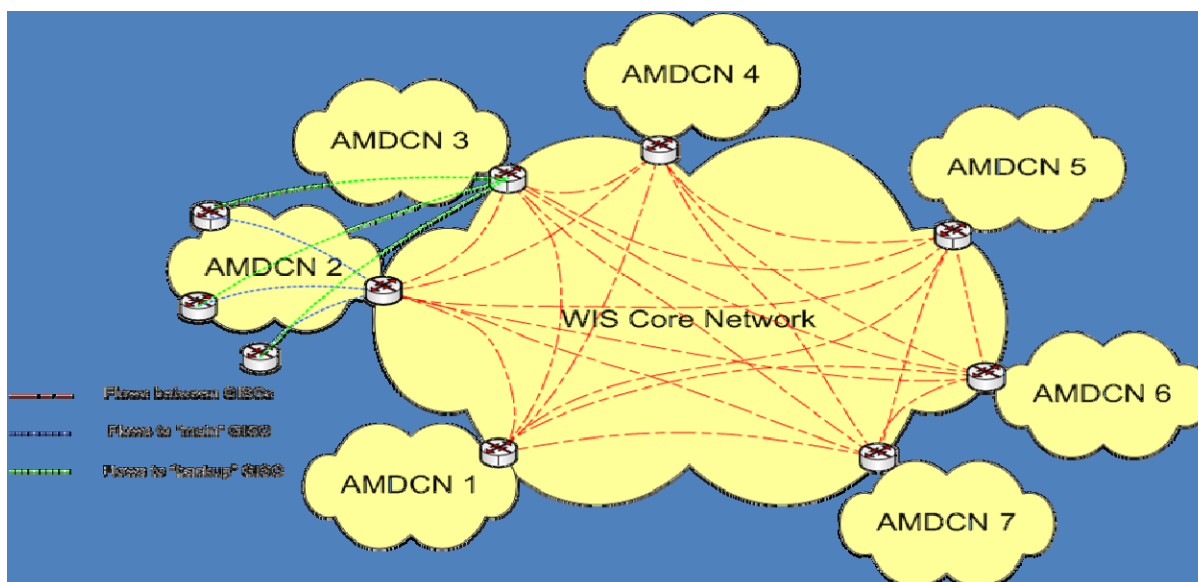
Figure 2: WIS network topology

4.5 From GTS to WIS: benefits

As an integrated part of WIS from the World Weather Watch Programme (WWW), the aim of the GTS is to ensure delivery of time-critical and operation-critical data, products and services for all WMO Programmes, including warnings to and from NMHSs. GTS realizes this through the "Routine collection and dissemination service for time-critical and operation-critical data and products", mentioned above.

The GTS will continue to develop and incorporate new technology, linking all WMO Members with a dedicated, secure network. This network will continue to be supported by advanced satellite distribution systems. In addition, the GTS will also be able to supplement the private networks and make better use of public communications such as the Internet, where appropriate.

The GTS data management framework will include the development of data representations, including fast and efficient coding practices that allow increasingly voluminous data streams to reach countries with less advanced or low capacity communication systems. New functionality of WIS for GTS users will include:

- Online discovery of which data and products are available on the GTS by interactively accessing a GISC portal;

- Download or re-runs of GTS data and products published during the past 24 hours. This is of interest for users that have missed data because of a failure of IT systems, equipment or networks;

- Updating of GTS routeing based on online subscription services rather than service messages requesting the GTS Point of Contacts to change the routeing. An NMHS may configure its own routeing information. Thus, a centre needs only deal with its associated GISC for changing subscription and publishing schedules;

- Configure upload of data to the GTS. Rather than requesting the GTS Point of Contact and WMO to change information about the data that is uploaded to the GTS, the NMHS may do the configuration.

- Ensure that the ownership and availability of the data provided is advertised by using the DAR metadata.

Existing centres within WMO Member States that comply with the required WIS functions and technical specifications will be designated as one of the three types of WIS centre. While Members can chose to apply for a type of centre matching their level of responsibilities and commitment, the expected mapping of current WWW centres into WIS centres remains to be:

WWW Centre	WIS Centre
NMC	NC
RSMC	DCPC
WMC	DCPC and/or GISC
RTH	DCPC
RTH on MTN	DCPC and/or GISC
Others	NC and/or DCPC

4.6   **WMO information sources and regulations on WIS**

Information on all aspects of WIS is available on the WMO website at: http://www.wmo.int/wis

The implementation of the WIS is coordinated through a Global Project and Implementation Plan available at: http://www.wmo.int/pages/prog/www/WIS/documents/WIS-ProjectPlan-v1-2-1.doc.

The technical regulations related to WIS are published in the **WMO Technical Regulations (WMO-No.49), Volume 1, General Meteorological Standards and Recommended Practices, Part A3**, and in **Annex VII, Manual on WIS (WMO-No.1060)**. Practical guidance on the implementation of the technical regulations is provided in the **Guide on WIS (WMO-No. 1061)**.

The RA VI TT/WIS-DI developed a special material to raise the understanding of the WIS by the Members, entitled **"WIS in a nutshell"**: http://wis.wmo.int/page=wis-in-a-nutshell .

5. WIS in Region VI (Europe)

5.1   Current status of RA VI telecommunication

The current GTS in RA VI is a hierarchical structure with nine Regional Telecommunications Hubs (RTH): Exeter, Moscow, Norrköping, Offenbach, Prague, Rome, Sofia, Toulouse, and Vienna.

All other Members are connected to at least one RTH. The data is sent from RTH to RTH and then from the RTHs to the other nodes connected to it. The current total communication bandwidth between the centres is given in Fig. 3 below.
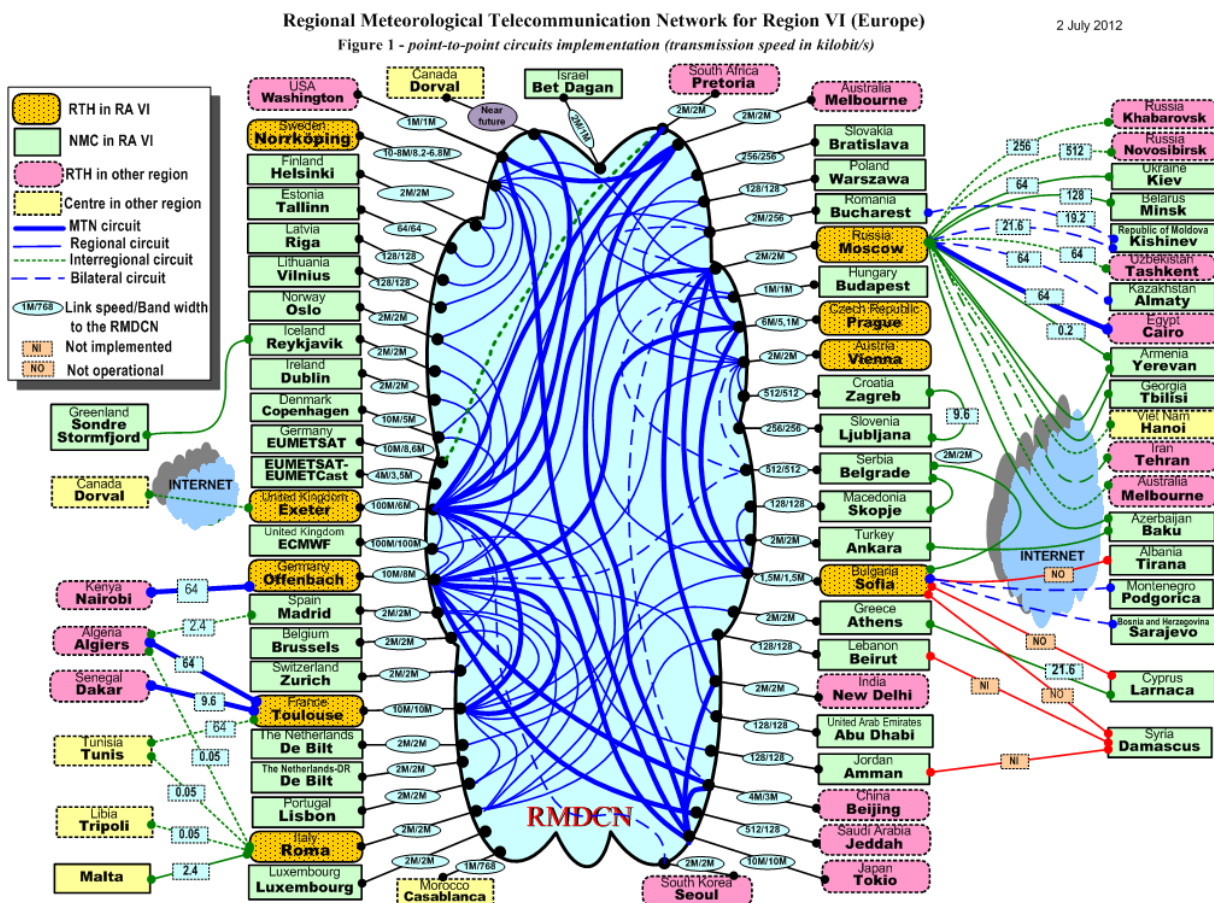
Figure 3: Communication network in RA VI

Since 1998, the Regional Meteorological Data Communication Network (RMDCN)[6] provides an Internet Protocol (IP) network infrastructure for the meteorological community in WMO Region VI. ECMWF leads and co-ordinates the procurement, implementation and operational monitoring of such a network for all RA VI Members.

As can be seen in Fig. 5, most members of RA VI are at present connected by the RMDCN, except those countries shown on the right of the picture. The network is based on the MPLS backbone infrastructure of Orange Business Services (OBS). This technology allows OBS to implement an IP Virtual Private Network (IPVPN) for the RMDCN community, i.e. every RMDCN member can directly communicate with any other member. However, actually information exchange across

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[6] see http://www.ecmwf.int/services/computing/rmdcn/

these links is restricted at the application level so that at this stage GTS Circuits are not fully utilising the any to any capability and restricted to those where agreements to exchange information by application layers are in place.

Information on the transmission programmes (i.e. contents and, when applicable, schedules) of data distribution systems of the GTS is described in WMO Publication No. 9, Weather Reporting. This publication is kept up-to-date by amendments during the year and a revised edition issued yearly by WMO on CD-ROM. In contrast, all the data distributed via WIS is described by DAR metadata records which are updated by the owner of the data whenever the data changes.

5.2 **Status of WIS Centres in Region VI (Europe)**

The procedures for the designation of the three types of WIS centres are provided in the *Manual on WIS (WMO No. 1060), Part II*. After successful completion of the designation procedure, the centre is included in Appendix B to the Manual, Approved WMO Information System Centres.

Note: Information on the current status of the designation of centres by Members is available on:
http://www.wmo.int/pages/prog/www/WIS/centres/index_en.php .

a. GISCs in RA VI

At present (December 2012), there are three GISCs in RA VI endorsed and all of them are operational. They form the nodes of the West European virtual GISC (WE-VGISC). Until the time the WE-VGISC becomes operational and, therefore, the individual nodes will act as independent three GISCs. The fourth GISC in RA VI which has been conditionally designated is in Moscow, Russian Federation. It is expected to become fully operational in 2013.

Member	Centre type	Function	Principal GISC	Const. Body	Endorsement CBS	Congress/EC
France	GISC	RTH	WE-VGISC Toulouse	CBS	Endorsed by CBS	01/06/2011
Germany	GISC	RTH	WE-VGISC Offenbach	CBS	Endorsed by CBS	01/06/2011
Russian Federation	GISC	WMC/RTH	Moscow	CBS	Under review by ET-GDDP	01/06/2011
United Kingdom of Great Britain and Northern Ireland	GISC	RTH	WE-VGISC Exeter	CBS	Endorsed by CBS	01/06/2011

Below is a list of links to the GISCs in RA VI:

- GISC Exeter (Component of the West European Virtual GISC)
- GISC Offenbach (Component of the West European Virtual GISC)
- GISC Toulouse (Component of the West European Virtual GISC)
- GISC Moscow (expected to be pre-operational in 2012, operational in 2013)

b. DCPCs in RA VI

The table below provides information on the DCPCs that have been designated by the RA VI Members with their planned functions.

Member	Function	Principal GISC	Const. Body	Endorsement CBS	Congress/EC
Bulgaria	RTH	WE-VGISC Offenbach	CBS	Not submitted to ET-GDDP	To be cons. CBS
Croatia	Marine Meteorological Centre	WE-VGISC Offenbach	JCOMM	Endorsed by CBS	To be cons. CBS
Czech Republic	RTH	WE-VGISC Offenbach	CBS	Endorsed by CBS	To be cons. CBS
ECMWF	RSMC-Medium-Range-Forecasting	WE-VGISC??	CBS	Endorsed by CBS	To be cons. CBS
EUMETSAT	Satellite Centre	WE-VGISC Offenbach	CBS	Endorsed by CBS	To be cons. CBS
Finland	Arctic Data Centre	WE-VGISC Offenbach	CBS	Not submitted to ET-GDDP	To be cons. CBS
France (7)	VAAC	WE-VGISC Toulouse	CAeM	Endorsed by CBS	To be cons. CBS
	RTH	WE-VGISC Toulouse	CBS	Endorsed by CBS	To be cons. CBS
	RSMC-Activity-ATM	WE-VGISC Toulouse	CBS	Endorsed by CBS	To be cons. CBS
	Regional NWP support	WE-VGISC Toulouse	CBS	Endorsed by CBS	To be cons. CBS
	RCC (Toulouse, Lead RA VI on LRF)	WE-VGISC Toulouse	CCl	Endorsed by CBS	To be cons. CBS
	Radar Data Centre (ODC)	WE-VGISC Toulouse	CBS	Under review by ET-GDDP	Equals WIS Manual
	GPC/LRF	WE-VGISC Toulouse	CBS	Endorsed by CBS	To be cons. CBS
Germany (10)	WRMC	WE-VGISC Offenbach	WCRP (GEWEX)	Endorsed by CBS	To be cons. CBS
	WDCC	WE-VGISC Offenbach	CCl	Endorsed by CBS	To be cons. CBS
	WDC-RSAT	WE-VGISC Offenbach	CAS	Endorsed by CBS	To be cons. CBS
	RTH	WE-VGISC Offenbach	CBS	Endorsed by CBS	To be cons. CBS
	RSMC-Geographical	WE-VGISC Offenbach	CBS	Endorsed by CBS	To be cons. CBS
	RCC (Offenbach, Lead RA VI)	WE-VGISC Offenbach	CCl	Endorsed by CBS	To be cons. CBS
	GRUAN-LC	WE-VGISC Offenbach	CBS	Endorsed by CBS	To be cons. CBS
	GRDC	WE-VGISC Offenbach	CHy	Endorsed by CBS	To be cons. CBS
	GPCC	WE-VGISC Offenbach	CBS/CCl/CHy	Endorsed by CBS	To be cons. CBS
	GCC	WE-VGISC Offenbach	JCOMM	Endorsed by CBS	To be cons. CBS
Italy (2)	RTH	WE-VGISC Offenbach	CBS	Under review by ET-GDDP	To be cons. CBS
	RSMC-Marine Meteorology	WE-VGISC Offenbach	JCOMM	Under review by ET-GDDP	To be cons. CBS
Netherlands (2)	Satellite Centre	WE-VGISC Exeter	CBS	Not submitted to ET-GDDP	To be cons. CBS
	RCC (AE De Bilt, Lead RA VI on Climate Data)	WE-VGISC Exeter	CCl	Not submitted to ET-GDDP	To be cons. CBS
Norway	NILU	WE-VGISC Offenbach	CAS	Under review by ET-GDDP	To be cons. CBS
Russian Federation (7)	WDC (ICE) (St. Petersburg)	Moscow	CBS	Not submitted to ET-GDDP	Equals WIS Manual
	RTH (Moscow)	Moscow	CBS	Under review by ET-GDDP	Equals WIS Manual

	RSMC-Geographical (Moscow)	Moscow	CBS	Not submitted to ET-GDDP	Equals WIS Manual
	RSMC-Activity-ATM (Obninsk)	Moscow	CBS	Not submitted to ET-GDDP	Equals WIS Manual
	RNODC and GDC (Obninsk)	Moscow	JCOMM	Not submitted to ET-GDDP	Equals WIS Manual
	RCC (Moscow, Lead RA II, Lead RA VI LRF)	Moscow	CCl /CBS	Not submitted to ET-GDDP	Equals WIS Manual
	GDC (Solar Radiation) (St. Petersburg)	Moscow	CBS	Not submitted to ET-GDDP	Equals WIS Manual
Serbia	RCC (Belgrade, RA VI Network Member)	WE-VGISC Offenbach	CCl	Endorsed by CBS	To be cons. CBS
Spain	MEDARE	WE-VGISC Toulouse	CCl	Not submitted to ET-GDDP	To be cons. CBS
Sweden	RTH	WE-VGISC Offenbach	CBS	Endorsed by CBS	To be cons. CBS
	Nordic Radar	WE-VGISC Offenbach	CBS	Under review by ET-GDDP	To be cons. CBS
United Kingdom (9)	WAFC	WE-VGISC Exeter	CAeM	Endorsed by CBS	To be cons. CBS
	VAAC	WE-VGISC Exeter	CAeM	Endorsed by CBS	To be cons. CBS
	Specialised Ocean/Wave Centre	WE-VGISC Exeter	JCOMM	Endorsed by CBS	To be cons. CBS
	RTH	WE-VGISC Exeter	CBS	Endorsed by CBS	To be cons. CBS
	RSMC-Geographical	WE-VGISC Exeter	CBS	Endorsed by CBS	To be cons. CBS
	RSMC-Activity-ATM	WE-VGISC Exeter	CBS	Endorsed by CBS	To be cons. CBS
	Marine Observations Centre	WE-VGISC Exeter	JCOMM	Endorsed by CBS	To be cons. CBS
	GPC/LRF	WE-VGISC Exeter	CBS	Endorsed by CBS	To be cons. CBS
	GCOS Lead Centre for Antarctica (BAS)	WE-VGISC Exeter	CBS	Under review by ET-GDDP	To be cons. CBS

c. NCs in RA VI

In accordance with the Manual on WIS (WMO No. 1060), each WMO Member shall notify WMO of the name and location of its centre(s) that are to be designated as NC(s). It is therefore expected that each Member will have at least one NC in WIS (and for most of the Members, it is likely that one NC would be sufficient),

In February 2012, WMO circulated a letter to all Members inquiring information from the Permanent Representatives regarding: 1) nomination of a principle GIS which will be associated with the WIS centre(s) of the Member; and, 2) nomination of a focal point for WIS/GTS related matters).

The table below presents the current status[7] of the designation of NCs in RA VI with their associated GISC and Focal Points. Color-highlighted countries have not responded yet to the WMO circular letter, thus the associated GISC included in the table is the one assumed based on the current GTS topology.

Member	NC	Principal GISC	Speed	Focal Point
Albania	Tirana	TBD		
Armenia	Yerevan	Moscow		GEVORGYAN, Gohar Ministry of Nature Protection Government Building 3 YEREVAN 375010 Armenia Tel: +(374 10) 533 271 Fax: +(374 10) 533 271 Email: ggevorgyan@meteo.am
Austria	Vienna	WE-VGISC Offenbach	2M	JURKOVIC, Anita Central Institute for Meteorology and Geodynamics Hohe Warte 38 P.O. Box 342 A-1191 VIENNA Austria Tel: +43 1 36026 2215 Email: anita.jurkovic@zamg.ac.at
Azerbaijan	Baku	Moscow		AZIZOV, Malik State Hydrometeorological Committee 3 Resul Rza str., GSP 370000 BAKU Azerbaijan Email: azizov-malik@mail.ru
Belarus	Minsk	Moscow		SUSCHENYA, M.A Republic Hydrometeorological Center Nevavisimosti st., 110 220114 MINSK Belarus Email: sma@hmc.by
Belgium	Brussels	WE-VGISC Toulouse	2M	Dr. Liliane Frappez IRM Avenue Circulaire, 3 B – 1180 Bruxelles Tel. +32 2 373 06 73 Email: liliane.frappez@meteo.be
Bosnia and Herzegovina	Sarajevo	WE-VGISC Offenbach		SEHBAJRAKTAREVIC, Kemal Meteorological Institute Bardakcije 12 71 000 SARAJEVO Bosnia and Herzegovina Tel: +(387 33) 276 709 Fax: +(387 33) 276 701 Email: kemo_seh@yahoo.com; kemals@fhmzbih.gov.ba

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[7] The current status is based on responses received to the WMO circular letter; information endorsed by CBS-15 (September 2012); and communication between NCs and GISCs. The table will be updated when new information becomes available.

Member	NC	Principal GISC	Speed	Focal Point
Bulgaria	Sofia	WE-VGISC Offenbach	1.5M	CHRISTOV, Svetoslav National Institute of Meteorology and Hydrology 66, Tsarigradsko shose, Blvd. 1784 SOFIA Bulgaria Tel: +359 2 462 4751 Fax: +359 2 988 4494 Email: Svetoslav.Christov@meteo.bg
Croatia	Zagreb	WE-VGISC Offenbach	512K	PANDZIC, Kresco Meteorological and Hydrological Service Gric 3, Hrvatska 10 000 ZAGREB Croatia Tel: +(385 1) 456 5684 Fax: +(385 1) 485 1901 Email: pandzic@cirus.dhz.hr
Cyprus	Larnaca	WE-VGISC Offenbach		CHARALAMBOUS, Demetris CYPRUS METEOROLOGICAL SERVICE 1418 Nicosia, Cyprus T: +357 24802974(direct), 24802977 F: +357 24304753 E-mail: dcharalambous@ms.moa.gov.cy
Czech Republic	Prague	WE-VGISC Offenbach	5M	GAL, Pavel Czech Hydrometeorological Institute Na Sabatce 17 143 06 PRAGUE 4 Komorany Czech Republic Tel: +420 244 032 135 Fax: +420 244 032 128 Mobile: +420 737 268 791 Email: pavel.gal@chmi.cz
Denmark	Copenhagen	WE-VGISC Offenbach	5M	LAURSEN, Ellen Vaarby Danish Meteorological Institute Lyngbyvei 100 DK-2100 Copenhagen Denmark Tel.: +45 39157597 Fax: +49 39157390 Email: evl@dmi.dk
Estonia	Tallinn		64K	
Finland	Helsinki	WE-VGISC Offenbach	2M	1) AALTONEN, Kimmo 2) KARLSSON, Kari P.O. Box 503 FIN-00101 HELSINKI 10 Finland Tel: +358 50 5996440 Email: kimmo.aaltonen@fmi.fi
France	Toulouse	WE-VGISC Toulouse	10M	
Georgia	Tbilisi	TBD		
Germany	Offenbach	WE-VGISC Offenbach	8M	1) RICHTER, Bernd 2) HEENE, Markus Deutscher Wetterdienst Frankfurter Strasse 135 D-63067 OFFENBACH AM MAIN Germany Tel (1): +49 69 8062 2559 Fax: +49 69 8062 3559 Email: bernd.richter@dwd.de Tel (2): +49 69 8062 2648 Email : markus.heene@dwd.de
Greece	Athens	WE-VGISC Offenbach	2M	KOLYDAS, Theodoros Hellenic National Meteorological Service El. Venizelou 14, GR16777 Hellinikon, Athens Greece Tel:+30 2109699053 Fax: +30 2109628952 kolydas@hnms.gr

Member	NC	Principal GISC	Speed	Focal Point
Hungary	Budapest	WE-VGISC Offenbach	1M	TÖLGYESI, László Hungarian Meteorological Service P.O.Box 38 H-1525 BUDAPEST Hungary Tel: +36 1 346 46 44 Email: tolgyesi.l@met.hu
Iceland	Reykjavik	WE-VGISC Exeter	2M	
Ireland	Dublin	WE-VGISC Exeter	2M	Dr. Sara O'Reilly Head of Technology Division Met Eireann Email: sara.oreilly@met.ie
Israel	Bet Dagan	WE-VGISC Offenbach	1M	Mr. Israel Rom Director of Information Systems IMS Email: romi@ims.gov.il
Italy	Rome	WE-VGISC Offenbach	2M	VOCINO, Antonio Italian Air Force Meteorological Service (CNMCA) National Center of Aeronautical Meteorology and Climatology Aeroporto De Bernard Via di Pratica di Mare-Km 7, I-00040 POMEZIA (Rome) Italy Tel: +39 0691293804 Fax: +39 0691293804 Email: vocino@meteoam.it
Jordan	Amman	WE-VGISC Offenbach	128K	AL-TIAMEH, Fahid Ministry of Transport, Meteorological Department P.O. Box: 341011 Amman1134 Jordan Fax: + 00 962 6 491 6191 Email: nfc[a]jometeo.gov.jo; ftiameh[a]hotmail.com
Kazakhstan	Almaty	Moscow		RAPIKOV, B.S Kazhydromet ul. Orynbor 11/1 010000 Astana Kazakhstan Tel: +8-7172-798399 Email: rapikov_b@kazhydromet.kz, rapikov@gmail.com
Latvia	Riga	WE-VGISC Offenbach	128K	CIEMGALS, Janis Latvian Hydrometeorological Agency 165, Maskavas Str., LV - 1019 RIGA Latvia Email: janis.ciemgals@lvgmc.lv
Lebanon	Beirut	TBD	128K	
Lithuania	Vilnius	WE-VGISC Offenbach	128K	DERENCIENE, Zita Lithuanian Hydrometeorological Service zita.derenciene@meteo.lt
Luxembourg	Luxembourg	TBD	2M	
Malta	Malta	TBD		
Monaco		TBD		
Montenegro	Podgorica	WE-VGISC Offenbach		ANDRIJASEVIC, Vera Institute for Hydrometeorology and Seismology of Montenegro IV Proleterske 19 81000 Podgorica Montenegro Email: vera.andrijasevic@meteo.co.me
Netherlands	De Bilt	WE-VGISC Exeter	2M	VAN NOORT, Piet Royal Netherlands Meteorological Institute Utrechtseweg 297 NL-3731 GK DE BILT Netherlands Email: piet.van.noort@knmi.nl
Norway	Oslo	WE-VGISC Offenbach	2M	SANNES, Pal Norwegian Meteorological Institute wis-oper@met.no

Member	NC	Principal GISC	Speed	Focal Point
Poland	Warszawa	WE-VGISC Offenbach	128K	WARTANOWICZ, Rafal Institute of Meteorology and Water Management 61 Podlesna Street 01-673 Warsaw Poland Tel : +48 (22) 5694148 Fax : +48 (22) 5694105 Email : Rafal.Wartanowicz@imgw.pl
Portugal	Lisbon	WE-VGISC Touluose	2M	
Republic of Moldova	Kishinev	Moscow		STREBITCAIA, Olga Hydrometeorological Service 193 Grenoble Str., 2043 CISHINAU Republic of Moldova Tel: + 373 22 77 35 22 Fax: +373 22 77 36 36 Email: olga@meteo.md
Romania	Bucharest	WE-VGISC Offenbach	256K	GOLOGAN, Petre National Meteorological Administration Ministry of Environment and Water Management Sos. Bucuresti-Ploiesti, nr 97 BUCHAREST 013686 Romania Tel: +40 21 316 21 38 Fax: +40 21 316 3143 Email: petre.gologan@meteoromania.ro
Russian Federation	Moscow	Moscow	2M	
Serbia	Belgrade	WE-VGISC Offenbach	512K	SUNDERIC, Perisa Republic Hydrometeorological Service of Serbia Kneza Viseslava 66 P.O. Box 37 11030 BELGRADE Serbia Tel: +381 11 30 50 886 Email: perisa.sunderic@hidmet.gov.rs
Slovakia	Bratislava	TBD	256K	
Slovenia	Ljubljana	WE-VGISC Offenbach	256K	JERMAN, Jurij Meteorological Office Slovenian Environment Agency Vojkova 1b SL-1000 Ljubljana Slovenia Tel : +386 1 478 41 43 Fax : +386 1 478 40 54 Email : jurij.jerman@gov.si
Spain	Madrid	WE-VGISC Toulouse	2M	YANEZ, Guillermo Garcia Agencia Estatal de Meteorología Leonardo Prieto Castro 8 28040 MADRID Spain Tel: +34 91 5819 757 Email: ggarciay@aemet.es
Sweden	Norrköping	WE-VGISC Offenbach	8.2M	MILD, Gunilla Swedish Meteorological and Hydrological Institute (SMHI) Folkborgsvaegen 1 SE-601 76 NORRKOEPING Sweden Tel: +(46 11) 495 8507 Fax: +(46 11) 495 8001 Email: gunilla.mild@smhi.se
Switzerland	Zurich	WE-VGISC Offenbach	2M	GRUETER, Estelle MeteoSwiss Kraehbuehlstrasse 58 CH-8044 Zurich Switzerland Tel: +41 44 256 92 68 Fax: +41 44 256 92 78 Email: estelle.grueter@meteoswiss.ch
Syrian Arab Republic	Damascus	Tehran		

Member	NC	Principal GISC	Speed	Focal Point
The former Yugoslav Republic of Macedonia	Skopje	WE-VGISC Offenbach	128K	KARANFILOVSKI, Aleksandar Republic Hydrometeorological Institute Skupi b.b., P.O. Box 218 SKOPJE 91000 The former Yugoslav Republic of Macedonia Tel: +389 2 3097 004 Fax: +389 2 3097 118 Email: akaranfilovski@meteo.gov.mk
Turkey	Ankara	WE-VGISC Offenbach	2M	BİLGİ, Aşkın Turkish State Meteorological Service Telecommunication Division P.O. Box 401, Ankara, Turkey Tel : +90 312 302 26 01 Fax : +90 312 359 34 30 Email: abilgi@mgm.gov.tr
Ukraine	Kiev	Moscow		FISUNOV, Vasiliy State Committee for Hydrometeorology 6, Zolotovorotskaya Street 252601 MSP KIEV 34 Ukraine Tel: 8-044-239-9366 Email: admin@meteo.gov.ua
United Kingdom of Great Britain and Northern Ireland	Exeter	WE-VGISC Exeter	6M	LITTLE, Chris Met Office FitzRoy Road EXETER EX1 3PB Devon United Kingdom of Great Britain and Northern Ireland Tel: +44 1392 88 5681 Fax: +44 870 900 6278 Email: chris.little@metoffice.gov.uk ; chris.little@mail.com
United Kingdom of Great Britain and Northern Ireland	WSO (Gribraltar)	WE-VGISC Exeter		

Note: In view of the important role the national WIS focal points are going to play in the coordination of the WIS implementation, the Members who have not yet responded to the WMO circular letter are strongly encouraged to do so as soon as possible. Members should also keep the Secretariat informed of any changes of the status and operation of their centres and/or changes of their focal points information.

6. WIS planning and implementation by RA VI Members

In planning the WIS implementation at national level, Members should strive to comply with the relevant WMO technical regulations, that include procedures, specifications and functional requirements, provided in the *WMO Technical Regulations (WMO-No. 49), Volume I, Part A3*, and the *Manual on WIS, (WMO-No. 1060)*. The *Guide on WIS (WMO-No. 1061)* complements the technical regulations with additional description and explanation of the WIS, which would assist Members in their implementation actions.

6.1 **Pre-requisites for use of WIS by an NMHS**

For a NMHS, there are several requirements to be met by a current GTS centre before it can start using WIS and thus become a compliant NC. They are mostly concerned with administrative issues and less with technical matters.

When a centre plans to use WIS, the PR of the country should nominate a "WIS Focal Point".

a. **WIS Focal Point**

The WIS Focal Point should be a member of staff who is familiar with the service, in particular the current GTS support. The person will receive all WIS related information with regard to the country on one hand, but is expected on the other hand to inform WMO and its relevant bodies about any progress or problems encountered when using WIS. He/she will attend training courses organized by WMO or WIS centres and serve as the national distributor of WIS knowledge, in particular metadata concepts. It is envisaged that the WIS Focal Point will provide the necessary monitoring information.

Since the structure of WIS assumes that an NC is connected to a GISC for its WIS functions and thus participates in the AMDCN organized by that GISC, it is necessary to set up the required administrative links with the GISC. In principle, an NC may belong to the users of any GISC, unless the network connectivity only allows one choice. In any case, an agreement should be reached between the NC and the GISC about their relationship, including identifying their "Principal GISC" for the purposes of managing discovery metadata, of which the WMO should be notified together with the nomination of the WIS Focal Point (see Appendix III).

b. **Principal GISC**

The principal GISC will ensure within its AMDCN that all connected centres will receive all the data meant for them, be it globally distributed, additional or addressed data. It will also receive the data sent by them and distribute it in accordance with the distribution lists in either GTS or other formats, using the WIS data transfer options. It will maintain the global metadata catalogue and provide means for its AMDCN centres to update those parts of the discovery metadata catalogue describing their data and products, possibly via Internet access.

The principal GISC is the organization to be contacted first by any of its connected centres about any issue related to WIS. It will organize regular meetings with the WIS Focal Points of the centres belonging to its AMDCN and provide training material and courses as required. It will support the metadata activities in its area of responsibility in a suitable manner and provide data for the regional WIS monitoring.

Besides the principal, a back-up GISC is required for operational continuity in case the principal GISC is not available for some reason.

c. **Back-up GISC**

To guarantee at least the dissemination and collection of the globally distributed GTS data set, a communication connection has to be established with a second GISC, the

"back-up" GISC. It should be chosen in collaboration with the principal GISC. Agreement needs to be reached on the network specific details, the conditions when it should be used and the actual services provided by it. Regular tests should be carried out to ensure the availability of the back-up when suddenly required. Details of further back-up arrangements to be provided still need further work by the relevant CBS WIS expert teams.

The choice of the principal and back-up GISCs may be influenced by the network "connectivity", of course.

d. Connectivity

As mentioned above, the network connections of RA VI Members vary from high-speed RMDCN links to dedicated low-speed lines between two adjacent centres. In addition, most NMHS's are connected to the Internet and can use this medium for less critical interactive access and file transfers. If a country belongs to the RMDCN cloud, then it may choose any RA VI GISC as its principal GISC, because all the GISCs in RA VI are connected to the RMDCN and this network allows any-to-any connectivity. If, however, only a dedicated link to an adjacent centre exists, a GTS RTH scenario, then the principal GISCs of these two centres should be the same to avoid unnecessary complications in traffic routeing. The RTH in this context will act as a gateway between the principal GISC and the NC. Similarly, an NC or DCPC in a Member State that is not the NMHS and not connected to the RMDCN, can use its NMHS NC as the connection to the RMDCN, or use the Internet to connect to the GISC. It is obvious that a RMDCN connection would be an advantage and all Members in RA VI are encouraged to participate in the RMDCN.

Besides the connectivity, the "bandwidth" of the communication links may also influence the use of WIS.

e. Bandwidth

In contrast to the GTS where the dedicated network bandwidth between adjacent centres was limited and thus the traffic between any two centres had to be prioritized in advance, the WIS approach allows for the use of the Internet and allows for the combined the bandwidth of the Internet, satellite broadcast systems and dedicated network to be sufficient to support the intended data exchange between the GISC and the NC. As long as the data to be transmitted consists of only the globally distributed and additional data sets, a dedicated bandwidth of 64 kbps seems to be the minimum for RA VI. If, however, specialized data sets like satellite or radar data are being considered, bandwidths in excess of 1 Mbps may have to be implemented. Depending on the local situation, it may be necessary to continue using GTS type dissemination until the network bandwidth, either RMDCN or Internet if appropriate, is sufficient for the intended use.

The major difference between GTS and WIS is the existence of discovery metadata records held by the GISCs for each data item present in WIS, because WIS is an information and not only a communication system.

f. Discovery Metadata

Whereas the GTS data is defined by its header which is recorded in the relevant volumes, held by WMO, the data in WIS is described by a discovery metadata record in accordance to the WMO Metadata Core Profile and is stored in a metadata catalogue for each GISC and shared amongst all GISCs at regular intervals. It is the responsibility of the data owner to generate the corresponding discovery metadata record and to maintain it. However, in order to facilitate the initial deployment of WIS, Météo France generated metadata records for all data currently exchanged via the GTS. In the longer term though, these initial records have to be taken over by the relevant data owners and updated if required. In addition, if any new data is being considered for exchange, a

corresponding discovery metadata record has to be generated and sent to the principal GISC in advance of the data.

Each NC, therefore, requires personnel with metadata knowledge and responsibility. To train the staff of NCs in discovery metadata handling, their principal GISC will offer regular training courses in addition to WMO sponsored training events like the WMO WIS Centre Jump-Start Offer[8]. Each NC should make sure that at least two staff are knowledgeable about the WMO Metadata Core Profile and are able to update its metadata records.

g. Access to metadata editor

The editor for metadata records consists of a software tool which can be used locally by an NC or remotely at a GISC which makes this service available to NCs. New or modified records have to be made available to the principal GISC for feeding them into the WIS.

Having taken the steps described, an NMHS may benefit from the additional services of WIS and has become a full member of the service.

h. Demonstration of compliance with WIS requirements

It is recommended that a National Centre should demonstrate its compliance with the relevant WIS standards as laid out in the Manual on WIS (WMO-No.1060). This could be achieved by the centre working with its principal GISC to successfully complete the three test cases described in Appendix IV. The successful completion of the tests will then be registered in the WIS section of the WMO Country Profile Data Base (see 8.5).

6.2   **Pre-requisites for use of WIS by other centres**

There may be other WIS centres besides the NC of an NMHS within a country. For example, the NMHS might also operate one or more DCPCs for specialized data or there may be multiple NCs run by different organizations like hydrology and oceanographic centres.

a. DCPC

As stated earlier, a DCPC provides programme-specific data for WIS, e.g. GTS data as a former RTH. Therefore, it has to be sponsored by a WMO programme and connected to a GISC in the region with sufficient bandwidth. In addition, special software to support the planned operation of a DCPC has to be installed at the centre. Once this has been achieved, the relevant PR or Director of the Organization may submit a proposal to WMO for the DCPC to be accepted, nominating a staff member responsible and stating the commitment to operate the DCPC after its validation.

In accordance with the Manual on WIS, a number of certifications and tests by WMO and, in particular, the CBS expert team designated for this role, will subsequently be carried out. When all operational and administrative requirements have been met successfully, CBS will propose to the EC that the DCPC becomes part of WIS. Of course, the staff of the DCPC will in the meantime have gained sufficient knowledge of the special software and the WMO Metadata Core Profile to support the activities of the new centre.

b. NC

Any NC additional to that of the NMHS will have to adhere to the same procedures as stated above. Its WIS centre Focal point should work closely with the national WIS Focal point of the NMHS who will be the main WIS interface of the country.

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[8] WIS Jump Start - http://www.wmo.int/pages/prog/www/WIS/documents/JumpStartFlyer.doc

7. Risks associated with WIS implementation

7.1 General WIS acceptance

The benefits of WIS rely to a large extent on the global acceptance of WIS as the standard communication, discovery and access platform for WMO and associated institutions. Only if most centres collecting or generating meteorological or similar data are connected to WIS and use its features, the global metadata directory to be held by GISCs will become the main source of information for meteorology, operational or research based. It is, therefore, necessary to ensure that WIS is able to meet all the requirements for data storage and exchange by the various programmes related to WMO. In particular, other initiatives such as WIGOS and GFCS should be encouraged to use WIS as their information system. If this adoption does not happen quickly the full benefits of WIS will not be applicable to all WMO Programmes and activities.

7.2 Lack of staff resources for operational WIS centre

Depending on the type of WIS centre being considered, there may be a question of staff resources, because, e.g., to operate a DCPC, some staff is required who understands the necessary special software such as DAR support and the metadata. For an NC, the requirements can usually be met by the available resources for the on-going GTS support. One of the staff assigned to support the WIS activities should be assigned the functions of the WIS focal point.

7.3 Discovery Metadata knowledge

Initially, there may be a lack of relevant metadata knowledge amongst the staff of the prospective WIS centre. Therefore, it is planned that each GISC would set up regular training courses on the WMO Metadata Core Profile for the centres connected to it. In addition, the WMO would try to arrange for training courses and support the attendance of relevant staff from developing countries. The necessary training material should be widely circulated. Furthermore, there exists the WIS Centre Jump-Start Offer by the secretariat which may be taken up by the centres involved.

7.4 Insufficient bandwidth of communication links

When looking at Fig. 5 above, there are still some RA VI Members whose communication links are just sufficient for a minimal GTS data supply. They need the traffic prioritization concept of a GTS link and are not in a position to accept additional information available through the WIS data dissemination policies at present. They either have to upgrade the bandwidth of the dedicated data links, e.g., by joining the RMDCN, or by using Internet links of sufficient bandwidth if appropriate. Due to greater risks of service interruptions associated with possible failures of the Internet network, countries should be aware of risks associated with the use of the public networks compared to dedicated networks and ensure operationally critical information is on suitable networks. Countries having such problems should contact the RTH to which they are connected in order to evolve plans to remedy the situation. The eventual solution may incur costs which are beyond the current budgetary means of the NMHS, thus, the financial planning of the organization should envisage ways to secure the necessary budget. Cost-benefit analysis related to WIS implementation might be helpful in this regard.

8. RA VI WIS Implementation Plan - Execution and Timeline

8.1 **Approval**

This Implementation Plan has been discussed with the relevant RA VI bodies like WG-TDI, TT/WIS-DI and the Management Group. All comments and suggestions have been incorporated. The Plan was approved by the President of RA VI in December 2012 and made available to all RA VI Members through the website of the WMO Regional Office for Europe: http://www.wmo.int/pages/prog/dra/eur.php.

8.2 **Regional coordination and monitoring**

The regional coordination of the WIS implementation by the RA VI Members was initiated at the **WIS Implementation Workshop held in Sofia, Bulgaria from 1 to 3 November 2011**. The materials of the workshop are available at: http://www-newdev.wmo.int/pages/prog/dra/eur/RA6_WIS_Workshop.php . The workshop discussed a draft regional implementation plan that should allow all RA VI Members to join WIS in a synchronous and harmonized manner. This includes different forms of assistance to those Members that will need to build their capacity for becoming WIS users.

An important aspect of the regional approach is the monitoring of the implementation actions that would allow quick identification and response to observed problems and deficiencies. Without monitoring, there is a high risk that the implementation of WIS in some parts of Region VI would be delayed. The monitoring procedures will be defined to include regular information flow between RA VI WIS Focal Points, the TT/WIS-DI and the Secretariat. GISCs and DCPCs will play an important role in the GISC performance monitoring as described in 8.8 below.

8.3 **RA VI WIS Implementation Focal Point**

To assist in monitoring the WIS implementation by the RA VI Members, DWD kindly offered to establish a temporary position of **RA VI WIS Implementation Focal Point,** to support the RA VI Task Team on WIS development and Implementation (TT-WIS/DI) and the Secretariat**.** The work of this position will be undertaken by Dr. Herman Asensio (e-mail: hermann.asensio@dwd.de). The RA VI WIS Focal Point will be active throughout 2013 (until the time of the XVI RA VI Session in September 2013) with the following main functions:

- Facilitate the maintenance of the list of all RA VI WIS focal points;
- Monitor and report on the status of implementation of the GISCs, DCPCs and NCs in RA VI;
- Monitor and report on the operational status of the AMDCNs in RA VI, identifying any centres without a clearly agreed principle GISC and initiating corrective action;
- Report on the uptake of the new functionalities and services of WIS in RA VI;
- Ascertain that the activities envisaged in the RA VI WIS implementation plan and respective timelines are followed;
- Propose changes to the RA VI WIS implementation plan as required;
- Support RA VI NMHSs and relevant institutions in their efforts to implement WIS;
- Distribute information about WIS implementation among RA VI Members;
- Support training activities on WIS in RA VI;
- Provide information on WIS implementation to RA VI subsidiary bodies as required.

8.4 **National implementation plans**

Members are expected to develop their own national WIS Implementation Plans by end of March 2013. The national WIS Focal point should communicate to the Secretariat and to the RA VI WIS Implementation Focal Point (see para 8.3) the target dates for the planned WIS centres to become operational (this information will be registered in the WIS section of the WMO Country Profile Data Base to allow measuring of progress). The national plans should be coordinated with the principal GISC and should be in agreement with the RA VI WIS Implementation Timeline.

8.5 RA VI WIS country database

The principle source of information on the WIS implementation by Members should be the WMO Country Profile Data Base (CPDB), maintained by the WMO Secretariat. The CPDB WIS section should contain (as a minimum) the following WIS-related information from Members:

- Contact information (national WIS Focal point(s))
- Network connection details and traffic patterns
- Local implementation plan details and results
- Specification of problem areas and failures

The data to be stored in the database is needed to monitor the proper implementation of the plan and to allow appropriate interventions and assistance to be provided to Members, as required. The WIS Focal points of the countries and the DCPCs will play crucial role in keeping the information up-to-date and to highlight any specific problems.

Note: Procedures for interacting with the CPDB, including login and inserting information by the WIS FPs will be provided in due course.

8.6 Capacity building – training courses and WIS users' meeting

Starting at the latest in the 3rd quarter of 2012, the GISCs in RA VI should hold regular users' meetings and organize metadata training courses for the members of their AMDCN. The frequency of these meetings should be agreed with the likely participants and be in accordance with the RA VI Implementation timeline.

8.7 Goals and timeline

After laying the foundations for a successful implementation of the plan in 2012, the main implementation effort should be carried out throughout 2013. The following meetings should review the progress:

- RA VI Management Group – 7th Meeting, 5-6 February 2013, Geneva. The Chair of WG-TDI to report the current status of implementation; the implementation timeline to be endorsed.
- WG-TDI, 3rd Meeting, 26-27 February 2013, Prague. TT/WIS-DI will report and further actions decided, as required;
- EC-65, May 2013, Geneva. RA VI President to provide updated progress report as part of his report to EC.
- XVI RA VI Session, 10-17 September 2013, Helsinki. Progress report to the Session. Proposals for finalization of the WIS implementation in RA VI and respective outstanding actions, as required.
- It will be essential to monitor for and identify Member States that are falling behind the implementation schedule and to arrange suitable assistance from other Members as required.

As discussed at the WIS Implementation Workshop, Sofia, November 2011, a realistic and achievable target is that by the XVI Session RA VI (September 2013), the majority of RA VI Members should be WIS users.

8.8 Performance Monitoring

When looking at the monitoring of WIS, one has to distinguish between the network and the users. With regard to the first, the "WIS Monitoring" paper[9] by Chris Little provides a first draft of what is needed. It concerns mainly the GISCs and to a lesser degree DCPCs. The proposal is being discussed by the relevant Expert Teams of CBS and will be implemented as soon as agreement is reached.

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[9] http://www.wmo.int/pages/prog/www/WIS/wiswiki/tiki-download_wiki_attachment.php?attId=1513

With regard to the users of WIS, the GISCs and DCPCs have to play a major role, but, the users, and in particular the NCs, should be involved as well. First of all, the GISC will keep records of traffic and problems encountered for each connected centre of its AMDCN. It will store summary reports in the country data base. The same applies to DCPCs, e.g. RTHs, and the centres connected to them directly. Furthermore, as GISCs are required to hold regular users' meeting and metadata training courses for their connected centres, they should regularly report on the metadata uptake of their users and of problems encountered. Again, these data should be stored in the country data base. Similarly, all national WIS Focal points should regularly update the records referring to their country in the country data base. Every second month, all data stored should be analyzed by a GISC representative as part of the RA VI WIS Monitoring and a report generated.

It is highly recommended that the GISCs in RA VI hold regular meetings, at least annually, to coordinate their work and to share experiences. These meetings could be held in conjunction with the global GISC meetings planned by CBS.

APPENDIX I

WIS Implementation Plan for NMHS with RMDCN Connection

in RA VI (NC)

1. Bring about an internal decision to join WIS in RA VI.

2. Choose a staff member to be nominated as the WIS Focal Point. The person should be knowledgeable about the current GTS transmissions.

3. Check the communication network connectivity, in particular the bandwidth to the current RTH and the Internet access.

4. Check the traffic pattern for the GTS data and ensure that the bandwidth is sufficient to send and receive all data without undue delays. If this is not the case, either plan an increase in bandwidth or stay with GTS data transmissions and have additional data via other means such as via the Internet.

5. Determine which GISC should become the principal GISC and communicate with the chosen GISC to gain its approval.

6. Inform WMO by letter from the PR about the decision to become an NC, the choice of the principal GISC and the nomination of the WIS Focal point.

7. Develop a national implementation plan in agreement with the principal GISC and report it to the Secretariat and RA VI WIS Implementation Focal Point for inclusion in the WMO Country Profile Data Base.

8. Set up a communication link to the principal GISC via RMDCN and create an user account at the GISC for administrative matters.

9. Decide whether the metadata editor should be supported locally or remotely by the GISC. In view of this decision, set up the necessary software environment: either by installing the editor on a local server or by setting-up a connection to the GISC for the editing.

10. Train a staff member and a back-up in the WMO metadata Core Profile by sending them to training courses organized by WMO or the GISC. It is also possible to ask for local support via the WMO Jumpstart Offer.

11. Take over responsibility for the metadata records describing the data submitted by the NMHS and modify if necessary the initial metadata records provided by Météo-France.

12. Start using the WIS functionality for sending and receiving data with their appropriate metadata descriptions.

13. Join the user group of the GISC by attending meetings and other organised events.

14. Support the monitoring of the regional WIS by regularly updating the country's records in the WMO Country Profile Data Base including availability of service, traffic figures, errors and other comments.

APPENDIX II

WIS Implementation Plan for DCPC in RA VI

1. Bring about an internal decision of the organization to join WIS in RA VI as a DCPC.

2. Choose a staff member to become the WIS Focal point. The person should be knowledgeable about communications protocols and the WMO Metadata Core Profile.

3. Gain the support of a WMO Programme for the special data to be made available as a DCPC. In case of a current RTH who wishes to become a DCPC, the NCs to be connected to the new DCPC for data collection and distribution services should be contacted for support, expressed by the relevant PR's.

4. Determine which GISC in the region should become the principal GISC and communicate with the chosen GISC to gain its approval.

5. Check the communication network connectivity, in particular the bandwidth to the chosen GISC and the interactive access.

6. Check the planned traffic pattern for the data and the interactive load, assuming full DCPC operations. Ensure that the bandwidth is sufficient to send and receive all data without undue delays. If this were not the case, make sure that an upgrade of the communication network is planned prior to starting operations as a DCPC.

7. In accordance with the mandatory services to be provided by a DCPC as described in the Manual on WIS , select the necessary special software and install it locally. Make sure that it passes all the tests for DCPCs which have been published by WMO.

8. Inform WMO, in particular CBS, by letter from the Director of the Organization about the wish to become a DCPC, the supporting WMO Programme, the choice of the principal GISC and the nomination of the WIS Focal point.

9. In accordance with the Manual on WIS, collaborate with the relevant CBS ET's to pass all the necessary tests for a DCPC.

10. Once the tests have been passed successfully and the centre has been endorsed by WMO Congress / EC, set up operations as a DCPC.

11. Join the user group of the GISC by attending meetings and other organised events.

12. Support the monitoring of the regional WIS by regularly updating the organization's records in the WMO Country Profile Data Base including availability of service, traffic figures, errors and other comments.

APPENDIX III

Sample letter by PR of country to WMO for Establishment of NC, naming WIS Focal point and principal GISC

To: the Secretary-General

WMO

Subject: Proposal for designation of WIS National Centre and nomination of WIS Focal point.

Dear Secretary-General,

In accordance with the *Manual on the WMO Information System (WMO-No. 1060)*, para 2.4.2, and as part of the national plan for the implementation of the WIS, I would like to request that the centre [*name, location*], which is part of the [*name of the NMHS*], be designated as a National Centre (NC) of the WMO Information System (WIS), in accordance with the established procedure. I would like to inform you that the principal Global Information System Centre (GISC) associated to NC [name] should be [GISC name].

For coordination of WIS-related issues, I hereby nominate Mr/Ms [*name, position, email address*] as the national WIS Focal Point.

Please update the records accordingly.

I look forward to receiving your advice on the action taken on the above request.

Yours sincerely

Permanent Representative of [*WMO Member*]

APPENDIX IV – NC Demonstration Test Cases

Test Case Name: NC Demonstration Test Case 1	
Uploading of Discovery Metadata for Data and Products into DAR catalogue	
Test Case ID	NC-TC1
Component	Metadata Management
Purpose of test	

Validate the function of adding, updating and deleting metadata records from NC to the Principal GISC.

All metadata records must be checked against the relevant schemas. (e.g. The record should be rejected if not fitting the schema)

Note 1: The term "upload" refers to the movement of metadata records between the a National Centre that provides the metadata and the WIS center that manages the DAR catalogue hosted by the Principal GISC. It can actually be implemented as a "pull" initiated from the DAR catalogue site, or as a "push" initiated by the metadata provider.

Note 2: this functionalities can be implemented as:
- A web interface allowing registered users to manage their metadata interactively
- A machine-to-machine interface allowing automated batch processing of metadata.

All GISCs support both methods. The NC may choose one or both methods

Relevant technical specifications
- Tech specs 1 (Uploading of metadata)
- Tech specs 8 (DAR Catalogue Search and Retrieval)
Precondition
1. Network connection (dedicated and/or public connection) exists between the NC and GISC
2. GISC has a file upload facility for collecting metadata from other WIS centre(s)
3. GISC has a fully functional DAR catalogue
4. GISC has a registered user/process that is authorised to manage metadata of a given WIS centre
5. GISC has a web interface to the DAR catalogue that allow searches (see WIS-TC6[10])
Test Steps

	Description	Expected Results	Actual Results
1	A user/process adds a valid metadata record to the DAR catalogue	The metadata record must be found when browsing/searching the DAR catalogue	
2	A user/process modifies a record from the DAR catalogue,	The modification should be immediately visible when browsing/searching the DAR catalogue	
3	A user/process deletes a record from the DAR	The deleted record should not be found when browsing/searching	

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[10] WIS Demonstration Process - http://www-db.wmo.int/WIS/centres/guidance.doc

	catalogue,	the DAR catalogue	
…	A authorized user/process attempts to upload an invalid metadata record	The user/process must be notified of the fact that the metadata record is invalid. The addition/update operation is aborted. The DAR catalogue is unchanged.	
…	A authorized user/process attempts to upload a record with a unique identifier that is already in the DAR catalogue	The DAR catalogue should not contain record with duplicate identifiers. Either: 1. The new metadata record replaces the old metadata record. The old metadata record should not be present in the catalogue. The new metadata record must be found when browsing/searching the catalogue 2. The user/process must be notified of the fact that the record is a duplicate. The addition/update operation is aborted. The DAR catalogue is unchanged. Note: it is essential to ensure an update is an edit and not an accidental duplication	
…	Access control - No unauthorised addition 1	A non-authorized user/process should not be able to add a metadata record to the DAR catalogue	
…	Access control - No unauthorised addition 2	A user/process should not be able to add a metadata record to the DAR catalogue representing data from another WIS centre	
…	Access control - No unauthorised modification 1	A non-authorized user/process should not be able to modify a metadata record from the DAR catalogue	
…	Access control - No unauthorised modification 2	A user/process should not be able to modify a metadata record from the DAR catalogue that belongs to another WIS centre	
…	Access control - No unauthorised deletion 1	A non-authorized user/process should not be able to delete a metadata record to the DAR catalogue	
…	Access control - No unauthorised deletion 2	A user/process should not be able to delete a metadata record from the DAR catalogue that belongs to another WIS centre	

Centre		Organization		Country	
Test Date					

Test Case Name: NC Demonstration Test Case 2	
Uploading and downloading of data between WIS centres	
Test Case ID	NC-TC2
Component	
Purpose of test	

Validate the upload and download of data and products and association with metadata			
Requirements Covered			
• Tech specs 2 (Uploading of data and products) • Tech specs 10 (Downloading file via dedicated network) • Tech specs 11 (Downloading file via non-dedicated network) • Tech specs 12 (Downloading file via other methods)			
Precondition			
1. Network connection (dedicated and/or public connection) between the NC and GISC (includes via RTH where relevant 2. Have file upload and download facilities (FTP, mail, HTTP, …) 3. Have data available for upload or download 4. Have DAR facilities available at GISC.			
Test Steps			

	Description	**Expected Results**	**Actual Results**
1	a.upload a file which is associated with a metadata record in the DAR catalogue of the GISC to a GISC centre b. use DAR facilities to search the metadata then retrieve the file	a. The uploaded file has been delivered to the GISC and match with the corresponding metadata b. The file can be downloaded	

Center		**Organisation**		**Country**	
Test Date					

Test Case Name: NC Demonstration Test Case 3
Maintenance of users, roles, authorization and authentication

Test Case ID	NC-TC3
Component	Management of users and access

Purpose of test

Create and exercise a variety of user types.

Note: A centre may utilise GISC user control interface

Relevant Technical Specifications

- Tech specs 4 (Maintenance of User Identification and Role Information)
- Tech specs 6 (Authentication of a User)
- Tech specs 7 (Authorization of a User Role)
- Tech specs 13 (Maintenance of Dissemination Metadata)

Precondition

1. The Centre has authority to provide access to users (ie PR approval)
2. A process is in place between the NC and GISC for the Centre to authorize its users to use the GISC with appropriate access levels.
3. The user interface is via the internet (i.e. web page)

Test Steps

	Description	Expected Results	Actual Results
1	Provide access for an external user to search metadata	Temporary user can search metadata, but not access data from the GISC or cache, or subscribe to data.	
	a) User goes to search web page b) User makes metadata search c) Tries to access data	a) User has access to search page b) User finds metadata c) User tries to access data and is referred to authorisation page at data source. Cannot access data without validating in an authorised user role	
2	Create accounts with access to WIS metadata and data for a WMO centre authorised user	Two users are created. One with access to metadata only, the other with the ability to access the Centre subscription service or ad hoc request from the cache	
	a) User goes to registered user web page b) User is required to login or create account c) User registers account and selects role of valid WMO member with authority to access WIS data (eg is from WMO NC) d) User enters login details e) User makes metadata search f) Tries to access WMO globally available	a) User has access to login page b) New user, so has to create an account c) User account is validated as a WMO NC member and account is created. The user receives a user login (eg code via email or encrypted symbol) d) User is logged in. As user us validated as WMO NC member, he is allocated access to search and access to download data from cache and to subscription services	

	data from the centre g) User tries to access additional data at centre that he is not authorised to access h) Tries to access data or product at another site i) User subscribes to data for future delivery from centre j) User returns on another session and reuses login to search or subscribe k) User edits subscription details l) User cancels a subscription m) User logs out or leaves centre's site and tries to return to a bookmarked page at a later date and access data	e) User finds metadata f) User successfully accesses data from centre g) User receives advice that he is not authorised to access this data and referred to access page where he can request change in user role or re-login as another user h) User is referred to authorisation page at other site. i) User receives scheduled data via agreed method at agreed time j) User maintains successful access with same access rights k) Users subscription details are updated and reflected in subsequent deliveries l) Users subscription details are updated and receives no further deliveries m) Attempting to use a bookmarked page from earlier session to access data, directs the user to the registered user login page.	
4	User checks status of account and subscriptions	User can view his account and subscription details, including historic and future transactions, and the status of current transactions	
…			

Center		Organisation		Country	
Test Date					

APPENDIX V

List of acronyms

AMDCN	Area Meteorological Data Communication Network
CBS	Commission for Basic Systems
Cg	Congress
DAR	Data Access and Recovery
DCPC	Data Collection or Production Centre
ECMWF	European Centre for Medium-range Weather Forecasts
ET-GDDP	CBS Expert Team on GISC-DCPC demonstration process
GFCS	Global Framework for Climate Services
GISC	Global Information System Centre
GTS	World Weather Watch Global Telecommunication System
IGDDS	Integrated Global Data Dissemination Service
IMTN	Improved Main Telecommunication Network
MTN	Main Telecommunication Network
NC	National Centre
NMHS	National Meteorological and Hydrological Service
PR	Permanent Representative
RA	Regional Association
RMDCN	Regional Meteorological Data Communication Network
RMTN	Regional Meteorological Telecommunications Network
RTH	Regional Telecommunication Hub
TT/WIS-DI	RA VI Task Team on WIS Development and Implementation
VPN	Virtual Private Network
WG-TDI	RA VI Working Group on Technology Development and Implementation
WIGOS	WMO Integrated Global Observing System
WIS	WMO Information System
WMO	World Meteorological Organization
WWW	World Weather Watch