# Manual on the WMO Information System

## Volume I

Annex VII to the WMO Technical Regulations

2023 edition

WEATHER CLIMATE WATER

WORLD METEOROLOGICAL ORGANIZATION

WMO-No. 1060

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**EDITORIAL NOTE**

The following typographical practice has been followed: Standard practices and procedures have been printed in **bold**. Recommended practices and procedures have been printed in regular font. Notes have been printed in smaller type.

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# INTRODUCTION

The *Manual on the WMO Information System* (WMO-No. 1060) is designed to ensure that the data, information and communication practices, procedures and specifications that WMO Members employ in the operation of the WMO Information System (WIS) are adequately uniform and standard.

The Manual is Annex VII to the *Technical Regulations* (WMO-No. 49), Volume I, which states, in Part II, that WIS is established and shall be operated in accordance with the practices, procedures and specifications described in the Manual.

The WMO Information System cuts across all WMO-related disciplines. It intersects many WMO practices, procedures and specifications that are primarily defined in specialized publications, including the *Manual on the WMO Integrated Processing and Prediction System* (formerly the *Manual on the Global Data-processing and Forecasting System*) (WMO-No. 485) and the *Manual on the WMO Integrated Global Observing System* (WMO-No. 1160). Other documents that are relevant to WIS are found in Appendix A to the present Manual.

As part of the Technical Regulations, the present Manual sets out standard and recommended practices and procedures.

Notes:

1. The General Provisions to the Technical Regulations, formerly reproduced as a part of the present Manual, can be found in the publication *Technical Regulations* (WMO-No. 49), Volume I. The General Provisions define the meaning of the phrase "standard and recommended practices and procedures".
2. The former appendix to the General Provisions, entitled "Procedures for amending WMO manuals and guides that are the responsibility of the Commission for Basic Systems", previously a part of the present Manual, has been updated and can be found in the *Rules of Procedure for Technical Commissions* (WMO-No. 1240).

# PART I. ORGANIZATION AND RESPONSIBILITIES

## 1.1 ORGANIZATION OF WIS

1.1.1 **In keeping with the *Technical Regulations* (WMO-No. 49), Volume I, Part II, 1.2.2, centres operated by WMO Members and their collaborating organizations shall be categorized as one of the three types of WIS centres forming the core infrastructure of WIS:**

**(a) Global Information System Centres (GISCs);**

**(b) Data Collection or Production Centres (DCPCs);**

**(c) National Centres (NCs).**

**The distinct functions of the three types of centres are referred to in Part III, Functions of WIS.**

1.1.2 **Each Permanent Representative with WMO shall be responsible for authorizing users of WIS. The right to manage the authorization process may be delegated.**

## 1.2 COMPLIANCE WITH REQUIRED WIS FUNCTIONS

**WIS centres shall comply with required WIS functions. This Manual contains instructions on practices, procedures and specifications for WIS functions. It is supplemented by additional information concerning practices, procedures and specifications for WIS functions that are set out in the *Guide to the WMO Information System* (WMO-No. 1061).**

## 1.3 INTERACTION AMONG WIS CENTRES

**GISCs shall connect to other GISCs through the WIS Core Network, which is based on the Main Telecommunication Network (MTN). Data, products and metadata shall flow to a GISC from the DCPCs and NCs that are within its area of responsibility. An Area Meteorological Data Communication Network (AMDCN) shall connect each GISC to DCPCs and NCs in the GISC area of responsibility. An AMDCN may span multiple Regional Meteorological Telecommunication Networks (RMTNs) and parts thereof.**

## 1.4 IMPLEMENTATION OF WIS

**WIS shall be implemented in two parallel parts. One part involves the continued evolution of the WMO Global Telecommunication System (GTS), which focuses on further improving the delivery of time- and mission-critical data, products and services, including warnings. The other part extends WMO services through discovery, access and retrieval (DAR) facilities, as well as through flexible timely delivery.**

## 1.5 DISCOVERY, ACCESS AND RETRIEVAL FUNCTION

**As required by the *Technical Regulations* (WMO-No. 49), Volume I, Part II, 1.2.5, WIS shall be based on catalogues that contain metadata describing data and products available across**

**WMO, plus metadata describing dissemination and access options. The DAR function of WIS shall be the primary means of realizing the WIS comprehensive catalogue, which is maintained collaboratively by all WIS centres.**

## 1.6 ROBUSTNESS AND RELIABILITY OF COMPONENTS

**Highly robust and reliable WIS components are essential to the operation of WIS. Performance indicators shall be evaluated in the designation procedure for WIS centres. This evaluation shall ascertain, among other things, whether or not data content flowing via WIS network technologies fully satisfies the requirements for security, authenticity and reliability. Some aspects of service levels are identified in this Manual.**

## 1.7 COLLECTION AND DISSEMINATION SERVICES

1.7.1 **WIS shall provide three types of collection and dissemination services:**

(a) **Routine collection and dissemination service for time- and operation-critical data and products: this service is based on real-time "push" mechanisms, including multicast and broadcast; it is implemented through dedicated telecommunication methods providing a guaranteed quality of service;**

(b) **Discovery, access and retrieval service: this service is based on a request/reply "pull" mechanism with relevant data-management functions; it is implemented through the Internet;**

(c) **Timely delivery service for data and products: this service is based on a delayed-mode "push" mechanism; it is implemented through a combination of dedicated telecommunication methods and public data telecommunication networks, especially the Internet.**

1.7.2 **WIS shall support the WMO virtual all-hazards network, thus ensuring the fast, secure and reliable exchange of alert and warning information, including International Telecommunication Union (ITU) Recommendation X.1303 (Common Alerting Protocol).**

Note: The virtual all-hazards network encompasses all the technical and operational arrangements necessary for the timely handling and delivery of alert and warning information involving WMO.

1.7.3 **The goal of the WMO Integrated Global Data Dissemination Service (IGDDS) is to ensure the definition and operational implementation of efficient circulation of space-based observation data and products meeting the needs of WMO programmes in the context of WIS. IGDDS shall remain an important component of WIS, mainly for the exchange and dissemination of data and products generated by space-based observing systems.**

## 1.8 COMPETENCIES OF PERSONNEL

As recommended by the *Technical Regulations* (WMO-No. 49), Volume I, Part V: Qualifications and competencies of personnel involved in the provision of meteorological (weather and climate) and hydrological services, centres should ensure that they have access to an adequate number of people who among them have the required levels of the WIS competencies that are defined in that volume (see also Appendix E to this Manual).

Note: Guidance on developing these competencies is available in the *Guide to the WMO Information System* (WMO-No. 1061).

# PART II. DESIGNATION PROCEDURES FOR WIS CENTRES

## 2.1 GENERAL

2.1.1 The establishment and operation of WIS depend on WMO Member organizations and those more broadly related to it, such as the Intergovernmental Oceanographic Commission (IOC) of the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the International Science Council (ISC), taking on the functional roles of GISCs, DCPCs and NCs. Procedures for designating a WIS centre rely on the agreed WIS functional architecture and the WIS compliance specifications.

2.1.2 **As required by the *Technical Regulations* (WMO-No. 49), Volume I, Part II, 1.2.3, Congress and the Executive Council shall consider the designation of GISCs and DCPCs based on recommendations of the Commission for Observation, Infrastructure and Information Systems (INFCOM). The development of INFCOM recommendations includes consultation and coordination with the relevant technical commissions that are responsible for the WMO and related international programmes concerned, as well as with the regional associations, as appropriate.**

Note: The relevant groups established by the Executive Council have a role in the GISC and DCPC designation process in accordance with their mandate.

## 2.2 PROCEDURE FOR DESIGNATING A GISC

### 2.2.1 Procedure

**The procedure for the designation of a GISC shall consist of four steps:**

**(1) Statement of WIS requirements;**

**(2) Service offer by a Member for a potential GISC;**

**(3) Demonstration of GISC capabilities;**

**(4) Designation of a GISC.**

### 2.2.2 Statement of WIS requirements

**The WMO technical commissions and other bodies representing the participating programmes, including regional bodies, shall state their requirements for WIS services and review them periodically. The list of all relevant requirements shall be compiled and regularly reviewed by INFCOM, and reported to the Executive Council.**

### 2.2.3 Service offer by a Member for a potential GISC

2.2.3.1 **A WMO Member can apply for a centre to be designated as one of the GISCs forming the core infrastructure of WIS. The service offer by the Member shall include:**

**(a) A statement of compliance with the required WIS functions;**

**(b) A proposal regarding the area of responsibility for WIS services;**

**(c) A formal commitment by the Permanent Representative of the Member that such services shall be provided on a routine basis and sustained over time.**

2.2.3.2 **The service offer shall be addressed to WMO. INFCOM, in consultation with the regional association(s) concerned, shall analyse the proposed service offer with regard to WIS requirements and compliance with GISC functions and specifications and shall formulate a recommendation.**

### 2.2.4 Demonstration of GISC capabilities

2.2.4.1 **The Member offering a GISC shall demonstrate to INFCOM the capabilities of the proposed centre to provide WIS services of the requisite reliability and quality to accredited users. Compliance shall be demonstrated for:**

**(a) Real-time functions of data and product collection and dissemination;**

**(b) Non-real-time services for requests;**

**(c) Storage functions for the required set of data and products and relevant up-to-date metadata catalogues;**

**(d) Coordination functions with other GISCs and the planning of mutual backup services;**

**(e) Adherence to WIS standards and relevant data-exchange policies and access rights.**

2.2.4.2 **A formal commitment to implement the GISC and a time schedule for providing GISC services in accordance with the offer shall be given by the Permanent Representative of the Member proposing to operate the candidate GISC.**

2.2.4.3 **Upon the demonstration of the capabilities of the candidate GISC, INFCOM shall submit its recommendation on the GISC designation to Congress or the Executive Council.**

### 2.2.5 Designated GISCs

The list of GISCs as approved by Congress or the Executive Council is included in Appendix B of this Manual.

## 2.3 PROCEDURE FOR DESIGNATING A DCPC

### 2.3.1 Background

**WMO has determined that all WMO and related international programmes shall be served by WIS. Each established centre shall therefore implement required WIS functions. INFCOM shall recommend how these centres are categorized as DCPCs within WIS.**

### 2.3.2 Procedure

**The procedure for designating a DCPC shall consist of three steps:**

(1) **Service offer by a potential DCPC;**

(2) **Demonstration of DCPC capabilities;**

(3) **Designation of a DCPC.**

### 2.3.3 Service offer by a potential DCPC

2.3.3.1 Required DCPC functions should be fulfilled by a centre that has been established under a WMO or related international programme and/or a regional association. **Accordingly, the relevant technical commission and/or regional association shall consider the service offers made by Members for potential DCPCs and shall endorse candidate DCPCs.**

2.3.3.2 **The service offer of candidate DCPCs shall then be submitted to INFCOM, which shall analyse the compliance of the candidate with the required DCPC functions and specifications and formulate a recommendation.**

### 2.3.4 Demonstration of DCPC capabilities

2.3.4.1 **The Member offering a DCPC shall be invited to demonstrate to INFCOM the ability of the proposed Centre to provide WIS services in compliance with the DCPC functions and responsibilities, including proper synchronization and communications with its associated GISC. Compliance shall be demonstrated, where applicable, with respect to the real-time functions of data and product dissemination, non-real-time services for requests, the provision of relevant up-to-date metadata catalogues, coordination and synchronization functions with the associated GISC, adherence to WIS standards and relevant data-exchange policies and access rights.**

Note: An associated GISC is defined by a bilateral agreement between a centre and a GISC for the purposes of uploading or downloading data. A centre can have multiple associated GISCs but shall identify a principal GISC for uploading and managing metadata.

2.3.4.2 **After the candidate DCPC has successfully demonstrated its capabilities, INFCOM shall recommend to Congress or the Executive Council that the candidate be approved.**

### 2.3.5 Designated DCPCs

The list of DCPCs as approved by Congress or the Executive Council is included in Appendix B to this Manual. Each DCPC entry includes the name of the associated GISC.

## 2.4 PROCEDURE FOR DESIGNATING AN NC

### 2.4.1 Background

**As required by the Technical Regulations (WMO-No. 49), Volume I, Part II, 1.2.8, each NC shall use WIS to provide data and products that are consistent with its programme responsibilities. These data and products shall be provided with associated metadata in accordance with WIS practices, procedures and specifications. Each NC shall participate as appropriate in the relevant monitoring of the performance of WIS.**

### 2.4.2 Procedure

**Each WMO Member shall notify WMO of the current name and location of each of its centres that is to be designated as an NC. INFCOM, with the involvement of relevant regional associations and with the assistance of the WMO Secretariat, shall review the Member designations to ensure support of each NC by a GISC, DCPC or other NC.**

### 2.4.3 Designated NCs

**The NCs designated by Members shall be included in the list of WIS centres in Appendix B to this Manual. Each NC entry shall include the name of the associated GISC.**

## 2.5 ROLLING REVIEW OF WIS CENTRES

### 2.5.1 Background

The ongoing performance of WIS relies on the continued compliance of WIS centres with agreed standards and practices. To this end, GISCs, DCPCs and NCs should have a rolling review of their compliance with WIS standards and practices.

### 2.5.2 Responsibility

Members are responsible for ensuring that their centres remain compliant with WIS standards and practices. INFCOM will oversee and support the rolling review processes with the aim of confirming a centre's compliance every eight years for NCs and DCPCs and every four years for GISCs.

### 2.5.3 Procedure

Guidelines for the rolling review of WIS centres are given in the *Guide to the WMO Information System* (WMO-No. 1061).

# PART III. FUNCTIONS OF WIS

## 3.1 ROLES IN AND REVIEW OF WIS FUNCTIONS

**An ongoing process for understanding user requirements, including quality of service, shall determine the functional scope and physical size of WIS, thereby ensuring the continued responsiveness of WIS to the current and future needs of the supported programmes. All supported programmes and technical commissions shall participate in this process, which shall be part of general WMO requirement reviews.**

## 3.2 LIST OF WIS FUNCTIONS

3.2.1 WIS centres collectively support the major WIS functions listed here:

(a) Collect observations, generate products, create metadata and archive information;

(b) Assign user role;

(c) Maintain and expose a catalogue of services and information;

(d) Authorize access to information by users;

(e) Deliver information to users (internal and external);

(f) Manage system performance.

Note: WIS is concerned with data management and telecommunication aspects, but the actual content of data and products falls outside the scope of WIS and is a matter for the specific programme supported.

3.2.2 The required standard interfaces to these functions are described in the WIS technical specifications (Part IV of this Manual).

## 3.3 FUNCTIONAL ARCHITECTURE OF WIS

Note: The *Guide to the WMO Information System* (WMO-No. 1061), 3.3, references the functional architecture of WIS, provided as supplementary guidance for WIS centres in a technical document.

## 3.4 DATA FLOW AMONG WIS FUNCTIONS

Note: The *Guide to the WMO Information System* (WMO-No. 1061), 3.4, provides as supplementary guidance for WIS centres a data-flow model of the WIS functional architecture for the required WIS functions, illustrating a possible implementation of major WIS functions.

## 3.5 FUNCTIONAL REQUIREMENTS OF A GISC

### 3.5.1 General

Note: The phrase "information intended for global exchange" encompasses time- and operation-critical information (data and products). Such information includes "essential data" and part of the "additional data", as specified in 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 (*Twelfth Meteorological Congress: Abridged Final Report with Resolutions* (WMO-No. 827), Resolution 25 (Cg-XIII) – Exchange of hydrological data and products (*Thirteenth World Meteorological Congress: Abridged Final Report with Resolutions* (WMO-No. 902), and Resolution 60 (Cg-17) – WMO policy for the international exchange of climate data and products to support the implementation of the Global Framework for Climate Services (*Seventeenth World Meteorological Congress: Abridged Final Report with Resolutions* (WMO-No. 1157).

### 3.5.2 Receive information from the GISC area

3.5.2.1 **Each GISC shall receive information intended for global exchange from NCs and DCPCs within its area of responsibility. This requirement also intersects the WIS DAR requirement that is noted below.**

3.5.2.2 See also 4.2, WIS-TechSpec-1 (Uploading of metadata for data and products) and 4.3, WIS-TechSpec-2 (Uploading of data and products).

### 3.5.3 Exchange information with other GISCs

3.5.3.1 **Each GISC shall collect from its area information that is intended for global exchange and shall share such information with other GISCs so that all GISCs have a common holding of information available for global exchange.** See also 3.5.5 (Maintain a 24-hour cache) and 3.5.8 (Coordinate telecommunications in a GISC area).

3.5.3.2 GISCs should employ the MTN and associated collaborative mechanisms to exchange the information efficiently and without detriment to the performance of any GISC.

3.5.3.3 See also 4.4, WIS-TechSpec-3 (Centralization of globally distributed data).

### 3.5.4 Disseminate information to the GISC area

3.5.4.1 **Each GISC shall disseminate information to NCs and DCPCs within its area of responsibility, including, but not limited to, the information intended for global exchange.**

3.5.4.2 See also 4.11, WIS-TechSpec-10 (Downloading files via dedicated networks), 4.12, WIS-TechSpec-11 (Downloading files via non-dedicated networks) and 4.13, WIS-TechSpec-12 (Downloading files via other methods).

### 3.5.5 Maintain a 24-hour cache

3.5.5.1 **Each GISC shall hold the information intended for global exchange for at least 24 hours to support subscription services, including, but not limited to, those for the GTS, and make the information available via WMO request/reply ("pull") mechanisms. Information limited to regional or AMDCN exchange need only be held in those GISCs supporting the region or AMDCN for which the information is to be available. This requirement intersects the WIS DAR requirement (see 3.5.6).**

Note: The method used in WIS discovery metadata records to identify information intended for global exchange is defined in Appendix C, Part C1, requirement 9.1.1.

3.5.5.2 See also 4.4, WIS-TechSpec-3 (Centralization of globally distributed data), 4.5, WIS-TechSpec-4 (Maintenance of user identification and role information) and 4.6, WIS-TechSpec-5 (Consolidated view of distributed identification and role information).

### 3.5.6 Discovery, access and retrieval

3.5.6.1 **In support of the DAR function, each GISC shall maintain and provide access to a comprehensive catalogue of information across all WMO programmes encompassed by WIS. This includes, but is not limited to, information intended for global exchange. In order to satisfy the DAR functional requirement, GISCs are required to support, in interactive and in batch modes: upload; change and deletion of metadata; user discovery of metadata; user access to metadata; and synchronization of the comprehensive WIS discovery metadata catalogue with other GISCs.**

3.5.6.2 See also 4.9, WIS-TechSpec-8 (DAR metadata (WIS discovery metadata) catalogue search and retrieval) and 4.10, WIS-TechSpec-9 (Consolidated view of distributed DAR metadata (WIS discovery metadata) catalogues).

### 3.5.7 Data network connectivity of a GISC

**Each GISC shall provide around-the-clock connectivity to the public and dedicated communication networks at a capacity that is sufficient to meet its global, regional and AMDCN responsibilities.** Each GISC should ensure that every telecommunication facility it employs in support of WIS has the appropriate level of availability and capacity, including, as necessary, routing and backup arrangements. Each GISC should maintain service level agreements with the suppliers of its communication links and associated hardware.

### 3.5.8 Coordinate telecommunications in a GISC area

**Each GISC shall coordinate with the centres in its area of responsibility to maintain a WIS telecommunication infrastructure that can meet the WIS requirements for information exchange within the area.** In the case of particular global and/or regional agreements, a GISC could also support the exchange of agreed WIS time- and operation-critical information with other AMDCNs. **The telecommunication infrastructure shall be implemented through various technologies and services (for example, the Internet, satellite-based data distribution, dedicated data networks) in accordance with capacity and reliability requirements.**

### 3.5.9 Recovery arrangements of a GISC

3.5.9.1 **Each GISC shall implement and operate proper procedures and arrangements to provide swift recovery or backup of its essential services in the event of an outage.** Each GISC should maintain arrangements for system backup in case of total site failure (for example, an offsite disaster recovery centre) and for partial backup in situations otherwise affecting WIS functions within the GISC.

3.5.9.2 **Each GISC shall maintain arrangements with one or more backup GISCs that include, as a minimum, the collection and dissemination of information to/from its AMDCN to be taken up by another GISC in case of an incapacitating system failure.**

### 3.5.10 Performance monitoring of a GISC

3.5.10.1 **Each GISC shall participate in monitoring the performance of WIS, including monitoring the collection and distribution of data and products intended for global exchange. Each GISC shall report routinely to other GISCs, as well as to the WMO Secretariat, information concerning the status and performance of connectivity to WIS centres in its**

**area, including capacity and technology used (for example, the Internet, satellite-based data distribution and dedicated data networks). INFCOM shall review and report on the status and performance of GISCs with the assistance of the WMO Secretariat.**

3.5.10.2 **Each GISC shall, in turn, and according to the schedule agreed among GISCs, take responsibility for monitoring the global operational performance of WIS.**

Note: Guidance on how this monitoring should be undertaken is provided in the *Guide to the WMO Information System* (WMO-No. 1061), Part VIII.

3.5.10.3 Monitoring of the collection and dissemination of WIS information (data and products) should include, as appropriate, WIS monitoring and monitoring related to WMO programmes.

3.5.10.4 See also 4.16, WIS-TechSpec-15 (Reporting of quality of service).

### 3.5.11 Coordination of activities between GISCs

**GISCs shall participate in an annual meeting to coordinate their activities.**

## 3.6 FUNCTIONAL REQUIREMENTS OF A DCPC

### 3.6.1 General

Note: The term "information" is used in a general sense and includes data and products.

**The specific performance and functional requirements of a particular DCPC shall be determined by the programme it supports. DCPCs that support programmes with mission-critical responsibilities, especially programmes with safety-of-life missions, shall maintain a high level of operational reliability, including required telecommunications. Each DCPC shall provide metadata describing the information it makes available through the WIS comprehensive catalogue, shall provide access to that information and shall participate in monitoring the overall performance of WIS.**

### 3.6.2 Collect information from a DCPC area

3.6.2.1 **As appropriate to its programme role, a DCPC shall collect information intended for dissemination to NCs within its area of responsibility (that is, regional collections).**

3.6.2.2 See also 4.2, WIS-TechSpec-1 (Uploading of metadata for data and products) and 4.3, WIS-TechSpec-2 (Uploading of data and products).

### 3.6.3 Collect programme-related information

3.6.3.1 **As appropriate to its programme role, a DCPC shall collect the specific programme-related data and products.**

3.6.3.2 See also 4.2, WIS-TechSpec-1 (Uploading of metadata for data and products) and 4.3, WIS-TechSpec-2 (Uploading of data and products).

### 3.6.4 Production support of programme-related information

**3.6.4.1 As appropriate to its programme role, a DCPC shall provide data management and data communications that are adequate to support the production of regional or specialized data and products.**

3.6.4.2 See also 4.2, WIS-TechSpec-1 (Uploading of metadata for data and products) and 4.3, WIS-TechSpec-2 (Uploading of data and products).

### 3.6.5 Provide information intended for global exchange

**3.6.5.1 As appropriate to its programme role, each DCPC shall provide information intended for global exchange to its responsible GISC.**

3.6.5.2 See also 4.2, WIS-TechSpec-1 (Uploading of metadata for data and products) and 4.3, WIS-TechSpec-2 (Uploading of data and products).

### 3.6.6 Disseminate information

**3.6.6.1 As appropriate to its programme role, each DCPC shall disseminate information other than that intended for global exchange.**

3.6.6.2 See also 4.11, WIS-TechSpec-10 (Downloading files via dedicated networks), 4.12, WIS-TechSpec-11 (Downloading files via non-dedicated networks) and 4.13, WIS-TechSpec-12 (Downloading files via other methods).

### 3.6.7 Provide access to information

**3.6.7.1 Each DCPC shall support access to its products via WMO request/reply ("pull") mechanisms in an appropriate manner.**

3.6.7.2 See also 4.5, WIS-TechSpec-4 (Maintenance of user identification and role information), 4.7, WIS-TechSpec-6 (Authentication of a user) 4.8, WIS-TechSpec-7 (Authorization of a user role).

### 3.6.8 Describe information with metadata

**3.6.8.1 Each DCPC shall describe its data and products according to an agreed WMO metadata standard, provide access to this catalogue of data and products and provide these metadata, as appropriate, to other centres, in particular to a GISC.**

3.6.8.2 See also 4.9, WIS-TechSpec-8 (DAR metadata (WIS discovery metadata) catalogue search and retrieval) and 4.10, WIS-TechSpec-9 (Consolidated view of distributed DAR metadata (WIS discovery metadata) catalogues).

### 3.6.9 Recovery arrangements of a DCPC

**As appropriate to its programme role, each DCPC shall implement and operate proper procedures and arrangements to provide swift recovery or backup of its essential services in the event of an outage.**

3.6.10 **Performance monitoring of a DCPC**

3.6.10.1 **Each DCPC shall participate in monitoring the performance of WIS.**

3.6.10.2 See also 4.16, WIS-TechSpec-15 (Reporting of quality of service).

## 3.7 FUNCTIONAL REQUIREMENTS OF AN NC

### 3.7.1 Provide data, products and metadata

3.7.1.1 **As required by the *Technical Regulations* (WMO-No. 49), Volume I, Part II, 1.2.8, each NC shall use WIS to provide data and products in line with its programme responsibilities. Such data and products shall be provided together with associated WIS discovery metadata in accordance with WIS practices, procedures and specifications.**

3.7.1.2 See also 4.2, WIS-TechSpec-1 (Uploading of metadata for data and products) and 4.3, WIS-TechSpec-2 (Uploading of data and products).

### 3.7.2 Collect programme-related information

3.7.2.1 **As appropriate to its programme role, each NC shall collect programme-related data and products.**

3.7.2.2 See also 4.2, WIS-TechSpec-1 (Uploading of metadata for data and products) and 4.3, WIS-TechSpec-2 (Uploading of data and products).

### 3.7.3 Production support of programme-related Information

3.7.3.1 **As appropriate to its programme role, each NC shall provide data management and data communications that are adequate to support the production of data and products.**

3.7.3.2 See also 4.2, WIS-TechSpec-1 (Uploading of metadata for data and products) and 4.3, WIS-TechSpec-2 (Uploading of data and products).

### 3.7.4 Describe information with metadata

3.7.4.1 **Each NC shall describe its data and products according to an agreed WMO metadata standard and provide this information, as appropriate, to other centres.**

3.7.4.2 See also 4.9, WIS-TechSpec-8 (DAR metadata (WIS discovery metadata) catalogue search and retrieval).

### 3.7.5 Performance monitoring of an NC

3.7.5.1 **As required by the *Technical Regulations* (WMO-No. 49), Volume I, Part II, 1.2.9, each NC shall participate in monitoring the performance of WIS.**

3.7.5.2 See also 4.16, WIS-TechSpec-15 (Reporting of quality of service).

# PART IV. WIS TECHNICAL SPECIFICATIONS

## 4.1 GENERAL

4.1.1 There are 15 technical specifications (WIS-TechSpecs) that define the interfaces to the major WIS functions. The specifications for these interfaces are described in more detail in Appendix D and are named and numbered as follows:

1. Uploading of metadata for data and products;
2. Uploading of data and products;
3. Centralization of globally distributed data;
4. Maintenance of user identification and role information;
5. Consolidated view of distributed identification and role information;
6. Authentication of a user;
7. Authorization of a user role;
8. DAR metadata (WIS discovery metadata) catalogue search and retrieval;
9. Consolidated view of distributed DAR metadata (WIS discovery metadata) catalogues;
10. Downloading files via dedicated networks;
11. Downloading files via non-dedicated networks;
12. Downloading files via other methods;
13. Maintenance of dissemination metadata;
14. Consolidated view of distributed dissemination metadata catalogues;
15. Reporting of quality of service.

4.1.2 **NCs shall support seven of the 15 technical specifications, specifically WIS-TechSpec-1, WIS-TechSpec-2, WIS-TechSpec-4, WIS-TechSpec-10, WIS-TechSpec-11, WIS-TechSpec-12 and WIS-TechSpec-15.** An NC can arrange through bilateral agreements for another NC, a DCPC or a GISC to perform functions on its behalf.

4.1.3 **According to the particular requirements of a DCPC in its programme role, DCPCs shall support up to 13 of the 15 technical specifications.** DCPCs are not required to support WIS-TechSpec-3 or WIS-TechSpec-9.

4.1.4 **WIS GISCs shall support all 15 technical specifications.**

4.1.5 Any DCPC or NC is welcome to implement interfaces beyond the minimum required. Accordingly, the technical specification is mandatory wherever application of the interface is applied.

4.1.6 **The GTS file-naming convention shall be used for files and the associated metadata record whenever necessary. The GTS file-naming convention is documented in the *Manual on the Global Telecommunication System* (WMO-No. 386), Part II, Attachment II-15.**

## 4.2 WIS-TECHSPEC-1: UPLOADING OF METADATA FOR DATA AND PRODUCTS

4.2.1 **This specification requires that each metadata record uploaded shall be represented in compliance with the WMO Core Metadata Profile of ISO 19115, as specified in Part V, with a unique identifier.**

4.2.2 **Uploading shall use methods prescribed by the receiver, which is typically the host of a WIS DAR metadata (WIS discovery metadata) catalogue.**

4.2.3 Discovery, access and retrieval metadata should be provided prior to the provision of files or messages associated with the metadata.

4.2.4 For updating the DAR metadata (WIS discovery metadata) catalogue, GISCs should support two kinds of maintenance facilities: a file-upload facility for batch updating (add, replace or delete metadata records treated as separate files) and an online form for changing metadata entries in the DAR metadata (WIS discovery metadata) catalogue (add, change or delete elements in a record, as well as whole records).

4.2.5 **GISCs shall maintain the updated DAR metadata (WIS discovery metadata) catalogue as a searchable resource (see WIS-TechSpec-8).**

4.2.6 See also sections 3.5.2 (Receive information from the GISC area), 3.6.2 (Collect information from the DCPC area), 3.6.3 (Collect programme-related information) and 3.6.4 (Production support of programme-related information).

## 4.3 WIS-TECHSPEC-2: UPLOADING OF DATA AND PRODUCTS

4.3.1 **This specification requires that uploaded data or products shall be represented in the manner prescribed by the relevant programme, including, where appropriate, the** *Manual on the Global Telecommunication System* **(WMO-No. 386), Part II, Attachment II-2, and the** *Manual on Codes* **(WMO-No. 306), Volume I.2, as well as other WMO Manuals and the GTS file-naming convention as noted in 4.1.6.**

4.3.2 Data and products should be handled as specified in the *Manual on the Global Telecommunication System* (WMO-No. 386), Part I, 1.3, Design principles of the GTS, and other WMO Manuals specific to the relevant programme.

4.3.3 See also 3.5.2 (Receive information from the GISC area), 3.6.2 (Collect information from the DCPC area), 3.6.3 (Collect programme-related information) and 3.6.4 (Production support of programme-related information).

## 4.4 WIS-TECHSPEC-3: CENTRALIZATION OF GLOBALLY DISTRIBUTED DATA

4.4.1 This specification requires that the *Manual on the Global Telecommunication System* (WMO-No. 386), Part I, Attachment I-3, is applied, as appropriate, to the centralized copies of information intended for global exchange (described in 3.5.1).

4.4.2 **Warnings shall be transmitted end-to-end within WIS within two minutes.**

4.4.3 See also 3.5.3 (Exchange information with other GISCs) and 3.5.5 (Maintain a 24-hour cache).

## 4.5 WIS-TECHSPEC-4: MAINTENANCE OF USER IDENTIFICATION AND ROLE INFORMATION

4.5.1 **User identification and role information shall be represented and communicated using methods prescribed by the receiver, which is typically the host of an identification and role-information database.**

Note: The term "user identification" in the given context does not imply that a user is personally identifiable. Administrators of authentication and authorization at WIS centres need to share updated identification and role information as a resource that is available across WIS centres. The sharing of this information by administrators is also necessary to prevent the inappropriate disclosure of any personally identifiable information.

4.5.2 User identification and role information maintenance should satisfy the timeliness requirements of the application and host centre.

4.5.3 See also 3.5.5 (Maintain a 24-hour cache) and 3.6.7 (Provide access to information).

## 4.6 WIS-TECHSPEC-5: CONSOLIDATED VIEW OF DISTRIBUTED IDENTIFICATION AND ROLE INFORMATION

4.6.1 This interface for a consolidated view of distributed identification and role information is not yet required (see also the Note in 4.5.1).

4.6.2 WIS centres that do exchange identification and role information should do so using data-encryption technologies.

4.6.3 See also 3.5.5 (Maintain a 24-hour cache) and 3.6.7 (Provide access to information).

## 4.7 WIS-TECHSPEC-6: AUTHENTICATION OF A USER

4.7.1 WIS centres should employ authentication standards, which may include public key infrastructure techniques.

Note: Commercial, off-the-shelf authentication software based on industry and/or international standards should be preferred.

4.7.2 User authentication should satisfy application-specific and host centre processing constraints and **shall provide a quality of service that meets user requirements**.

4.7.3 See also 3.5.5 (Maintain a 24-hour cache) and 3.6.7 (Provide access to information).

## 4.8 WIS-TECHSPEC-7: AUTHORIZATION OF A USER ROLE

4.8.1 WIS centres should employ government-endorsed standards for user authorization software, techniques and procedures.

4.8.2 User authorization should satisfy application-specific and host centre processing constraints. **User authorization shall also provide a quality of service that meets user requirements.**

4.8.3 See also 3.5.5 (Maintain a 24-hour cache) and 3.6.7 (Provide access to information).

## 4.9 WIS-TECHSPEC-8: DAR METADATA (WIS DISCOVERY METADATA) CATALOGUE SEARCH AND RETRIEVAL

4.9.1 **This specification requires that each metadata catalogue host shall support the Search and Retrieve via URL (SRU) specification of the ISO 23950 Information Search and Retrieval Protocol. A WIS-compliant SRU server shall support SRU version 1.1, the SRU searchRetrieve operation, the SRU Explain operation, the diagnostic schema for returning errors, and SRU Contextual Query Language (CQL) level 2.**

4.9.2 **In addition to being capable of performing a full text search, a WIS-compliant SRU server shall have the capacity to search at least eight indexes as character strings (abstract, title, author, keywords, format, identifier, type and Coordinate Reference System (CRS)), at least five indexes as ordered dates (creationDate, modificationDate, publicationDate, beginningDate, endingDate), and the index "bounding" as geographic coordinates (decimal degrees and space delimited, in the following order: north, west, south, east).**

4.9.3 **The search service shall provide a quality of service that meets user requirements.**

4.9.4 See also 3.5.6 (Discovery, access and retrieval) and 3.6.8 (Describe information with metadata).

## 4.10 WIS-TECHSPEC-9: CONSOLIDATED VIEW OF DISTRIBUTED DAR METADATA (WIS DISCOVERY METADATA) CATALOGUES

4.10.1 GISCs should exchange metadata catalogue updates using version 2 of the Open Archives Initiative–Protocol for Metadata Harvesting (OAI-PMH).

4.10.2 The exchange of metadata catalogue updates should satisfy the requirement for distributed instances of DAR metadata (WIS discovery metadata) not to diverge in content by more than one day. A mechanism for rapid update on an emergency basis should also be provided.

4.10.3 See also 3.5.6 (Discovery, access and retrieval).

## 4.11 WIS-TECHSPEC-10: DOWNLOADING FILES VIA DEDICATED NETWORKS

4.11.1 **This specification requires that downloaded data or products shall be represented in the manner prescribed by the relevant programme, including, where appropriate, the** *Manual on the Global Telecommunication System* **(WMO-No. 386), Part II, Attachment II-2, as well as other WMO Manuals and the GTS file-naming convention, as noted in 4.1.6.**

4.11.2 Data and products should be handled as specified in the *Manual on the Global Telecommunication System* (WMO-No. 386), Part I, 1.3, Design principles of the GTS, and other WMO Manuals that are specific to the relevant programme.

4.11.3 See also 3.5.4 (Disseminate information to the GISC area) and 3.6.5 (Provide information intended for global exchange).

## 4.12 WIS-TECHSPEC-11: DOWNLOADING FILES VIA NON-DEDICATED NETWORKS

4.12.1 **This specification requires that downloaded data or products shall be represented and communicated in a manner appropriate to the relevant programme.**

4.12.2 Data and products should be handled as specified in the *Manual on the Global Telecommunication System* (WMO-No. 386), Part I, 1.3, Design principles of the GTS, and other WMO Manuals that are specific to the relevant programme.

4.12.3 See also 3.5.4 (Disseminate information to the GISC area) and 3.6.5 (Provide information intended for global exchange).

## 4.13 WIS-TECHSPEC-12: DOWNLOADING FILES VIA OTHER METHODS

4.13.1 **This specification requires that downloaded data or products shall be represented and communicated in a manner appropriate to the relevant programme.**

4.13.2 Data and products should be handled as specified in the *Manual on the Global Telecommunication System* (WMO-No. 386), Part I, 1.3, Design principles of the GTS, and in other WMO manuals that are specific to the relevant programme.

4.13.3 See also 3.5.4 (Disseminate information to the GISC area) and 3.6.5 (Provide information intended for global exchange).

## 4.14 WIS-TECHSPEC-13: MAINTENANCE OF DISSEMINATION METADATA

4.14.1 **This specification requires that the dissemination metadata (including subscription information, such as accounts and delivery particulars) shall be represented and communicated as prescribed by the host of the database containing dissemination metadata.**

4.14.2 Requests for changes to dissemination for information that are not part of the routine global exchange may be subject to the notification period for changes specified in GTS. Otherwise, changes to dissemination should apply within one day.

4.14.3 See also 3.5.6 (Discovery, access and retrieval) and 3.6.5 (Provide information intended for global exchange).

## 4.15 WIS-TECHSPEC-14: CONSOLIDATED VIEW OF DISTRIBUTED DISSEMINATION METADATA CATALOGUES

4.15.1 This interface is not yet required; however, it may be needed as part of a backup arrangement between centres.

4.15.2 See also 3.5.6 (Discovery, access and retrieval).

## 4.16 WIS-TECHSPEC-15: REPORTING OF QUALITY OF SERVICE

4.16.1 **This specification requires that reporting of quality of service shall be represented and communicated as prescribed by the host of the centralized reporting database.**

4.16.2 Reports should be sent on a schedule determined by the centralized reporting manager, based on the needs of WIS centres.

4.16.3 See also 3.5.7 (Data network connectivity of a GISC), 3.5.8 (Coordinate telecommunications in a GISC area), 3.5.9 (Recovery arrangements of a GISC), 3.5.10 (Performance monitoring of a GISC), 3.6.9 (Recovery arrangements of a DCPC) and 3.6.10 (Performance monitoring of a DCPC).

# PART V. WIS DISCOVERY METADATA

5.1 **All information to be exchanged through WIS shall have a WIS discovery metadata record associated with it.**

5.2 **WIS discovery metadata records shall be provided by the data custodian to the principal GISC for the centre to which the data custodian is attached.** No change should be made to a WIS discovery metadata record without the express approval of the data custodian other than in the case that a WIS discovery metadata record is found to interfere with the correct operation of WIS. In this situation, the principal GISC for the data custodian may alter or withdraw the record as an emergency change, and the **data custodian shall be requested to provide an appropriately corrected discovery metadata record**.

5.3 **WIS discovery metadata records shall conform to the ISO 19115 Standard and, as a minimum, contain the information specified as mandatory in the WMO Core Metadata Profile of that standard as defined in Appendix C to this Manual.**

5.4 **INFCOM shall maintain and develop the WMO Core Metadata Profile.**

Note: Guidance on application of the WMO Core Metadata Profile is available in the *Guide to the WMO Information System* (WMO-No. 1061), Part V.

# PART VI. INFORMATION MANAGEMENT

## 6.1 MANAGING INFORMATION AND COMMUNICATION TECHNOLOGY OPERATIONS

6.1.1 WIS centres should participate in the WIS IT Security Incident Response Process specified in the *Guide to the WMO Information System* (WMO-No. 1061), Part VII, Appendix F, to the extent permitted by national regulations, policies and procedures.

6.1.2 **All Members shall use appropriate information management processes to generate, share, use, archive and dispose of information supporting WMO and partner organization programmes.**

6.1.3 **Information management practices shall include: documentation, governance, quality assurance and competencies.**

6.1.4 Members should apply the guidance provided in the *Guide to the WMO Information System* (WMO-No. 1061) Part VI.

6.1.5 **Members shall manage their information and communication technology (ICT) to a standard consistent with the requirements of the services that depend on that ICT.**

# APPENDIX A. SELECTED WMO DOCUMENTS RELEVANT TO WIS

Note: This appendix is designated as technical specifications to which the simple procedure for the approval of amendments may be applied.

## Policy documents

| | |
|---|---|
| WMO-No. 15 | *Basic Documents No. 1* |
| WMO-No. 49 | *Technical Regulations*: |
| | Volume I – General Meteorological Standards and Recommended Practices |
| | Volume II – Meteorological Service for International Air Navigation[1] |
| | Volume III – Hydrology |
| WMO-No. 60 | *Agreements and Working Arrangements with Other International Organizations* |
| WMO-No. 508 | *Guidelines for the Development and Adoption of Resolutions, Decisions and Recommendations* |

## International exchange of data and products

The World Meteorological Organization facilitates the free and unrestricted exchange of data and information, and products and services in real- or near-real-time on matters relating to the safety and security of society, economic welfare and the protection of the environment.

| | |
|---|---|
| WMO-No. 827 | *Twelfth World Meteorological Congress: Abridged Final report with Resolutions,* 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 |
| WMO-No. 837 | *Exchanging Meteorological Data: Guidelines on Relationships in Commercial Meteorological Activities – WMO Policy and Practice* |
| WMO-No. 902 | *Thirteenth World Meteorological Congress: Abridged Final Report with Resolutions*, Resolution 25 (Cg-XIII) – Exchange of hydrological data and products |
| | *Thirteenth World Meteorological Congress: Abridged Final Report with Resolutions*, Annex IV – Geneva Declaration of the Thirteenth World Meteorological Congress |

[1] The publication of Parts I and II of Volume II was discontinued on 31 December 2023. The publication of Parts III and IV of Volume II will be discontinued upon incorporation of material of continuing relevance into the International Civil Aviation Organization (ICAO) Procedures for Air Navigation Services – Meteorology (PANS-MET) (Doc 10157) (provisionally in 2026). WMO technical regulations pertaining to meteorological service for international air navigation are also contained in Annex 3 to the Convention on International Civil Aviation (ICAO Annex 3) – Meteorological Service for International Air Navigation.

| | |
|---|---|
| WMO-No. 1157 | *Seventeenth World Meteorological Congress: Abridged Final Report with Resolutions*, Resolution 60 (Cg-17) – WMO policy for the international exchange of climate data and products to support the implementation of the Global Framework for Climate Services |

**Manuals**

| | |
|---|---|
| WMO-No. 9 | *Weather Reporting*:<br>Volume A – Observing Stations<br>Volume C1 – Catalogue of Meteorological Bulletins<br>Volume C2 – Transmission Programmes<br>Volume D – Information for Shipping |
| WMO-No. 306 | *Manual on Codes*, Volume I.1, I.2 and I.3 |
| WMO-No. 386 | *Manual on the Global Telecommunication System* |
| WMO-No. 485 | *Manual on the WMO Integrated Processing and Prediction System* (formerly *Manual on the Global Data-processing and Forecasting System*) |
| WMO-No. 1160 | *Manual on the WMO Integrated Global Observing System* |

**Guides**

| | |
|---|---|
| WMO-No. 8 | *Guide to Instruments and Methods of Observation* |
| WMO-No. 100 | *Guide to Climatological Practices* |
| WMO-No. 134 | *Guide to Agricultural Meteorological Practices* |
| WMO-No. 168 | *Guide to Hydrological Practices*, Volume I and Volume II |
| WMO-No. 305 | *Guide to the WMO Integrated Processing and Prediction System* |
| WMO-No. 471 | *Guide to Marine Meteorological Services* |
| WMO-No. 488 | *Guide to the Global Observing System* |
| WMO-No. 636 | *Guide on the Automation of Data-processing Centres* |
| WMO-No. 702 | *Guide to Wave Analysis and Forecasting* |
| WMO-No. 731 | *Guide to Meteorological Observing and Information Distribution Systems for Aviation Weather Services* |
| WMO-No. 732 | *Guide to Practices for Meteorological Offices Serving Aviation* |
| WMO-No. 750 | *Guide to Moored Buoys and Other Ocean Data Acquisition Systems* |
| WMO-No. 788 | *Guide on World Weather Watch Data Management* |
| WMO-No. 834 | *Guide to Public Weather Services Practices* |
| WMO-No. 1061 | *Guide to the WMO Information System* |
| WMO-No. 1115 | *Guide to Information Technology Security* |

WMO-No. 1116 *Guide to Virtual Private Networks via the Internet between WMO Information System Centres*

WMO-No. 1165 *Guide to the WMO Integrated Global Observing System*

# APPENDIX B. APPROVED WIS CENTRES

## 1. Global Information System Centres

| *WMO Member* | *Centre name* | *Region* |
|---|---|---|
| Australia | GISC Melbourne | V |
| Brazil | GISC Brasilia | III |
| China | GISC Beijing | II |
| France | GISC Toulouse | VI |
| Germany | GISC Offenbach | VI |
| India | GISC New Delhi | II |
| Iran (Islamic Republic of) | GISC Tehran | II |
| Japan | GISC Tokyo | II |
| Morocco | GISC Casablanca | I |
| Republic of Korea | GISC Seoul | II |
| Russian Federation | GISC Moscow | VI |
| Saudi Arabia | GISC Jeddah | II |
| South Africa | GISC Pretoria | I |
| United Kingdom of Great Britain and Northern Ireland | GISC Exeter | VI |
| United States of America | GISC Washington | IV |

## 2. Data Collection or Production Centres

Note: Per Resolution 51 (Cg-XVI) – Designation of Centres of the WMO Information System (*Sixteenth World Meteorological Congress: Abridged Final Report with Resolutions* (WMO-No. 1077)), DCPCs in this table that are marked with an asterisk were conditionally designated as WIS DCPCs, subject to their having demonstrated the pre-operational compliance requirements.

| *WMO Member or contributing organization* | *Centre name* | *Centre location region/city* | | *Function* | *Technical commission* | *GISC* |
|---|---|---|---|---|---|---|
| Argentina | Volcanic Ash Advisory Centre (VAAC) | III | Buenos Aires | VAAC | INFCOM/SERCOM | Brasilia |
| | Regional Telecommunication Hub (RTH) | III | Buenos Aires | RTH | INFCOM | Brasilia |
| | Regional Specialized Meteorological Centre (RSMC)-Geographical | III | Buenos Aires | RSMC-Geographical | INFCOM | Brasilia |
| Australia | IPS (Ionospheric Prediction Service) | V | Sydney | IPS | INFCOM | Melbourne |
| | National Climate Centre (NCC) | V | Melbourne | NCC | INFCOM/SERCOM | Melbourne |
| | RSMC Darwin | V | Darwin | RSMC–Geographical | INFCOM | Melbourne |
| | World Meteorological Centre (WMC) Melbourne | V | Melbourne | RTH | INFCOM | Melbourne |
| | Joint Australian Tsunami Warning Centre (JATWC) | V | Melbourne | Tsunami Warning System (TWS) | INFCOM/SERCOM | Melbourne |
| Austria | RTH | VI | Vienna | RTH | INFCOM | Offenbach |
| Brazil | RTH | III | Brasilia | RTH | INFCOM | Brasilia |
| Bulgaria | RTH | VI | Sofia | RTH | INFCOM | Offenbach |
| Canada | RSMC Montreal | IV | Montreal | RSMC–Activity–atmospheric transport modelling (ATM) | INFCOM | Washington |

| *WMO Member or contributing organization* | *Centre name* | *Centre location region/city* | | *Function* | *Technical commission* | *GISC* |
|---|---|---|---|---|---|---|
| China | Beijing NCC | II | Beijing | Regional Climate Centre (RCC)-RA II | INFCOM/SERCOM | Beijing |
| | National Satellite Meteorological Centre (NSMC) | II | Beijing | NSMC | INFCOM | Beijing |
| | RSMC–Geographical Beijing (NMC) | II | Beijing | RSMC–Geographical | INFCOM | Beijing |
| | RSMC–Activity–ATM (NMC) | II | Beijing | RSMC–Activity– ATM | INFCOM | Beijing |
| | RTH | II | Beijing | RTH | INFCOM | Beijing |
| Croatia | Marine Meteorology Centre | VI | Zagreb | Marine Meteorology Centre | INFCOM/SERCOM | Offenbach |
| Czechia | RTH | VI | Prague | RTH | INFCOM | Offenbach |
| ECMWF | European Centre for Medium-Range Weather Forecasts (ECMWF) | VI | Reading | RSMC–Activity–Medium-Range-Forecasting | INFCOM | Exeter |
| EUMETSAT | European Organization for the Exploitation of Meteorological Satellites (EUMETSAT) | VI | Darmstadt, Germany | Satellite Centre | INFCOM | Offenbach |

| *WMO Member or contributing organization* | *Centre name* | *Centre location region/city* | | *Function* | *Technical commission* | *GISC* |
|---|---|---|---|---|---|---|
| France | Global Producing Centre/ Lead Centre for Long Range Forecast Multi-Model Ensemble (GPC/LRFMME) | VI | Toulouse | GPC/LRF | INFCOM | Toulouse |
| | RCC Toulouse | VI | Toulouse | Lead RA VI on LRF | INFCOM/SERCOM | Toulouse |
| | RSMC–Numerical Weather Prediction (NWP) | VI | Toulouse | Regional NWP support | INFCOM | Toulouse |
| | RSMC–Environmental emergency response (EER) | VI | Toulouse | RSMC–Activity–ATM | INFCOM | Toulouse |
| | RSMC La Réunion–Tropical Cyclone Centre | I | La Réunion | RSMC–Activity–TC | INFCOM | Toulouse |
| | RTH | VI | Toulouse | RTH | INFCOM | Toulouse |
| | VAAC | VI | Toulouse | VAAC | INFCOM/SERCOM | Toulouse |
| | Opera Data Centre (ODC) (Toulouse) | VI | Toulouse | Radar Data Centre | INFCOM | Toulouse |
| | Copernicus Regional Air Quality Data Centre | VI | Toulouse | Copernicus Regional Air Quality Data Centre | RA VI | Toulouse |

| *WMO Member or contributing organization* | *Centre name* | *Centre location region/city* | | *Function* | *Technical commission* | *GISC* |
|---|---|---|---|---|---|---|
| Germany | Global Collecting Centre (GCC)–ship observations | VI | Hamburg | GCC | INFCOM/SERCOM | Offenbach |
| | RSMC | VI | Offenbach | Global Precipitation Climatology Centre (GPCC) | INFCOM/SERCOM | Offenbach |
| | Global Runoff Data Centre (GRDC) | VI | Koblenz | GRDC | INFCOM/SERCOM | Offenbach |
| | GCOS Reference Upper Air Network (GRUAN) Lead Centre | VI | Tauche/ Lindenberg | GRUAN-LC | INFCOM | Offenbach |
| | RCC–Offenbach | VI | Offenbach | RCC lead RA VI | INFCOM/SERCOM | Offenbach |
| | RSMC | VI | Offenbach | RSMC–Geographical | INFCOM | Offenbach |
| | RTH | VI | Offenbach | RTH | INFCOM | Offenbach |
| | ICSU World Data Centre for Climate | VI | Hamburg | WDCC | INFCOM/SERCOM | Offenbach |
| | World Data Centre for Remote Sensing of the Atmosphere (WDC–RSAT) | VI | Oberpfaffen-hofen | WDC-RSAT | INFCOM/SERCOM | Offenbach |
| | WRMC | VI | Bremerhaven | WRMC | INFCOM/SERCOM | Offenbach |
| Hong Kong, China | World Weather Information Service (WWIS) | II | Hong Kong | WWIS | INFCOM | Beijing |
| India | RSMC–Tropical Cyclones New Delhi | II | New Delhi | RSMC–Activity–TC | INFCOM | New Delhi |
| | RTH | II | New Delhi | RTH | INFCOM | New Delhi |
| Indonesia | Transboundary forest fires | V | Jakarta | RSMC–Activity–ATM | INFCOM | Melbourne |
| | Tropical Cyclone Warning Centre (TCWC) | V | Jakarta | RSMC–Activity–TC | INFCOM | Melbourne |
| | Numerical Weather Prediction (NWP) Atmospheric Transport – SE Asia | V | Jakarta | RSMC–Activity–ATM | INFCOM | Melbourne |
| | Indian Ocean Tsunami Warning Centre (IOTWC) | V | Jakarta | Tsunami Warning System (TWS) | INFCOM/SERCOM | Melbourne |
| Iran (Islamic Republic of) | RTH | II | Tehran | RTH | INFCOM | Tehran |

| *WMO Member or contributing organization* | *Centre name* | *Centre location region/city* | | *Function* | *Technical commission* | *GISC* |
|---|---|---|---|---|---|---|
| Italy | REC-MMO-MED (Regional Centre for Marine Meteorology and Oceanography over the Mediterranean Sea) | VI | Rome | RSMC–Geographical | INFCOM/SERCOM | Offenbach |
| | RTH | VI | Rome | RTH | INFCOM | Offenbach |
| Japan | Global Producing Centre for Long-Range Forecast (GPC/LRF) | II | Tokyo | GPC/LRF | INFCOM | Tokyo |
| | Tokyo NCC | II | Tokyo | RCC-RA II | INFCOM/SERCOM | Tokyo |
| | RSMC on Atmospheric Transport Modelling Products for Environmental Emergency Response and Backtracking | II | Tokyo | RSMC–Activity–ATM | INFCOM | Tokyo |
| | RSMC on Tropical Cyclones | II | Tokyo | RSMC–Activity–TC | INFCOM | Tokyo |
| | RSMC on Data-processing and Forecasting System | II | Tokyo | RSMC–Geographical | INFCOM | Tokyo |
| | RTH | II | Tokyo | RTH | INFCOM | Tokyo |
| | Meteorological Satellite Centre | II | Tokyo | Satellite Centre | INFCOM | Tokyo |
| | WDC for Greenhouse Gases (GHG) | II | Tokyo | WDC–GHG | INFCOM/SERCOM | Tokyo |
| | National Institute of Information and Communication Technology (NICT) | II | Tokyo | Space weather | INFCOM/SERCOM | Tokyo |
| Kenya | RTH (Nairobi) | I | Nairobi | RTH | INFCOM | Offenbach |
| | RSMC–Geographical | I | Nairobi | RSMC–Geographical | INFCOM | Offenbach |
| Netherlands (Kingdom of the) | RCC–De Bilt | VI | De Bilt | RCC Lead RA VI on climate data | INFCOM/SERCOM | Exeter |
| | *Satellite Centre | VI | De Bilt | Satellite Centre | INFCOM | Exeter |

| *WMO Member or contributing organization* | *Centre name* | *Centre location region/city* | | *Function* | *Technical commission* | *GISC* |
|---|---|---|---|---|---|---|
| New Zealand | RSMC | V | Wellington | RSMC–Geographical | INFCOM | Melbourne |
| | RTH | V | Wellington | RTH | INFCOM | Melbourne |
| | VAAC | V | Wellington | VAAC | INFCOM/SERCOM | Melbourne |
| Norway | Norwegian Institute for Air Research (NILU) | VI | Kjeller | NILU | INFCOM/SERCOM | Offenbach |
| Qatar | Gulf Marine Centre | II | Doha | Marine Meteorological Centre | INFCOM/SERCOM | Jeddah |
| Republic of Korea | Global Producing Centre/ Lead Centre for LRF Multi-Model Ensemble (GPC/LRFMME)–Seoul | II | Seoul | GPC/LC–LRFMME | INFCOM | Seoul |
| | NMSC (National Meteorological Satellite Centre) | II | Jincheon | NMSC | INFCOM | Seoul |
| | WAMIS (World Agrometeorological Information Service) | II | Seoul | WAMIS | INFCOM/SERCOM | Seoul |
| Russian Federation | Responsible National Oceanographic Data Centre (RNODC) and Global Data Centre (GDC) | VI | Obninsk | RNODC and GDC | INFCOM/SERCOM | Moscow |
| | RSMC–EER | VI | Obninsk | RSMC–Activity–ATM | INFCOM | Moscow |
| | RSMC | VI | Moscow | RSMC–Geographical | INFCOM | Moscow |
| | WMC Moscow | VI | Moscow | RTH | INFCOM | Moscow |
| | RTH/RSMC | II | Khabarovsk | RTH/RSMC–Geographical | INFCOM | Moscow |
| | RTH/RSMC | II | Novosibirsk | RTH/RSMC–Geographical | INFCOM | Moscow |
| | WDC (World Data Centre) Ice–St Petersburg (Global Cryosphere Watch) | VI | St Petersburg | WDC (ICE) | INFCOM | Moscow |
| Saudi Arabia | RTH | II | Jeddah | RTH | INFCOM | Jeddah |
| | RSMC–Geographical (Jeddah) | II | Jeddah | RSMC–Geographical | INFCOM | Jeddah |
| Serbia | RCC–Belgrade | VI | Belgrade | RCC–RA VI network member | INFCOM/SERCOM | Offenbach |

| *WMO Member or contributing organization* | *Centre name* | *Centre location region/city* | | *Function* | *Technical commission* | *GISC* |
|---|---|---|---|---|---|---|
| Singapore | ASEAN Specialized Meteorological Centre (ASMC) | V | Singapore | Regional monitoring and alerting of transboundary smoke haze | INFCOM | Melbourne |
| South Africa | RTH | I | Pretoria | RTH | INFCOM | Pretoria |
| Spain | MEditerranean climate DAta REscue initiative (MEDARE) | VI | Tarragona | Centre for climate change | INFCOM/SERCOM | Toulouse |
| Sweden | *BALTRAD (Weather radar network for the Baltic Sea Region) | VI | Norrköping | Regional radar | INFCOM | Offenbach |
| | RTH Norrköping | VI | Norrköping | RTH | INFCOM | Offenbach |
| Thailand | RTH | II | Bangkok | RTH | INFCOM | Tokyo |
| Türkiye | Eastern Mediterranean Climate Centre (EMCC–RA VI) | VI | Ankara | RCC | INFCOM/SERCOM | Offenbach |
| United Kingdom of Great Britain and Northern Ireland | RSMC–Numerical Weather Prediction (NWP) | VI | Exeter | GPC/LRF | INFCOM | Exeter |
| | Marine Observations Centre | VI | Exeter | Marine Observations Centre | INFCOM/SERCOM | Exeter |
| | RSMC | VI | Exeter | RSMC–Activity–ATM | INFCOM | Exeter |
| | VAAC (London) | VI | Exeter | VAAC | INFCOM/SERCOM | Exeter |
| | World Area Forecast Centre (WAFC, London) | VI | Exeter | WAFC | INFCOM/SERCOM | Exeter |
| | RSMC–Global and Regional Climate Centre | VI | Exeter | RSMC–Geographical | INFCOM | Exeter |
| | RTH Exeter | VI | Exeter | RTH | INFCOM | Exeter |
| | Specialized Ocean & Wave Forecasting Centre | VI | Exeter | Specialized ocean/wave forecasting | INFCOM/SERCOM | Exeter |
| | British Antarctic Survey (BAS) | VI | Cambridge | GCOS Lead Centre for Antarctica | INFCOM/SERCOM | Exeter |
| | Opera Data Centre (ODC) (Exeter) | VI | Exeter | Radar Data Centre | INFCOM | Exeter |

| *WMO Member or contributing organization* | *Centre name* | *Centre location region/city* | | *Function* | *Technical commission* | *GISC* |
|---|---|---|---|---|---|---|
| United States of America | *Global Observing Systems Information Centre (GOSIC) | IV | Asheville, NC | GOSIC | SERCOM | Washington |
| | *National Centres for Environmental Prediction (NCEP) | IV | Washington, DC | GPC/LC-LRFMME | INFCOM | Washington |
| | *National Centre for Atmospheric Research (NCAR) | IV | Boulder, CO | NCAR | INFCOM | Washington |
| | *National Centres for Environmental Information (NCEI) | IV | Washington, D.C. | NCEI | INFCOM/SERCOM | Washington |
| | *National Environmental Satellite, Data, and Information Service (NESDIS) | IV | Washington, D.C. | RMSC-Geographical/ NESDIS | INFCOM | Washington |
| | *Air Resources Laboratory (ARL) | IV | Washington, D.C. | RSMC–Activity–ATM | INFCOM | Washington |
| | WMC Washington | IV | Washington, D.C. | RTH | INFCOM | Washington |
| | *WAFC Washington | IV | Washington, D.C. | WAFC | INFCOM/SERCOM | Washington |

## 3. National Centres

| *WMO Member or contributing organization* | *Centre name* | *GTS function* | *Centre Region location* | | *Principal GISC* | *Constituent body* |
|---|---|---|---|---|---|---|
| Afghanistan | Afghan Meteorological Authority | NMC | II | Kabul | Tehran | INFCOM |
| Albania | The Hydro-meteorological Institute | NMC | VI | Tirana | TBD | INFCOM |
| Algeria | Office National de la Météorologie | NMC | I | Algiers | Toulouse | INFCOM |
| Angola | Instituto Nacional de Hidrometeorología e Geofísica | NMC | I | Luanda | Pretoria | INFCOM |
| Antigua and Barbuda | Antigua and Barbuda Meteorological Services | NMC | IV | St John's | Washington | INFCOM |
| Argentina | Servicio Meteorológico Nacional | NMC | III | Buenos Aires | Brasilia | INFCOM |
| Armenia | Armenian State Hydro-meteorological and Monitoring Service | NMC | VI | Yerevan | Moscow | INFCOM |
| Aruba (Netherlands) | Departamento Meteorologico Aruba | NMC | IV | Aruba | Washington | INFCOM |
| Australia | Bureau of Meteorology Water Division | NHS | V | Canberra | Melbourne | SERCOM |
| | Cocos and Christmas Island Field Office | WSO (Christmas Island) | V | Cocos Island | Melbourne | INFCOM |
| | National Meteorological and Oceanographic Centre | NMC | V | Melbourne | Melbourne | INFCOM |
| Austria | Central Institute for Meteorology and Geodynamics | NMC | VI | Vienna | Offenbach | INFCOM |
| Azerbaijan | National Hydro-meteorological Department | NMC | VI | Baku | Moscow | INFCOM |
| Bahamas | Department of Meteorology | NMC | IV | Nassau | Washington | INFCOM |
| Bahrain | Bahrain Meteorological Service | NMC | II | Manama | Jeddah | INFCOM |
| Bangladesh | Bangladesh Meteorological Department | NMC | II | Dhaka | New Delhi | INFCOM |
| Barbados | Meteorological Services | NMC | IV | Bridgetown | Washington | INFCOM |
| Belarus | Department of Hydrometeorology | NMC | VI | Minsk | Moscow | INFCOM |
| Belgium | Institut Royal Météorologique | NMC | VI | Brussels | Toulouse | INFCOM |
| Belize | National Meteorological Service | NMC | IV | Belize City | Washington | INFCOM |
| Benin | Service Météorologique National | NMC | I | Cotonou | Casablanca | INFCOM |
| Bhutan | Council for Renewable Natural Resources Research | NMC | II | Thimphu | New Delhi | INFCOM |
| Bolivia (Plurinational State of) | Servicio Nacional de Meteorología e Hidrología | NMC | III | La Paz | Brasilia | INFCOM |
| Bosnia and Herzegovina | Meteorological Institute | NMC | VI | Sarajevo | Offenbach | INFCOM |
| Botswana | Botswana Meteorological Services | NMC | I | Gaborone | Pretoria | INFCOM |

| *WMO Member or contributing organization* | *Centre name* | *GTS function* | *Centre Region location* | | *Principal GISC* | *Constituent body* |
|---|---|---|---|---|---|---|
| Brazil | Instituto Nacional de Meteorologia | NMC | III | Brasilia | Brasilia | INFCOM |
| British Caribbean Territories | Caribbean Meteorological Organization (Anguilla) | WSO (Anguilla) | IV | The Valley | Washington | INFCOM |
| | Caribbean Meteorological Organization (British Virgin Islands) | WSO (British Virgin Islands) | IV | Road Town | Washington | INFCOM |
| | Caribbean Meteorological Organization (Cayman Islands) | NMC (Cayman Islands) | IV | George Town | Washington | INFCOM |
| | Caribbean Meteorological Organization (Montserrat) | WSO (Montserrat) | IV | Plymouth | Washington | INFCOM |
| | Caribbean Meteorological Organization (Turks and Caicos Islands) | WSO (Turks and Caicos Islands) | IV | Cockburn Town | Washington | INFCOM |
| Brunei Darussalam | The Brunei Meteorological Service | NMC | V | Bandar Seri Begawan | Melbourne | INFCOM |
| Bulgaria | National Institute of Meteorology and Hydrology | NMC | VI | Sofia | Offenbach | INFCOM |
| Burkina Faso | Direction de la Météorologie | NMC | I | Ouagadougou | Casablanca | INFCOM |
| Burundi | Institut Géographique du Burundi | NMC | I | Bujumbura | Casablanca | INFCOM |
| Cambodia | Department of Meteorology | NMC | II | Phnom Penh | Tokyo | INFCOM |
| Cameroon | Direction de la Météorologie Nationale | NMC | I | Douala | Casablanca | INFCOM |
| Canada | Meteorological Service of Canada | NMC | IV | Montreal | Washington | INFCOM |
| Cabo Verde | Instituto Nacional de Meteorologia e Geofísica | NMC | I | Sal | Casablanca | INFCOM |
| Central African Republic | Direction Générale de l'Aviation Civile et de la Météorologie | NMC | I | Bangui | Casablanca | INFCOM |
| Chad | Direction des Ressources en Eau et de la Météorologie | NMC | I | N'Djamena | Casablanca | INFCOM |
| Chile | Dirección Meteorológica de Chile | NMC | III | Santiago | Brasilia | INFCOM |
| China | China Meteorological Administration | NMC | II | Beijing | Beijing | INFCOM |
| Colombia | Instituto de Hidrología, Meteorología y Estudios Ambientales | NMC | III | Bogotá | Brasilia | INFCOM |
| Comoros | Direction de la Météorologie Nationale | NMC | I | Moroni | Casablanca | INFCOM |
| Congo | Direction de la Météorologie Nationale | NMC | I | Brazzaville | Casablanca | INFCOM |
| Cook Islands | Cook Islands Meteorological Service | NMC | V | Avarua | Melbourne | INFCOM |
| Costa Rica | Instituto Meteorológico Nacional | NMC | IV | San José | Washington | INFCOM |
| Côte d'Ivoire | Direction de la Météorologie Nationale | NMC | I | Abidjan | Casablanca | INFCOM |
| Croatia | Meteorological and Hydrological Service | NMC | VI | Zagreb | Offenbach | INFCOM |

| *WMO Member or contributing organization* | *Centre name* | *GTS function* | *Centre Region location* | | *Principal GISC* | *Constituent body* |
|---|---|---|---|---|---|---|
| Cuba | Instituto de Meteorología | NMC | IV | Havana | Washington | INFCOM |
| Curaçao and Sint Maarten | Meteorological Department Curaçao | NMC | IV | Willemstad | Washington | INFCOM |
| Cyprus | Meteorological Service | NMC | VI | Nicosia | Offenbach | INFCOM |
| Czechia | Czech Hydrometeorological Institute | NMC | VI | Prague | Offenbach | INFCOM |
| Democratic People's Republic of Korea | State Hydrometeorological Administration | NMC | II | Pyongyang | Beijing | INFCOM |
| Democratic Republic of the Congo | Agence Nationale de Météorologie et de Télédétection par Satellite | NMC | I | Kinshasa | Casablanca | INFCOM |
| Denmark | Danish Meteorological Institute | NMC | VI | Copenhagen | Offenbach | INFCOM |
| Djibouti | Service de la Météorologie | NMC | I | Djibouti | Casablanca | INFCOM |
| Dominica | Dominica Meteorological Services | NMC | IV | Roseau | Washington | INFCOM |
| Dominican Republic | Instituto Nacional de Recursos Hidráulicos (INDRHI) | NHS | IV | Santo Domingo | Washington | INFCOM/ SERCOM |
| | Oficina Nacional de Meteorología | NMC | IV | Santo Domingo | Washington | INFCOM |
| Ecuador | Instituto Nacional de Meteorología e Hidrología | NMC | III | Quito | Brasilia | INFCOM |
| Egypt | The Egyptian Meteorological Authority | NMC | I | Cairo | Casablanca | INFCOM |
| El Salvador | Servicio Nacional de Estudios Territoriales | NMC | IV | San Salvador | Washington | INFCOM |
| Equatorial Guinea | Service de la Météorologie | NMC | I | Malabo | Casablanca | INFCOM |
| Eritrea | Civil Aviation Authority | NMC | I | Asmara | Casablanca | INFCOM |
| Estonia | Estonian Meteorological and Hydrological Institute | NMC | VI | Tallinn | Offenbach | INFCOM |
| Eswatini | Eswatini Meteorological Service | NMC | I | Manzini | Pretoria | INFCOM |
| Ethiopia | National Meteorological Services Agency | NMC | I | Addis Ababa | Casablanca | INFCOM |
| Fiji | Fiji Meteorological Service | NMC | V | Nadi | Melbourne | INFCOM |
| Finland | Finnish Meteorological Institute | NMC | VI | Helsinki | Offenbach | INFCOM |

| *WMO Member or contributing organization* | *Centre name* | *GTS function* | *Centre Region location* | | *Principal GISC* | *Constituent body* |
|---|---|---|---|---|---|---|
| France | Météo-France (Clipperton) | WSO (Clipperton) | IV | Clipperton | Toulouse | INFCOM |
| | Météo-France (French Guiana) | WSO (French Guiana) | III | French Guiana | Toulouse | INFCOM |
| | Météo-France (Guadeloupe, St Martin, St Barthelemy) | WSO (Guadeloupe, St Martin, St Barthelemy) | IV | Guadeloupe, St Martin, St Barthelemy | Toulouse | INFCOM |
| | Météo-France (Kerguelen Islands) | WSO (Kerguelen Islands) | I | Kerguelen | Toulouse | INFCOM |
| | Météo-France (La Réunion) | WSO (Réunion) | I | La Réunion | Toulouse | INFCOM |
| | Météo-France (Martinique) | WSO (Martinique) | IV | Martinique | Toulouse | INFCOM |
| | Météo-France (St Pierre and Miquelon) | WSO (St Pierre and Miquelon) | IV | St Pierre and Miquelon | Toulouse | INFCOM |
| | Météo-France (Toulouse) | NMC | VI | Toulouse | Toulouse | INFCOM |
| | Météo-France (Wallis and Futuna) | WSO (Wallis and Futuna) | V | Wallis and Futuna | Toulouse | INFCOM |
| French Polynesia | Météo-France (Polynésie française) | NMC | V | Papeete | Melbourne | INFCOM |
| Gabon | Direction de la Météorologie Nationale | NMC | I | Libreville | Casablanca | INFCOM |
| Gambia (The) | Department of Water Resources | NMC | I | Banjul | Casablanca | INFCOM |
| Georgia | Department of Hydrometeorology | NMC | VI | Tbilisi | Moscow | INFCOM |
| Germany | Deutscher Wetterdienst | NMC | VI | Offenbach | Offenbach | INFCOM |
| Ghana | Ghana Meteorological Services Department | NMC | I | Accra | Casablanca | INFCOM |
| Greece | Hellenic National Meteorological Service | NMC | VI | Athens | Offenbach | INFCOM |
| Guatemala | Instituto Nacional de Sismología, Vulcanología, Meteorología e Hidrología | NMC | IV | Guatemala | Washington | INFCOM |
| Guinea | Direction Nationale de la Météorologie | NMC | I | Conakry | Casablanca | INFCOM |
| Guinea-Bissau | Météorologie de Guinée-Bissau | NMC | I | Bissau | Casablanca | INFCOM |
| Guyana | Hydrometeorological Service | NMC | III | Georgetown | Brasilia | INFCOM |
| Haiti | Centre national de la météorologie | NMC | IV | Port-au-Prince | Washington | INFCOM |
| Honduras | Servicio Meteorológico Nacional | NMC | IV | Tegucigalpa | Washington | INFCOM |
| Hong Kong, China | Hong Kong Observatory | NMC | II | Hong Kong | Beijing | INFCOM |
| Hungary | Meteorological Service of Hungary | NMC | VI | Budapest | Offenbach | INFCOM |

| *WMO Member or contributing organization* | *Centre name* | *GTS function* | *Centre Region location* | | *Principal GISC* | *Constituent body* |
|---|---|---|---|---|---|---|
| Iceland | Icelandic Meteorological Office | NMC | VI | Reykjavik | Exeter | INFCOM |
| India | India Meteorological Department | NMC | II | New Delhi | New Delhi | INFCOM |
| Indonesia | Agency for Meteorology, Climatology and Geophysics | NMC | V | Jakarta | Melbourne | INFCOM |
| Iran (Islamic Republic of) | Islamic Republic of Iran Meteorological Organization | NMC | II | Tehran | Tehran | INFCOM |
| Iraq | Iraqi Meteorological Organization | NMC | II | Baghdad | Tehran | INFCOM |
| Ireland | Met Éireann | NMC | VI | Dublin | Exeter | INFCOM |
| Israel | Israel Meteorological Service | NMC | VI | Tel Aviv | Offenbach | INFCOM |
| Italy | Servizio Meteorologico | NMC | VI | Rome | Offenbach | INFCOM |
| Jamaica | Meteorological Service | NMC | IV | Kingston | Washington | INFCOM |
| Japan | Japan Meteorological Agency | NMC | II | Tokyo | Tokyo | INFCOM |
| Jordan | Jordan Meteorological Department | NMC | VI | Amman | Offenbach | INFCOM |
| Kazakhstan | National Meteorological and Hydrological Service (Almaty) | NMC | II | Almaty | Moscow | INFCOM |
| Kazakhstan | National Meteorological and Hydrological Service (Astana) | NMC | II | Astana | Moscow | INFCOM |
| Kenya | Kenya Meteorological Department | NMC | I | Nairobi | Offenbach | INFCOM |
| Kiribati | Kiribati Meteorological Service | NMC (Phoenix Islands) | V | South Tarawa | Melbourne | INFCOM |
| Kuwait | Department of Meteorology | NMC | II | Kuwait City | Jeddah | INFCOM |
| Kyrgyzstan | Main Hydrometeorological Administration | NMC | II | Bishkek | Moscow | INFCOM |
| Lao People's Democratic Republic | Department of Meteorology and Hydrology | NMC | II | Vientiane | Tokyo | INFCOM |
| Latvia | Latvian Environment, Geology and Meteorology Agency | NMC | VI | Riga | Offenbach | INFCOM |
| Lebanon | Service Météorologique | NMC | VI | Beirut | TBD | INFCOM |
| Lesotho | Lesotho Meteorological Services | NMC | I | Maseru | Pretoria | INFCOM |
| Liberia | Ministry of Transport | NMC | I | Monrovia | Casablanca | INFCOM |
| Libya | Libyan National Meteorological Centre | NMC | I | Tripoli | Casablanca | INFCOM |
| Lithuania | Lithuanian Hydrometeorological Service | NMC | VI | Vilnius | Offenbach | INFCOM |
| Luxembourg | Administration de l'Aéroport de Luxembourg | NMC | VI | Luxembourg | Toulouse | INFCOM |
| Macao, China | Meteorological and Geophysical Bureau | WSO | II | Macao | Beijing | INFCOM |

| *WMO Member or contributing organization* | *Centre name* | *GTS function* | *Centre Region location* | | *Principal GISC* | *Constituent body* |
|---|---|---|---|---|---|---|
| Madagascar | Direction de la Météorologie et de l'Hydrologie | NMC | I | Antananarivo | Casablanca | INFCOM |
| Malawi | Malawi Meteorological Services | NMC | I | Lilongwe | Pretoria | INFCOM |
| Malaysia | Malaysian Meteorological Department | NMC | V | Kuala Lumpur | Melbourne | INFCOM |
| Maldives | Department of Meteorology | NMC | II | Male | New Delhi | INFCOM |
| Mali | Direction Nationale de la Météorologie du Mali | NMC | I | Bamako | Casablanca | INFCOM |
| Malta | Meteorological Office | NMC | VI | Valletta | TBD | INFCOM |
| Mauritania | Office National de la Météorologie | NMC | I | Nouakchott | Casablanca | INFCOM |
| Mauritius | Mauritius Meteorological Services | NMC | I | Port Louis | Casablanca | INFCOM |
| Mexico | Servicio Meteorológico Nacional | NMC | IV | Mexico City | Washington | INFCOM |
| Micronesia (Federated States of) | FSM Weather Station | N/A | V | Palikir | Melbourne | INFCOM |
| Monaco | Mission Permanente de la Principauté de Monaco | NMC | VI | Monaco | Toulouse | INFCOM |
| Mongolia | National Agency for Meteorology, Hydrology and Environment Monitoring | NMC | II | Ulaanbaatar | Beijing | INFCOM |
| Montenegro | Hydrometeorological Institute of Montenegro | NMC | VI | Podgorica | Offenbach | INFCOM |
| Morocco | Direction de la Météorologie Nationale | NMC | I | Casablanca | Casablanca | INFCOM |
| Mozambique | Instituto Nacional de Meteorologia | NMC | I | Maputo | Pretoria | INFCOM |
| Myanmar | Department of Meteorology and Hydrology | NMC | II | Nay Pyi Taw | Tokyo | INFCOM |
| Namibia | Namibia Meteorological Service | NMC | I | Windhoek | Pretoria | INFCOM |
| Nepal | Department of Hydrology and Meteorology | NMC | II | Kathmandu | Beijing | INFCOM |
| Netherlands (Kingdom of the) | Royal Netherlands Meteorological Institute | NMC (includes European part of Netherlands and Bonaire, St Eustatius, Saba) | VI | De Bilt | Exeter | INFCOM |
| New Caledonia | Météo-France (Nouvelle Calédonie) | NMC | V | Noumea | Melbourne | INFCOM |
| New Zealand | New Zealand National Meteorological Service | NMC | V | Wellington | Melbourne | INFCOM |
| | New Zealand National Meteorological Service (Tokelau) | NMC (Tokelau) | V | Tokelau | Melbourne | INFCOM |
| Nicaragua | Dirección General de Meteorología | NMC | IV | Managua | Washington | INFCOM |
| Niger | Direction de la Météorologie Nationale | NMC | I | Niamey | Casablanca | INFCOM |

| *WMO Member or contributing organization* | *Centre name* | *GTS function* | *Centre Region location* | | *Principal GISC* | *Constituent body* |
|---|---|---|---|---|---|---|
| Nigeria | Nigerian Meteorological Agency | NMC | I | Lagos | Casablanca | INFCOM |
| Niue | Niue Meteorological Service | NMC | V | Alofi | Melbourne | INFCOM |
| North Macedonia | Republic Hydrometeorological Institute | NMC | VI | Skopje | Offenbach | INFCOM |
| Norway | Norwegian Meteorological Arctic Data Centre | Arctic Data Centre | VI | Oslo | Offenbach | INFCOM |
| | Norwegian Meteorological Institute | NMC | VI | Oslo | Offenbach | INFCOM |
| Oman | Department of Meteorology | NMC | II | Muscat | Jeddah | INFCOM |
| Pakistan | Pakistan Meteorological Department | NMC | II | Karachi | Beijing | INFCOM |
| Panama | Hidrometeorología | NMC | IV | Panama City | Washington | INFCOM |
| Papua New Guinea | Papua New Guinea Meteorological Service | NMC | V | Port Moresby | Melbourne | INFCOM |
| Paraguay | Dirección de Meteorología et Hidrología | NMC | III | Asunción | Brasilia | INFCOM |
| Peru | Dirección Nacional de Meteorología et Hidrología | NMC | III | Lima | Brasilia | INFCOM |
| Philippines | Philippine Atmospheric Geophysical and Astronomical Services Administration | NMC | V | Manila | Tokyo | INFCOM |
| Poland | Institute of Meteorology and Water Management | NMC | VI | Warsaw | Offenbach | INFCOM |
| Portugal | Instituto de Meteorologia | NMC | VI | Lisbon | Toulouse | INFCOM |
| | Instituto de Meteorologia (Madeira) | NMC (Madeira) | I | Madeira | Toulouse | INFCOM |
| Qatar | Qatar Meteorology Department | Aviation Centre | II | Doha | Jeddah | INFCOM/ SERCOM |
| | Qatar Meteorology Department | NMC | II | Doha | Jeddah | INFCOM |
| Republic of Korea | Korea Meteorological Administration | NMC | II | Seoul | Seoul | INFCOM |
| Republic of Moldova | Serviciul Hidrometeorologic de Stat Moldova | NMC | VI | Kishinev | Moscow | INFCOM |
| Romania | National Meteorological Administration | NMC | VI | Bucharest | Offenbach | INFCOM |
| Russian Federation | Russian Federal Service for Hydrometeorology and Environmental Monitoring | NMC | VI | Moscow | Moscow | INFCOM |
| | Russian Federal Service for Hydrometeorology and Environmental Monitoring (Khabarovsk) | WSO (Khabarovsk) | II | Khabarovsk | Moscow | INFCOM |
| | Russian Federal Service for Hydrometeorology and Environmental Monitoring (Novosibirsk) | WSO (Novosibirsk) | II | Novosibirsk | Moscow | INFCOM |
| Rwanda | Rwanda Meteorological Service | NMC | I | Kigali | Casablanca | INFCOM |
| Saint Kitts and Nevis | St Kitts and Nevis Meteorological Service | NMC | IV | Basseterre | Washington | INFCOM |
| Saint Lucia | Saint Lucia Meteorological Service | NMC | IV | Castries | Washington | INFCOM |

| *WMO Member or contributing organization* | *Centre name* | *GTS function* | *Centre Region location* | | *Principal GISC* | *Constituent body* |
|---|---|---|---|---|---|---|
| Samoa | Samoa Meteorology Division | NMC | V | Apia | Melbourne | INFCOM |
| Sao Tome and Principe | Instituto Nacional de Meteorologia | NMC | I | Sao Tome | Casablanca | INFCOM |
| Saudi Arabia | Presidency of Meteorology and Environment | NMC | II | Jeddah | Jeddah | INFCOM |
| | National Drought Centre (Regional Drought Monitoring and Early Warning Centre) | NMC | II | Jeddah | Jeddah | INFCOM/ SERCOM |
| Senegal | Direction de la Météorologie Nationale | NMC | I | Dakar | Casablanca | INFCOM |
| Serbia | Republic Hydrometeorological Service of Serbia | NMC | VI | Belgrade | Offenbach | INFCOM |
| Seychelles | National Meteorological Services | NMC | I | Victoria | Casablanca | INFCOM |
| Sierra Leone | Meteorological Department | NMC | I | Freetown | Casablanca | INFCOM |
| Singapore | Meteorological Services Division | NMC | V | Singapore | Melbourne | INFCOM |
| Slovakia | Slovak Hydrometeorological Institute | NMC | VI | Bratislava | TBD | INFCOM |
| Slovenia | Meteorological Office | NMC | VI | Ljubljana | Offenbach | INFCOM |
| Solomon Islands | Solomon Islands Meteorological Service | NMC | V | Honiara | Melbourne | INFCOM |
| Somalia | Permanent Mission of Somalia | NMC | I | Mogadishu | Casablanca | INFCOM |
| South Africa | South African Weather Service | NMC | I | Pretoria | Pretoria | INFCOM |
| Spain | Agencia Estatal de Meteorología | NMC | VI | Madrid | Toulouse | INFCOM |
| | Agencia Estatal de Meteorología (Canary Islands) | NMC (Canary Islands) | I | Santa Cruz | Toulouse | INFCOM |
| Sri Lanka | Department of Meteorology | NMC | II | Colombo | New Delhi | INFCOM |
| Sudan | Sudan Meteorological Authority | NMC | I | Khartoum | Pretoria | INFCOM |
| Suriname | Meteorological Service | NMC | III | Paramaribo | Brasilia | INFCOM |
| Sweden | Swedish Meteorological and Hydrological Institute | NMC | VI | Norrköping | Offenbach | INFCOM |
| Switzerland | MeteoSwiss | NMC | VI | Zurich | Offenbach | INFCOM |
| Syrian Arab Republic | Ministry of Defence Meteorological Department | NMC | VI | Damascus | Tehran | INFCOM |
| Tajikistan | Main Administration of Hydrometeorology and Monitoring of the Environment | NMC | II | Dushanbe | Moscow | INFCOM |
| Thailand | Thai Meteorological Department | NMC | II | Bangkok | Tokyo | INFCOM |
| Timor-Leste | Direcção Nacional da Meteorologia e Geofísica | NMC | V | Dili | Melbourne | INFCOM |
| Togo | Direction de la Météorologie Nationale | NMC | I | Lomé | Casablanca | INFCOM |
| Tonga | Tonga Meteorological Service | NMC | V | Nuku'alofa | Melbourne | INFCOM |

| *WMO Member or contributing organization* | *Centre name* | *GTS function* | *Centre Region location* | | *Principal GISC* | *Constituent body* |
|---|---|---|---|---|---|---|
| Trinidad and Tobago | Meteorological Service | NMC | IV | Port of Spain | Washington | INFCOM |
| Tunisia | National Institute of Meteorology | NMC | I | Tunis | Casablanca | INFCOM |
| Türkiye | Turkish State Meteorological Service | NMC | VI | Ankara | Offenbach | INFCOM |
| Turkmenistan | Administration of Hydrometeorology | NMC | II | Ashgabat | TBD | INFCOM |
| Tuvalu | Tuvalu Meteorological Service | NMC | V | Funafuti | Melbourne | INFCOM |
| Uganda | Department of Meteorology | NMC | I | Entebbe | Casablanca | INFCOM |
| Ukraine | Ukrainian Hydrometeorological Centre | NMC | VI | Kiev | Moscow | INFCOM |
| United Arab Emirates | Meteorological Department | NMC | II | Abu Dhabi | Jeddah | INFCOM |
| United Kingdom of Great Britain and Northern Ireland | Met Office (Ascension Island) | WSO (Ascension Island) | I | Ascension | Exeter | INFCOM |
| | Met Office (Bermuda) | WSO (Bermuda) | IV | Bermuda | Exeter | INFCOM |
| | Met Office (Exeter) | NMC | VI | Exeter | Exeter | INFCOM |
| | Met Office (Gibraltar) | WSO (Gibraltar) | VI | Gibraltar | Exeter | INFCOM |
| | Met Office (Pitcairn Islands) | WSO (Pitcairn Islands) | V | Adamstown | Exeter | INFCOM |
| | Met Office (St Helena Island) | WSO (St Helena Island) | I | Jamestown | Exeter | INFCOM |
| United Republic of Tanzania | Tanzania Meteorological Agency | NMC | I | Dar es Salaam | Exeter | INFCOM |
| United States of America | National Oceanic and Atmospheric Administration, National Weather Service | NMC | IV | Silver Springs | Washington | INFCOM |
| | National Oceanic and Atmospheric Administration, National Weather Service (Line Islands) | WSO (Line Islands) | V | Line Islands | Washington | INFCOM |
| | National Oceanic and Atmospheric Administration, National Weather Service (Guam) | WSO (Guam) | V | Guam | Washington | INFCOM |
| | National Oceanic and Atmospheric Administration, National Weather Service (Puerto Rico) | WSO (Puerto Rico) | IV | Puerto Rico | Washington | INFCOM |
| Uruguay | Dirección Nacional de Meteorología | NMC | III | Montevideo | Brasilia | INFCOM |
| Uzbekistan | Uzhydromet | NMC | II | Tashkent | Moscow | INFCOM |
| Vanuatu | Vanuatu Meteorological Services | NMC | V | Port Vila | Melbourne | INFCOM |
| Venezuela (Bolivarian Republic of) | Servicio de Meteorología de la Aviación | NMC | III | Maracay | Brasilia | INFCOM |

| *WMO Member or contributing organization* | *Centre name* | *GTS function* | *Centre Region location* | | *Principal GISC* | *Constituent body* |
|---|---|---|---|---|---|---|
| Viet Nam | Hydrometeorological Service | NMC | II | Hanoi | Tokyo | INFCOM |
| Yemen | Yemen Meteorological Service | NMC | II | Sana'a | Jeddah | INFCOM |
| Zambia | Zambia Meteorological Department | NMC | I | Lusaka | Pretoria | INFCOM |
| Zimbabwe | Zimbabwe Meteorological Services Department | NMC | I | Harare | Pretoria | INFCOM |

# APPENDIX C. THE WMO CORE METADATA PROFILE OF THE ISO 19115 METADATA STANDARD

## 1. Implementation of the WMO Core Metadata Profile

1.1 The WMO Core Metadata Profile of the ISO 19115 Metadata Standard places constraints on the contents of a discovery metadata record that are additional to those in the ISO Standard. **Authors of WIS discovery metadata records shall apply these constraints.**

1.2 **Specifications in this Manual shall take precedence over the specifications in ISO 19115.**

1.3 **The Secretariat shall publish guidance material to assist authors of WIS discovery metadata to maintain consistency between metadata records.**

1.4 **WIS discovery metadata records shall be provided to GISCs in conformance with ISO 19136 and ISO 19139 expressed in Geographic Markup Language (GML).**

## 2. Procedures for amending the WMO Core Metadata Profile

Section 3 of Part C2 of this appendix (WMO Core Metadata Profile Data Dictionary) is designated as technical specifications to which the simple procedure for the approval of amendments may be applied.

## 3. Contents of the WMO Core Metadata Profile

Each supported version of the WMO Core Metadata Profile is listed in section 4. Versions that are no longer supported by WIS are denoted as "obsolete" and their definitions should be retained on the WMO website. Definitions of the versions of the WMO Core Metadata Profile are in Part C1 and Part C2 of this appendix.

## 4. WMO Core Metadata Profile versions

Note: Versions of the WMO Core Metadata Profile before version 1.2 did not provide all the functionality required by WIS and are no longer supported.

WMO Core Metadata Profile version 1.2. This version is defined at http://wis.wmo.int/2010/metadata/version_1-2.

Note: Metadata created using profile version 1.2 are compatible with those created under version 1.3; however, if the records have been completed inconsistently, they may fail the version 1.3 checking rules.

WMO Core Metadata Profile version 1.3. This version is defined and described in Part C1 and Part C2 of this appendix.

# PART C1. WMO CORE METADATA PROFILE VERSION 1.3 SPECIFICATION: CONFORMANCE REQUIREMENTS

## 1. SCOPE

The specification defines the content, structure and encoding of discovery metadata published within the WIS discovery, access and retrieval (DAR) catalogue.

The metadata standard defined herein is an informal category-1 profile[1] of International Standard ISO 19115:2003 Geographic information – Metadata. **This metadata standard shall be referred to as the WMO Core Metadata Profile.**

**WIS discovery metadata records shall be encoded in XML as defined by ISO/TS 19139:2007.**

Part C1 of this specification defines the conformance requirements for the WMO Core Metadata Profile. Part C2 defines the abstract test suite, data dictionary and code lists. Unless otherwise stated, references to Part C1 and Part C2 are to the relevant parts of this specification.

## 2. CONFORMANCE

### 2.1 Conformance requirements

The *Technical Regulations* (WMO-No. 49), Volume I, Part II, 1.2.5 states:

> **The WMO Information System functions and operation shall be based on catalogues that contain metadata for data and products available across WMO, and metadata describing dissemination and access options. These catalogues shall be maintained by WMO Information System Centres.**

In Part C1:

(a) 6 describes the XML encoding requirements for the discovery metadata records published to the WIS DAR metadata (WIS discovery metadata) catalogue.

(b) 7 describes how compliance with this version of the WMO Core Metadata Profile is declared within a WIS discovery metadata record.

(c) 8 and 9 describe additional constraints applying to WIS discovery metadata records. These are organized into two groups to support the following formal requirements for WIS discovery metadata:

- Metadata uniqueness and discovery within the WIS DAR metadata (WIS discovery metadata) catalogue
- Description of data for global exchange within WIS.

Unified Modelling Language (UML) is used to describe the additional constraints defined in this appendix applying to WIS discovery metadata records within the context of ISO 19115:2003/ Cor. 1:2006.

**Where there are inconsistencies between the text description of a requirement and the UML description, the UML version shall be considered authoritative.**

[1] A category-1 profile places additional restrictions on the use of an International Standard to meet the more specific requirements of a given community. Profiles of International Standards may be formally registered. The WMO profile of ISO 19115 has not been registered and thus remains an "informal" profile.

Authors of discovery metadata records published within the WIS DAR metadata (WIS discovery metadata) catalogue are required to comply with the WMO Core Metadata Profile. **Thus, WIS discovery metadata shall be compliant with:**

- **ISO 19115:2003 'Geographic information – Metadata';**
- **ISO 19115:2003/Cor. 1:2006 'Geographic information – Metadata – Corrigendum 1';**
- **Additional constraints described in this Manual.**

**Specifications in this Manual shall take precedence over the specifications in ISO 19115:2003 and ISO 19115:2003/Cor. 1:2006.**

**The Secretariat shall publish guidance material to assist authors of WIS discovery metadata in maintaining consistency between metadata records.**

Note: See https://community.wmo.int/activity-areas/wis/wcmp.

## 2.2 Conformance classes for WIS discovery metadata

**Metadata records claiming conformance with the WMO Core Metadata Profile shall conform to the rules specified in Clauses 6–9 and pass all relevant test cases of the abstract test suite in Part C2, 2.**

Depending on the characteristics of a WIS discovery metadata record, eight conformance classes are distinguished. Table 1 lists these classes and the corresponding subclause of the abstract test suite.

**Table 1. Conformance classes related to the WMO Core Metadata Profile**

| | *Conformance class* | *Reference in Part C2* |
|---|---|---|
| 6.1 | ISO/TS 19139:2007 compliance | 2.1.1 |
| 6.2 | Explicit identification of namespaces in XML | 2.1.2 |
| 6.3 | GML namespace | 2.1.3 |
| 8.1 | Unique identification of WIS discovery metadata records | 2.2.1 |
| 8.2 | Provision of information to support discovery within the WIS DAR metadata (WIS discovery metadata) catalogue | 2.2.2, 2.2.3 |
| 9.1 | Identifying the scope of distribution | 2.3.1 |
| 9.2 | Identifiers for metadata describing data published for global exchange | 2.3.1 |
| 9.3 | Defining WMO data policy and GTS priority for data published for global exchange | 2.3.2, 2.3.3 |

A WIS discovery metadata record may also be validated against guidance published by the Secretariat.

Note: See https://community.wmo.int/activity-areas/wis/wcmp.

**During such validation, a warning shall be issued for each occasion that a metadata record fails to comply with guidance.**

## 3. NORMATIVE REFERENCES

The following referenced documents are indispensable for the application of this specification. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 639-2 'Code for the representation of names of languages – Part 2: Alpha-3 code'

ISO 3166 (all parts) 'Codes for the representation of names of countries and their subdivisions'

ISO 8601 'Data elements and interchange formats – Information interchange – Representation of dates and times'

ISO 19115:2003 'Geographic information – Metadata'

ISO 19115:2003/Cor. 1:2006 'Geographic information – Metadata – Corrigendum 1'

ISO/TS 19139:2007 'Geographic information – Metadata – XML schema implementation'

ISO/IEC 19757-3:2006 'Information technology – Document Schema Definition Language (DSDL) – Part 3: Rule-based validation – Schematron'

W3C XMLName 'Namespaces in XML. W3C Recommendation (14 January 1999)'

W3C XMLSchema-1 'XM3L Schema Part 1: Structures. W3C Recommendation (2 May 2001)'

W3C XMLSchema-2 'XML Schema Part 2: Datatypes. W3C Recommendation (2 May 2001)'

W3C XML 'Extensible Markup Language (XML) 1.0 (Second Edition). W3C Recommendation (6 October 2000)'

W3C XLink 'XML Linking Language (XLink) version 1.1. W3C Recommendation (6 May 2010)'

## 4. TERMS AND DEFINITIONS

**Namespace**

Collection of names, identified by a uniform resource identifier (URI) reference, which are used in XML documents as element names and attribute names.

**WIS discovery metadata**

Metadata consistent with the WMO Core Metadata Profile that is used within WIS for discovery of information shared through WIS.

## 5. SYMBOLS AND ABBREVIATED TERMS

### 5.1 Namespace abbreviations

In the list below, the item on the left describes the common namespace prefix used to describe the elements in the namespace. The second item is an English description of the namespace prefix, and the item in parenthesis is the uniform resource name (URN) of the actual namespace. These URNs do not necessarily correspond to an effective location of the schemas, however. When available, an authoritative location for the schema is provided.

The WMO Core Metadata Profile does not specify a namespace as it contains no XML schema extensions.

The list below corresponds to external namespaces used by the WMO Core Metadata Profile.

gco Geographic Common extensible markup language (http://www.isotc211.org/2005/gco)
gmd Geographic MetaData extensible markup language (http://www.isotc211.org/2005/gmd)
gmx Geographic Metadata XML schema (http://www.isotc211.org/2005/gmx)
gss Geographic Spatial Schema extensible markup language (http://www.isotc211.org/2005/gss)
gsr Geographic Spatial Referencing extensible markup language (http://www.isotc211.org/2005/gsr)
gts Geographic Temporal Schema extensible markup language (http://www.isotc211.org/2005/gts)
srv geographic SeRVice metadata (http://www.isotc211.org/2005/srv)[2]
gml Geography Markup Language (http://www.opengis.net/gml/3.2)[2]
xlink XML LINKing language (http://www.w3.org/1999/xlink)[2]
xsi W3C XML Schema Instance (http://www.w3.org/2001/XMLSchema-instance)[2]

### 5.2 External classes

All the model elements used within the WMO Core Metadata Profile are defined in ISO geographic information standards. By convention with ISO/TC 211, names of UML classes, with the exception of basic data-type classes, include a two- or three-letter prefix that identifies the International Standard and the UML package in which the class is defined. Table 2 lists the standards and packages in which UML classes are used in the WMO Core Metadata Profile.

**Table 2. Sources of UML classes**

| *Prefix* | *International Standard* | *Package* |
|---|---|---|
| CI | ISO 19115:2003 | Citation Information |
| EX | ISO 19115:2003 | Extent Information |
| MD | ISO 19115:2003 | Metadata Entity |

## 6. XML ENCODING

WIS implementation is predicated on the publication of metadata records as XML documents.

### 6.1 ISO/TS 19139:2007 COMPLIANCE

**Compliance with this specification requires that WIS discovery metadata records shall validate without error against the XML schemas created from the UML model of ISO 19115:2003/Cor. 1:2006 using the encoding rules defined in ISO/TS 19139:2007 'Geographic information – Metadata – XML schema implementation' Clause 9.**

The WMO Core Metadata Profile requires that:

6.1.1 **Each WIS discovery metadata record shall validate without error against the XML schemas defined in ISO/TS 19139:2007.**

[2] This http reference is to the identifier of the namespace and may not refer to an actual Internet link.

Notes:

1. Not all XML validation tools implement the full W3C XML Schema recommendation and not all XML validation tools interpret the W3C XML Schema recommendation in the same manner. It is recommended that a tool with strict interpretation of XML Schema and full support for the W3C XML Schema recommendation be used to ensure conformance.
2. WMO hosts a copy of the ISO/TS 19139:2007 XML schemas at: http://wis.wmo.int/2012/schemata/iso19139_2007/schema/. The directory structure in which the XML schemata are published mirrors that of the normative XML schema repository published by ISO at: https://standards.iso.org/iso/19139/. For example, gmd.xsd can be found at https://standards.iso.org/iso/19139/Schemas/gmd/gmd.xsd.

XML 1.0 does not support the enforcement of certain types of constraints. **For example, gmd:CI_ResponsibleParty shall include at least one of gmd:individualName, gmd:organisationName** or gmd:positionName. As a result, it is imperative that implementers heed the constraints identified within the UML model defined in ISO 19115:2003 and the associated corrigendum. These are listed in ISO/TS 19139:2007 Annex A: 'Table A.1 – Conformance Rules not enforceable with XML Schema'.

The WMO Core Metadata Profile requires that:

**6.1.2 Each WIS discovery metadata record shall validate without error against the rule-based constraints listed in ISO/TS 19139:2007 Annex A (Table A.1).**

Note: WMO provides an automated test suite including validation against the constraints listed in ISO/TS 19139:2007 Annex A. These are implemented as Schematron rules (ISO/IEC 19757-3:2006 'Information technology – Document Schema Definition Language (DSDL) – Part 3: Rule-based validation – Schematron') and can be found at the following location: http://wis.wmo.int/2012/metadata/validationTestSuite.

## 6.2 Explicit identification of namespaces in XML

**To support the provision of reusable XML validation test suites, it shall be mandatory to explicitly define XML namespaces used within a WIS discovery metadata record.** Use of a default (implied) namespace may lead to misinterpretation of the XML document and failure to validate.

The WMO Core Metadata Profile places the following additional restriction on ISO 19139:2007:

**6.2.1 Each WIS discovery metadata record shall explicitly name all namespaces used within the record: use of default namespaces is prohibited.**

## 6.3 GML namespace

ISO/TS 19139:2007 is dependent on ISO 19136:2007 'Geographic information – Geography Markup Language (GML)'. ISO 19136:2007 relates to GML version 3.2.1. The associated namespace URN is http://www.opengis.net/gml/3.2.

The WMO Core Metadata Profile places the following additional restriction on ISO 19139:2007:

**6.3.1 Each WIS discovery metadata record shall declare the following XML namespace for GML: http://www.opengis.net/gml/3.2.**

## 7. DECLARING COMPLIANCE WITH THE WMO CORE METADATA PROFILE

A WIS discovery metadata record may declare compliance with this version of the WMO Core Metadata Profile as follows:

- /gmd:MD_Metadata/gmd:metadataStandardName = "WMO Core Metadata Profile of ISO 19115 (WMO Core), 2003/Cor.1:2006 (ISO 19115), 2007 (ISO/TS 19139)"
- /gmd:MD_Metadata/gmd:metadataStandardversion = "1.3"

## 8. METADATA UNIQUENESS AND DISCOVERY WITHIN WIS DAR METADATA (WIS DISCOVERY METADATA) CATALOGUE

### 8.1 Unique identification of WIS discovery metadata records

Section 4.2 of this Manual (WIS-TechSpec-1: Uploading of metadata for data and products) requires the use of the WMO Core Metadata Profile and the provision of a globally unique identifier for each WIS discovery metadata record:

**4.2.1 This specification requires that each metadata record uploaded shall be represented in compliance with the WMO Core Metadata Profile of ISO 19115 with a unique identifier.**

**A WIS discovery metadata record shall be uniquely identified using the gmd:MD_Metadata/gmd:fileIdentifier attribute.**

The WMO Core Metadata Profile places the following additional restrictions on ISO 19115:2003/Cor. 1:2006 –

**8.1.1 Each WIS discovery metadata record shall include one gmd:MD_Metadata/gmd:fileIdentifier attribute.**

**8.1.2 The gmd:MD_Metadata/gmd:fileIdentifier attribute for each WIS discovery metadata record shall be unique within WIS.**

(i.e. the attribute is mandatory in the WMO Core Metadata Profile and must be globally unique within WIS).

Note that the gmd:MD_Metadata/gmd:fileIdentifier elements are treated as CASE-INSENSITIVE when assessing metadata records for duplication.

The WMO Core Metadata Profile recommends the use of a URI structure for gmd:fileIdentifier attributes. The URI should be structured as follows:

- Fixed string "urn:x-wmo:md:";
- Citation authority based on the Internet domain name of the data-provider organization, e.g. "*int.wmo.wis*", "*gov.noaa*", "*edu.ucar.ncar*", "*cn.gov.cma*" or "*uk.gov.metoffice*";
- Double separator colons: "::";
- Unique identifier:
  - For metadata records describing GTS products in bulletins or named according to the WMO file-naming convention P-flag = "T" or P-flag= "A", the unique identifier is "«TTAAii»«CCCC»";
  - For metadata records describing products named according to the WMO file-naming convention P-flag = "W", the unique identifier should be a truncated version of the WMO product identifier field of the associated data-files, excluding the date-stamp and any other varying elements as necessary;
  - For metadata records describing other products, the unique identifier may be assigned by the citation authority so as to be unique among the identifiers assigned by the citation authority.

**The Secretariat shall maintain a list of citation authorities and the associated organization.**

**Each "citation authority" organization shall implement procedures that ensure that its authorized metadata authors can create unique values for the "unique identifier".** Note that inclusion of "citation authority" in fileIdentifier guarantees global uniqueness, provided the organization has a procedure to ensure local uniqueness.

If the data custodian has its own methodology for assigning metadata identifiers and is able to guarantee the global uniqueness of the identifier, that identifier may be used.

**Amendments to a WIS discovery metadata record shall not change the gmd:MD_Metadata/gmd:fileIdentifier attribute. Each amendment shall be published with an updated gmd:MD_Metadata/gmd:dateStamp attribute indicating the date of publication of the amended version of the metadata record.**

**gmd:MD_Metadata/gmd:dateStamp shall be specified using a single date as specified by ISO 8601 in the extended date format (YYYY-MM-DD), where YYYY is the year, MM is the month and DD is the day.** Time (hh:$m_m m_m$:$s_s s_s$, where hh is the hour, $m_m m_m$ the minutes and $s_s s_s$ the seconds) may be added if required, separated from the day by "T".

**A set of WIS discovery metadata records with the same gmd:MD_Metadata/gmd:fileIdentifier shall be considered to be versions of the same WIS discovery metadata record. The sequence (time-order) of these records shall be determined from the gmd:MD_Metadata/gmd:dateStamp.**

## 8.2 Provision of information to support discovery within the WIS DAR metadata (WIS discovery metadata) catalogue

Section 4.9 of this Manual (WIS-TechSpec-8: DAR metadata (WIS discovery metadata) catalogue search and retrieval) outlines the mechanisms by which WIS DAR metadata (WIS discovery metadata) catalogue content may be searched according to indexed metadata attributes.

The Search function within the WIS DAR metadata (WIS discovery metadata) catalogue is based on terms from SRU, ISO 23950:1998.

**As a minimum, for text-based searches, these shall include:**

i. **subject**
ii. **abstract**
iii. **title**
iv. **author**
v. **keywords**
vi. **format**
vii. **identifier**
viii. **type**
ix. **crs (coordinate reference system)**

**For date-based searches, these shall include:**

i. **creationDate**
ii. **modificationDate**
iii. **publicationDate**
iv. **beginningDate**
v. **endingDate**

**Finally, a geographic search shall also be provided:**

i. **bounding box (specified in decimal degrees, north, west, south and east)**

Table 3 provides a mapping of SRU terms to ISO 19115 attributes (defined via XPath).

**Table 3. Mapping from SRU search terms to ISO 19115 attributes**

| *SRU term* | *ISO 19115 attribute* |
|---|---|
| Subject | /gmd:MD_Metadata/gmd:identificationInfo//gmd:descriptiveKeywords//gmd:keyword |
| Abstract | /gmd:MD_Metadata/gmd:identificationInfo//gmd:abstract |
| Title | /gmd:MD_Metadata/gmd:identificationInfo//gmd:citation//gmd:title |
| Author | /gmd:MD_Metadata/gmd:contact |
| Keywords | /gmd:MD_Metadata/gmd:identificationInfo//gmd:descriptiveKeywords//gmd:keyword |
| Format | /gmd:MD_Metadata/gmd:distributionInfo//gmd:distributionFormat//gmd:name |
| Identifier | /gmd:MD_Metadata/gmd:identificationInfo//gmd:citation//gmd:identifier |
| Type | /gmd:MD_Metadata/gmd:identificationInfo//spatialRepresentationType |
| Crs | /gmd:MD_Metadata//gmd:referenceSystemInfo/gmd:MD_ReferenceSystem/gmd:referenceSystemIdentifier/gmd:RS_Identifier/gmd:code |
| creationDate | /gmd:MD_Metadata/gmd:identificationInfo//gmd:citation//gmd:date//gmd:date |
| | /gmd:MD_Metadata/gmd:identificationInfo//gmd:citation//gmd:date//gmd:dateType="creation" |
| modificationDate | /gmd:MD_Metadata/gmd:identificationInfo//gmd:citation//gmd:date//gmd:date |
| | /gmd:MD_Metadata/gmd:identificationInfo//gmd:citation//gmd:date//gmd:dateType="revision" |
| publicationDate | /gmd:MD_Metadata/gmd:identificationInfo//gmd:citation//gmd:date//gmd:date |
| | /gmd:MD_Metadata/gmd:identificationInfo//gmd:citation//gmd:date//gmd:dateType="publication" |
| beginningDate | /gmd:MD_Metadata/gmd:identificationInfo//gmd:extent//gmd:temporalElement/gmd:extent |
| endingDate | /gmd:MD_Metadata/gmd:identificationInfo//gmd:extent//gmd:temporalElement/gmd:extent |
| boundingBox | /gmd:MD_Metadata/gmd:identificationInfo//gmd:extent//gmd:geographicElement/gmd:EX_GeographicBoundingBox/gmd:northBoundLatitude |
| | /gmd:MD_Metadata/gmd:identificationInfo//gmd:extent//gmd:geographicElement/gmd:EX_GeographicBoundingBox/gmd:westBoundLatitude |
| | /gmd:MD_Metadata/gmd:identificationInfo//gmd:extent//gmd:geographicElement/gmd:EX_GeographicBoundingBox/gmd:southBoundLatitude |
| | /gmd:MD_Metadata/gmd:identificationInfo//gmd:extent//gmd:geographicElement/gmd:EX_GeographicBoundingBox/gmd:eastBoundLatitude |

The following elements from Table 3 are declared mandatory in ISO 19115:2003/Cor. 1:2006:

- [abstract]
  /gmd:MD_Metadata/gmd:identificationInfo//gmd:abstract
- [title]
  /gmd:MD_Metadata/gmd:identificationInfo//gmd:citation//gmd:title
- [creationDate, modificationDate]
  /gmd:MD_Metadata/gmd:identificationInfo//gmd:citation//gmd:date
- [author]
  /gmd:MD_Metadata/gmd:contact

CI_ResponsibleParty entity /gmd:MD_Metadata/gmd:contact element should use the CI_RoleCode "pointOfContact"; e.g./gmd:MD_Metadata/gmd:contact//gmd:role = "pointOfContact"

Note that the abstract should provide a clear and concise statement that enables the reader to understand the content of the dataset. For guidance when completing the abstract, consider these points:

(a) State what the "things" are that are recorded.
(b) State the key aspects recorded about these things.
(c) State what form the data takes.
(d) State any other limiting information, such as time period of validity of the data.
(e) Add the purpose of the data resource where relevant (e.g. for survey data).
(f) Aim to be understood by non-experts.
(g) Do not include general background information.
(h) Avoid jargon and unexplained abbreviations.

It is recommended that /gmd:MD_Metadata/gmd:identificationInfo//gmd:pointOfContact should provide a minimum of a name and an e-mail address.

In order to improve the consistency of WIS discovery metadata records with regard to search and discovery within the WIS DAR metadata catalogue, the keyword and boundingBox attributes are mandatory within the WMO Core Metadata Profile.

The WMO Core Metadata Profile places the following additional restrictions on ISO 19115:2003/ Cor. 1:2006:

**8.2.1 Each WIS discovery metadata record shall include at least one keyword from the WMO_CategoryCode code list.**

**8.2.2 Keywords from the WMO_CategoryCode code list shall be defined as keyword type "theme".**

**8.2.3 All keywords sourced from a particular keyword thesaurus shall be grouped into a single instance of the MD_Keywords class.**

**8.2.4 Each WIS discovery metadata record describing geographic data shall include the description of at least one geographic bounding box defining the spatial extent of the data.**

A new code-list dictionary is published as part of this specification, defining the set of permissible values for WMO_CategoryCode (see Part C2, Table 16). **Keywords from WMO_CategoryCode shall be of type "theme".**

The GeographicBoundingBox is determined by four coordinates.

Bounding boxes that cross the 180 degree meridian can be differentiated from bounding boxes that do not by the following rule:

**In a dataset that does not cross the 180 degree meridian, the westernmost longitude shall always be less than the easternmost longitude. Conversely, if a bounding box crosses the 180 degree meridian, the westernmost longitude shall be greater than the easternmost longitude.**

Other constraints on geographic bounding boxes:

**(a) The total longitudinal span shall be greater than zero and less than, or equal to, 360 degrees.**

**(b) Geographic points shall be designated with the northernmost and southernmost latitudes equal and the westernmost and easternmost longitudes equal.**

**(c) The northernmost latitude shall always be greater than, or equal to, the southernmost latitude.**

**(d) Longitude and latitude shall be recorded in a coordinate reference system that has the same axes, units and prime meridian as WGS84.**

**Attribute /gmd:MD_Metadata/gmd:identificationInfo//gmd:citation//gmd:date//gmd:date shall be expressed as an ISO 8601 compliant date.** The extended date format (YYYY-MM-DD) should be used, where YYYY is the year, MM is the month and DD is the day. Time (hh:$m_m m_m$:$s_s s_s$, where hh is the hour, $m_m m_m$ the minutes and $s_s s_s$ the seconds) may be added if required, separated from the day by "T".

The remaining elements from Table 3 are optional in this version of the WMO Core Metadata Profile:

- [format]
- [identifier]
- [type]
- [crs]
- [beginningDate]
- [endingDate]

Note: Further guidance on the use of these elements is published by the Secretariat at https://community.wmo.int/activity-areas/wis/wcmp.

The primary language used in metadata conforming to the WMO Core Metadata Profile is English. Translations of English elements within the record may also be included.

**8.2.5 All information contained within a metadata record shall, as a minimum, be provided in English within the metadata record.**

Translations of all or part of the English content may also be included.

## 9. DESCRIPTION OF DATA FOR GLOBAL EXCHANGE WITHIN WIS

Within WIS, it is important for GISCs to be able to identify which data are published for global exchange. This determines whether the data are incorporated into the GISC cache. The WIS discovery metadata record describing a given dataset may identify whether that dataset is published for global exchange within WIS.

## 9.1 Identifying the scope of distribution

The scope of distribution for a dataset (whether it is published for global exchange within WIS) may be specified using a keyword:

- /gmd:MD_Metadata/gmd:identificationInfo//gmd:descriptiveKeywords//gmd:keyword

The semantics of a keyword are inferred from a specified keyword thesaurus. The thesaurus relating to a particular keyword may be cited using the following element:

- /gmd:MD_Metadata/gmd:identificationInfo//gmd:descriptiveKeywords//gmd:thesaurusName

**The scope of distribution for data within WIS shall be expressed using the following controlled vocabulary: "GlobalExchange", "RegionalExchange" and "OriginatingCentre".**

A new code-list dictionary is published as part of this specification defining the set of permissible values for specifying the scope of distribution within WIS: WMO_DistributionScopeCode (see Part C2, Table 17).

The type of keyword may be specified using the following element:

- /gmd:MD_Metadata/gmd:identificationInfo//gmd:descriptiveKeywords//gmd:type

**The keyword type associated with WMO_DistributionScopeCode thesaurus shall be "dataCentre".** Keyword type "dataCentre" is taken from the MD_KeywordTypeCode class described in ISO/DIS 19115-1:2013.

The WMO Core Metadata Profile places the following additional restriction on ISO 19115:2003/Cor. 1:2006:

**9.1.1 A WIS discovery metadata record describing data for global exchange via WIS shall indicate the scope of distribution using the keyword "GlobalExchange" of type "dataCentre" from thesaurus WMO_DistributionScopeCode.**

## 9.2 Identifiers for metadata describing data published for global exchange

**The identifier (gmd:MD_Metadata/gmd:fileIdentifier) for a WIS discovery metadata record that describes data published for global exchange via WIS shall be formatted as follows:**

- gmd:MD_Metadata/gmd:fileIdentifier = "urn:x-wmo:md:*int.wmo.wis*::{uid}"

where {uid} is a unique identifier derived from the GTS bulletin or file name.

**Unique identifiers ({uid}) for globally exchanged data shall be defined as follows:**

**(a) If a GTS «TTAAii» and «CCCC» is allocated for the product (i.e. where the datasets described by the metadata record employ the WMO file-naming convention P-flag = "T" or P-flag = "A"), use «TTAAii»«CCCC» for the unique identifier; or**

**(b) If a WMO product identifier is allocated for the product (i.e. WMO file-naming convention P-flag = "W"), use a truncated WMO product-identifier field of the associated data-files, excluding the date-stamp and any other varying elements as necessary.**

The WMO Core Metadata Profile places the following additional restriction on ISO 19115:2003/Cor. 1:2006:

**9.2.1 A WIS discovery metadata record describing data for global exchange via WIS shall have a gmd:MD_Metadata/gmd:fileIdentifier attribute formatted as follows: urn:x-wmo:md:*int.wmo.wis*::{uid} (where {uid} is a unique identifier derived from the GTS bulletin or file name).**

Note: To assist readers, the following are examples of gmd:fileIdentifier attributes for data globally exchanged via WIS:

- urn:x-wmo:md:int.wmo.wis::FCUK31EGRR
- urn:x-wmo:md:*int.wmo.wis*::FR-meteofrance-toulouse,GRIB,ARPEGE-75N10N-60W65E_C_LFPW

## 9.3 Defining the WMO data policy and GTS priority for data published for global exchange

**The WMO data policy pertaining to Resolution 40 (Cg-XII), Resolution 25 (Cg-XIII), Resolution 60 (Cg-17) or other regulations (e.g. ICAO Annex 3 – Meteorological Services for International Air Navigation) shall be expressed using the following controlled vocabulary: "WMOEssential", "WMOAdditional" and "WMOOther".**

A new code-list dictionary is published as part of this specification defining the set of permissible values for specifying the WMO data policy: WMO_DataLicenseCode (see Part C2, Table 14).

Note: Inclusion of the data policy in a metadata record describing information satisfies the requirements in the above-mentioned resolutions to notify the Secretary-General or third parties of limitations on the use of the information described in the metadata record Resolution 12 (EC-69). Additional information on the type of restriction on use should be included in the metadata record if the text of the resolution does not describe the restriction adequately. Further information on the description of the data policy is provided in the *Guide to the WMO Information System* (WMO-No. 1061).

The WMO data policy is considered to be a legal constraint applying to both usage and access.

**The WMO data policy shall be defined using the following element:**

- **/gmd:MD_Metadata/gmd:identificationInfo//gmd:resourceConstraints//gmd:otherConstraints**

The presence of more than one WMO data-policy statement in a single metadata record yields an ambiguous state; **a WIS discovery metadata record describing data for global exchange shall declare only a single WMO data policy**.

The WMO Core Metadata Profile places the following additional restriction on ISO 19115:2003/Cor. 1:2006:

**9.3.1 A WIS discovery metadata record describing data for global exchange via WIS shall indicate the WMO data license as a legal constraint (type: "otherConstraints") using one and only one term from the WMO_DataLicenseCode code list.**

Notes:

1. Only exact matches to the terms from the code list are acceptable: "wmo-essential", "WMO Essential" or "WmOaDdiTiOnaL" will all fail to validate.
2. Where WMO data policies "WMOAdditional" or "WMOOther" are cited, a more precise definition of the additional access or usage restrictions may be provided by the data publisher.
3. Guidance on the provision of alternative data policies and access or usage restrictions is provided at: https://community.wmo.int/activity-areas/wis/wcmp.

**GTS priority (also known as GTS product category code) shall be expressed using the following controlled vocabulary: "GTSPriority1", "GTSPriority2", "GTSPriority3" and "GTSPriority4".**

A new code-list dictionary is published as part of this specification defining the set of permissible values for specifying WMO data policy: WMO_GTSProductCategoryCode (see Part C2, Table 15).

GTS priority is considered to be a legal constraint applying to both usage and access.

**GTS priority shall be defined using the following element:**

- /gmd:MD_Metadata/gmd:identificationInfo//gmd:resourceConstraints//gmd: otherConstraints

The presence of more than one GTS priority statement in a single metadata record yields an ambiguous state; **a WIS discovery metadata record describing data for global exchange shall declare only a single GTS priority**.

The WMO Core Metadata Profile places the following additional restriction on ISO 19115:2003/ Cor. 1:2006:

**9.3.2 A WIS discovery metadata record describing data for global exchange via WIS shall indicate GTS priority as a legal constraint (type: "otherConstraints") using one and only one term from the WMO_ GTSProductCategoryCode code list.**

Note: Only exact matches to the terms from the code list are acceptable: "gts-priority-4", "GTS Priority 4", or "GtsPriority4" will all fail to validate.

**The absence of both gmd:accessConstraints and gmd:useConstraints shall be interpreted such that the terms expressed in gmd:otherConstraints (e.g. WMO data policy and GTS priority) apply to both access and use.**

However, this should be made explicit by expressing:

gmd:MD_LegalConstraints/gmd:accessConstraints and
gmd:MD_LegalConstraints/gmd:useConstraints using
gmd:MD_RestrictionCode "otherRestrictions".

Note: Example

```
<gmd:resourceConstraints>
  <gmd:MD _ LegalConstraints>
     <gmd:accessConstraints>
         <gmd:MD _ RestrictionCode
            codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/
            ISO _ 19139 _ Schemas/resources/Codelist/gmxCodelists.xml#MD _ RestrictionCode"
            codeListValue="otherRestrictions">
            otherRestrictions
     </gmd:MD _ RestrictionCode>
  </gmd:accessConstraints>
  <gmd:useConstraints>
     <gmd:MD _ RestrictionCode
            codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/
            ISO _ 19139 _ Schemas/resources/Codelist/gmxCodelists.xml#MD _ RestrictionCode"
            codeListValue="otherRestrictions">
            otherRestrictions
     </gmd:MD _ RestrictionCode>
  </gmd:useConstraints>
  <gmd:otherConstraints>
```

```
      <gco:CharacterString>WMOEssential</gco:CharacterString>
  </gmd:otherConstraints>
  <gmd:otherConstraints>
     <gco:CharacterString>GTSPriority3</gco:CharacterString>
     </gmd:otherConstraints>
  </gmd:MD _ LegalConstraints>
</gmd:resourceConstraints>
```

All statements regarding constraints originating from a single source should be grouped into a single gmd:resourceConstraints element.

Note: This practice aims to ensure forward compatibility with ISO 19115-1:2013 (currently in Draft International Standard status), where the amended gmd:MD_Constraints class is expected to include information about the source of a (set of) constraint(s).

## 10. SUMMARY OF ADDITIONAL RESTRICTIONS

The requirements defined in this specification are summarized in Table 4, Table 5 and Table 6. They are grouped according to the encoding requirements expressed in section 6 and the formal requirements expressed in sections 8 and 9.

**Table 4. XML encoding (6)**

| | *Encoding rule* | | *Description* |
|---|---|---|---|
| 1 | ISO/TS 19139:2007 compliance | 6.1.1 | [MANDATORY obligation] **Each WIS discovery metadata record shall validate without error against the XML schemas defined in ISO/TS 19139:2007.** |
| | | 6.1.2 | [MANDATORY obligation] **Each WIS discovery metadata record shall validate without error against the rule-based constraints listed in ISO/TS 19139:2007 Annex A (Table A.1).** |
| 2 | Explicit identification of namespaces in XML | 6.2.1 | [MANDATORY obligation] **Each WIS discovery metadata record shall explicitly name all namespaces used within the record; use of default namespaces is prohibited.** |
| 3 | Specification of GML namespace | 6.3.1 | [MANDATORY obligation] **Each WIS discovery metadata record shall declare the following XML namespace for GML:** http://www.opengis.net/gml/3.2. |

**Table 5. Metadata uniqueness and discovery within the WIS DAR metadata (WIS discovery metadata) catalogue (8)**

| | *Target element(s)* | | *Description* |
|---|---|---|---|
| 4 | gmd:MD_Metadata/gmd:fileIdentifier | 8.1.1 | [MANDATORY obligation] **Each WIS discovery metadata record shall include one gmd:MD_Metadata/gmd: fileIdentifier attribute.** |
| | | 8.1.2 | [MANDATORY obligation] **The gmd:MD _Metadata/gmd:fileIdentifier attribute for each WIS discovery metadata record shall be unique within WIS.** |
| 5 | gmd:MD_Metadata/gmd:identificationInfo/ ↘gmd:MD_Identification/gmd: descriptiveKeywords | 8.2.1 | [MANDATORY obligation] **Each WIS discovery metadata record shall include at least one keyword from the WMO_CategoryCode code list.** |

| | *Target element(s)* | | *Description* |
|---|---|---|---|
| | | 8.2.2 | [MANDATORY obligation] **Keywords from the WMO_CategoryCode code list shall be defined as keyword type "theme".** |
| | | 8.2.3 | [MANDATORY obligation] **All keywords sourced from a particular keyword thesaurus shall be grouped into a single instance of the MD_Keywords class.** |
| 6 | gmd:MD_Metadata/gmd:identificationInfo/↘gmd:MD_DataIdentification/gmd:extent/↘gmd:EX_Extent/gmd:geographicExtent/ | 8.2.4 | [CONDITIONAL obligation: geographic data only] **Each WIS discovery metadata record describing geographic data shall include the description of at least one geographic bounding box defining the spatial extent of the data.** |

**Table 6. Description of data for global exchange via WIS (9)**

| | *Target element(s)* | | *Description* |
|---|---|---|---|
| 7 | gmd:MD_Metadata/gmd:identificationInfo/↘gmd:MD_Identification/gmd:descriptiveKeywords | 9.1.1 | [MANDATORY obligation] **A WIS discovery metadata record describing data for global exchange via WIS shall indicate the scope of distribution using the keyword "GlobalExchange" of type "dataCentre" from thesaurus WMO_DistributionScopeCode.** |
| 8 | gmd:MD_Metadata/gmd:fileIdentifier | 9.2.1 | [CONDITIONAL obligation: data globally exchanged via WIS only] **A WIS discovery metadata record describing data for global exchange via WIS shall have a gmd:MD_Metadata/gmd:fileIdentifier attribute formatted as follows: urn:x-wmo:md:int.wmo.wis::{uid} (where {uid} is a unique identifier derived from the GTS bulletin or file name).** |
| 9 | gmd:MD_Metadata/gmd:identificationInfo/↘gmd:MD_DataIdentification/↘gmd:resourceConstraints/↘gmd:MD_LegalConstraints/gmd:otherConstraints | 9.3.1 | [CONDITIONAL obligation: data globally exchanged via WIS only] **A WIS discovery metadata record describing data for global exchange via WIS shall indicate the WMO data license as a legal constraint (type: "otherConstraints") using one and only one term from the WMO_DataLicenseCode code list.** |
| | | 9.3.2 | [CONDITIONAL obligation: data globally exchanged via WIS only] **A WIS discovery metadata record describing data for global exchange via WIS shall indicate the GTS priority as a legal constraint (type: "otherConstraints") using one and only one term from the WMO_GTSProductCategoryCode code list.** |

## 11. AMENDMENTS TO CODE LISTS/NEW CODE LISTS

Table 7 lists the modifications and additions to the code lists defined in ISO 19115:2003. Please refer to Part C2, 4, for more information on code-list extensions.

**Table 7. Modifications and additions to the ISO 19115:2003 code lists**

| | *Target code list* | *Change* | *Description* |
|---|---|---|---|
| 1 | CI_DateTypeCode | Amendment | Additional term «reference» [004]<br>See Part C2, Table 8. |
| 2 | MD_KeywordTypeCode | Amendment | Additional term «dataCentre» [006] – from ISO/DIS 19115-1:2013.<br>See Part C2, Table 10. |
| 3 | WMO_DataLicenseCode | New | WMO data license applied to the data resource – derived from WMO Resolution 40 (Cg-XII), Resolution 25 (Cg-XIII) and Resolution 60 (Cg-17).<br>See Part C2, Table 14. |
| 4 | WMO_ GTSProductCategoryCode | New | Product category used for prioritizing messages over the WMO GTS<br>See Part C2, Table 15. |
| 5 | WMO_CategoryCode | New | Additional topic categories for the WMO community<br>See Part C2, Table 16. |
| 6 | WMO_DistributionScopeCode | New | Scope of distribution of data within WIS<br>See Part C2, Table 17. |

## 12. WMO CORE METADATA PROFILE UML MODEL

**Metadata records compliant with the WMO Core Metadata Profile shall contain as a minimum the information defined in Figure 1.** These are the "mandatory" elements of the record.

**The WMO Core Metadata Profile specification defines a further set of elements that shall be included in a WIS discovery metadata record under certain conditions.** These are illustrated in Figure 2.

Details of the UML classes and attributes are provided in Part C2, 3.

Note: For reference, the normative UML model for ISO 19115:2003/Cor. 1:2006 is published by ISO/TC 211 at: https://committee.iso.org/home/tc211.

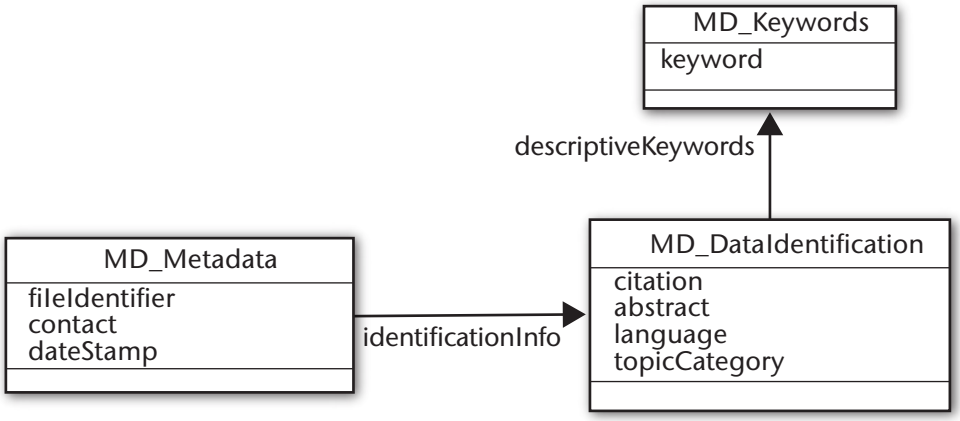


**Figure 1. Mandatory contents of a WIS discovery metadata record**

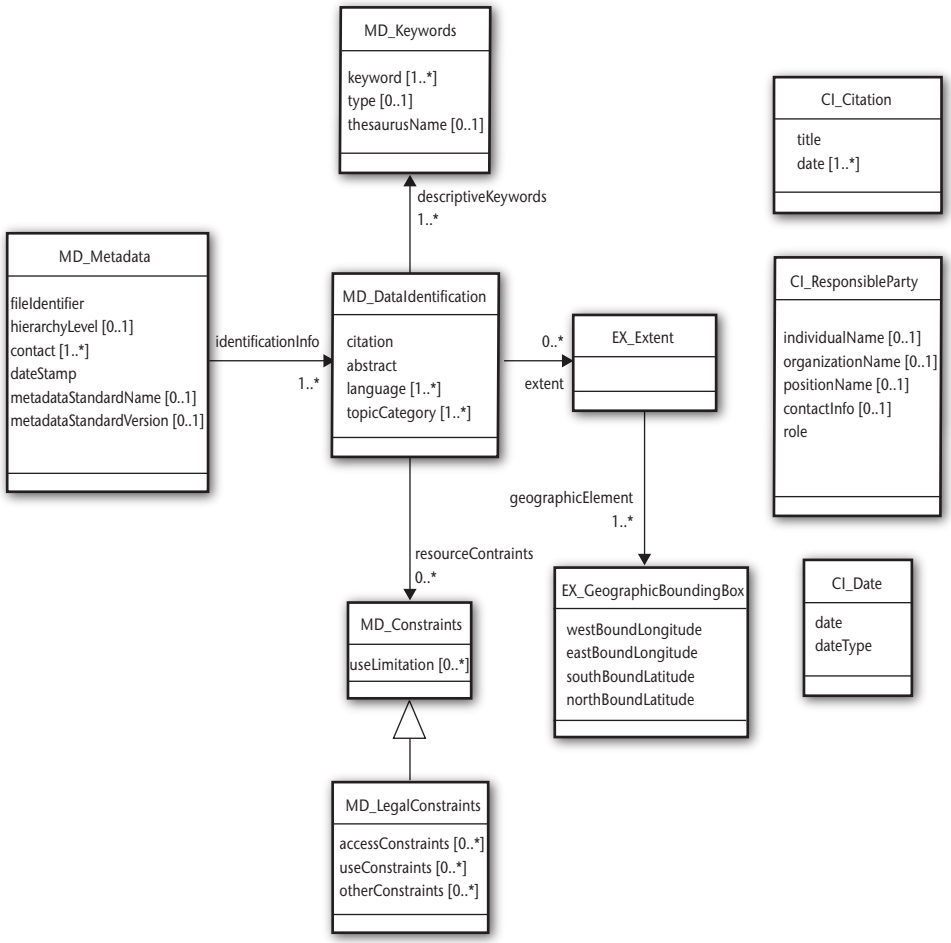


**Figure 2. Full specification of the WMO Core Metadata Profile, including both optional and mandatory items**

# PART C2. WMO CORE METADATA PROFILE VERSION 1.3 SPECIFICATION: ABSTRACT TEST SUITE, DATA DICTIONARY AND CODE LISTS

## 1. SCOPE

The specification defines the content, structure and encoding of discovery metadata published within the WIS DAR metadata (WIS discovery metadata) catalogue.

The metadata standard defined herein is an informal category-1 profile[1] of the International Standard ISO 19115:2003 'Geographic information – Metadata'. **This metadata standard shall be referred to as the WMO Core Metadata Profile.**

**WIS discovery metadata records shall be encoded in XML as defined by ISO/TS 19139:2007.**

Part C1 of this specification defines the conformance requirements for the WMO Core Metadata Profile. Part C2 defines the abstract test suite, data dictionary and code lists. Unless otherwise stated, references to Part C1 and Part C2 are to the relevant parts of this specification.

## 2. ABSTRACT TEST SUITE (NORMATIVE)

Notes:

1. Automated test suites for validating XML metadata records against both formal requirements and guidance can be found at : https://community.wmo.int/activity-areas/wis/wcmp.
2. An authoritative copy of the automated test suite for validating against the formal requirements described in this specification can be found at: http://wis.wmo.int/2012/metadata/validationTestSuite.

### 2.1 Abstract tests for XML encoding

#### 2.1.1 *ISO/TS 19139:2007 compliance*

Test id: ISO-TS-19139-2007-xml-schema-validation

Test purpose: **Requirement 6.1.1: Each WIS discovery metadata record shall validate without error against the XML schemas defined in ISO/TS 19139:2007.**

Test method: Using a tool with strict interpretation of XML schema and full support for the W3C XML schema, validate the instance document under test against the XML schemas created from the UML model of ISO 19115:2003/Cor. 1:2006 using the encoding rules defined in ISO/TS 19139:2007 'Geographic information – Metadata – XML schema implementation' Clause 9. The normative location for these XML schemas is hosted by ISO at: https://standards.iso.org/iso/19139/.

A reference copy of these XML schemas is hosted by WMO at: http://wis.wmo.int/2012/schemata/iso19139_2007/schema/gmd/gmd.xsd.

Test id: ISO-TS-19139-2007-rule-based-validation

[1] A category-1 profile places additional restrictions on the use of an international standard to meet the more specific requirements of a given community. Profiles of international standards may be formally registered. The WMO profile of ISO 19115 has not been registered and thus remains an "informal" profile.

Test purpose: **Requirement 6.1.2: Each WIS discovery metadata record shall validate without error against the rule-based constraints listed in ISO/TS 19139:2007 Annex A (Table A.1).**

Test method: Using a tool that supports Schematron (ISO/IEC 19757-3:2006 'Information technology – Document Schema Definition Language (DSDL) – Part 3: Rule-based validation – Schematron'), validate the instance document under test against the rule-based constraints listed in ISO/TS 19139:2007 Annex A (Table A.1). A reference set of Schematron rules for this purpose is hosted by WMO at: http://wis.wmo.int/2012/metadata/validationTestSuite.

### 2.1.2 *Explicit identification of namespaces in XML*

Test id: explicit-xml-namespace-identification

Test purpose: **Requirement 6.2.1: Each WIS discovery metadata record shall explicitly name all namespaces used within the record; use of default namespaces is prohibited.**

Test method: In the instance document under test, inspect all "xmlns" declarations to ensure that an XML namespace is provided, for example: <gmd:MD_Metadata xmlns:gmd="http://www.isotc211.org/2005/gmd" … > The following "xmlns" declaration is not permitted: <MD_Metadata xmlns:="http://www.isotc211.org/2005/gmd" … >

### 2.1.3 *Specification of GML namespace*

Test id: gml-namespace-specification

Test purpose: Requirement 6.3.1: Each WIS discovery metadata record shall declare the following XML namespace for GML: http://www.opengis.net/gml/3.2.

Test method: In the instance document under test, inspect all "xmlns" declarations to ensure that the GML namespace is specified as http://www.opengis.net/gml/3.2, for example:

xmlns:gml="http://www.opengis.net/gmd/3.2"

## 2.2 Abstract tests for metadata uniqueness and discovery within the WIS DAR metadata (WIS discovery metadata) catalogue

### 2.2.1 *Unique gmd:fileIdentifier attribute*

Test id: fileIdentifier-cardinality

Test purpose: Requirement 8.1.1: Each WIS discovery metadata record shall include one gmd:MD_Metadata/gmd:fileIdentifier attribute.

Test method: In the instance document under test, validate that there is one and only one instance of the element identified by the following XPath: /gmd:MD_Metadata/gmd:fileIdentifier

Note: There is no abstract test for Requirement 8.1.2: The gmd:MD_Metadata/gmd:fileIdentifier attribute for each WIS discovery metadata record shall be unique within WIS.

### 2.2.2 *Mandatory WMO_CategoryCode keyword*

Test id: WMO_CategoryCode-keyword-cardinality

Test purpose: **Requirement 8.2.1: Each WIS discovery metadata record shall include at least one keyword from the WMO_CategoryCode code list.**

Test method: (i) Inspect the instance document under test to assess whether the WMO_CategoryCode code list is specified as a keyword thesaurus within an instance of gmd:MD_Keywords using the following XPath:
/gmd:MD_Metadata/gmd:identificationInfo//gmd:descriptiveKeywords/↘gmd:MD_Keywords/gmd:thesaurusName/gmd:CI_Citation/gmd:title// = "WMO_CategoryCode"
A gmx:Anchor element may be used to specify the location of the code list, e.g.
/gmd:MD_Metadata/gmd:identificationInfo//gmd:descriptiveKeywords/↘gmd:MD_Keywords/gmd:thesaurusName/gmd:CI_Citation/gmd:title/↘gmx:Anchor/@xlink:href = "http://wis.wmo.int/2012/codelists/WMOCodeLists.xml#WMO_CategoryCode"
(ii) Inspect the associated gmd:MD_Keywords element to ensure that at least one instance of a keyword from the WMO_CategoryCode code list is present. A normative version of the WMO_CategoryCode code list is published by WMO at: http://wis.wmo.int/2012/codelists/WMOCodeLists.xml. Instances of keyword are identified by the following XPath:
/gmd:MD_Metadata/gmd:identificationInfo//gmd:descriptiveKeywords/↘gmd:MD_Keywords/gmd:keyword

Test id: WMO_CategoryCode-keyword-theme

Test purpose: **Requirement 8.2.2: Keywords from WMO_CategoryCode code list shall be defined as keyword type "theme".**

Test method: (i) Inspect the instance document under test to assess whether the WMO_CategoryCode code list is specified as a keyword thesaurus within an instance of gmd:MD_Keywords using the following XPath:
/gmd:MD_Metadata/gmd:identificationInfo//gmd:descriptiveKeywords/↘gmd:MD_Keywords/gmd:thesaurusName/gmd:CI_Citation/gmd:title// = "WMO_CategoryCode"
A gmx:Anchor element may be used to specify the location of the code list, e.g.
/gmd:MD_Metadata/gmd:identificationInfo//gmd:descriptiveKeywords/↘gmd:MD_Keywords/gmd:thesaurusName/gmd:CI_Citation/gmd:title/↘gmx:Anchor/@xlink:href = "http://wis.wmo.int/2012/codelists/WMOCodeLists.xml#WMO_CategoryCode"
(ii) Inspect the associated gmd:MD_Keywords element to ensure that the keyword type is specified as "theme" from the MD_KeywordTypeCode code list, e.g.
/gmd:MD_Metadata/gmd:identificationInfo//gmd:descriptiveKeywords/↘gmd:MD_Keywords/gmd:type/gmd:MD_KeywordTypeCode = "theme"

Test id: keyword-grouping

Test purpose: **Requirement 8.2.3: All keywords sourced from a particular keyword thesaurus shall be grouped into a single instance of the MD_Keywords class.**

Test method: Inspect the instance document under test to assess whether each keyword thesaurus is specified once and once only. The keyword thesaurus title is specified using the following XPath:
/gmd:MD_Metadata/gmd:identificationInfo//gmd:descriptiveKeywords/
↘gmd:MD_Keywords/gmd:thesaurusName/gmd:CI_Citation/gmd:title//

### 2.2.3 *Geographic data extent specification with bounding box*

Test id: geographic-bounding-box

Test purpose: **Requirement 8.2.4: Each WIS discovery metadata record describing geographic data shall include the description of at least one geographic bounding box defining the spatial extent of the data.**

Test method: (i) Inspect the instance document under test to assess whether the metadata record is describing geographic data, e.g.

/gmd:MD_Metadata/gmd:hierarchyLevel/gmd:MD_ScopeCode != "nonGeographicDataset"

(ii) Inspect the instance document under test to assess whether the geographic extent is specified using a bounding box. **Abstract test** ISO-TS-19139-2007-rule-based-validation **shall ensure that the bounding box is correctly specified.** The geographic extent bounding box is specified using the following XPath:

/gmd:MD_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/
↘gmd:extent/

↘gmd:EX_Extent/gmd:geographicElement/gmd:EX
_GeographicBoundingBox

Note: There is no abstract test for Requirement 8.2.5: All information within a metadata record shall, as a minimum, be provided in English within the metadata record.

## 2.3 Description of data for global exchange via WIS

### 2.3.1 *Identification of data for global exchange via WIS*

Test id: identification-of-globally-exchanged-data

Test purpose: **Requirement 9.1.1: A WIS discovery metadata record describing data for global exchange via WIS shall indicate the scope of distribution using the keyword "GlobalExchange" of type "dataCentre" from thesaurus WMO_ DistributionScopeCode.**

Test method: (i) Inspect the instance document under test to assess whether the WMO_ DistributionScopeCode code list is specified as a keyword thesaurus within an instance of gmd:MD_Keywords using the following XPath:

/gmd:MD_Metadata/gmd:identificationInfo//gmd:descriptiveKeywords/
↘gmd:MD_Keywords/gmd:thesaurusName/gmd:CI_Citation/gmd:title// =
"WMO_DistributionScopeCode"

A gmx:Anchor element may be used to specify the location of the Code List; e.g.

/gmd:MD_Metadata/gmd:identificationInfo//gmd:descriptiveKeywords/
↘gmd:MD_Keywords/gmd:thesaurusName/gmd:CI_Citation/gmd:title/

↘gmx:Anchor/@xlink:href = "http://wis.wmo.int/2012/codelists/
WMOCodeLists.xml#WMO_DistributionScopeCode"

(ii) Inspect the associated gmd:MD_Keywords element to ensure that the keyword type is specified as "dataCentre" from the (amended) MD_KeywordTypeCode code list, e.g.

/gmd:MD_Metadata/gmd:identificationInfo//gmd:descriptiveKeywords/
↘gmd:MD_Keywords/gmd:type/gmd:MD_KeywordTypeCode =
"dataCentre"

(iii) Inspect the associated gmd:MD_Keywords element to assess whether the keyword "GlobalExchange" from the WMO_DistributionScopeCode code list is present; e.g.

/gmd:MD_Metadata/gmd:identificationInfo//gmd:descriptiveKeywords/
↘gmd:MD_Keywords/gmd:keyword = "GlobalExchange"

Test id: fileIdentifier-for-globally-exchanged-data

Test purpose: **Requirement 9.2.1: A WIS discovery metadata record describing data for global exchange via WIS shall have a gmd:MD_Metadata/gmd:fileIdentifier attribute formatted as follows: urn:x-wmo:md:int.wmo.wis::{uid} (where {uid} is a unique identifier derived from the GTS bulletin or file name).**

Test method: In the instance document under test, validate that the gmd:fileIdentifier element conforms to the following regular expression:

/gmd:MD_Metadata/gmd:fileIdentifier// = "urn:x-wmo:md:int.wmo.wis::"

### 2.3.2 *Specification of WMO data policy for globally exchanged data*

Test id: WMO-data-policy-for-globally-exchanged-data

Test purpose: **Requirement 9.3.1: A WIS discovery metadata record describing data for global exchange via WIS shall indicate the WMO data license as a legal constraint (type: "otherConstraints") using one and only one term from the WMO_DataLicenseCode code list.**

Test method: Inspect the instance document under test to assess whether one and only one instance of a term from the WMO_DataLicenseCode code list is specified using the following XPath:

/gmd:MD_Metadata/gmd:identificationInfo//gmd:resourceConstraints/
↘gmd:MD_LegalConstaints/gmd:otherConstraints//

A normative version of the WMO_DataLicenseCode code list is published by WMO at: http://wis.wmo.int/2012/codelists/WMOCodeLists.xml.

A gmx:Anchor element may be used to specify the location of the code list, e.g.

/gmd:MD_Metadata/gmd:identificationInfo//gmd:resourceConstraints/
↘gmd:MD_LegalConstaints/gmd:otherConstraints/gmx:Anchor/@xlink:
href = "http://wis.wmo.int/2012/codelists/WMOCodeLists.xml#WMO
_DataLicenseCode"

### 2.3.3 *Specification of GTS product category (GTS priority) for globally exchanged data*

Test id: GTS-priority-for-globally-exchanged-data

Test purpose: **Requirement 9.3.2: A WIS discovery metadata record describing data for global exchange via WIS shall indicate the GTS priority as a legal constraint (type: "otherConstraints") using one and only one term from the WMO_ GTSProductCategoryCode code list.**

Test method: Inspect the instance document under test to assess whether one and only one instance of a term from the WMO_GTSProductCategoryCode code list is specified using the following XPath:

/gmd:MD_Metadata/gmd:identificationInfo//gmd:resourceConstraints/ ↘gmd:
MD_LegalConstaints/gmd:otherConstraints//

A normative version of the WMO_GTSProductCategoryCode code list is published by WMO at: http://wis.wmo.int/2012/codelists/WMOCodeLists.xml.

A gmx:Anchor element may be used to specify the location of the code list, for example:

/gmd:MD_Metadata/gmd:identificationInfo//gmd:resourceConstraints/ ↘gmd:
MD_LegalConstaints/gmd:otherConstraints/gmx:Anchor/@xlink:href =

"http://wis.wmo.int/2012/codelists/WMOCodeLists.xml"

## 3. WMO CORE METADATA PROFILE DATA DICTIONARY

This data dictionary includes only mandatory elements from ISO 19115:2003 and associated corrigendum and elements explicitly mentioned within this specification. Other elements are omitted. Please refer to ISO 19115:2003 and ISO 19115:2003/Cor. 1:2006 for further information. Note that additional guidance for metadata authors is provided at https://community.wmo.int/activity-areas/wis/wcmp.

Table 1 to Table 7 are tabular representations of the UML diagrams for the WMO Core Metadata Profile. **Items marked with "M" in the "Obligation/Condition" column shall be present in a valid WMO Core Metadata Profile record.** Entries marked with "O" should be present if they are applicable. **Entries marked with "C" shall be present if the associated condition is met.**

Line numbers match those defined in ISO 19115:2003 and the associated corrigendum.

**Table 1. Metadata entity set information**

| | *Name/role name* | *Definition* | *Obligation/ condition* | *Maximum occurrence* | *Data type* | *Domain* |
|---|---|---|---|---|---|---|
| 1 | MD_Metadata | root entity which defines metadata about a resource or resources | M | 1 | Class | Lines 2-22 |
| 2 | fileIdentifier | unique identifier for this metadata file | M | 1 | CharacterString | Free text<br>See Part C1, 8.1 and 9.2. |
| 6 | hierarchyLevel | scope to which the metadata applies | O | 1 | Class | MD_ScopeCode «CodeList»<br>See Table 12. |
| 8 | Contact | party responsible for the metadata | M | N | Class | CI_ResponsibleParty «DataType»<br>See Table 6. |
| 9 | dateStamp | date that the metadata was created or revised | M | 1 | Class | Date |
| 10 | metadataStandardName | name of the metadata standard (including profile name) used | O | 1 | CharacterString | Free text |
| 11 | metadataStandardVersion | version of the metadata standard (version of the profile) used | O | 1 | CharacterString | Free text<br>See Part C1, 7. |
| 15 | Role name: identificationInfo | basic information about the resource(s) to which the metadata applies | M | N | Association | MD_DataIdentification<br>See Table 2. |

**Table 2. Identification information (includes data identification)**

| | *Name/role name* | *Definition* | *Obligation/ condition* | *Maximum occurrence* | *Data type* | *Domain* |
|---|---|---|---|---|---|---|
| 23 | MD_Identification | basic information required to uniquely identify a resource or resources | Use obligation from referencing object | Use maximum occurrence from referencing object | Aggregated class (MD_Metadata) «Abstract» | Lines 24-35.1 |
| 24 | Citation | information about citing the resource(s) | M | 1 | Class | CI_Citation«DataType»<br>See Table 6. |
| 25 | Abstract | brief narrative summary of the content of the resource(s) | M | 1 | CharacterString | Free text |
| 33 | Role name: descriptiveKeywords | provides category keywords, their type, and reference source | M | N | Association | MD_Keywords<br>See Table 3<br>See Part C1, 8.2 and 9.1. |
| 35 | Role name: resourceConstraints | provides information about constraints which apply to the resource(s) | O | N | Association | MD_Constraints<br>See Table 4.<br>See Part C1, 9.3. |
| 36 | MD_DataIdentification | basic information required to uniquely identify a dataset | Use obligation from referencing object | Use maximum occurrence from referencing object | Specified Class (MD_Identification) | Lines 37-46 and 24-35.1 |
| 39 | Language | language(s) used within the dataset | M | N | CharacterString | ISO 639-2 recommended |
| 41 | topicCategory | main theme(s) of the dataset | M | N | Class | MD_ TopicCategoryCode«Enumeration»<br>See Table 13. |
| 45 | Extent | extent information including the bounding box, bounding polygon, vertical and temporal extent of the dataset | C | N | Association | EX_Extent«DataType»<br>See Table 5<br>See Part C1, 8.2. |

**Table 3. Keyword information**

| | *Name/role name* | *Definition* | *Obligation/ condition* | *Maximum occurrence* | *Data type* | *Domain* |
|---|---|---|---|---|---|---|
| 52 | MD_Keywords | Keywords, their type and source | Use obligation from referencing object | Use maximum occurrence from referencing object | Aggregated class (MD_Identification) | Lines 53-55 |
| 53 | Keyword | commonly used word(s) or formalized word(s) or phrase(s) used to describe the subject | M | N | CharacterString | Free text<br>See Part C1, 8.2 and Part C1, 9.1. |
| 54 | Type | subject matter used to group similar keywords | O | 1 | Class | MD_KeywordTypeCode «CodeList»<br>See Table 10.<br>See Part C1, 8.2 and Part C1, 9.1. |
| 55 | thesaurusName | name of a formally registered thesaurus or a similar authoritative source of keywords | O | 1 | Class | CI_Citation «DataType»<br>See Table 6<br>See Part C1, 8.2 and Part C1, 9.1. |

**Table 4. Constraint information (includes legal)**

| | *Name/role name* | *Definition* | *Obligation/ condition* | *Maximum occurrence* | *Data type* | *Domain* |
|---|---|---|---|---|---|---|
| 67 | MD_Constraints | restrictions on the access and use of a resource or metadata | Use obligation from referencing object | Use maximum occurrence from referencing object | Aggregated class (MD_Metadata and MD_Identification) | Line 68 |
| 68 | useLimitation | limitation affecting the fitness for use of the resource or metadata. Example, “not to be used for navigation” | O | N | CharacterString | Free text |
| 69 | MD_LegalConstraints | restrictions and legal prerequisites for accessing and using the resource or metadata | Use obligation from referencing object | N | Specialized class (MD_Constraints) | Lines 70-72 and 68 |
| 70 | accessConstraints | access constraints applied to assure the protection of privacy or intellectual property, and any special restrictions or limitations or warnings on obtaining the resource or metadata | O | N | Class | MD_RestrictionCode «CodeList» See Table 11. |
| 71 | useConstraints | constraints applied to assure the protection of privacy or intellectual property, and any special restrictions or limitations or warnings on using the resource or metadata | O | N | Class | MD_RestrictionCode «CodeList» See Table 11. |
| 72 | otherConstraints | other restrictions and legal prerequisites for accessing and using the resource or metadata | C /accessConstraints or useConstraints equal “otherRestrictions” | N | CharacterString | Free text or code table See Part C1, 9.3. |

**Table 5. Extent information**

| | *Name/role name* | *Definition* | *Obligation/ condition* | *Maximum occurrence* | *Data type* | *Domain* |
|---|---|---|---|---|---|---|
| 334 | EX_Extent | information about horizontal, vertical and temporal extent | Use obligation from referencing object | Use maximum occurrence from referencing object | Class «DataType» | Lines 335-338 |
| 336 | Role name: geographicElement | provides geographic component of the extent of the referring object | C | N | Association | EX_GeographicExtent «Abstract» See Table 5. See Part C1, 8.2. |
| 339 | EX_GeographicExtent | geographic area of the dataset | Use obligation from referencing object | Use maximum occurrence from referencing object | Aggregated class (EX_Extent and EX_ SpatialTemporalExtent) «Abstract» | Line 340 |
| 343 | EX_ GeographicBoundingBox | geographic position of the dataset NOTE This is only an approximate reference so specifying the coordinate reference system is unnecessary | C | Use maximum occurrence from referencing object | Specialized class (EX_ GeographicExtent) | Lines 344-347 and 340 |
| | | | See Subclause 8.2 (Part C1) | | | |
| 344 | westBoundLongitude | westernmost coordinate of the limit of the dataset extent, expressed in longitude in decimal degrees (positive east) | M | 1 | Class | Angle -180.0 ≤ West Bounding Longitude Value ≤180.0 See Part C1, 8.2. |
| 345 | eastBoundLongitude | easternmost coordinate of the limit of the dataset extent, expressed in longitude in decimal degrees (positive east) | M | 1 | Class | Angle -180.0 ≤ East Bounding Longitude Value ≤180.0 See Part C1, 8.2. |

| | *Name/role name* | *Definition* | *Obligation/ condition* | *Maximum occurrence* | *Data type* | *Domain* |
|---|---|---|---|---|---|---|
| 346 | southBoundLatitude | southernmost coordinate of the limit of the dataset extent, expressed in latitude in decimal degrees (positive north) | M | 1 | Class | -90.0 ≤ South Bounding Latitude Value ≤ 90.0; South Bounding Latitude Value ≤ North Bounding Latitude Value See Part C1, 8.2. |
| 347 | northBoundLatitude | northernmost, coordinate of the limit of the dataset extent expressed in latitude in decimal degrees (positive north) | M | 1 | Class | -90.0 ≤ North Bounding Latitude Value ≤ 90.0; North Bounding Latitude Value ≥ South Bounding Latitude Value See Part C1, 8.2. |

**Table 6. Citation and responsible party information**

| | *Name/role name* | *Definition* | *Obligation/ condition* | *Maximum occurrence* | *Data type* | *Domain* |
|---|---|---|---|---|---|---|
| 359 | CI_Citation | standardized resource reference object | Use obligation/condition from referencing object | Use maximum occurrence from referencing | Class «DataType» | Lines 360-373 |
| 360 | Title | name by which the cited resource is known | M | 1 | CharacterString | Free text |
| 362 | Date | reference date for the cited resource | M | N | Class | CI_Date «DataType» SeeTable 7. |
| 374 | CI_ResponsibleParty | identification of, and means of communication with, person(s) and organizations associated with the dataset | Use obligation/condition from referencing object | Use maximum occurrence from referencing object | Class «DataType» | Lines 375-379 |
| 375 | individualName | name of the responsible person surname, given name, title separated by a delimiter | C /organisationName and positionName not documented? | 1 | CharacterString | Free text |
| 376 | organisationName | name of the responsible organization | C /individualName and positionName not documented? | 1 | CharacterString | Free text |
| 377 | positionName | role or position of the responsible person | C /individualName and organisationName not documented? | 1 | CharacterString | Free text |
| 378 | contactInfo | contact information for the responsible party | O | 1 | Class | CI_Contact «DataType» |
| 379 | Role | function performed by the responsible party | M | 1 | Class | CI_RoleCode «CodeList» See Table 9. |

**Table 7. Date information**

| | *Name/role name* | *Definition* | *Obligation/ condition* | *Maximum occurrence* | *Data type* | *Domain* |
|---|---|---|---|---|---|---|
| 393 | CI_Date | reference date and event used to describe it | Use obligation/ condition from referencing object | Use maximum occurrence from referencing object | Class «DataType» | Lines 119-120 |
| 394 | Date | reference date for the cited resource | M | 1 | Class | Date |
| 395 | dateType | event used for the reference date | M | 1 | Class | CI_DateTypeCode «CodeList» See Table 8. |

## 4. CODE LISTS AND ENUMERATIONS

Table 8 to Table 13 describe the code lists defined in ISO 19115:2003 and ISO 19115:2003/Cor. 1:2006 that are referenced in the WMO Core Metadata Profile Specification.

Table 14 to Table 17 describe the new code lists defined in the WMO Core Metadata Profile. A GML code-list dictionary implementation of the new and amended code lists is published at: http://wis.wmo.int/2012/codelists/WMOCodeLists.xml.

**Table 8. CI_DateTypeCode «CodeList»**

| | *Name* | *Domain code* | *Definition* |
|---|---|---|---|
| 1. | CI_DateTypeCode | DateTypCd | identification of when a given event occurred |
| 2. | Creation | 001 | date identifies when the resource was brought into existence |
| 3. | Publication | 002 | date identifies when the resource was issued |
| 4. | Revision | 003 | date identifies when the resource was examined and improved or amended |
| 5. | Reference | 004 | date identifies when the resource was referenced or accessed |

**Table 9. CI_RoleCode «CodeList»**

| | *Name* | *Domain code* | *Definition* |
|---|---|---|---|
| 1. | CI_RoleCode | RoleCd | function performed by the responsible party |
| 2. | resourceProvider | 001 | party that supplies the resource |
| 3. | Custodian | 002 | party that accepts accountability and responsibility for the data and ensures appropriate care and maintenance of the resource |
| 4. | Owner | 003 | party that owns the resource |
| 5. | User | 004 | party who uses the resource |
| 6. | Distributor | 005 | party who distributes the resource |
| 7. | Originator | 006 | party who created the resource |
| 8. | pointOfContact | 007 | party who can be contacted for acquiring knowledge about or acquisition of the resource |
| 9. | principalInvestigator | 008 | key party responsible for gathering information and conducting research |
| 10. | Processor | 009 | party who has processed the data in a manner such that the resource has been modified |
| 11. | Publisher | 010 | party who published the resource |
| 12. | Author | 011 | party who authored the resource |

**Table 10. MD_KeywordTypeCode «CodeList»**

| | *Name* | *Domain code* | *Definition* |
|---|---|---|---|
| 1. | MD_ KeywordTypeCode | KeyTypCd | methods used to group similar keywords |
| 2. | Discipline | 001 | keyword identifies a branch of instruction or specialized learning |

| | *Name* | *Domain code* | *Definition* |
|---|---|---|---|
| 3. | Place | 002 | keyword identifies a location |
| 4. | Stratum | 003 | keyword identifies layer(s) of any deposited substance |
| 5. | Temporal | 004 | keyword identifies a time period related to the dataset |
| 6. | Theme | 005 | keyword identifies a particular subject or topic |
| 7. | dataCentre | 006 | keyword identifies a repository or archive that manages and distributes data (from ISO/DIS 19115-1:2013) |
| 8. | dataParam | 007 | keyword defines a data parameter contained within the resource |

**Table 11. MD_RestrictionCode «CodeList»**

| | *Name* | *Domain code* | *Definition* |
|---|---|---|---|
| 1. | MD_RestrictionCode | RestrictCd | limitation(s) placed upon access or use of the data |
| 2. | Copyright | 001 | exclusive right to the publication, production, or sale of the rights to a literary, dramatic, musical or artistic work, or to the use of a commercial print or label, granted by law for a specified period of time to an author, composer, artist or distributor |
| 3. | Patent | 002 | government has granted exclusive right to make, sell, use or license an invention or discovery |
| 4. | patentPending | 003 | produced or sold information awaiting a patent |
| 5. | Trademark | 004 | a name, symbol, or other device identifying a product, officially registered and legally restricted to the use of the owner or manufacturer |
| 6. | License | 005 | formal permission to do something |
| 7. | intellectualPropertyRights | 006 | Rights to financially benefit from and control distribution of non-tangible property that is the result of creativity |
| 8. | Restricted | 007 | Withheld from general circulation or disclosure |
| 9. | otherRestrictions | 008 | limitation not listed |

**Table 12. MD_ScopeCode «CodeList»**

| | *Name* | *Domain code* | *Definition* |
|---|---|---|---|
| 1. | MD_ScopeCode | ScopeCd | class of information to which the referencing entity applies |
| 2. | Attribute | 001 | information applies to the attribute class |
| 3. | attributeType | 002 | information applies to the characteristic of a feature |
| 4. | collectionHardware | 003 | information applies to the collection hardware class |
| 5. | collectionSession | 004 | information applies to the collection session |
| 6. | Dataset | 005 | information applies to the dataset |
| 7. | Series | 006 | information applies to the series |
| 8. | nonGeographicDataset | 007 | information applies to non-geographic data |
| 9. | dimensionGroup | 008 | information applies to a dimension group |
| 10. | Feature | 009 | information applies to a feature |

| | *Name* | *Domain code* | *Definition* |
|---|---|---|---|
| 11. | featureType | 010 | information applies to a feature type |
| 12. | propertyType | 011 | information applies to a property type |
| 13. | fieldSession | 012 | information applies to a field session |
| 14. | Software | 013 | information applies to a computer programme or routine |
| 15. | Service | 014 | information applies to a capability which a service provider entity makes available to a service user entity through a set of interfaces that define a behaviour, such as a use case |
| 16. | Model | 015 | information applies to a copy or imitation of an existing or hypothetical object |
| 17. | Tile | 016 | information applies to a tile, a spatial subset of geographic data |
| 18. | Document | 017 | information applies to a document |

**Table 13. MD_TopicCategoryCode «Enumeration»**

| | *Name* | *Domain code* | *Definition* |
|---|---|---|---|
| 1. | MD_TopicCategoryCode | TopicCatCd | high-level geographic data thematic classification to assist in the grouping and search of available geographic datasets, can be used to group keywords as well. Listed examples are not exhaustive.<br>NOTE: It is understood there are overlaps between general categories, and the user is encouraged to select the one most appropriate. |
| 2. | Farming | 001 | rearing of animals and/or cultivation of plants<br>Examples: agriculture, plantations, herding, pests and diseases affecting crops and livestock |
| 3. | Biota | 002 | flora and/or fauna in natural environment<br>Examples: wildlife, vegetation, biological sciences, ecology, sea life, habitat |
| 4. | Boundaries | 003 | legal land descriptions<br>Examples: political and administrative boundaries |
| 5. | climatologyMeteorology Atmosphere | 004 | processes and phenomena of the atmosphere<br>Examples: weather, climate, atmospheric conditions, climate change, precipitation |
| 6. | Economy | 005 | economic activities, conditions and employment<br>Examples: production, labour, revenue, commerce, industry, tourism and ecotourism, forestry, fisheries, commercial or subsistence hunting, exploration and exploitation of resources such as minerals, oil and gas |
| 7. | Elevation | 006 | height above or below sea level<br>Examples: altitude, bathymetry, digital elevation models, slope, derived products |

| | *Name* | *Domain code* | *Definition* |
|---|---|---|---|
| 8. | Environment | 007 | environmental resources, protection and conservation<br>Examples: environmental pollution, waste storage and treatment, environmental impact assessment, monitoring environmental risk, nature reserves, landscape |
| 9. | geoscientificInformation | 008 | information pertaining to Earth sciences<br>Examples: geophysical features and processes, geology, minerals, sciences dealing with the composition, structure and origin of the Earth's rocks, risks of earthquakes, volcanic activity, landslides, gravity information, soils, permafrost, hydrogeology, erosion |
| 10. | Health | 009 | health, health services, human ecology, and safety<br>Examples: disease and illness, factors affecting health, hygiene, substance abuse, mental and physical health, health services |
| 11. | imageryBaseMapsEarthCover | 010 | base maps<br>Examples: land cover, topographic maps, imagery, unclassified images, annotations |
| 12. | intelligenceMilitary | 011 | military bases, structures, activities<br>Examples: barracks, training grounds, military transportation, information collection |
| 13. | inlandWaters | 012 | inland water features, drainage systems and their characteristics<br>Examples: rivers and glaciers, salt lakes, water utilization plans, dams, currents, floods, water quality, hydrographic charts |
| 14. | Location | 013 | positional information and services<br>Examples: addresses, geodetic networks, control points, postal zones and services, place names |
| 15. | Oceans | 014 | features and characteristics of saltwater bodies (excluding inland waters)<br>Examples: tides, tidal waves, coastal information, reefs |
| 16. | planningCadastre | 015 | information used for appropriate actions for future use of the land<br>Examples: land use maps, zoning maps, cadastral surveys, land ownership |
| 17. | Society | 016 | characteristics of society and cultures<br>Examples: settlements, anthropology, archaeology, education, traditional beliefs, manners and customs, demographic data, recreational areas and activities, social impact assessments, crime and justice, census information |
| 18. | Structure | 017 | man-made construction<br>Examples: buildings, museums, churches, factories, housing, monuments, shops, towers |
| 19. | Transportation | 018 | means and aids for conveying persons and/or goods<br>Examples: roads, airports/airstrips, shipping routes, tunnels, nautical charts, vehicle or vessel location, aeronautical charts, railways |

| | *Name* | *Domain code* | *Definition* |
|---|---|---|---|
| 20. | utilitiesCommunication | 019 | energy, water and waste systems and communication infrastructure and services Examples: hydroelectricity, geothermal, solar and nuclear sources of energy, water purification and distribution, sewage collection and disposal, electricity and gas distribution, data communication, telecommunication, radio, communication networks |

**Table 14. WMO_DataLicenseCode «CodeList»**

| | *Name* | *Domain code* | *Definition* |
|---|---|---|---|
| 1. | WMO_DataLicenseCode | WMODatLicCd | WMO data license applied to the data resource – derived from WMO Resolution 40 (Cg-XII), Resolution 25 (Cg-XIII) and Resolution 60 (Cg-17) |
| 2. | WMOEssential | 001 | WMO Essential Data: free and unrestricted international exchange of basic meteorological, hydrological or Global Framework for Climate Services relevant climate-related data and products |
| 3. | WMOAdditional | 002 | WMO Additional Data: free and unrestricted access to data and products exchanged under the auspices of WMO to the research and education communities for non-commercial activities. A more precise definition of the data policy may be additionally supplied within the metadata. In all cases, it shall be the responsibility of the data consumer to ensure that they understand the data policy specified by the data provider – which may necessitate dialogue with the data publisher for confirmation of terms and conditions. |
| 4. | WMOOther | 003 | Data that is not covered by WMO Resolution 40 (Cg-XII) and Resolution 25 (Cg-XIII) , e.g. aviation OPMET data. Data marked with "WMOOther" data policy shall be treated like "WMOAdditional" where a more precise definition of the data policy may be additionally supplied within the metadata. In all cases, it shall be the responsibility of the data consumer to ensure that they understand the data policy specified by the data provider – which may necessitate dialogue with the data publisher for confirmation of terms and conditions. |
| 5. | NoLimitation | 004 | No limitation on distribution or use. |

**Table 15. WMO_GTSProductCategoryCode «CodeList»**

| | *Name* | *Domain code* | *Definition* |
|---|---|---|---|
| 1. | WMO_ GTSProductCategoryCode | WMOGTSCatCd | Product category used for prioritizing messages over the WMO GTS |
| 2. | GTSPriority1 | 001 | GTS Priority 1 – highest priority products |
| 3. | GTSPriority2 | 002 | GTS Priority 2 |
| 4. | GTSPriority3 | 003 | GTS Priority 3 |
| 5. | GTSPriority4 | 004 | GTS Priority 4 |

**Table 16. WMO_CategoryCode «CodeList»**

| | *Name* | *Domain code* | *Definition* |
|---|---|---|---|
| 1. | WMO_CategoryCode | WMOCatCd | additional topic categories for the WMO community |
| 2. | weatherObservations | 001 | weather observations |
| 3. | weatherForecasts | 002 | weather forecasts |
| 4. | Meteorology | 003 | meteorology |
| 5. | Hydrology | 004 | hydrology |
| 6. | Climatology | 005 | climatology |
| 7. | landMeteorologyClimate | 006 | land meteorology and climate |
| 8. | synopticMeteorology | 007 | synoptic meteorology |
| 9. | marineMeteorology | 008 | marine meteorology |
| 10. | agriculturalMeteorology | 009 | agricultural meteorology |
| 11. | Aerology | 010 | aerology |
| 12. | marineAerology | 011 | marine aerology |
| 13. | Oceanography | 012 | oceanography |
| 14. | landHydrology | 013 | land hydrology |
| 15. | rocketSounding | 014 | rocket sounding |
| 16. | Pollution | 015 | pollution |
| 17. | waterPollution | 016 | water pollution |
| 18. | landWaterPollution | 017 | land water pollution |
| 19. | seaPollution | 018 | sea pollution |
| 20. | landPollution | 019 | land pollution |
| 21. | airPollution | 020 | air pollution |
| 22. | Glaciology | 021 | glaciology |
| 23. | Actinometry | 022 | actinometry |
| 24. | satelliteObservation | 023 | satellite observation |
| 25. | airplaneObservation | 024 | airplane observation |
| 26. | observationPlatform | 025 | observation platform |
| 27. | spaceWeather | 026 | the physical and phenomenological state of the natural space environment including the Sun, the solar wind, the magnetosphere, the ionosphere and the thermosphere, and its interaction with the Earth |
| 28. | atmosphericComposition | 027 | the chemical abundance in the Earth's atmosphere of its constituents including nitrogen, oxygen, argon, carbon dioxide, water vapour, ozone, neon, helium, krypton, methane, hydrogen and nitrous oxide |
| 29. | Radiation | 028 | radiation |

**Table 17. WMO_DistributionScopeCode «CodeList»**

| | *Name* | *Domain code* | *Definition* |
|---|---|---|---|
| 1. | WMO_DistributionScopeCode | WMODisScoCd | Scope of distribution for data published for exchange within WIS |
| 2. | GlobalExchange | 001 | Data are published for global exchange via WIS. Data shall be incorporated into the GISC cache. |
| 3. | RegionalExchange | 002 | Data are published for regional exchange via a GISC. |
| 4. | OriginatingCentre | 003 | Data are published for exchange directly via the originating centre. |

# APPENDIX D. WIS TECHNICAL SPECIFICATIONS

### *WIS-TechSpec-1: Uploading of metadata for data and products*

| | |
|---|---|
| Applicable standards | Content: ISO 19115, Geographic Information – Metadata, WMO Core Metadata Profile<br>File naming convention (associates file with its metadata): documented in *Manual on the Global Telecommunication System* (WMO-No. 386), Part II, Attachment II-15<br>Communication: to be defined by host of DAR metadata (WIS discovery metadata) catalogue (typical communication types are listed below) |
| Communication types | Terminal-host, store-and-forward or file transfer, client-server, and request-response (for example, HTTP POST) |
| Service level required | A mix of dedicated and public services |
| Network transport and supporting services | Various types of transport, which may include encryption (to be defined as needed for connection to host server) |
| Performance metrics: DAR metadata (WIS discovery metadata) | Metadata must be transmitted prior to the file being associated with the metadata |
| Use cases | *Guide to the WMO Information System* (WMO-No. 1061), Appendix B: WIS Technical Specifications – Use cases, B.1 Providing metadata for data or products |
| WIS requirements<br>(in addition to requirements applicable to all interfaces) | – **Each GISC shall:**<br>- **Provide a metadata catalogue of data, products and services across all GISCs;**<br>- **Assure catalogue interoperability using ISO 23950 search and geospatial services;**<br>- **Catalogue WIS contributions in the Global Earth Observation System of Systems (GEOSS) Clearinghouse;**<br>- **Use ISO 19115 and the WMO Core Metadata Profile;**<br>- **Standardize practices for electronic archiving of metadata;**<br>- **Provide metadata with quality indications to enable search, retrieval and archiving;**<br>- **Use dedicated telecommunications and public Internet for timely delivery;**<br>- **Use ISO standards for references to specific places on Earth;**<br>- **Draw on existing Spatial Data Infrastructure (SDI) components as institutional and technical precedents;**<br>- **Receive from NCs and DCPCs within its area of responsibility the data and products intended for global exchange;**<br>– Each centre should implement backup and recovery of essential services. |
| Notes:<br>1. This interface builds on existing GTS practice, adding the particular standard format for WIS metadata about data, products and services.<br>2. For updating the DAR metadata (WIS discovery metadata) catalogue, WIS centres should support two kinds of maintenance facilities: a file upload facility for "batch" updating (adding, replacing or deleting metadata records treated as separate files) and an online form for changing metadata entries in the DAR metadata (WIS discovery metadata) catalogue (adding, changing or deleting elements in a record as well as whole records).<br>3. WIS centres need to maintain the updated DAR metadata (WIS discovery metadata) catalogue as a searchable resource offered to all authorized searchers (see WIS-TechSpec-8).<br>4. WIS centres shall communicate all changes to each physically distributed part of the logically centralized DAR metadata (WIS discovery metadata) catalogue (see WIS-TechSpec-9). | |

### *WIS-TechSpec-2: Uploading of data and products*

| | |
|---|---|
| Applicable standards | Content: *Manual on the Global Telecommunication System* (WMO-No. 386), Part II, Attachment II-2, and other WMO programme-specific manuals<br>File naming convention (associates file with its metadata): documented in the above-mentioned GTS Manual, Part II, Attachment II-15 |
| Communication types | Terminal-host, store-and-forward or file transfer, client-server, and request-response |
| Service level required | Dedicated bandwidth and high reliability |
| Network transport and supporting services | GTS, public or private Internet using TCP/IP with encryption |
| Performance metrics: products and data | Products and data should be handled as specified in the above-mentioned GTS Manual, Part I, 1.3 Design principles of the GTS, and other WMO programme-specific manuals. |
| Use cases | *Guide to the WMO Information System* (WMO-No. 1061), Appendix B: WIS Technical Specifications – Use cases, B.2 Uploading data or products to DCPC or GISC |
| WIS requirements (in addition to requirements applicable to all interfaces) | – Make the data contained in Resolution 40 (Cg-XII) available through the interoperable arrangements of GEOSS;<br>– Use ISO standards for references to specific places on Earth;<br>– Harmonize data formats, transmission, archiving and distribution across disciplines;<br>– Use World Weather Watch (WWW) communication links for high-priority real-time data;<br>– Use dedicated telecommunications for the collection and dissemination of time-critical and operation-critical data and products;<br>– Support rapid access and integration of real-time and non real-time (archive) datasets;<br>– Identify and use a variety of data types across WMO programmes:<br>- **Each NC shall: (a) collect national data and generate and disseminate products for national use; and (b) upload data and products intended for global exchange to its associated GISC (and DCPC where applicable);**<br>- **Each DCPC shall: (a) collect programme-specific data and products; (b) gather data and products intended for dissemination to NCs within its area of responsibility; and (c) upload data and products intended for global exchange to its associated GISC;**<br>- **Each GISC shall receive from NCs and DCPCs within its area of responsibility the data and products intended for global exchange;**<br>– Implement backup and recovery of essential services. |
| Notes:<br>1. This interface builds on existing GTS practice, supplemented with other file transfer mechanisms such as the Internet.<br>2. Although it is required that data arrive only after its associated metadata, a grace period of two minutes is allowed before the data file is regarded as erroneous. | |

### *WIS-TechSpec-3: Centralization of globally distributed data*

| | |
|---|---|
| Applicable standards | *Manual on the Global Telecommunication System* (WMO-No. 386), Part I, Attachment I-3 |
| Communication types | Terminal-host, store-and-forward or file transfer |
| Service level required | Dedicated bandwidth and high reliability |
| Network transport and supporting services | GTS |
| Performance metrics: global information | Some of the operation-critical data intended for global distribution are to be transmitted end-to-end within two minutes. |

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|---|---|
| Use cases | *Guide to the WMO Information System* (WMO-No. 1061), Appendix B: WIS Technical Specifications – Use cases, B.4 Managing cache of data across GISCs |
| WIS requirements (in addition to requirements applicable to all interfaces) | – Standardize practices for electronic archiving of metadata;<br>– Harmonize data formats, transmission, archiving and distribution across disciplines;<br>– Use dedicated telecommunications for the collection and dissemination of time-critical and operation-critical data and products;<br>– Support rapid access and integration of real-time and non real-time (archive) datasets;<br>– Identify and use a variety of data types across WMO programmes;<br>– **Each GISC shall receive from NCs and DCPCs within its area of responsibility the data and products intended for global exchange and shall disseminate them within its area of responsibility;**<br>– **Each GISC shall: (a) exchange with other GISCs the data and products intended for global exchange; (b) coordinate activities with other GISCs and provide them with backup; and (c) hold the data and products intended for global exchange for at least 24 hours.** |
| Notes:<br>1. The set of WMO data and products required to be cached for 24 hours at the GISCs is that designated as "intended for global dissemination". This does not encompass all of the material handled by IGDDS.<br>2. Although it is generally required that the cache of data and products intended for global distribution be current across all GISCs to within 15 minutes, operation-critical data such as hazard warnings must be current to within two minutes. The cache size is expected to grow from one gigabyte per day. The cache needs to be highly accurate, and the system for logical centralization needs to be affordable and robust; single points of failure and complex procedures are not acceptable.<br>3. At this point in the WIS system design, multiple methods can be envisioned for centralizing the distributed cache. One approach would be that all GISCs are subscribed to receive all message traffic. For performance efficiency with adequate redundancy among up to ten GISCs, GISC subscriptions would be arranged in up to three tiers. | |

### *WIS-TechSpec-4: Maintenance of user identification and role information*

| | |
|---|---|
| Applicable standards | Standards for content and communications are to be defined by host of identification and role information database. |
| Communication types | Terminal-host, store-and-forward or file transfer (for example, FTP and HTTP), client-server, and request-response (for example, HTTP with CGI Web form) |
| Service level required | Non-dedicated shared network may be used, provided there is privacy protection for identified individuals as required by national laws. |
| Network transport and supporting services | Public or private Internet using TCP/IP with encryption, typically HTTP with GET or POST methods, which may include SOAP |
| Performance metrics: identification and role information | The timeliness of changes to user identification and role information is application-specific and subject to NC or DCPC procedures. |
| Use cases | *Guide to the WMO Information System* (WMO-No. 1061), Appendix B: WIS Technical Specifications – Use cases, B.5 Maintaining identification and role information for WIS users |
| WIS requirements (in addition to requirements applicable to all interfaces) | – Use ISO standards for references to specific places on Earth;<br>– Harmonize data formats, transmission, archiving and distribution across disciplines;<br>– Use dedicated telecommunications and public Internet for timely delivery;<br>– Identify and use a variety of data types across WMO programmes;<br>– **Each NC shall authorize its national users to access WIS;**<br>– **Each DCPC shall support access to data and products via Internet request/reply and implement backup and recovery of essential services.** |
| Note: For updating the identification and role information concerning candidate or current users of WIS, WIS centres should support two kinds of maintenance facilities: a file upload facility for "batch" updating (adding, replacing or deleting identification and role records treated as separate files) and an online form for changing individual identification and role entries (adding, changing or deleting elements in a record as well as whole records). | |

### *WIS-TechSpec-5: Consolidated view of distributed identification and role information*

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|---|---|
| Applicable standards | To be defined by host of particular identification and role information collection (typical communication types are listed below) |
| Communication types | Terminal-host, store-and-forward or file transfer, client-server, and request-response (for example, HTTP POST) |
| Service level required | A mix of dedicated and public services, provided there is privacy protection for identified individuals as required by national laws |
| Network transport and supporting services | Various types of transport, which may include encryption (to be defined as needed for connection to host server) |
| Performance metrics: currency | Collection of user identification and role information should be current to intervals of no more than half the currency required by the WIS centres concerned (see WIS-TechSpec-4) |
| Use cases | *Guide to the WMO Information System* (WMO-No. 1061), Appendix B: WIS Technical Specifications – Use cases, B.5 Maintaining identification and role information for WIS users |
| WIS requirements (in addition to requirements applicable to all interfaces) | – Use ISO standards for references to specific places on Earth;<br>– Harmonize data formats, transmission, archiving and distribution across disciplines;<br>– Use dedicated telecommunications and public Internet for timely delivery;<br>– Draw on existing SDI components as institutional and technical precedents;<br>– Identify and use a variety of data types across WMO programmes;<br>– **Each NC shall authorize its national users to access WIS;**<br>– **Each DCPC shall implement backup and recovery of essential services;**<br>– **Each GISC shall coordinate activities with other GISCs and provide them with backup.** |
| Notes:<br>1. Administrators of authentication and authorization at WIS centres need to share updated identification and role information as a resource available across WIS centres. Yet, it is necessary to prevent the inappropriate disclosure of any personally identifiable information. This aspect is complicated by the requirement for international data access to make use of authentication mechanisms at the level of national organizations.<br>2. At this point in the WIS system design, mechanisms for handling identification and role information as needed across WIS centres have not yet been decided. | |

### *WIS-TechSpec-6: Authentication of a user*

| | |
|---|---|
| Applicable standards | Standards used by commercial, off-the-shelf authentication software; they may include Public Key Infrastructure (PKI). |
| Communication types | Client-server, request-response, and stateless transaction |
| Service level required | Dedicated bandwidth and high reliability, including privacy protection for identified individuals as required by national laws |
| Network transport and supporting services | Public or private Internet using TCP/IP with encryption |
| Performance metrics: response time, request rate, concurrency | Maximum: 2 seconds per authentication request<br>Minimum: 40 authentication requests per second<br>Minimum: 20 active sessions |
| Use cases | *Guide to the WMO Information System* (WMO-No. 1061), Appendix B: WIS Technical Specifications – Use cases, B.5 Maintaining identification and role information for WIS users |

| | |
|---|---|
| WIS requirements (in addition to requirements applicable to all interfaces) | – Harmonize data formats, transmission, archiving and distribution across disciplines;<br>– Use WWW communication links for high-priority real-time data;<br>– Use dedicated telecommunications and public Internet for timely delivery;<br>– **Each NC shall authorize its national users to access WIS;**<br>– **Each DCPC shall implement backup and recovery of essential services;**<br>– **Each GISC shall coordinate activities with other GISCs and provide them with backup.** |
| Note: The client sends to the authentication server a request for a particular user whose identification and credentials are included in the request. The authentication server checks the consolidated identification and role information resource for WIS and responds. That response either confirms or denies that the identified user has provided sufficient credentials. | |

### *WIS-TechSpec-7: Authorization of a user role*

| | |
|---|---|
| Applicable standards | Standards used by governments for user authorization software |
| Communication types | Client-server, request-response, and stateless transaction |
| Service level required | Dedicated bandwidth and high reliability |
| Network transport and supporting services | Public or private Internet using TCP/IP with encryption |
| Performance metrics: response time, request rate, concurrency | Maximum: 2 seconds per authorization request<br>Minimum: 40 authorization requests per second<br>Minimum: 20 active sessions |
| Use cases | *Guide to the WMO Information System* (WMO-No. 1061), Appendix B: WIS Technical Specifications – Use cases, B.5 Maintaining identification and role information for WIS users |
| WIS requirements (in addition to requirements applicable to all interfaces) | – Harmonize data formats, transmission, archiving and distribution across disciplines;<br>– Use WWW communication links for high-priority real-time data;<br>– Use dedicated telecommunications and public Internet for timely delivery;<br>– **Each NC shall authorize its national users to access WIS;**<br>– **Each DCPC shall implement backup and recovery of essential services;**<br>– **Each GISC shall coordinate activities with other GISCs and provide them with backup.** |
| Note: The client sends to the authorization server a request for a particular user whose identification is included in the request. The authorization server checks the consolidated identification and role information resource for WIS and responds. That response either contains a list of the authorized roles for the user or denies that the identified user has any authorized roles. | |

### *WIS-TechSpec-8: DAR metadata (WIS discovery metadata) catalogue search and retrieval*

| | |
|---|---|
| Applicable standards | Search/Retrieval via URL (Library of Congress), profile of ISO 23950, Information and documentation – Information Retrieval (Z39.50) – Application service definition and protocol specification; Application Profile for Geospatial Metadata (GEO Profile), Version 2.2, and Appendix C of this Manual |
| Communication types | Client-server and request-response |
| Service level required | Non-dedicated shared network |
| Network transport and supporting services | Public or private Internet using TCP/IP, which may include encryption; typically HTTP (with GET or POST methods) or SOAP |
| Performance metrics: response time, search request rate, concurrency | Maximum: 2 seconds per request<br>Minimum: 40 keyword and bounding box searches per second<br>Minimum: 20 active sessions |

| | |
|---|---|
| Use cases | *Guide to the WMO Information System* (WMO-No. 1061), Appendix B: WIS Technical Specifications – Use cases, B.6 Discovering data or products |
| WIS requirements (in addition to requirements applicable to all interfaces) | – Provide a metadata catalogue of data, products and services across all GISCs;<br>– Assure catalogue interoperability using ISO 23950 search and geospatial services;<br>– Catalogue WIS contributions in the GEOSS Clearinghouse;<br>– Use ISO 19115 and the WMO Core Metadata Profile;<br>– Standardize practices for electronic archiving of metadata;<br>– Provide metadata with quality indications to enable search, retrieval and archiving;<br>– Make WMO Resolution 40 (Cg-XII) data available through GEOSS interoperable arrangements;<br>– Use ISO standards for references to specific places on Earth;<br>– Draw on existing SDI components as institutional and technical precedents;<br>– Harmonize data formats, transmission, archiving and distribution across disciplines;<br>– Use public Internet for data discovery, access and retrieval;<br>– Support rapid access to and integration of real-time and non real-time (archive) datasets;<br>– Identify and use a variety of data types across WMO programmes;<br>– Support WIS as a GEOSS component with a core role;<br>– **Each DCPC shall support access to data and products via Internet request/reply and implement backup and recovery of essential services;**<br>– **Each GISC shall coordinate activities with other GISCs and provide them with backup.** |
| Note: The procedures for designating a GISC or DCPC require that both types of WIS centres maintain data, product and service catalogues in the WMO-agreed standard format and facilitate access to these catalogues. Therefore, network services should be treated as a type of WIS product that can be discovered through the DAR catalogue. | |

### *WIS-TechSpec-9: Consolidated view of distributed DAR metadata (WIS discovery metadata) catalogues*

| | |
|---|---|
| Applicable standards | To be defined by host of particular DAR metadata (WIS discovery metadata) catalogue instance (typical communication types are listed below) |
| Communication types | Terminal-host, store-and-forward or file transfer, client-server, and request-response (for example, HTTP POST) |
| Service level required | Mix of dedicated and public services |
| Network transport and supporting services | Various types of transport, which may include encryption (to be defined as needed for connection to host server) |
| Performance metrics: currency | Distributed instances of DAR metadata (WIS discovery metadata) should not diverge in content by more than one day |
| Use cases | *Guide to the WMO Information System* (WMO-No. 1061), Appendix B: WIS Technical Specifications – Use cases, B.6 Discovering data or products |

| | |
|---|---|
| WIS requirements (in addition to requirements applicable to all interfaces) | – Provide metadata catalogue of data, products and services across all GISCs;<br>– Assure catalogue interoperability using ISO 23950 search and geospatial services;<br>– Catalogue WIS contributions in the GEOSS Clearinghouse;<br>– Use ISO 19115 and the WMO Core Metadata Profile;<br>– Standardize practices for electronic archiving of metadata;<br>– Provide metadata with quality indications to enable search, retrieval and archiving;<br>– Make WMO Resolution 40 (Cg-XII) data available through GEOSS interoperable arrangements;<br>– Use ISO standards for references to specific places on Earth;<br>– Draw on existing SDI components as institutional and technical precedents;<br>– Harmonize data formats, transmission, archiving and distribution across disciplines;<br>– Use public Internet for data discovery, access and retrieval;<br>– Support WIS as a GEOSS component with a core role;<br>– **Each DCPC shall support access to data and products via Internet request/reply and implement backup and recovery of essential services;**<br>– **Each GISC shall coordinate activities with other GISCs and provide them with backup.** |
| Note: At this point in the WIS system design, multiple methods can be envisioned for logically centralizing the physically distributed DAR metadata (WIS discovery metadata) catalogue. At a meeting of the Expert Team on WIS Centres (Geneva, 2010), the first set of GISCs decided to use the Open Archives Initiative Protocol for Metadata Harvesting, version 2.0, initially. | |

### *WIS-TechSpec-10: Downloading files via dedicated networks*

| | |
|---|---|
| Applicable standards | *Manual on the Global Telecommunication System* (WMO-No. 386), Part II, Attachment II-2 and other WMO programme-specific manuals |
| Communication types | Terminal-host, file transfer, broadcast or multicast, client-server, publish-subscribe or request-response |
| Service level required | Dedicated bandwidth and high reliability |
| Network transport and supporting services | GTS, IGDDS satellite broadcast (radio or television frequencies), and public or private Internet using TCP/IP with encryption |
| Performance metrics: operation-critical data | The data should be handled as specified in the above-mentioned GTS Manual, Part I, 1.3 Design principles of the GTS, and other WMO programme-specific manuals. |
| Use cases | *Guide to the WMO Information System* (WMO-No. 1061), Appendix B: WIS Technical Specifications – Use cases, B.7 Ad hoc request for data or products (“pull”), B.8 Subscribing to data or products (“push”) and B.9 Downloading data or products from a WIS centre |

| | |
|---|---|
| WIS requirements (in addition to requirements applicable to all interfaces) | – Harmonize data formats, transmission, archiving and distribution across disciplines;<br>– **Each DCPC shall support access to data and products via Internet request/reply;**<br>– **Each GISC shall (a) coordinate activities with other GISCs and provide them with backup; and (b) hold the data and products intended for global exchange for at least 24 hours;**<br>– Draw on existing SDI components as institutional and technical precedents;<br>– Use WWW communication links for high-priority real-time data;<br>– Use dedicated telecommunications for the collection and dissemination of time-critical and operation-critical data and products;<br>– Support rapid access to and integration of real-time and non real-time (archive) datasets;<br>– Identify and use a variety of data types across WMO programmes;<br>– **Each NC shall generate and disseminate products for national use;**<br>– **Each DCPC shall disseminate data and products intended for regional exchange;**<br>– **Each GISC shall disseminate the data and products intended for global exchange within its area of responsibility.** |

### *WIS-TechSpec-11: Downloading files via non-dedicated networks*

| | |
|---|---|
| Applicable standards | WMO programme-specific manual(s) |
| Communication types | Terminal-host, file transfer, broadcast or multicast, client-server, publish-subscribe or request-response |
| Service level required | Non-dedicated shared network |
| Network transport and supporting services | IGDDS satellite broadcast (radio or television frequencies), and public or private Internet using TCP/IP, which may include encryption |
| Performance metrics | See *Manual on the Global Telecommunication System* (WMO-No. 386), Part II, Attachment II-15, or as otherwise specified in WMO programme-specific manuals (non-dedicated network should not be used for operation-critical data) |
| Use cases | *Guide to the WMO Information System* (WMO-No. 1061), Appendix B: WIS Technical Specifications – Use cases, B.7 Ad hoc request for data or products (“pull”), B.8 Subscribing to data or products (“push”) and B.9 Downloading data or products from a WIS centre |
| WIS requirements (in addition to requirements applicable to all interfaces) | – Harmonize data formats, transmission, archiving and distribution across disciplines;<br>– **Each DCPC shall support access to data and products via Internet request/reply;**<br>– **Each GISC shall (a) coordinate activities with other GISCs and provide them with backup; and (b) hold the data and products intended for global exchange for at least 24 hours;**<br>– Use dedicated telecommunications and public Internet for timely delivery;<br>– Use public Internet for data discovery, access and retrieval;<br>– Support rapid access to and integration of real-time and non real-time (archive) datasets;<br>– Identify and use a variety of data types across WMO programmes;<br>– **Each NC shall generate and disseminate products for national use;**<br>– **Each DCPC shall disseminate data and products intended for regional exchange;**<br>– **Each GISC shall disseminate the data and products intended for global exchange within its area of responsibility.** |

### *WIS-TechSpec-12: Downloading files via other methods*

| | |
|---|---|
| Applicable standards | WMO programme-specific manual(s) |
| Communication types | Facsimile, shipping of physical media, etc. |
| Service level required | Priority delivery for operation-critical data |
| Network transport and supporting services | Various |
| Performance metrics: operation-critical data Other data/products | These data should be handled as specified in *Manual on the Global Telecommunication System* (WMO-No. 386), Part I, 1.3 Design principles of the GTS, and other WMO programme-specific manuals. |
| Use cases | *Guide to the WMO Information System* (WMO-No. 1061), Appendix B: WIS Technical Specifications – Use cases, B.7 Ad hoc request for data or products ("pull"), B.8 Subscribing to data or products ("push") and B.9 Downloading data or products from a WIS centre |
| WIS requirements (in addition to requirements applicable to all interfaces) | – Provide metadata with quality indications to enable search, retrieval and archiving;<br>– Harmonize data formats, transmission, archiving and distribution across disciplines;<br>– **Each DCPC shall support access to data and products via Internet request/reply and shall implement backup and recovery of essential services;**<br>– **Each GISC shall (a) coordinate activities with other GISCs and provide them with backup; and (b) hold the data and products intended for global exchange for at least 24 hours;**<br>– Draw on existing SDI components as institutional and technical precedents;<br>– Identify and use a variety of data types across WMO programmes;<br>– **Each NC shall generate and disseminate products for national use;**<br>– **Each DCPC shall disseminate data and products intended for regional exchange;**<br>– **Each GISC shall disseminate the data and products intended for global exchange within its area of responsibility.** |

### *WIS-TechSpec-13: Maintenance of dissemination metadata*

| | |
|---|---|
| Applicable standards | Standards for content and communications are to be defined by host of dissemination metadata database. |
| Communication types | Terminal-host, store-and-forward or file transfer, client-server, and request-response (for example, HTTP with CGI Web form) |
| Service level required | Mix of dedicated and public services |
| Network transport and supporting services | Public or private Internet using TCP/IP, which may include encryption; typically HTTP (with GET or POST methods) or SOAP |
| Performance metrics: dissemination metadata changes | The GTS requires that requests for changes to dissemination metadata be submitted two months before delivery is to begin. |
| Use cases | *Guide to the WMO Information System* (WMO-No. 1061), Appendix B: WIS Technical Specifications – Use cases, B.10 Providing dissemination metadata |

| | |
|---|---|
| WIS requirements (in addition to requirements applicable to all interfaces) | – Provide metadata with quality indications to enable search, retrieval and archiving;<br>– Use ISO standards for references to specific places on Earth;<br>– Harmonize data formats, transmission, archiving and distribution across disciplines;<br>– **Each DCPC shall implement backup and recovery of essential services;**<br>– **Each GISC shall coordinate activities with other GISCs and provide them with backup;**<br>– Use WWW communication links for high-priority real-time data;<br>– Use dedicated telecommunications for the collection and dissemination of time-critical and operation-critical data and products;<br>– Use dedicated telecommunications and public Internet for timely delivery;<br>– Support rapid access to and integration of real-time and non real-time (archive) datasets;<br>– **Each NC shall generate and disseminate products for national use and shall upload data and products intended for global exchange to its associated GISC (and DCPC where applicable);**<br>– **Each DCPC shall disseminate data and products intended for regional exchange and shall upload data and products intended for global exchange to its associated GISC;**<br>– **Each GISC shall disseminate the data and products intended for global exchange within its area of responsibility.** |
| Notes:<br>1. For updating the dissemination metadata, WIS centres should support two kinds of maintenance facilities: a file upload facility for "batch" updating (adding, replacing or deleting metadata records treated as separate files) and an online form for changing individual entries (adding, changing or deleting elements in a record as well as whole records).<br>2. WIS centres are required to communicate all changes to each physically distributed part of the logically centralized dissemination metadata (see WIS-TechSpec-14).<br>3. The plan is for population of the DAR metadata (WIS discovery metadata) to be accomplished centrally, based on an offer from Météo-France to generate DAR metadata from *Weather Reporting* (WMO-No. 9), Volume C1. Because full transition of WMO centres to the new metadata will occur over some time, procedures are required to ensure that changes to either set of metadata are reflected in both. | |

### *WIS-TechSpec-14: Consolidated view of distributed dissemination metadata catalogues*

| | |
|---|---|
| Applicable standards | To be defined by host of particular dissemination metadata collection (typical communication types are listed below) |
| Communication types | Terminal-host, store-and-forward or file transfer, client-server, and request-response (for example, HTTP POST) |
| Service level required | Mix of dedicated and public services |
| Network transport and supporting services | Various types of transport, which may include encryption (to be defined as needed for connection to host server) |
| Performance metrics: currency | Distributed instances of dissemination metadata should not diverge in content by more than one week |
| Use cases | *Guide to the WMO Information System* (WMO-No. 1061), Appendix B: WIS Technical Specifications – Use cases, B.10 Providing dissemination metadata |

| | |
|---|---|
| WIS requirements (in addition to requirements applicable to all interfaces) | – Provide metadata catalogue of data, products and services across all GISCs;<br>– Provide metadata with quality indications to enable search, retrieval and archiving;<br>– Harmonize data formats, transmission, archiving and distribution across disciplines;<br>– **Each DCPC shall implement backup and recovery of essential services;**<br>– **Each GISC shall coordinate activities with other GISCs and provide them with backup;**<br>– Use WWW communication links for high-priority real-time data;<br>– Use dedicated telecommunications for the collection and dissemination of time-critical and operation-critical data and products;<br>– Use dedicated telecommunications and public Internet for timely delivery;<br>– Support rapid access to and integration of real-time and non real-time (archive) datasets;<br>– Identify and use a variety of data types across WMO programmes;<br>– **Each NC shall upload data and products intended for global exchange to its associated GISC (and DCPC where applicable);**<br>– **Each DCPC shall disseminate data and products intended for regional exchange and upload data and products intended for global exchange to its associated GISC;**<br>– **Each GISC shall disseminate the data and products intended for global exchange within its area of responsibility.** |
| Note: Dissemination metadata, as updated at WIS centres, must be available across WIS centres. At this point in the WIS system design, it has not yet been decided how these data will be shared. | |

### *WIS-TechSpec-15: Reporting of quality of service*

| | |
|---|---|
| Applicable standards | Standards for content and communications are to be defined by host of centralized reporting database. |
| Communication types | Terminal-host, store-and-forward or file transfer (for example, FTP and HTTP), client-server, and request-response (for example, HTTP with CGI Web form) |
| Service level required | Non-dedicated shared network |
| Network transport | Public or private Internet using TCP/IP, which may include encryption; typically HTTP (with GET or POST methods) or SOAP |
| Performance metrics: reports | Reports should be sent according to a schedule determined by the centralized reporting manager on the basis of the needs of the WIS centres. |
| Use cases | *Guide to the WMO Information System* (WMO-No. 1061), Appendix B: WIS Technical Specifications – Use cases, B.11 Reporting quality of service across WIS centres |
| WIS requirements (in addition to requirements applicable to all interfaces) | Use ISO standards for references to specific places on Earth. |
| Notes:<br>1. As noted in the *Guide to the WMO Information System* (WMO-No. 1061), Appendix B: WIS Technical Specifications – Use cases, B.11, agreements on service levels can be anticipated eventually for WIS operations. These should include data and network security as well as performance and reliability.<br>2. Although not yet addressed in the WIS system design, performance reports can be generated efficiently by having each WIS centre upload its reports to a single analysis site within a fixed time window. | |

# APPENDIX E. WMO INFORMATION SYSTEM COMPETENCIES

## 1. INTRODUCTION

1.1 A variety of skilled personnel, including project managers, engineers, technicians and information technology staff may provide WIS services within a National Meteorological and Hydrological Service (NMHS) or a related service. Third party organizations, such as universities, international and regional institutions and centres, private sector companies and other providers, may also supply data, products and information for WIS services.

1.2 This document sets out a competency framework for personnel involved in the provision of WIS services. It is not necessary for each individual staff member to have the full set of competencies; rather, within specific application conditions (see 2 below), which are different for each organization, it is expected that any institution providing WIS services will have staff members somewhere within the organization who together demonstrate all the competencies at the institution's infrastructural capacity level. The performance and knowledge requirements that support the competencies should be customized based on the particular context of an organization. However, the general criteria and requirements provided here apply in most circumstances.

## 2. APPLICATION CONDITIONS

(a) The organizational context, priorities and stakeholder requirements;

(b) The way in which internal and external personnel are used to provide WIS services;

(c) The available resources and capabilities (financial, human and technological resources, and facilities) and organizational structures, policies and procedures;

(d) National and institutional legislation, rules and procedures.

## 3. COMPETENCIES

Seven competencies across four basic functional areas have been defined as follows:

### Infrastructure

1 Manage the physical infrastructure;

2 Manage the operational applications.

### Data

3 Manage the data flow;

4 Manage data discovery.

### External interactions

5 Manage interaction among WIS centres;

6 Manage external user interactions.

**Overall service**

7 Manage the operational service.

## COMPETENCY 1: MANAGE THE PHYSICAL INFRASTRUCTURE

### Competency description

Prepare, plan, design, procure, implement and operate the physical infrastructure, networks and applications required to support the WIS centre.

### Performance components

***Management of information technology operations***

1a. Maintain the system in optimal operational condition by setting and meeting service levels, including:

- Configuration;
- Preventative and corrective maintenance and servicing;
- Equipment replacement or upgrade;
- Networking and processing capacity;
- System monitoring and reporting procedure, and corrective actions.

1b. Provide contingency planning, operation backup and restoration;

***Management of facilities***

1c. Manage the security of the physical site;

1d. Manage the environmental control of the physical site.

### Knowledge and skill requirements

- General ICT skills;
- Operation, configuration and maintenance of equipment and applications;
- Recognized information technology service management frameworks;
- Current technologies and emerging trends;
- Service level agreements.

## COMPETENCY 2: MANAGE THE OPERATIONAL APPLICATIONS

### Competency description

Prepare, plan, design, procure, implement and operate the applications required to support WIS functions.

### Performance components

2a. Meet service levels by maintaining applications in optimal operational condition by:

- Configuring applications;
- Monitoring and responding to the behaviour of applications;
- Carrying out preventative and corrective maintenance;
- Replacing or upgrading applications;

2b. Provide contingency planning and application backup and restoration;

2c. Ensure data integrity and completeness in the event of system failure;

2d. Ensure system security.

### Knowledge and skill requirements

- General ICT skills;
- Operation, configuration and maintenance of applications;
- Recognized information technology service management frameworks;
- Current technologies and emerging trends;
- WIS functions and requirements;
- WIS security policies.

## COMPETENCY 3: MANAGE THE DATA FLOW

### Competency description

Manage the collection, processing and distribution of data and products through scheduled and on-demand services.

### Performance components

3a. Ensure that the data and products are collected and distributed as per the data policy;

3b. Publish data and products;

3c. Subscribe to data and products;

3d. Encode, decode, validate and package data and products;

3e. Create, update and maintain data flow catalogues;

3f. Manage connectivity between centres;

3g. Control the data flow to meet service levels.

### Knowledge and skill requirements

- System and network monitoring and viewing tools;
- Data formats and protocols;
- Licensing and data policies;
- Message and file switching systems.

## COMPETENCY 4: MANAGE DATA DISCOVERY

### Competency description

Create and maintain discovery metadata records describing services and information, and upload them to the WIS discovery metadata catalogue.

Performance components

4a. Create and maintain discovery metadata records describing products and services;

4b. Add, replace or delete metadata records within the catalogue;

4c. Ensure that all information and service offerings from a WIS centre have complete, valid and meaningful discovery metadata records uploaded to the catalogue.

### Knowledge and skill requirements

- Knowledge of WMO and ISO documentation sufficient to create complete and valid metadata;
- Metadata entry and management tools;
- Policies;
- Discovery metadata concepts and formats;
- Written English.

## COMPETENCY 5: MANAGE INTERACTION AMONG WIS CENTRES

### Competency description

Manage relationships and compliance between WIS centres.

### Performance components

5a. Exchange information with other centres on operational matters;

5b. Facilitate the registration of new WIS centres;

5c. Facilitate the registration of new data and products by other WIS centres;

5d. Create and respond to WIS service messages, including GTS.

### Knowledge and skill requirements

- Knowledge of current exchanges and requirements for the notification of operational changes;
- Procedures and practices for the registration of other centres and their data and products;
- Service level agreements;
- Written English.

## COMPETENCY 6: MANAGE EXTERNAL USER INTERACTIONS

### Competency description

Ensure users, including data providers and subscribers, can publish and access data and products through WIS.

### Performance components

6a. Register data providers and subscribers and maintain a service agreement;

6b. Set and register access criteria;

6c. Provide systems and support for users to publish and access data and products;

6d. Manage user relations to ensure a high satisfaction level.

### Knowledge and skill requirements

- Data policies;
- External WIS interface;

- WIS registration and monitoring tools and policies;
- User support documentation and help files;
- Written English.

## COMPETENCY 7: MANAGE THE OPERATIONAL SERVICE

### Competency description

Ensure the quality and continuity of the service.

### Performance components

7a. Coordinate all WIS functions and activities of the centre;

7b. Ensure and demonstrate compliance with regulations and policies;

7c. Monitor and meet quality and service performance standards;

7d. Ensure service continuity through risk management, planning and the implementation of service contingency, backup and restoration, and ensure data continuity in the event of system failure;

7e. Plan and coordinate the delivery of new functionalities.

### Knowledge and skill requirements

- General management skills;
- Overview of local and external WIS operations and associated service agreements;
- WIS regulations and policies;
- Functional specifications;
- Written English.

For more information, please contact:

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