Manual on the WMO Information System

Annex VII to the WMO Technical Regulations

2015 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.

METEOTERM, the WMO terminology database, may be consulted at http://www.wmo.int/pages/prog/lsp/meteoterm_wmo_en.html. Acronyms may also be found at: http://www.wmo.int/pages/themes/acronyms/index_en.html.

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NOTE

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Date	*Part/chapter/ section*	*Purpose of amendment*	*Proposed by*	*Approved by*
18/4/2016	General provisions	Alignment with the *Technical Regulations* (WMO-No. 49), 2015 edition. Applicable only to Arabic, Chinese, English, French and Spanish.	—	—

CONTENTS

INTRODUCTION

The *Manual on the WMO Information System* (WMO-No. 1060) is designed to ensure adequate uniformity and standardization of data, information and communications practices, procedures and specifications employed among World Meteorological Organization (WMO) Members in the operation of the WMO Information System (WIS) as it supports the mission of the Organization.

The Manual is Annex VII to the *Technical Regulations* (WMO-No. 49), Volume I: General Meteorological Standards and Recommended Practices, in which it is stated 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 publications dedicated specifically to them, for example, the *Manual on the Global Data-processing and Forecasting System* (WMO-No. 485) and the *Manual on the Global Observing System* (WMO-No. 544). Other documents that are relevant to the WMO Information System are found in Appendix A to the present Manual.

As part of the Technical Regulations, the *Manual on the WMO Information System* sets out standard and recommended practices and procedures. The General Provisions, included in this publication, define the meaning of the phrase "standard and recommended practices and procedures". The General Provisions also contain information on the procedure for amending, updating or issuing a new edition of the *Technical Regulations* (including Manuals) and Guides.

GENERAL PROVISIONS

1. The *Technical Regulations* (WMO-No. 49) of the World Meteorological Organization are presented in four volumes:

Volume I – General meteorological standards and recommended practices
Volume II – Meteorological service for international air navigation
Volume III – Hydrology
Volume IV – Quality management

Purpose of the Technical Regulations

2. The Technical Regulations are determined by the World Meteorological Congress in accordance with Article 8 (d) of the Convention.

3. These Regulations are designed:

(a) To facilitate cooperation in meteorology and hydrology among Members;
(b) To meet, in the most effective manner, specific needs in the various fields of application of meteorology and operational hydrology in the international sphere;
(c) To ensure adequate uniformity and standardization in the practices and procedures employed in achieving (a) and (b) above.

Types of Regulations

4. The Technical Regulations comprise *standard* practices and procedures and *recommended* practices and procedures.

5. The definitions of these two types of Regulations are as follows:

The *standard* practices and procedures:

(a) Shall be the practices and procedures that Members are required to follow or implement;
(b) Shall have the status of requirements in a technical resolution in respect of which Article 9 (b) of the Convention is applicable;
(c) Shall invariably be distinguished by the use of the term *shall* in the English text, and by suitable equivalent terms in the Arabic, Chinese, French, Russian and Spanish texts.

The *recommended* practices and procedures:

(a) Shall be the practices and procedures with which Members are urged to comply;
(b) Shall have the status of recommendations to Members, to which Article 9 (b) of the Convention shall not be applied;
(c) Shall be distinguished by the use of the term *should* in the English text (except where otherwise provided by decision of Congress) and by suitable equivalent terms in the Arabic, Chinese, French, Russian and Spanish texts.

6. In accordance with the above definitions, Members shall do their utmost to implement the *standard* practices and procedures. In accordance with Article 9 (b) of the Convention and in conformity with Regulation 128 of the General Regulations, Members shall formally notify the Secretary-General, in writing, of their intention to apply the *standard* practices and procedures of the Technical Regulations, except those for which they have lodged a specific deviation. Members shall also inform the Secretary-General, at least three months in advance, of any change in the degree of their implementation of a *standard* practice or procedure as previously notified and the effective date of the change.

7. Members are urged to comply with *recommended* practices and procedures, but it is not necessary to notify the Secretary-General of non-observance except with regard to the practices and procedures contained in Volume II.

8. In order to clarify the status of the various Regulations, the *standard* practices and procedures are distinguished from the *recommended* practices and procedures by a difference in typographical practice, as indicated in the editorial note.

Status of annexes and appendices

9. The following annexes to the *Technical Regulations* (Volumes I to IV), also called Manuals, are published separately and contain regulatory material having the status of *standard* and/or *recommended* practices and procedures:

I *International Cloud Atlas* (WMO-No. 407), Volume I – Manual on the Observation of Clouds and Other Meteors, Part I; Part II: paragraphs II.1.1, II.1.4, II.1.5 and II.2.3; subparagraphs 1, 2, 3 and 4 of each paragraph from II.3.1 to II.3.10; paragraphs II.8.2 and II.8.4; Part III: paragraph III.1 and the definitions (in italics) of paragraph III.2;
II *Manual on Codes* (WMO-No. 306), Volume I;
III *Manual on the Global Telecommunication System* (WMO-No. 386);
IV *Manual on the Global Data-processing and Forecasting System* (WMO-No.485), Volume I;
V *Manual on the Global Observing System* (WMO-No. 544), Volume I;
VI *Manual on Marine Meteorological Services* (WMO-No. 558), Volume I;
VII *Manual on the WMO Information System* (WMO-No. 1060);
VIII *Manual on the WMO Integrated Global Observing System* (WMO-No. 1160).

These annexes (Manuals) are established by decision of Congress and are intended to facilitate the application of Technical Regulations to specific fields. Annexes may contain both *standard* and *recommended* practices and procedures.

10. Texts called appendices, appearing in the *Technical Regulations* or in an annex to the *Technical Regulations*, have the same status as the Regulations to which they refer.

Status of notes and attachments

11. Certain notes (preceded by the indication "Note") are included in the *Technical Regulations* for explanatory purposes; they may, for instance, refer to relevant WMO Guides and publications. These notes do not have the status of Technical Regulations.

12. The *Technical Regulations* may also include attachments, which usually contain detailed guidelines related to *standard* and *recommended* practices and procedures. Attachments, however, do not have regulatory status.

Updating of the *Technical Regulations* and their annexes (Manuals)

13. The *Technical Regulations* are updated, as necessary, in the light of developments in meteorology and hydrology and related techniques, and in the application of meteorology and operational hydrology. Certain principles previously agreed upon by Congress and applied in the selection of material for inclusion in the Technical Regulations are reproduced below. These principles provide guidance for constituent bodies, in particular technical commissions, when dealing with matters pertaining to the Technical Regulations:

(a) Technical commissions should not recommend that a Regulation be a *standard* practice unless it is supported by a strong majority;
(b) Technical Regulations should contain appropriate instructions to Members regarding implementation of the provision in question;
(c) No major changes should be made to the Technical Regulations without consulting the appropriate technical commissions;

(d) Any amendments to the Technical Regulations submitted by Members or by constituent bodies should be communicated to all Members at least three months before they are submitted to Congress.

14. Amendments to the *Technical Regulations* – as a rule – are approved by Congress.

15. If a recommendation for an amendment is made by a session of the appropriate technical commission and if the new regulation needs to be implemented before the next session of Congress, the Executive Council may, on behalf of the Organization, approve the amendment in accordance with Article 14 (c) of the Convention. Amendments to annexes to the *Technical Regulations* proposed by the appropriate technical commissions are normally approved by the Executive Council.

16. If a recommendation for an amendment is made by the appropriate technical commission and the implementation of the new regulation is urgent, the President of the Organization may, on behalf of the Executive Council, take action as provided by Regulation 9 (5) of the General Regulations.

Note: A fast-track procedure can be applied for additions to certain codes and associated code tables contained in Annex II (*Manual on Codes* (WMO-No. 306)). Application of the fast-track procedure is described in detail in Annex II.

17. After each session of Congress (every four years), a new edition of the *Technical Regulations*, including the amendments approved by Congress, is issued. With regard to the amendments between sessions of Congress, Volumes I, III and IV of the *Technical Regulations* are updated, as necessary, upon approval of changes thereto by the Executive Council. The *Technical Regulations* updated as a result of an approved amendment by the Executive Council are considered a new update of the current edition. The material in Volume II is prepared by the World Meteorological Organization and the International Civil Aviation Organization working in close cooperation, in accordance with the Working Arrangements agreed by these Organizations. In order to ensure consistency between Volume II and Annex 3 to the Convention on International Civil Aviation – *Meteorological Service for International Air Navigation*, the issuance of amendments to Volume II is synchronized with the respective amendments to Annex 3 by the International Civil Aviation Organization.

Note: Editions are identified by the year of the respective session of Congress whereas updates are identified by the year of approval by the Executive Council, for example "Updated in 2012".

WMO Guides

18. In addition to the *Technical Regulations*, appropriate Guides are published by the Organization. They describe practices, procedures and specifications which Members are invited to follow or implement in establishing and conducting their arrangements for compliance with the Technical Regulations, and in otherwise developing meteorological and hydrological services in their respective countries. The Guides are updated, as necessary, in the light of scientific and technological developments in hydrometeorology, climatology and their applications. The technical commissions are responsible for the selection of material to be included in the Guides. These Guides and their subsequent amendments shall be considered by the Executive Council.

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 I, 3.3.2, 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 (GISC, DCPC, NC) 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 I, 3.3.5, 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 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 means 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 means 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, hydrological and/or climate services, centres should ensure that they have access to an adequate number of people who among them have the required levels of the WIS competences that are defined in that volume (see also Appendix E to this Manual).

Note: Guidance on developing these competencies is available in *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) and the International Council for Science (ICSU), 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 I, 3.3.3, Congress and the Executive Council shall consider the designation of GISCs and DCPCs based on recommendations of the Commission for Basic Systems (CBS). The development of CBS 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 CBS, 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. CBS, 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 CBS 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 back-up 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, CBS 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. CBS 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 CBS, 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 CBS 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 real-time functions of data and product dissemination, non-real-time services for requests, 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, CBS 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 I, 3.3.8, 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. The Commission for Basic Systems, 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. The Commission for Basic Systems 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 telecommunications 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 WMO Resolution 40 (Cg-XII) and Resolution 25 (Cg-XIII).

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, routeing and back-up 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 telecommunications 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 telecommunications 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 back-up of its essential services in the event of an outage.** Each GISC should maintain arrangements for system back-up in case of total site failure (for example, an offsite Disaster Recovery Centre) and for partial back-up in situations otherwise affecting WIS functions within the GISC.

3.5.9.2 **Each GISC shall maintain arrangements with one or more back-up 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). CBS shall review and report on the status and performance of GISCs with the assistance of the WMO Secretariat.**

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

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

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, and 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 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 back-up 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 I, 3.3.8, 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 I, 3.3.9, 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, -2, -4, -10, -11, -12 and -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 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), 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 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 timeliness requirements of the application and host centre.

4.5.3 See also 3.5.5 (Maintain 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 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 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 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 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 the SRU Contextual Query Language (CQL) level 2.**

4.9.2 **In addition to full text search, a WIS-compliant SRU server shall 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 Telecommunications 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 other WMO manuals, 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 back-up 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 (Network connectivity of GISC), 3.5.8 (Coordinate telecommunications in the GISC area), 3.5.9 (Recovery arrangements of 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 the 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 the principal GISC for the data custodian may alter or withdraw the WIS discovery metadata record if it is found to interfere with the correct operation of WIS, in which case an emergency change should be made 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 **CBS shall maintain and develop the WMO Core Metadata Profile. Changes to the WMO Core Metadata Profile shall be governed using the procedures defined in Appendix C to this Manual.**

APPENDIX A. SELECTED WMO DOCUMENTS RELEVANT TO WIS

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 Services for Air Navigation Volume III – Hydrology Volume IV – Quality Management
WMO-No. 60	*Agreements and Working Arrangements*
WMO-No. 508	*Resolutions of Congress and the Executive Council*

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 safety and security of society, economic welfare and the protection of the environment.

WMO-No. 837	Exchanging Meteorological Data – Guidelines on Relationships in Commercial Meteorological Activities. WMO Policy and Practice.
WMO-No. 827	Resolution 40 (Cg-XII) – WMO policy and practice for the exchange of meteorological and related data and products including guidelines on the relationships in commercial meteorological activities.
WMO-No. 902	Resolution 25 (Cg-XIII) – Exchange of hydrological data and products Annex IV – Geneva Declaration of Thirteenth World Meteorological Congress

Manuals

WMO-No. 9	*Weather Reporting*: Volume A – Observing Stations Volume C1 – Catalogue of Meteorological Bulletins Volume C2 – Transmission Programmes Volume D – Information for Shipping
WMO-No. 306	*Manual on Codes*
WMO-No. 386	*Manual on the Global Telecommunication System*
WMO-No. 485	*Manual on the Global Data-processing and Forecasting Systems*, Volume I, Parts 1, 2 and 3
WMO-No. 544	*Manual on the Global Observing System*
WMO-No. 1160	*Manual on the WMO Integrated Global Observing System*

Guides

WMO-No. 8	*Guide to Meteorological 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*
WMO-No. 305	*Guide on the Global Data-processing 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 on Meteorological Observation 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 (VPN) via the Internet between GTS Centres*
WMO-No. 1165 *Guide to the WMO Integrated Global Observing System*

Technical documents

A Guide to the Code Form FM 92-IX Ext. GRIB Edition 1, Technical Report No. 17 (WMO/TD-No. 611). Geneva, May 1994
Guide to WMO Table-driven Code Forms: FM 94 BUFR and FM 95 CREX. Geneva, 1 January 2002
Guide to the WMO Table-driven Code Form Used for the Representation and Exchange of Regularly Spaced Data in Binary Form: FM 92 GRIB Edition 2. Geneva, 1 January 2003.

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), Data Collection or Production Centres (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 of CBS.

WMO Member or contributing organization	*Centre name*	*Centre location region/city*		*Function*	*Technical commission/ programme*	*GISC*
Australia	IPS (Ionospheric Prediction Service)	V	Sydney	IPS	CBS	Melbourne
	National Climate Centre (NCC)	V	Melbourne	NCC	CCl	Melbourne
	Regional Specialized Meteorological Centre (RSMC) Darwin	V	Darwin	RSMC-Geographical	CBS	Melbourne
	World Meteorological Centre (WMC) Melbourne	V	Melbourne	RTH	CBS	Melbourne
	Joint Australian Tsunami Warning Centre (JATWC)	V	Melbourne	Tsunami Warning System (TWS)	JCOMM	Melbourne
Austria	Regional Telecommunication Hub (RTH)	VI	Vienna	RTH	CBS	Offenbach
Brazil	RTH	III	Brasilia	RTH	CBS	Brasilia
Bulgaria	RTH	VI	Sofia	RTH	CBS	Offenbach

WMO Member or contributing organization	*Centre name*	*Centre location region/city*		*Function*	*Technical commission/ programme*	*GISC*
Canada	RSMC Montreal	IV	Montreal	RSMC-Activity-atmospheric transport modelling (ATM)	CBS	Washington
China	Beijing NCC	II	Beijing	Regional Climate Centre (RCC)-RA II	CCl	Beijing
	National Satellite Meteorological Centre (NSMC)	II	Beijing	NSMC	CBS	Beijing
	RSMC–Geographical Beijing (NMC)	II	Beijing	RSMC-Geographical	CBS	Beijing
	RSMC–Activity-ATM (NMC)	II	Beijing	RSMC-Activity-ATM	CBS	Beijing
	RTH	II	Beijing	RTH	CBS	Beijing
Croatia	Marine Meteorology Centre	VI	Zagreb	Marine Meteorology Centre	JCOMM	Offenbach
Czech Republic	RTH	VI	Prague	RTH	CBS	Offenbach
ECMWF	European Centre for Medium-Range Weather Forecasts (ECMWF)	VI	Reading	RSMC-Activity-Medium-Range-Forecasting	CBS	Exeter
EUMETSAT	European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT)	VI	Darmstadt, Germany	Satellite Centre	CBS	Offenbach
Finland	*Finnish Meteorological Institute–Arctic Research Centre (FMI-ARC)	VI	Sodankylä	Arctic Data Centre (ADC)	CBS	Offenbach
France	Global Producing Centre/Lead Centre for Long Range Forecast Multi-Model Ensemble (GPC/LRFMME)	VI	Toulouse	GPC/LRF	CBS	Toulouse
	RCC Toulouse	VI	Toulouse	Lead RA VI on LRF	CCl	Toulouse
	RSMC–Numerical Weather Prediction (NWP)	VI	Toulouse	Regional NWP support	CBS	Toulouse
	RSMC–Environmental emergency response (EER)	VI	Toulouse	RSMC-Activity-ATM	CBS	Toulouse
	RSMC La Réunion–Tropical Cyclone Centre	I	La Réunion	RSMC-Activity-TC	CBS	Toulouse
	RTH	VI	Toulouse	RTH	CBS	Toulouse

WMO Member or contributing organization	*Centre name*	*Centre location region/city*		*Function*	*Technical commission/ programme*	*GISC*
France (*continued*)	Volcanic Ash Advisory Centre (VAAC)	VI	Toulouse	VAAC	CAeM	Toulouse
	ODC (Toulouse)	VI	Toulouse	Radar Data Centre	CBS	Toulouse
Germany	Global Collecting Centre (GCC)–ship observations	VI	Hamburg	GCC	JCOMM	Offenbach
	RSMC	VI	Offenbach	Global Precipitation Climatology Centre (GPCC)	CBS/CCl/ CHy	Offenbach
	Global Runoff Data Centre (GRDC)	VI	Koblenz	GRDC	CHy	Offenbach
	GCOS Reference Upper Air Network (GRUAN) Lead Centre	VI	Tauche/ Lindenberg	GRUAN-LC	CBS	Offenbach
	RCC–Offenbach	VI	Offenbach	RCC lead RA VI	CCl	Offenbach
	RSMC	VI	Offenbach	RSMC-Geographical	CBS	Offenbach
	RTH	VI	Offenbach	RTH	CBS	Offenbach
	ICSU World Data Centre for Climate	VI	Hamburg	WDCC	CCl	Offenbach
	World Data Center for Remote Sensing of the Atmosphere (WDC–RSAT)	VI	Oberpfaffen-hofen	WDC-RSAT	CAS	Offenbach
	WRMC	VI	Bremerhaven	WRMC	WCRP (GEWEX)	Offenbach
Hong Kong, China	World Weather Information Service (WWIS)	II	Hong Kong	WWIS	CBS	Beijing
India	*RSMC–Tropical Cyclones New Delhi	II	New Delhi	RSMC-Activity-TC	CBS	New Dehli
	RTH	II	New Delhi	RTH	CBS	New Delhi
Iran, Islamic Republic of	RTH	II	Tehran	RTH	CBS	Tehran
Italy	*RSMC–Marine and ocean products	VI	Rome	RSMC-Geographical	JCOMM	Offenbach
	RTH	VI	Rome	RTH	CBS	Offenbach
Japan	Global Producing Centre for Long-Range Forecast (GPC/LRF)	II	Tokyo	GPC/LRF	CBS	Tokyo
	Tokyo NCC	II	Tokyo	RCC-RA II	CCl	Tokyo
	RSMC on Atmospheric Transport Modeling Products for Environmental Emergency Response and Backtracking	II	Tokyo	RSMC-Activity-ATM	CBS	Tokyo

WMO Member or contributing organization	*Centre name*	*Centre location region/city*		*Function*	*Technical commission/ programme*	*GISC*
Japan (*continued*)	RSMC on Tropical Cyclones	II	Tokyo	RSMC-Activity-TC	CBS	Tokyo
	RSMC on Data Processing and Forecasting System	II	Tokyo	RSMC-Geographical	CBS	Tokyo
	RTH	II	Tokyo	RTH	CBS	Tokyo
	Meteorological Satellite Centre	II	Tokyo	Satellite Centre	CBS	Tokyo
	WDC for Greenhouse Gases (GHG)	II	Tokyo	WDC–GHG	CAS	Tokyo
	National Institute of Information and Communication Technology (NICT)	II	Tokyo	Space weather	CAeM/CBS	Tokyo
Netherlands	*RCC–De Bilt	VI	De Bilt	RCC–Lead RA VI on climate data	CCl	Exeter
	*Satellite Centre	VI	De Bilt	Satellite Centre	CBS	Exeter
New Zealand	RSMC	V	Wellington	RSMC-Geographical	CBS	Melbourne
	RTH	V	Wellington	RTH	CBS	Melbourne
	VAAC	V	Wellington	VAAC	CAeM	Melbourne
Norway	*Norwegian Institute for Air Research (NILU)	VI	Kjeller	NILU	CAS	Offenbach
Qatar	Gulf Marine Centre	II	Doha	Marine Meteorological Centre	JCOMM	Jeddah
Republic of Korea	Global Producing Centre/Lead Centre for LRF Multi-Model Ensemble (GPC/LRFMME)–Seoul	II	Seoul	GPC/LC–LRFMME	CBS	Seoul
	NMSC (National Meteorological Satellite Centre)	II	Jincheon	NMSC	CBS	Seoul
	WAMIS (World Agrometeorological Information Service)	II	Seoul	WAMIS	CAgM	Seoul
Russian Federation	Responsible National Oceanographic Data Centre (RNODC) and Global Data Centre (GDC)	VI	Obninsk	RNODC and GDC	JCOMM	Moscow
	RSMC–EER	VI	Obninsk	RSMC–Activity–ATM	CBS	Moscow
	RSMC	VI	Moscow	RSMC–Geographical	CBS	Moscow
	WMC Moscow	VI	Moscow	RTH	CBS	Moscow
	RTH/RSMC	II	Khabarovsk	RTH/RSMC–Geographical	CBS	Moscow
	RTH/RSMC	II	Novosibirsk	RTH/RSMC–Geographical	CBS	Moscow

WMO Member or contributing organization	*Centre name*	*Centre location region/city*		*Function*	*Technical commission/ programme*	*GISC*
Russian Federation (*continued*)	WDC (World Data Centre) Ice–St Petersburg (Global Cryosphere Watch)	VI	St Petersburg	WDC (ICE)	CBS	Moscow
Saudi Arabia	RTH	II	Jeddah	RTH	CBS	Jeddah
Serbia	RCC–Belgrade	VI	Belgrade	RCC–RA VI network member	CCl	Offenbach
South Africa	RTH	I	Pretoria	RTH	CBS	Pretoria
Spain	MEditerranean climate DAta REscue initiative (MEDARE)	VI	Tarragona	Centre for climate change	CCl	Toulouse
Sweden	*BALTRAD (Weather radar network for the Baltic Sea Region)	VI	Norrköping	Regional radar	CBS	Offenbach
	RTH Norrköping	VI	Norrköping	RTH	CBS	Offenbach
Thailand	RTH	II	Bangkok	RTH	CBS	Tokyo
Turkey	Eastern Mediterranean Climate Centre (EMCC–RA VI)	VI	Ankara	RCC	CCl	Offenbach
United Kingdom	RSMC–Numerical Weather Prediction (NWP)	VI	Exeter	GPC/LRF	CBS	Exeter
	Marine Observations Centre	VI	Exeter	Marine Observations Centre	JCOMM	Exeter
	RSMC	VI	Exeter	RSMC-Activity-ATM	CBS	Exeter
	VAAC (London)	VI	Exeter	VAAC	CAeM	Exeter
	World Area Forecast Centre (WAFC, London)	VI	Exeter	WAFC	CAeM	Exeter
	RSMC–Global and Regional Climate Centre	VI	Exeter	RSMC–Geographical	CBS	Exeter
	RTH Exeter	VI	Exeter	RTH	CBS	Exeter
	Specialized Ocean & Wave Forecasting Centre	VI	Exeter	Specialized ocean/wave forecasting	JCOMM	Exeter
	British Antarctic Survey (BAS)	VI	Cambridge	GCOS Lead Centre for Antarctica	CCl	Exeter
	ODC (Exeter)	VI	Exeter	Radar Data Centre	CBS	Exeter
United States of America	*Global Observing Systems Information Center (GOSIC)	IV	Asheville, NC	GOSIC	CCl	Washington
	*National Centers for Environmental Prediction (NCEP)	IV	Washington, DC	GPC/LC-LRFMME	CBS	Washington
	*National Center for Atmospheric Research (NCAR)	IV	Boulder, CO	NCAR	CBS	Washington

WMO Member or contributing organization	*Centre name*	*Centre location region/city*		*Function*	*Technical commission/ programme*	*GISC*
United States of America (*continued*)	*National Geophysical Data Center (NGDC)	IV	Washington, DC	NGDC	CBS	Washington
	*National Oceanographic Data Center (NODC)	IV	Washington, DC	NODC	JCOMM	Washington
	*National Environmental Satellite, Data, and Information Service (NESDIS)	IV	Washington, DC	RMSC-Geographical/ NESDIS	CBS	Washington
	*Air Resources Laboratory (ARL)	IV	Washington, DC	RSMC-Activity-ATM	CBS	Washington
	WMC Washington	IV	Washington, DC	RTH	CBS	Washington
	*WAFC Washington	IV	Washington, DC	WAFC	CAeM	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	CBS
Albania	The Hydro-meteorological Institute	NMC	VI	Tirana	TBD	CBS
Algeria	Office National de la Météorologie	NMC	I	Algiers	Casablanca	CBS
Angola	Instituto Nacional de Hidrometeorología e Geofísica	NMC	I	Luanda	Pretoria	CBS
Antigua and Barbuda	Antigua and Barbuda Meteorological Services	NMC	IV	St John's	Washington	CBS
Argentina	Servicio Meteorológico Nacional	NMC	III	Buenos Aires	Brasilia	CBS
Armenia	Armenian State Hydro-meteorological and Monitoring Service	NMC	VI	Yerevan	Moscow	CBS
Australia	Bureau of Meteorology Water Division	NHS	V	Canberra	Melbourne	CHy
	Cocos and Christmas Island Field Office	WSO (Christmas Island)	V	Cocos Island	Melbourne	CBS
	National Meteorological and Oceanographic Centre	NMC	V	Melbourne	Melbourne	CBS
Austria	Central Institute for Meteorology and Geodynamics	NMC	VI	Vienna	Offenbach	CBS

WMO Member or contributing organization	*Centre name*	*GTS function*		*Centre Region location*	*Principal GISC*	*Constituent body*
Azerbaijan	National Hydro-meteorological Department	NMC	VI	Baku	Moscow	CBS
Bahamas	Department of Meteorology	NMC	IV	Nassau	Washington	CBS
Bahrain	Bahrain Meteorological Service	NMC	II	Manama	Jeddah	CBS
Bangladesh	Bangladesh Meteorological Department	NMC	II	Dhaka	New Delhi	CBS
Barbados	Meteorological Services	NMC	IV	Bridgetown	Washington	CBS
Belarus	Department of Hydrometeorology	NMC	VI	Minsk	Moscow	CBS
Belgium	Institut Royal Météorologique	NMC	VI	Brussels	Toulouse	CBS
Belize	National Meteorological Service	NMC	IV	Belize City	Washington	CBS
Benin	Service Météorologique National	NMC	I	Cotonou	Casablanca	CBS
Bhutan	Council for Renewable Natural Resources Research	NMC	II	Thimphu	New Delhi	CBS
Bolivia, Plurinational State of	Servicio Nacional de Meteorología e Hidrología	NMC	III	La Paz	Brasilia	CBS
Bosnia and Herzegovina	Meteorological Institute	NMC	VI	Sarajevo	Offenbach	CBS
Botswana	Botswana Meteorological Services	NMC	I	Gaborone	Pretoria	CBS
Brazil	Instituto Nacional de Meteorologia	NMC	III	Brasilia	Brasilia	CBS
British Caribbean Territories	Caribbean Meteorological Organization (Anguilla)	WSO (Anguilla)	IV	The Valley	Washington	CBS
	Caribbean Meteorological Organization (British Virgin Islands)	WSO (British Virgin Islands)	IV	Road Town	Washington	CBS
	Caribbean Meteorological Organization (Cayman Islands)	NMC (Cayman Islands)	IV	George Town	Washington	CBS
	Caribbean Meteorological Organization (Montserrat)	WSO (Montserrat)	IV	Plymouth	Washington	CBS
	Caribbean Meteorological Organization (Turks and Caicos Islands)	WSO (Turks and Caicos Islands)	IV	Cockburn Town	Washington	CBS

WMO Member or contributing organization	*Centre name*	*GTS function*		*Centre Region location*	*Principal GISC*	*Constituent body*
Brunei Darussalam	The Brunei Meteorological Service	NMC	V	Bandar Seri Begawan	Melbourne	CBS
Bulgaria	National Institute of Meteorology and Hydrology	NMC	VI	Sofia	Offenbach	CBS
Burkina Faso	Direction de la Météorologie	NMC	I	Ouagadougou	Casablanca	CBS
Burundi	Institut Géographique du Burundi	NMC	I	Bujumbura	Casablanca	CBS
Cambodia	Department of Meteorology	NMC	II	Phnom Penh	Tokyo	CBS
Cameroon	Direction de la Météorologie Nationale	NMC	I	Douala	Casablanca	CBS
Canada	Meteorological Service of Canada	NMC	IV	Montreal	Washington	CBS
Cabo Verde	Instituto Nacional de Meteorologia e Geofisica	NMC	I	Sal	Casablanca	CBS
Central African Republic	Direction Générale de l'Aviation Civile et de la Météorologie	NMC	I	Bangui	Casablanca	CBS
Chad	Direction des Ressources en Eau et de la Météorologie	NMC	I	N'Djaména	Casablanca	CBS
Chile	Dirección Meteorológica de Chile	NMC	III	Santiago	Brasilia	CBS
China	China Meteorological Administration	NMC	II	Beijing	Beijing	CBS
Colombia	Instituto de Hidrología, Meteorología y Estudios Ambientales	NMC	III	Bogotá	Brasilia	CBS
Comoros	Direction de la Météorologie Nationale	NMC	I	Moroni	Casablanca	CBS
Congo	Direction de la Météorologie Nationale	NMC	I	Brazzaville	Casablanca	CBS
Cook Islands	Cook Islands Meteorological Service	NMC	V	Avarua	Melbourne	CBS
Costa Rica	Instituto Meteorológico Nacional	NMC	IV	San José	Washington	CBS
Côte d'Ivoire	Direction de la Météorologie Nationale	NMC	I	Abidjan	Casablanca	CBS
Croatia	Meteorological and Hydrological Service	NMC	VI	Zagreb	Offenbach	CBS
Cuba	Instituto de Meteorología	NMC	IV	Havana	Washington	CBS
Curaçao and Sint Maarten	Meteorological Department Curaçao	NMC	IV	Willemstad	Washington	CBS
Cyprus	Meteorological Service	NMC	VI	Nicosia	Offenbach	CBS
Czech Republic	Czech Hydrometeorological Institute	NMC	VI	Prague	Offenbach	CBS

WMO Member or contributing organization	*Centre name*	*GTS function*		*Centre Region location*	*Principal GISC*	*Constituent body*
Democratic People's Republic of Korea	State Hydrometeorological Administration	NMC	II	Pyongyang	Beijing	CBS
Democratic Republic of the Congo	Agence Nationale de Météorologie et de Télédétection par Satellite	NMC	I	Kinshasa	Casablanca	CBS
Denmark	Danish Meteorological Institute	NMC	VI	Copenhagen	TBD	CBS
Djibouti	Service de la Météorologie	NMC	I	Djibouti	Casablanca	CBS
Dominica	Dominica Meteorological Services	NMC	IV	Roseau	Washington	CBS
Dominican Republic	Instituto Nacional de Recursos Hidráulicos (INDRHI)	NHS	IV	Santo Domingo	Washington	CHy
	Oficina Nacional de Meteorología	NMC	IV	Santo Domingo	Washington	CBS
Ecuador	Instituto Nacional de Meteorología e Hidrología	NMC	III	Quito	Brasilia	CBS
Egypt	The Egyptian Meteorological Authority	NMC	I	Cairo	Casablanca	CBS
El Salvador	Servicio Nacional de Estudios Territoriales	NMC	IV	San Salvador	Washington	CBS
Equatorial Guinea	Service de la Météorologie	NMC	I	Malabo	Casablanca	CBS
Eritrea	Civil Aviation Authority	NMC	I	Asmara	Casablanca	CBS
Estonia	Estonian Meteorological and Hydrological Institute	NMC	VI	Tallinn	TBD	CBS
Ethiopia	National Meteorological Services Agency	NMC	I	Addis Ababa	Casablanca	CBS
Fiji	Fiji Meteorological Service	NMC	V	Nadi	Melbourne	CBS
Finland	Finnish Meteorological Institute	NMC	VI	Helsinki	Offenbach	CBS
France	Météo-France (Clipperton)	WSO (Clipperton)	IV	Clipperton	Toulouse	CBS
	Météo-France (French Guiana)	WSO (French Guiana)	III	French Guiana	Toulouse	CBS
	Météo-France (Guadeloupe, St Martin, St Barthélemy)	WSO (Guadeloupe, St Martin, St Barthelemy)	IV	Guadeloupe, St Martin, St Barthélemy	Toulouse	CBS
	Météo-France (Kerguelen Islands)	WSO (Kerguelen Islands)	I	Kerguelen	Toulouse	CBS
	Météo-France (La Réunion)	WSO (Reunion)	I	La Réunion	Toulouse	CBS

WMO Member or contributing organization	*Centre name*	*GTS function*	*Centre Region location*		*Principal GISC*	*Constituent body*
France (*continued*)	Météo-France (Martinique)	WSO (Martinique)	IV	Martinique	Toulouse	CBS
	Météo-France (St Pierre and Miquelon)	WSO (St Pierre and Miquelon)	IV	St Pierre and Miquelon	Toulouse	CBS
	Météo-France (Toulouse)	NMC	VI	Toulouse	Toulouse	CBS
	Météo-France (Wallis and Futuna)	WSO (Wallis and Futuna)	V	Wallis and Futuna	Toulouse	CBS
French Polynesia	Météo-France (Polynésie française)	NMC	V	Papeete	Melbourne	CBS
Gabon	Direction de la Météorologie Nationale	NMC	I	Libreville	Casablanca	CBS
Gambia	Department of Water Resources	NMC	I	Banjul	Casablanca	CBS
Georgia	Department of Hydrometeorology	NMC	VI	Tbilisi	Moscow	CBS
Germany	Deutscher Wetterdienst	NMC	VI	Offenbach	Offenbach	CBS
Ghana	Ghana Meteorological Services Department	NMC	I	Accra	Casablanca	CBS
Greece	Hellenic National Meteorological Service	NMC	VI	Athens	Offenbach	CBS
Guatemala	Instituto Nacional de Sismología, Vulcanología, Meteorología e Hidrología	NMC	IV	Guatemala	Washington	CBS
Guinea	Direction Nationale de la Météorologie	NMC	I	Conakry	Casablanca	CBS
Guinea Bissau	Météorologie de Guinée-Bissau	NMC	I	Bissau	Casablanca	CBS
Guyana	Hydrometeorological Service	NMC	III	Georgetown	Brasilia	CBS
Haiti	Centre national de la météorologie	NMC	IV	Port-au-Prince	Washington	CBS
Honduras	Servicio Meteorológico Nacional	NMC	IV	Tegucigalpa	Washington	CBS
Hong Kong, China	Hong Kong Observatory	NMC	II	Hong Kong	Beijing	CBS
Hungary	Meteorological Service of Hungary	NMC	VI	Budapest	Offenbach	CBS
Iceland	Icelandic Meteorological Office	NMC	VI	Reykjavik	Exeter	CBS
India	India Meteorological Department	NMC	II	New Delhi	New Delhi	CBS
Indonesia	Agency for Meteorology, Climatology and Geophysics	NMC	V	Jakarta	Melbourne	CBS

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

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

WMO Member or contributing organization	*Centre name*	*GTS function*	*Centre Region location*		*Principal GISC*	*Constituent body*
New Zealand	New Zealand National Meteorological Service	NMC	V	Wellington	Melbourne	CBS
	New Zealand National Meteorological Service (Tokelau)	NMC (Tokelau)	V	Tokelau	Melbourne	CBS
Nicaragua	Dirección General de Meteorología	NMC	IV	Managua	Washington	CBS
Niger	Direction de la Météorologie Nationale	NMC	I	Niamey	Casablanca	CBS
Nigeria	Nigerian Meteorological Agency	NMC	I	Lagos	Casablanca	CBS
Niue	Niue Meteorological Service	NMC	V	Alofi	Melbourne	CBS
Norway	Norwegian Meteorological Arctic Data Centre	Arctic Data Centre	VI	Oslo	Offenbach	CBS
	Norwegian Meteorological Institute	NMC	VI	Oslo	Offenbach	CBS
Oman	Department of Meteorology	NMC	II	Muscat	Jeddah	CBS
Pakistan	Pakistan Meteorological Department	NMC	II	Karachi	Beijing	CBS
Panama	Hidrometeorología	NMC	IV	Panama City	Washington	CBS
Papua New Guinea	Papua New Guinea Meteorological Service	NMC	V	Port Moresby	Melbourne	CBS
Paraguay	Dirección de Meteorología et Hidrología	NMC	III	Asunción	Brasilia	CBS
Peru	Dirección Nacional de Meteorología et Hidrología	NMC	III	Lima	Brasilia	CBS
Philippines	Philippine Atmospheric Geophysical and Astronomical Services Administration	NMC	V	Manila	Tokyo	CBS
Poland	Institute of Meteorology and Water Management	NMC	VI	Warsaw	Offenbach	CBS
Portugal	Instituto de Meteorologia	NMC	VI	Lisbon	Toulouse	CBS
	Instituto de Meteorologia (Madeira)	NMC (Madeira)	I	Madeira	Toulouse	CBS
Qatar	Qatar Meteorology Department	Aviation Centre	II	Doha	Jeddah	CAeM
	Qatar Meteorology Department	NMC	II	Doha	Jeddah	CBS
Republic of Korea	Korea Meteorological Administration	NMC	II	Seoul	Seoul	CBS
Republic of Moldova	Serviciul Hidrometeorologic de Stat Moldova	NMC	VI	Kishinev	Moscow	CBS

WMO Member or contributing organization	*Centre name*	*GTS function*	*Centre Region location*		*Principal GISC*	*Constituent body*
Romania	National Meteorological Administration	NMC	VI	Bucharest	Offenbach	CBS
Russian Federation	Russian Federal Service for Hydrometeorology and Environmental Monitoring	NMC	VI	Moscow	Moscow	CBS
	Russian Federal Service for Hydrometeorology and Environmental Monitoring (Khabarovsk)	WSO (Khabarovsk)	II	Khabarovsk	Moscow	CBS
	Russian Federal Service for Hydrometeorology and Environmental Monitoring (Novosibirsk)	WSO (Novosibirsk)	II	Novosibirsk	Moscow	CBS
Rwanda	Rwanda Meteorological Service	NMC	I	Kigali	Casablanca	CBS
St Kitts and Nevis	St Kitts and Nevis Meteorological Service	NMC	IV	Basseterre	Washington	CBS
Saint Lucia	Saint Lucia Meteorological Service	NMC	IV	Castries	Washington	CBS
Samoa	Samoa Meteorology Division	NMC	V	Apia	Melbourne	CBS
Sao Tome and Principe	Instituto Nacional de Meteorologia	NMC	I	Sao Tome	Casablanca	CBS
Saudi Arabia	Presidency of Meteorology and Environment	NMC	II	Jeddah	Jeddah	CBS
Senegal	Direction de la Météorologie Nationale	NMC	I	Dakar	Casablanca	CBS
Serbia	Republic Hydrometeorological Service of Serbia	NMC	VI	Belgrade	Offenbach	CBS
Seychelles	National Meteorological Services	NMC	I	Victoria	Casablanca	CBS
Sierra Leone	Meteorological Department	NMC	I	Freetown	Casablanca	CBS
Singapore	Meteorological Services Division	NMC	V	Singapore	Melbourne	CBS
Slovakia	Slovak Hydrometeorological Institute	NMC	VI	Bratislava	TBD	CBS
Slovenia	Meteorological Office	NMC	VI	Ljubljana	Offenbach	CBS
Solomon Islands	Solomon Islands Meteorological Service	NMC	V	Honiara	Melbourne	CBS
Somalia	Permanent Mission of Somalia	NMC	I	Mogadishu	Casablanca	CBS

WMO Member or contributing organization	*Centre name*	*GTS function*		*Centre Region location*	*Principal GISC*	*Constituent body*
South Africa	South African Weather Service	NMC	I	Pretoria	Pretoria	CBS
Spain	Agencia Estatal de Meteorología	NMC	VI	Madrid	Toulouse	CBS
	Agencia Estatal de Meteorología (Canary Islands)	NMC (Canary Islands)	I	Santa Cruz	Toulouse	CBS
Sri Lanka	Department of Meteorology	NMC	II	Colombo	New Delhi	CBS
Sudan	Sudan Meteorological Authority	NMC	I	Khartoum	Pretoria	CBS
Suriname	Meteorological Service	NMC	III	Paramaribo	Brasilia	CBS
Swaziland	Swaziland Meteorological Service	NMC	I	Manzini	Pretoria	CBS
Sweden	Swedish Meteorological and Hydrological Institute	NMC	VI	Norrköping	Offenbach	CBS
Switzerland	MeteoSwiss	NMC	VI	Zurich	Offenbach	CBS
Syrian Arab Republic	Ministry of Defence Meteorological Department	NMC	VI	Damascus	Tehran	CBS
Tajikistan	Main Administration of Hydrometeorology and Monitoring of the Environment	NMC	II	Dushanbe	Moscow	CBS
Thailand	Thai Meteorological Department	NMC	II	Bangkok	Tokyo	CBS
The former Yugoslav Republic of Macedonia	Republic Hydrometeorological Institute	NMC	VI	Skopje	Offenbach	CBS
Timor-Leste	Direcção Nacional da Meteorologia e Geofisica	NMC	V	Dili	Melbourne	CBS
Togo	Direction de la Météorologie Nationale	NMC	I	Lomé	Casablanca	CBS
Tonga	Tonga Meteorological Service	NMC	V	Nuku'alofa	Melbourne	CBS
Trinidad and Tobago	Meteorological Service	NMC	IV	Port of Spain	Washington	CBS
Tunisia	National Institute of Meteorology	NMC	I	Tunis	Casablanca	CBS
Turkey	Turkish State Meteorological Service	NMC	VI	Ankara	Offenbach	CBS
Turkmenistan	Administration of Hydrometeorology	NMC	II	Ashgabat	TBD	CBS
Tuvalu	Tuvalu Meteorological Service	NMC	V	Funafuti	Melbourne	CBS
Uganda	Department of Meteorology	NMC	I	Entebbe	Casablanca	CBS

WMO Member or contributing organization	*Centre name*	*GTS function*	*Centre Region location*		*Principal GISC*	*Constituent body*
Ukraine	Ukrainian Hydrometeorological Centre	NMC	VI	Kiev	Moscow	CBS
United Arab Emirates	Meteorological Department	NMC	II	Abu Dhabi	Jeddah	CBS
United Kingdom of Great Britain and Northern Ireland	Met Office (Ascension Island)	WSO (Ascension Island)	I	Ascension	Exeter	CBS
	Met Office (Bermuda)	WSO (Bermuda)	IV	Bermuda	Exeter	CBS
	Met Office (Exeter)	NMC	VI	Exeter	Exeter	CBS
	Met Office (Gibraltar)	WSO (Gibraltar)	VI	Gibraltar	Exeter	CBS
	Met Office (Pitcairn Islands)	WSO (Pitcairn Islands)	V	Adamstown	Exeter	CBS
	Met Office (St Helena Island)	WSO (St Helena Island)	I	Jamestown	Exeter	CBS
United Republic of Tanzania	Tanzania Meteorological Agency	NMC	I	Dar es Salaam	Exeter	CBS
United States of America	National Oceanic and Atmospheric Administration, National Weather Service	NMC	IV	Silver Springs	Washington	CBS
	National Oceanic and Atmospheric Administration, National Weather Service (Line Islands)	WSO (Line Islands)	V	Line Islands	Washington	CBS
	National Oceanic and Atmospheric Administration, National Weather Service (Guam)	WSO (Guam)	V	Guam	Washington	CBS
	National Oceanic and Atmospheric Administration, National Weather Service (Puerto Rico)	WSO (Puerto Rico)	IV	Puerto Rico	Washington	CBS
Uruguay	Dirección Nacional de Meteorología	NMC	III	Montevideo	Brasilia	CBS
Uzbekistan	Uzhydromet	NMC	II	Tashkent	Seoul	CBS
Vanuatu	Vanuatu Meteorological Services	NMC	V	Port Vila	Melbourne	CBS
Venezuela, Bolivarian Republic of	Servicio de Meteorología de la Aviación	NMC	III	Maracay	Brasilia	CBS
Viet Nam	Hydrometeorological Service	NMC	II	Hanoi	Tokyo	CBS
Yemen	Yemen Meteorological Service	NMC	II	Sana'a	Jeddah	CBS

WMO Member or contributing organization	*Centre name*	*GTS function*		*Centre Region location*	*Principal GISC*	*Constituent body*
Zambia	Zambia Meteorological Department	NMC	I	Lusaka	Pretoria	CBS
Zimbabwe	Zimbabwe Meteorological Services Department	NMC	I	Harare	Pretoria	CBS

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 maintain consistency between metadata records.**

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

2. PROCEDURES FOR AMENDING THE WMO CORE METADATA PROFILE

2.1 General validation and implementation procedures

2.1.1 *Proposal of amendments*

Amendments to the WMO Core Metadata Profile shall be proposed in writing to the WMO Secretariat. The proposal shall specify the needs, purposes and requirements and include information on a contact point for technical matters.

2.1.2 *Drafting recommendation*

The Inter-Programme Expert Team on Metadata and Data Representation Development (IPET-MDRD[1]), supported by the Secretariat, shall validate the stated requirements (unless it is consequential to an amendment to the WMO Technical Regulations) and develop a draft recommendation to respond to the requirements, as appropriate.

2.1.3 *Date of implementation*

IPET-MDRD should define a date of implementation in order to give sufficient time to WMO Members to implement the amendments after the date of notification; IPET-MDRD should document the reasons to propose a time span of less than six months except for the fast-track procedure.

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[1] IPET-MDRD, the Implementation/Coordination Team on Information Systems and Services (ICT-ISS) and OPAG-ISS are the bodies currently dealing with the WMO Core Metadata Profile within CBS. If they are replaced by other bodies performing the same function, the same rules shall apply, replacing the names of the entities appropriately.

2.1.4 *Procedures for approval*

After a draft recommendation of IPET-MDRD has been validated in accordance with the procedure given in 2.6 below, depending on the type of amendments, IPET-MDRD should select one of the following procedures for the approval of the amendments:

(a) Fast-track procedure (see 2.2);
(b) Procedure for the adoption of amendments between CBS sessions (see 2.3);
(c) Procedure for the adoption of amendments during CBS sessions (see 2.4).

2.1.5 *Urgent introduction*

Regardless of the above procedures, and as an exceptional measure, the following procedure accommodates urgent user needs to introduce new entries in the code lists and XML schema that support the WMO Core Metadata Profile or to correct errors in the metadata validation criteria.

(a) A draft recommendation developed by IPET-MDRD shall be validated according to 2.6.1, 2.6.2 and 2.6.3;
(b) The draft recommendation for pre-operational use, which can be used in operational data and products, shall be approved by the chairpersons of IPET-MDRD and OPAG-ISS and the president of CBS. The list of pre-operational entries is kept online on the WMO web server;
(c) Preoperational entries need to be approved by one of the procedures in 2.1.4 for operational use;
(d) The lowest level of the version number of the metadata standard shall be incremented (see 2.1.6).

2.1.6 *Issuing updated version*

Once amendments to the WMO Core Metadata Profile are adopted, an updated version of the relevant part of the Manual on WIS shall be issued in the four languages: English, French, Russian and Spanish. The Secretariat shall inform all WMO Members of the availability of a new updated version of that part at the date of notification mentioned in 2.1.3.

Version numbers of the WMO Core Metadata Profile have the form *a*, *b*, *c*, where:

(a) ***a* shall be incremented if the change requires modifications to software (for example moving to a new version of the ISO 19115 standard).** This is the top level of the version number. Such changes should follow the procedure for changes during sessions in 2.4;
(b) ***b* shall be incremented if changes to conformance-checking rules or changes to code lists are introduced and are mandatory for compliant metadata records.** This is the middle level of the version number. Such changes should follow the procedure for changes between sessions in 2.3;
(c) ***c* shall be incremented if the changes have no impact on existing metadata records** (for example, adding a new entry to a code list or introducing a conformance-checking rule that results in a warning rather than causing a metadata record to be declared invalid). This is the lowest level of the version number. Such changes should use the fast-track procedure in 2.2.

Note: Development versions of the WMO Core Metadata Profile, not intended for operational use, are denoted by the digit 0 in the second part of the version number, for example: 2.0.1. Development versions are intended to enable the development of a new version of the WMO Core Metadata Profile requiring changes to software systems.

2.2 Fast-track procedure

2.2.1 *Scope*

The fast-track procedure can be used for additions to code lists and validation rules that result only in warnings.

2.2.2 *Endorsement*

Draft recommendations developed by IPET-MDRD, including a date of implementation of the amendments, must be endorsed by the chairperson of OPAG-ISS.

2.2.3 *Approval*

2.2.3.1 Minor adjustments

Correcting typographical errors in descriptive text in code lists is considered a minor adjustment and shall be done by the Secretariat in consultation with the president of CBS.

Note: A code list is a list of valid entries that are permitted in a metadata field.

2.2.3.2 Other types of amendments

For other types of amendments, the English version of the draft recommendation, including a date of implementation, should be distributed to the focal points for discovery metadata matters for comments, with a deadline of two months for the reply. It should then be submitted to the president of CBS for consultation with the presidents of other technical commissions and adoption on behalf of the Executive Council (EC).

2.2.4 *Frequency*

The implementation of amendments approved through the fast-track procedure can be twice a year, in May and November.

2.3 Procedure for the adoption of amendments between CBS sessions

2.3.1 *Approval of draft recommendation*

For the direct adoption of amendments between CBS sessions, the draft recommendation developed by IPET-MDRD, including a date of implementation of the amendments, shall be submitted to the chairperson of OPAG-ISS and president and vice-president of CBS for approval. The president of CBS shall consult with the presidents of other technical commissions.

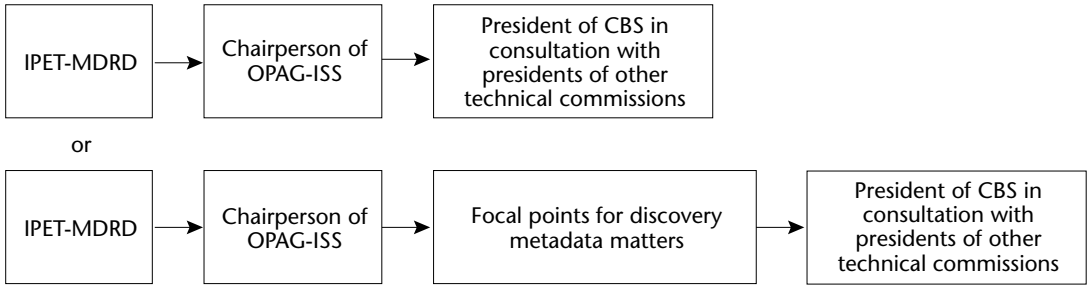

Figure 1. Adoption of amendments by the fast-track procedure

2.3.2 *Circulation to Members*

Upon approval of the president of CBS, the Secretariat sends the recommendation in the four languages (English, French, Russian and Spanish), including a date of implementation of the amendments, to all WMO Members for comments to be submitted within two months following the dispatch of the amendments.

2.3.3 *Agreement*

Those WMO Members not having replied within the two months following the dispatch of the amendments are implicitly considered as having agreed to the amendments.

2.3.4 *Coordination*

WMO Members are invited to designate a focal point responsible for discussing any comments/ disagreements with IPET-MDRD. **If discussions between IPET-MDRD and the focal point do not result in an agreement on a specific amendment by a WMO Member, this amendment shall be reconsidered by IPET-MDRD.**

2.3.5 *Notification*

Once amendments are agreed by WMO Members, and after consultation with the chairperson of OPAG-ISS and the president and vice-president of CBS, the Secretariat notifies WMO Members and the members of EC at the same time of the approved amendments and the date of their implementation.

2.4 Procedure for the adoption of amendments during CBS sessions

For the adoption of amendments during CBS sessions, IPET-MDRD submits its recommendation, including a date of implementation of the amendments, to ICT-ISS of OPAG-ISS. **The recommendation is then passed to the presidents of technical commissions for consultation and to a CBS session that shall be invited to consider comments submitted by the presidents of technical commissions. The recommendation shall then be submitted to an EC session for decision.**

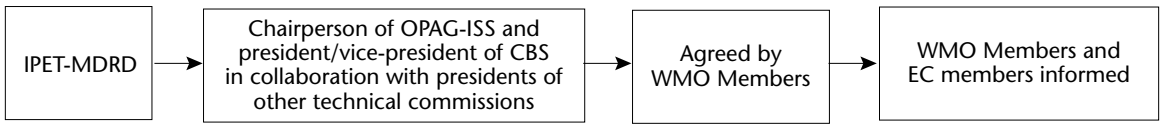

Figure 2. Adoption of amendments between CBS sessions

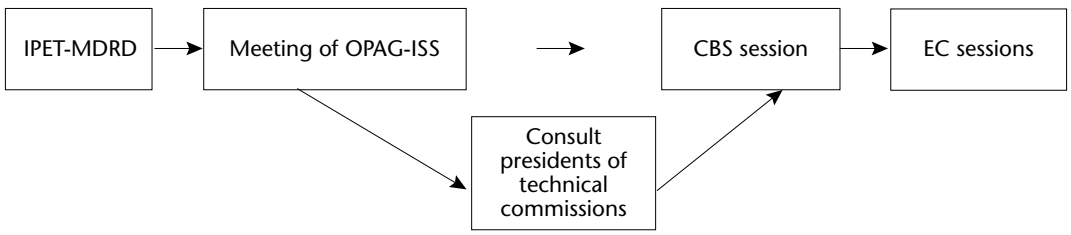

Figure 3. Adoption of amendments during CBS sessions

2.5 Procedure for the correction of existing entries in the code lists and validation rules

2.5.1 *Correcting errors in the text describing a code-list entry*

Where a minor error in the specification of a code list is found (e.g. typing error or incomplete definition) the code-list entry shall be amended and re-published. The code list dictionary itself (the XML document) shall increment its version number. If, however, the error is in the meaning of the code list, then a new code list entry should be created and the existing (erroneous) entry marked as deprecated. Authors of metadata records should not use deprecated code-list items. This situation is considered a minor adjustment according to 2.2.3.1.

2.5.2 *Correcting an error in a conformance-checking rule*

If an erroneous specification of a conformance-checking rule is found, a new descriptor should preferably be added to the appropriate table through the fast-track procedure or the procedure for adoption of amendments between CBS sessions. The new conformance-checking rule should be used instead of the old. **An appropriate explanation shall be added to the description in the description of the conformance-checking rule to clarify the practice along with the date of the change.**

2.5.3 *Submission of changes to code-list entries or conformance-checking rules as a result of correcting an error*

Such changes shall be submitted through the fast-track procedure.

2.6 Validation procedure

2.6.1 *Documentation of need and purpose*

The need for, and the purpose of, the proposal for changes should be documented.

2.6.2 *Documentation of result*

This documentation shall include the results of validation testing of the proposal as described below.

2.6.3 *Testing with WIS metadata applications*

For new or modified code-list entries and validation rules, proposed changes should be tested by the use of at least two independently developed metadata editors and two independently developed GISC catalogues which incorporated the proposed change. Results should be made available to IPET-MDRD with a view to verifying the technical specifications.

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 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 other than that the records may have been completed inconsistently and therefore may fail the version 1.3 checking rules.

WMO Core Metadata Profile version 1.3. This is defined at http://wis.wmo.int/2012/metadata/version_1-3 and is 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[2] 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. CONFORMANCE

2.1 Conformance requirements

The WMO *Technical Regulations* (WMO-No. 49), Volume I, Part I, 3.3.5 states:

> **The functions and operation of the WMO Information System 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.**

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[2] 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.

In this document:

(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.

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'; and**
- **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 http://wis.wmo.int/MD_Index.

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, 8 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	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 http://wis.wmo.int/MD_Conform.

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 'XML 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)[3]
gml Geography Markup Language (http://www.opengis.net/gml/3.2)[3]
xlink XML LINKing language (http://www.w3.org/1999/xlink)[3]
xsi W3C XML Schema Instance (http://www.w3.org/2001X/MLSchema-instance)[3]

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 Unified Modelling Language (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.

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

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.

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/2011/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: http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/. For example, gmd.xsd can be found at http://wis.wmo.int/2011/schemata/iso19139_2007/schema/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 name explicitly 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.

Search 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, 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 purpose of 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, then 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 http://wis.wmo.int/MD_OptElt.

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 WMO data policy and GTS priority for data published for global exchange

WMO data policy pertaining to Resolution 40 (Cg-XII) and Resolution 25 (Cg-XIII) and 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).

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

Note: More details on WMO data policy (WMO Resolution 25 (Cg-XIII) and Resolution 40 (Cg-XII)) are described at http://www.wmo.int/pages/about/exchangingdata_en.html.

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 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: http://wis.wmo.int/MD_DataPolicy.

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 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/PublicallyAvailableStandards/
                      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/PublicallyAvailableStandards/
                    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.**

	Encoding rule		*Description*
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.**
		8.2.2	[MANDATORY obligation] **Keywords from 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 legal constraint (type: "otherConstraints") using one and only one term from the WMO_DataLicenseCode code list.**

Target element(s)		*Description*
	9.3.2	[CONDITIONAL obligation: data globally exchanged via WIS only] **A WIS dscovery metadata record describing data for global exchange via WIS shall indicate the GTS priority as 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] See Part C2, Table 8.
2	MD_KeywordTypeCode	Amendment	Additional term «dataCentre» [006] – from ISO/DIS 19115-1:2013. See Part C2, Table 10.
3	WMO_DataLicenseCode	New	WMO data license applied to the data resource – derived from WMO Resolution 40 (Cg-XII) and Resolution 25 (Cg-XIII) (http://www.wmo.int/pages/about/exchangingdata_en.html) See Part C2, Table 14.
4	WMO_GTSProductCategoryCode	New	Product category used for prioritizing messages over the WMO GTS See Part C2, Table 15.
5	WMO_CategoryCode	New	Additional topic categories for the WMO community See Part C2, Table 16.
6	WMO_DistributionScopeCode	New	Scope of distribution of data within the WIS 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: http://www.isotc211.org/hmmg/HTML/index.htm.

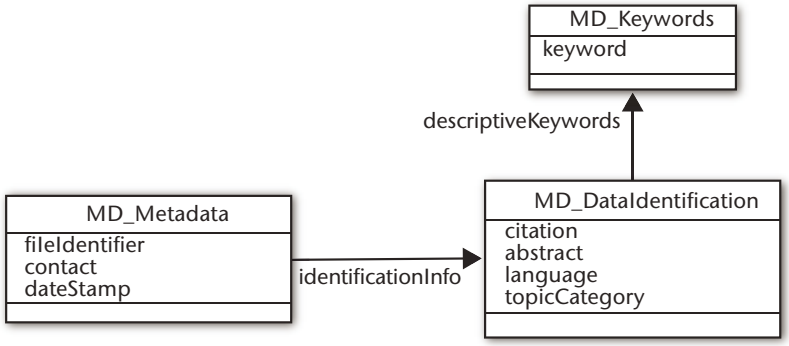

Figure 1. Mandatory contents of a WIS discovery metadata record

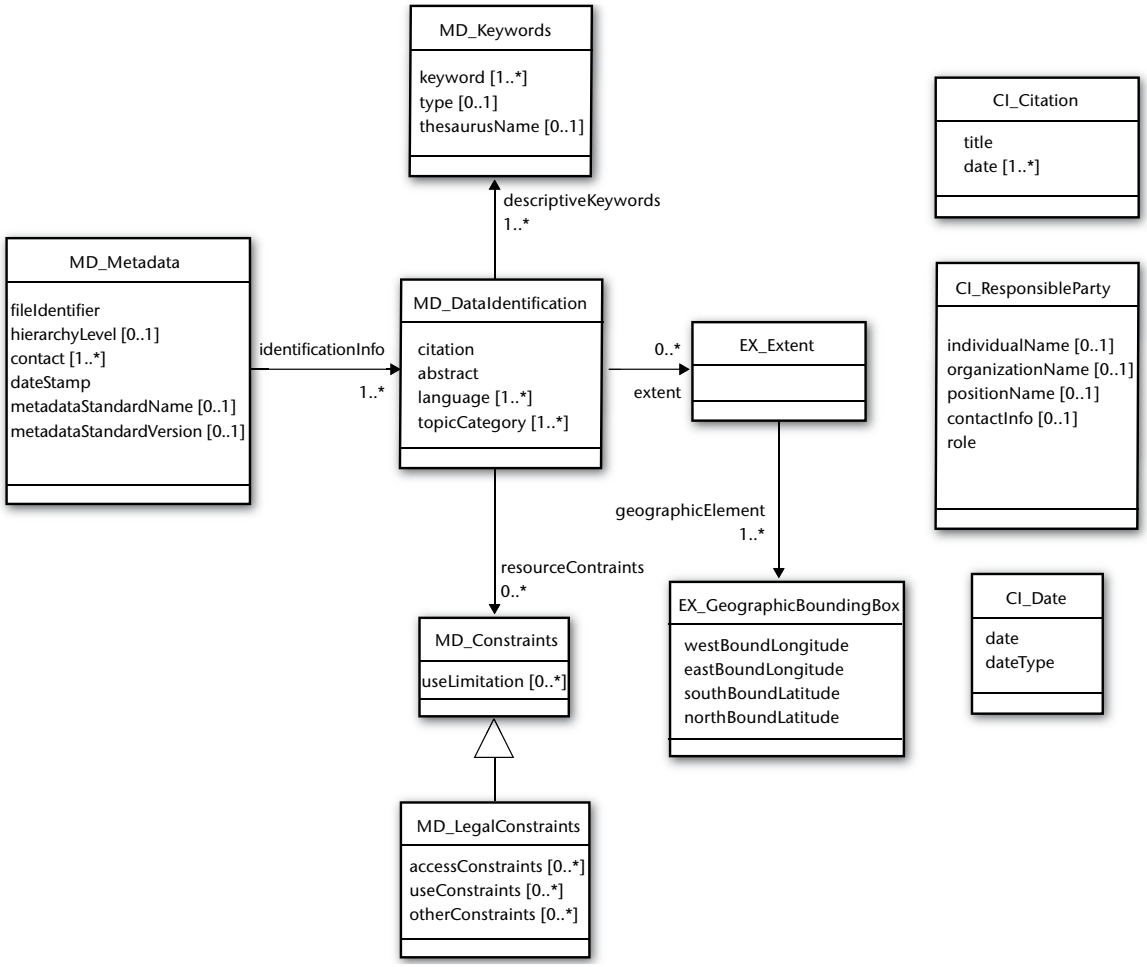

Figure 2. Full specification of the WMO Core Metadata Profile, including both optional and mandatory items

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[4] 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 from the WIS wiki: http://wis.wmo.int/MD_Conform.

(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: http://wis.wmo.int/2012/metadata/conf/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 are hosted by ISO at: http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/.
A reference copy of these XML schemas is hosted by WMO at: http://wis.wmo.int/2011/schemata/iso19139_2007/schema/.

Test id: http://wis.wmo.int/2012/metadata/conf/ISO-TS-19139-2007-rule-based-validation

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/.

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[4] 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.

2.1.2 *Explicit identification of namespaces in XML*

Test id: http://wis.wmo.int/2012/metadata/conf/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: http://wis.wmo.int/2012/metadata/conf/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: http://wis.wmo.int/2012/metadata/conf/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: http://wis.wmo.int/2012/metadata/conf/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: http://wis.wmo.int/2012/metadata/conf/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: http://wis.wmo.int/2012/metadata/conf/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. 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: http://wis.wmo.int/2012/metadata/conf/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** http://wis.wmo.int/2012/metadata/conf/ISO-TS-19139-2007-rule-based-validation **shall ensure that the bounding box is correctly specified.** 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: http://wis.wmo.int/2012/metadata/conf/identification-of-globally-exchanged-data

Test purpose: **Requirement 9.1.1: A WIS discovery metadata record describing data for global exchange via the 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: http://wis.wmo.int/2012/metadata/conf/fileIdentifier-for-globally-exchanged-data

Test purpose: **Requirement 9.2.1: A WIS discovery metadata record describing data for global exchange via the 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: http://wis.wmo.int/2012/metadata/conf/WMO-data-policy-for-globally-exchanged-data

Test purpose: **Requirement 9.3.1: A WIS discovery metadata record describing data for global exchange via the WIS shall indicate the WMO data license as 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: http://wis.wmo.int/2012/metadata/conf/GTS-priority-for-globally-exchanged-data

Test purpose: **Requirement 9.3.2: A WIS discovery metadata record describing data for global exchange via the WIS shall indicate the GTS priority as 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#WMO_GTSProductCategoryCode"

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 http://wis.wmo.int/MD_Index.

Table 1 to Table 7 are tabular representations of the UML diagrams for the section 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.** Those entries marked with "O" should be present if they are applicable. **Entries marked "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 See Part C1, 8.1 and 9.2.
6	hierarchyLevel	scope to which the metadata applies	O	1	Class	MD_ScopeCode «CodeList» See Table 12.
8	contact	party responsible for the metadata	M	N	Class	CI_ResponsibleParty «DataType» 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 See Part C1, 7.
15	Role name: identificationInfo	basic information about the resource(s) to which the metadata applies	M	N	Association	MD_DataIdentification 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» 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 See Table 3 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 See Table 4. 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» 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» See Table 5 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 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» See Table 10. 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» See Table 6 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.

	Name/Role name	Definition	Obligation/Condition	Maximum occurrence	Data type	Domain
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 See Subclause 8.2 (Part C1)	Use maximum occurrence from referencing object	Specialized class (EX_GeographicExtent)	Lines 344-347 and 340
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.

	Name/role name	*Definition*	*Obligation/ Condition*	*Maximum occurrence*	*Data type*	*Domain*
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.
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

	Name/role name	*Definition*	*Obligation/ Condition*	*Maximum occurrence*	*Data type*	*Domain*
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 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 specialised learning
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

	Name	*Domain code*	*Definition*
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 of 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
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

	Name	*Domain code*	*Definition*
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 data sets, Can be used to group keywords as well. Listed examples are not exhaustive. 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 Examples: agriculture, plantations, herding, pests and diseases affecting crops and livestock
3.	biota	002	flora and/or fauna in natural environment Examples: wildlife, vegetation, biological sciences, ecology, sea-life, habitat
4.	boundaries	003	legal land descriptions Examples: political and administrative boundaries
5.	climatologyMeteorology Atmosphere	004	processes and phenomena of the atmosphere Examples: weather, climate, atmospheric conditions, climate change, precipitation
6.	economy	005	economic activities, conditions and employment 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 Examples: altitude, bathymetry, digital elevation models, slope, derived products
8.	environment	007	environmental resources, protection and conservation Examples: environmental pollution, waste storage and treatment, environmental impact assessment, monitoring environmental risk, nature reserves, landscape
9.	geoscientificInformation	008	information pertaining to earth sciences 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 Examples: disease and illness, factors affecting health, hygiene, substance abuse, mental and physical health, health services
11.	imageryBaseMapsEarthCover	010	base maps Examples: land cover, topographic maps, imagery, unclassified images, annotations
12.	intelligenceMilitary	011	military bases, structures, activities Examples: barracks, training grounds, military transportation, information collection

	Name	*Domain code*	*Definition*
13.	inlandWaters	012	inland water features, drainage systems and their characteristics Examples: rivers and glaciers, salt lakes, water utilization plans, dams, currents, floods, water quality, hydrographic charts
14.	location	013	positional information and services Examples: addresses, geodetic networks, control points, postal zones and services, place names
15.	oceans	014	features and characteristics of salt water bodies (excluding inland waters) Examples: tides, tidal waves, coastal information, reefs
16.	planningCadastre	015	information used for appropriate actions for future use of the land Examples: land use maps, zoning maps, cadastral surveys, land ownership
17.	society	016	characteristics of society and cultures 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 Examples: buildings, museums, churches, factories, housing, monuments, shops, towers
19.	transportation	018	means and aids for conveying persons and/or goods Examples: roads, airports/airstrips, shipping routes, tunnels, nautical charts, vehicle or vessel location, aeronautical charts, railways
20.	utilitiesCommunication	019	energy, water and waste systems and communications 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) and Resolution 25 (Cg-XIII) (http://www.wmo.int/pages/about/exchangingdata_en.html)
2.	WMOEssential	001	WMO Essential Data: free and unrestricted international exchange of basic meteorological 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.**

	Name	*Domain code*	*Definition*
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 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

	Name	*Domain code*	*Definition*
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 constiuents 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 File naming convention (associates file with its metadata): documented in *Manual on the Global Telecommunication System* (WMO-No. 386), Part II, Attachment II-15 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 associated with the metadata
Use cases	*Guide to the WMO Information System* (WMO-No. 1061), Appendix B: WIS Technical Specifications – Use cases for major WIS functions, B.1 Provide metadata for data or product
WIS requirements (in addition to requirements applicable to all interfaces)	– **Each GISC shall:** - **Provide metadata catalogue of data, products and services across all GISCs;** - **Assure catalogue interoperability using ISO 23950 search and geospatial services;** - **Catalogue WIS contributions in the Global Earth Observation System of Systems (GEOSS) Clearinghouse;** - **Use ISO 19115 and the WMO Core Metadata Profile;** - **Standardize practices for electronic archiving of metadata;** - **Provide metadata with quality indications to enable search, retrieval and archiving;** - **Use dedicated telecommunications and public Internet for timely delivery;** - **Use ISO standards for references to specific places on Earth;** - **Draw on existing Spatial Data Infrastructure (SDI) components as institutional and technical precedents;** - **Receive from NCs and DCPCs within its area of responsibility the data and products intended for global exchange;** – Each centre should implement backup and recovery of essential services.

Notes:
1. This interface builds on existing GTS practice, adding the particular standard format for WIS metadata about data, products and services.
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).
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).
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 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 for major WIS functions, B.2 Upload data or product 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 the Global Earth Observation System of Systems (GEOSS); – Use ISO standards for references to specific places on Earth; – Harmonize data formats, transmission, archiving and distribution across disciplines; – Use World Weather Watch (WWW) communication links for high-priority real-time data; – Use dedicated telecommunications for the collection and dissemination of time-critical and operation-critical data and products; – Support rapid access and integration of real-time and non real-time (archive) data sets; – Identify and use a variety of data types across WMO Programmes: - **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);** - **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;** - **Each GISC shall receive from NCs and DCPCs within its area of responsibility the data and products intended for global exchange;** – Implement backup and recovery of essential services.
Notes: 1. This interface builds on existing GTS practice, supplemented with other file transfer mechanisms such as the Internet. 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.

WIS-TechSpec-3: Centralization of globally distributed data *(continued)*

Use cases	*Guide to the WMO Information System* (WMO-No. 1061), Appendix B: WIS Technical Specifications – Use cases for major WIS functions, B.4 Manage cache of data across GISCs
WIS requirements (in addition to requirements applicable to all interfaces)	– Standardize practices for electronic archiving of metadata; – Harmonize data formats, transmission, archiving and distribution across disciplines; – Use dedicated telecommunications for the collection and dissemination of time-critical and operation-critical data and products; – Support rapid access and integration of real-time and non real-time (archive) data sets; – Identify and use a variety of data types across WMO Programmes; – **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;** – **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: 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. 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. 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 for major WIS functions, B.5 Maintain identification and role information for WIS users

***WIS-TechSpec-4: Maintenance of user identification and role information** (continued)*

WIS requirements (in addition to requirements applicable to all interfaces)	– Use ISO standards for references to specific places on Earth; – Harmonize data formats, transmission, archiving and distribution across disciplines; – Use dedicated telecommunications and public Internet for timely delivery; – Identify and use a variety of data types across WMO Programmes; – **Each NC shall authorize its national users to access WIS;** – **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

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 for major WIS functions, B.5 Maintain 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; – Harmonize data formats, transmission, archiving and distribution across disciplines; – Use dedicated telecommunications and public Internet for timely delivery; – Draw on existing Spatial Data Infrastructure (SDI) components as institutional and technical precedents; – Identify and use a variety of data types across WMO Programmes; – **Each NC shall authorize its national users to access WIS;** – **Each DCPC shall implement backup and recovery of essential services;** – **Each GISC shall coordinate activities with other GISCs and provide them with backup.**
Notes: 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. 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 Minimum: 40 authentication requests per second Minimum: 20 active sessions
Use cases	*Guide to the WMO Information System* (WMO-No. 1061), Appendix B: WIS Technical Specifications – Use cases for major WIS functions, B.5 Maintain 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; – Use World Weather Watch (WWW) communication links for high-priority real-time data; – Use dedicated telecommunications and public Internet for timely delivery; – **Each NC shall authorize its national users to access WIS;** – **Each DCPC shall implement backup and recovery of essential services;** – **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 Minimum: 40 authorization requests per second Minimum: 20 active sessions
Use cases	*Guide to the WMO Information System* (WMO-No. 1061), Appendix B: WIS Technical Specifications – Use cases for major WIS functions, B.5 Maintain 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; – Use World Weather Watch (WWW) communication links for high-priority real-time data; – Use dedicated telecommunications and public Internet for timely delivery; – **Each NC shall authorize its national users to access WIS;** – **Each DCPC shall implement backup and recovery of essential services;** – **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 Minimum: 40 keyword and bounding box searches per second Minimum: 20 active sessions
Use cases	*Guide to the WMO Information System* (WMO-No. 1061), Appendix B: WIS Technical Specifications – Use cases for major WIS functions, B.6 Discover 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; – Assure catalogue interoperability using ISO 23950 search and geospatial services; – Catalogue WIS contributions in the Global Earth Observation System of Systems (GEOSS) Clearinghouse; – Use ISO 19115 and the WMO Core Metadata Profile; – Standardize practices for electronic archiving of metadata; – Provide metadata with quality indications to enable search, retrieval and archiving; – Make WMO Resolution 40 (Cg-XII) data available through GEOSS interoperable arrangements; – Use ISO standards for references to specific places on Earth; – Draw on existing Spatial Data Infrastructure (SDI) components as institutional and technical precedents; – Harmonize data formats, transmission, archiving and distribution across disciplines; – Use public Internet for data discovery, access and retrieval; – Support rapid access to and integration of real-time and non real-time (archive) data sets; – Identify and use a variety of data types across WMO Programmes; – Support WIS as a GEOSS component with a core role; – **Each DCPC shall support access to data and products via Internet request/reply and implement backup and recovery of essential services;** – **Each GISC shall coordinate activities with other GISCs and provide them with backup.**
Notes The procedures for designating a GISC or DCPC require that both types of WIS centre 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)

WIS-TechSpec-9: Consolidated view of distributed DAR metadata (WIS Discovery Metadata) vatalogues *(continued)*

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 for major WIS functions, B.6 Discover data or products
WIS requirements (in addition to requirements applicable to all interfaces)	– Provide metadata catalogue of data, products and services across all GISCs; – Assure catalogue interoperability using ISO 23950 search and geospatial services; – Catalogue WIS contributions in the Global Earth Observation System of Systems (GEOSS) Clearinghouse; – Use ISO 19115 and the WMO Core Metadata Profile; – Standardize practices for electronic archiving of metadata; – Provide metadata with quality indications to enable search, retrieval and archiving; – Make WMO Resolution 40 (Cg-XII) data available through GEOSS interoperable arrangements; – Use ISO standards for references to specific places on Earth; – Draw on existing Spatial Data Infrastructure (SDI) components as institutional and technical precedents; – Harmonize data formats, transmission, archiving and distribution across disciplines; – Use public Internet for data discovery, access and retrieval; – Support WIS as a GEOSS component with a core role; – **Each DCPC shall support access to data and products via Internet request/reply and implement backup and recovery of essential services;** – **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 for major WIS functions, B.7 Ad hoc request for data or product ("pull"), B.8 Subscribe to data or product ("push"), and B.9 Download data or product from WIS centre

***WIS-TechSpec-10: Downloading files via dedicated networks** (continued)*

WIS requirements (in addition to requirements applicable to all interfaces)	– Harmonize data formats, transmission, archiving and distribution across disciplines; – **Each DCPC shall support access to data and products via Internet request/reply;** – **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;** – Draw on existing Spatial Data Infrastructure (SDI) components as institutional and technical precedents; – Use World Weather Watch (WWW) communication links for high-priority real-time data; – Use dedicated telecommunications for the collection and dissemination of time-critical and operation-critical data and products; – Support rapid access to and integration of real-time and non real-time (archive) data sets; – Identify and use a variety of data types across WMO Programmes; – **Each NC shall generate and disseminate products for national use;** – **Each DCPC shall disseminate data and products intended for regional exchange;** – **Each GISC shall disseminate the data and products intended for global exchange within its area of responsibility.**
Notes:	

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 for major WIS functions, B.7 Ad hoc request for data or product ("pull"), B.8 Subscribe to data or product ("push"), and B.9 Download data or product from WIS centre
WIS requirements (in addition to requirements applicable to all interfaces)	– Harmonize data formats, transmission, archiving and distribution across disciplines; – **Each DCPC shall support access to data and products via Internet request/reply;** – **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;** – Use dedicated telecommunications and public Internet for timely delivery; – Use public Internet for data discovery, access and retrieval; – Support rapid access to and integration of real-time and non real-time (archive) data sets; – Identify and use a variety of data types across WMO Programmes; – **Each NC shall generate and disseminate products for national use;** – **Each DCPC shall disseminate data and products intended for regional exchange;** – **Each GISC shall disseminate the data and products intended for global exchange within its area of responsibility.**
Notes:	

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 for major WIS functions, B.7 Ad hoc request for data or product ("pull"), B.8 Subscribe to data or product ("push"), and B.9 Download data or product from WIS centre
WIS requirements (in addition to requirements applicable to all interfaces)	– Provide metadata with quality indications to enable search, retrieval and archiving; – Harmonize data formats, transmission, archiving and distribution across disciplines; – **Each DCPC shall support access to data and products via Internet request/reply and shall implement backup and recovery of essential services;** – **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;** – Draw on existing Spatial Data Infrastructure (SDI) components as institutional and technical precedents; – Identify and use a variety of data types across WMO Programmes; – **Each NC shall generate and disseminate products for national use;** – **Each DCPC shall disseminate data and products intended for regional exchange;** – **Each GISC shall disseminate the data and products intended for global exchange within its area of responsibility.**
Notes:	

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 for major WIS functions, B.10 Provide dissemination metadata

***WIS-TechSpec-13: Maintenance of dissemination metadata** (continued)*

WIS requirements (in addition to requirements applicable to all interfaces)	– Provide metadata with quality indications to enable search, retrieval and archiving; – Use ISO standards for references to specific places on Earth; – Harmonize data formats, transmission, archiving and distribution across disciplines; – **Each DCPC shall implement backup and recovery of essential services;** – **Each GISC shall coordinate activities with other GISCs and provide them with backup;** – Use World Weather Watch (WWW) communication links for high-priority real-time data; – Use dedicated telecommunications for the collection and dissemination of time-critical and operation-critical data and products; – Use dedicated telecommunications and public Internet for timely delivery; – Support rapid access to and integration of real-time and non real-time (archive) data sets; – **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);** – **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;** – **Each GISC shall disseminate the data and products intended for global exchange within its area of responsibility.**
Notes: 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). 2. WIS centres are required to communicate all changes to each physically distributed part of the logically centralized dissemination metadata (see WIS-TechSpec-14). 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 for major WIS functions, B.10 Provide dissemination metadata

***WIS-TechSpec-14: Consolidated view of distributed dissemination metadata catalogues** (continued)*

WIS requirements (in addition to requirements applicable to all interfaces)	– Provide metadata catalogue of data, products and services across all GISCs; – Provide metadata with quality indications to enable search, retrieval and archiving; – Harmonize data formats, transmission, archiving and distribution across disciplines; – **Each DCPC shall implement backup and recovery of essential services;** – **Each GISC shall coordinate activities with other GISCs and provide them with backup;** – Use World Weather Watch (WWW) communication links for high-priority real-time data; – Use dedicated telecommunications for the collection and dissemination of time-critical and operation-critical data and products; – Use dedicated telecommunications and public Internet for timely delivery; – Support rapid access to and integration of real-time and non real-time (archive) data sets; – Identify and use a variety of data types across WMO Programmes; – **Each NC shall upload data and products intended for global exchange to its associated GISC (and DCPC where applicable);** – **Each DCPC shall disseminate data and products intended for regional exchange and upload data and products intended for global exchange to its associated GISC;** – **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 been decided yet 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 needs of the WIS centres.
Use cases	*Guide to the WMO Information System* (WMO-No. 1061), Appendix B: WIS Technical Specifications – Use cases for major WIS functions, B.11 Report 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: 1. As noted in *Guide to the WMO Information System* (WMO-No. 1061), Appendix B: WIS Technical Specifications – Use cases for major WIS functions, 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. 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 The provision of WIS services within a National Meteorological and Hydrological Service (NMHS) or related services might be accomplished by a variety of skilled personnel, including project managers, engineers, technicians and information technology staff. Third party organizations, such as universities, international and regional institutions and centres, private sector companies and other providers, might also supply data, products and information for the WIS service(s).

1.2 This document sets out a competency framework for personnel involved in the provision of WIS services, but it is not necessary that each person has the full set of competencies. However, within specific application conditions (see 2 below), which will be 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 will 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 physical site security;
1d. Manage physical site environmental control.

Knowledge and skill requirements

- General information and communications technology (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 the WIS functions.

Performance components

2a. Meet service levels by maintaining applications in optimal operational condition through:
- Configuration of applications;
- Monitoring and responding to applications' behavior;
- Preventative and corrective maintenance;
- Replacement or upgrade of 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 collection and distribution of data and products as per 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 your centre and other WIS centres.

Performance components

5a. Exchange information with other centres on operational matters;
5b. Facilitate registration of new WIS centres;
5c. Facilitate 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 notification of operational changes;
- Procedures and practices for 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 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 functionality.

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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