|  |  |  |
| --- | --- | --- |
| TIEMPO CLIMA AGUA | Organización Meteorológica Mundial  **COMISIÓN DE OBSERVACIONES, INFRAESTRUCTURA Y SISTEMAS DE INFORMACIÓN**  **Segunda reunión** Ginebra, 24 a 28 de octubre de 2022 | **INFCOM-2/Doc. 6.3(2)** |
| Presentado por: presidente de la plenaria  26.X.2022  **APROBADO** |

**PUNTO 6 DEL ORDEN DEL DÍA: REGLAMENTO TÉCNICO Y OTRAS DECISIONES   
DE CARÁCTER TÉCNICO**

**PUNTO 6.3: Comité Permanente de Gestión y Tecnología   
de la Información**

# PUESTA AL DÍA DE LA *GUÍA DEL SISTEMA DE INFORMACIÓN DE LA OMM* (OMM-Nº 1061)



# PROYECTO DE RECOMENDACIÓN

## Proyecto de Recomendación 6.3(2)/1 (INFCOM-2)

## Puesta al día de la *Guía del Sistema de Información de la OMM* (OMM-Nº 1061)

LA COMISIÓN DE OBSERVACIONES, INFRAESTRUCTURA Y SISTEMAS DE INFORMACIÓN (INFCOM),

**Recordando**:

1) la [Resolución 7 (EC-69)](https://library.wmo.int/doc_num.php?explnum_id=3789#page=145) — Ejecución del Sistema de Información de la OMM,

2) la [Resolución 22 (EC-73)](https://library.wmo.int/doc_num.php?explnum_id=11030#page=398) — Plan de Ejecución, arquitectura funcional y proyectos de demostración de la versión 2.0 del Sistema de Información de la OMM,

3) la [Decisión 22 (INFCOM-1)](https://library.wmo.int/doc_num.php?explnum_id=10973#page=259) — Actualización de los procedimientos de control y de los indicadores de calidad de los metadatos del Sistema de Información de la OMM,

**Reconociendo** la importancia de brindar orientación a los Miembros sobre la gestión de la información a lo largo de su ciclo de vida,

**Tomando nota** de los progresos realizados por el Comité Permanente de Gestión y Tecnología de la Información (SC-IMT) en el establecimiento de un conjunto de principales indicadores de ejecución (KPI) que ayuden a evaluar el catálogo del Sistema de Información de la OMM (WIS) en cuanto que herramienta para localizar datos puestos en común mediante el WIS y acceder a ellos (véase el documento [INFCOM-2/INF 6.3(2)](https://meetings.wmo.int/INFCOM-2/InformationDocuments/Forms/AllItems.aspx)),

**Tomando nota también** de la evolución del catálogo del WIS, y de la norma sobre metadatos correspondiente, fruto de la implementación de la versión 2.0 del WIS, descrita en el documento [INFCOM-2/INF. 6.3.1(2)](https://meetings.wmo.int/INFCOM-2/InformationDocuments/Forms/AllItems.aspx),

**Recomienda** al Consejo Ejecutivo que apruebe los cambios en la [*Guía del Sistema de Información de la OMM*](https://library.wmo.int/index.php?lvl=notice_display&id=6856#.Y0AtG3ZByUk)(OMM-Nº 1061) mediante el proyecto de resolución que figura en el [anexo](#AnexoRecomendación) a la presente recomendación.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_

[Anexo: 1](#AnexoRecomendación)

## Anexo al proyecto de Recomendación 6.3(2)/1 (INFCOM-2)

## Proyecto de Resolución ##/1 (EC-76)

### EL CONSEJO EJECUTIVO,

**Recordando**:

1) la [Resolución 7 (EC-69)](https://library.wmo.int/doc_num.php?explnum_id=3789#page=145) — Ejecución del Sistema de Información de la OMM,

2) la [Resolución 22 (EC-73)](https://library.wmo.int/doc_num.php?explnum_id=11030#page=398) — Plan de Ejecución, arquitectura funcional y proyectos de demostración de la versión 2.0 del Sistema de Información de la OMM,

**Habiendo examinado** la [Decisión 22 (INFCOM-1)](https://library.wmo.int/doc_num.php?explnum_id=10973#page=259) — Actualización de los procedimientos de control y de los indicadores de calidad de los metadatos del Sistema de Información de la OMM,

**Notando** la estrecha colaboración mantenida entre la Comisión de Observaciones, Infraestructura y Sistemas de Información (INFCOM) y la Comisión de Aplicaciones y Servicios Meteorológicos, Climáticos, Hidrológicos y Medioambientales Conexos (SERCOM) al definir los materiales de orientación relativos a la gestión de la información que se incluirán en la [*Guía del Sistema de Información de la OMM*](https://library.wmo.int/index.php?lvl=notice_display&id=6856#.Y0AtG3ZByUk) (OMM-Nº 1061),

**Notando también**:

1) la necesidad de supervisar la calidad de los metadatos del Sistema de Información de la OMM (WIS) mediante el cálculo periódico de principales indicadores de ejecución (KPI), descritos en el documento [INFCOM-2/INF 6.3(2)](https://meetings.wmo.int/INFCOM-2/InformationDocuments/Forms/AllItems.aspx),

2) la evolución del catálogo del WIS fruto de la implementación de la versión 2.0 del WIS, descrita en el documento [INFCOM-2/INF 6.3(1.2)](https://meetings.wmo.int/INFCOM-2/InformationDocuments/Forms/AllItems.aspx),

**Estando conforme** con el [proyecto de Recomendación 6.3(2)/1 (INFCOM-2)](#Recomendacion) — Puesta al día de la *Guía del Sistema de Información de la OMM* (OMM-Nº 1061),

**Decide**:

1) añadir un nuevo capítulo a la [*Guía del Sistema de Información de la OMM*](https://library.wmo.int/index.php?lvl=notice_display&id=6856#.Y0AtG3ZByUk)(OMM‑Nº 1061) dedicado a la gestión de la información, que figura en el [anexo 1](#Annex_1)   
a la presente resolución;

2) añadir un nuevo capítulo a la [*Guía del Sistema de Información de la OMM*](https://library.wmo.int/index.php?lvl=notice_display&id=6856#.Y0AtG3ZByUk)(OMM-Nº 1061) dedicado a los principales indicadores de ejecución (KPI) de los   
registros de metadatos del WIS, que figura en el [anexo 2](#Annex_2) a la presente resolución;

3) aprobar los cambios debidos a la reforma de la Organización Meteorológica Mundial (OMM), que figuran en el [anexo 3](#Annex_3) a la presente resolución;

### Solicita a la INFCOM que elabore los KPI de los registros de metadatos del WIS, así como un proceso relacionado que, en el contexto de la implementación de la versión 2.0 del WIS, permita localizar datos en el catálogo del WIS de forma cada vez más eficaz.

Véase el documento [INFCOM-2/INF 6.3(2)](https://meetings.wmo.int/INFCOM-2/InformationDocuments/Forms/AllItems.aspx) para obtener más información.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_

[Anexo 1](#Annex_1): Orientaciones para la gestión de la información

[Anexo 2](#Annex_2): Principales indicadores de ejecución de los registros de metadatos del Sistema de Información de la OMM

[Anexo 3](#Annex_3): Cambios en la *Guía del Sistema de Información de la OMM* (OMM-Nº 1061) debidos a la reforma de la Organización Meteorológica Mundial

## Anexo 1 al proyecto de Resolución ##/1 (EC-76)

**ORIENTACIONES para LA GESTIÓN DE LA InformaCiÓn**

Change Part VI Information Management of the [*Manual on the WMO Information System Volume I. WMO Information System 1.0*](https://library.wmo.int/doc_num.php?explnum_id=11077) (WMO-No. 1060) as follows.

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

~~6.1.4 Members shall assess the maturity of their information management practices against the maturity levels to be specified in~~ [***~~Guide to the WMO Information System~~***](https://library.wmo.int/index.php?lvl=notice_display&id=6856)~~(WMO‑No. 1061), Part VI, shall compare the results with the maturity required for the information being handled, and report both the actual and required maturity to the WMO Secretariat.~~

~~6.1.5 Members should use the guidance in their information management practices against the maturity levels to be specified in~~ [*~~Guide to the WMO Information System~~*](https://library.wmo.int/index.php?lvl=notice_display&id=6856)~~(WMO‑No. 1061), Part VI, when designing, applying and improving their processes for managing information.~~

6.1.~~6~~5 Members shall manage their Information and Communication Technology (ICT) to a standard consistent with the requirements of the services that depend on that ICT.

~~Note: Further guidance on information management best practices is provided in Guide to the WMO Information System (WMO-No. 1061), Part VI.~~

Change Part VI Information Management of the [*Guide to the WMO Information System*](https://library.wmo.int/doc_num.php?explnum_id=11213) (WMO-No. 1061) as follows.

**PART VI. INFORMATION MANAGEMENT**

~~Guidance on management of information about climate reports and climate observing stations is available in Climate Data Management Systems Specifications (WMO-No. 1131), which is an attachment to this Guide.~~

**6.1 Introduction**

**6.1.1 Background**

The efficient and effective provision of services relying on meteorological, climatological, hydrological and oceanographic information depends on a reliable information infrastructure. This infrastructure should be guided by community best practices and standards, including recommendations and requirements on sourcing, securing, managing, archiving, exchanging, and providing easy access to information. These terms and activities can be grouped under the term “information management” and this part of the Guide aims to provide high-level guidance on those activities. This is done by identifying and describing the fundamental principles of good information management and by highlighting the different stages of the information management lifecycle.

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

**6.1.2 Scope**

6.1.2.1 High-level guidance on information management practices that apply in the context of information related to the Earth system is provided in this part of the Guide. Detailed technical information, such as specification of data formats or quality control and assurance methods, is provided in other parts of the Guide and in other WMO publications. These are referenced where applicable.

6.1.2.3 The principles of information management are described in Section 6.2. Section 6.3 describes the information management lifecycle through the identification of five focus areas. These are:

1. **Planning, information creation and acquisition**. Creation of information using internal and external data sources and the acquisition of information from various sources.

~~2.~~ **Representation and metadata**. Standards to represent metadata, data and information are of primary importance to enable interoperability and long-term usability of the information.

3. **Publication and exchange of information**. The creation and publication of discovery metadata in a standardized format enabling users to discover, access and retrieve the information.

4. **Usage and communication.** Publication of guidance material on the use of published information, including on the limitations and suitability of the information and any licensing terms.

5. **Storage, archival and disposal**. Policies and procedures for business continuity and disaster recovery, as well as retention and disposal.

**6.1.3 Intended audience**

6.1.3.1 This guidance is primarily aimed at personnel within WMO centres, with responsibility for planning and undertaking the creation or acquisition, stewardship, exchange and provision of information related to the Earth system.

6.1.3.2 Specifically, the guidance has five main target audiences across the information lifecycle:

1. Information producers or creators (those who produce or acquire the information – they need to ensure the scientific quality of the underpinning information).

2. Information managers (those who manage information).

3. Information providers or publishers (those who publish the information – they are responsible for the provision of the information, and for ensuring that appropriate access is enabled, licensing agreements are in place, etc.).

4. Service providers (those who disseminate the information – they are responsible for ensuring information availability and maintaining capability for easy and secure access to the information).

5. Information consumers (those who utilize the information – they need to understand the restrictions, rights, responsibilities and limitations associated with the information together with the suitability for intended usage or purpose).

**6.2 principles of information management**

Effective management of information is essential for WMO centres to deliver operational services and information that is authoritative, seamless, secure and timely. The principles below underpin this management across the full information lifecycle and provide a framework for information management. The principles are independent of information type and are largely independent of technology, they are therefore expected to remain stable over time.

**6.2.1 Principle 1: Information is a valued asset**

6.2.1.1 An information asset is information that has value. This value may be related to the cost of generating and collecting the information, a value associated with the immediate use or a value associated with the longer term preservation and subsequent reuse of the information.

6.2.1.2 This value should be recognizable and quantifiable and the asset should have an identifiable lifecycle. Risks associated with, and to, an information asset should also be identified. As such, information management must be considered an integral part of a WMO centre’s responsibilities and needs to be adequately resourced over the full lifecycle of the information.

**6.2.2 Principle 2: Information must be managed**

6.2.2.1 An information asset must be managed throughout its lifecycle, from creation to use to eventual disposal, in a way that makes it valuable, maximizes its benefits and reflects its value in time and its different uses.

6.2.2.2 Information managers must consider the entire information lifecycle, from identifying needs and business cases to creating, quality assurance, maintenance, reuse, archiving, and disposal. Careful consideration must be given to disposal, ensuring that information is destroyed only when it has ceased to be useful for all categories of users.

6.2.2.3 Professionally qualified and adequately skilled staff with clear roles and responsibilities should apply a sound custodianship framework concerning security, confidentiality and other statutory requirements of different types of information.

**6.3.3 Principle 3: Information must be fit for purpose**

6.2.3.1 Information should be developed and managed in accordance with its function and use for internal and external users.

6.2.3.2 WMO centres should regularly assess information to ensure that it is fit for its purpose and that processes, procedures, and documentation are adequate.

6.2.3.3 Processes should be consistent with the general provisions and principles of quality management as described in the WMO *Technical Regulations* (WMO-No. 49).

**6.2.4 Principle 4: Information must be standardized and interoperable**

6.2.4.1 Information must be stored and exchanged in standardized formats to ensure wide usability in the short and long term. It is essential for long-term archiving that information is stored in a form that can be understood and used after several decades.

6.2.4.2 Standardization is essential for structured information such as data set definitions and metadata to support interoperability.

6.2.4.3 Interoperability is essential for users to utilize information through different systems and software. Open standards help ensure interoperability with their openness and wide adoption across various communities.

6.2.4.4 Which standards to use depends on the user community and organizational policies. Interoperability requirements should be considered when selecting the standard for internal use and broader dissemination.

6.2.4.5 The use of closed and proprietary standards is strongly discouraged.

**6.2.5 Principle 5: Information must be well documented**

6.2.5.1 WMO centres should comprehensively document information processes, policies, and procedures to facilitate broad and long-term use.

6.2.5.2 WMO centres should keep documentation up to date to ensure full traceability of processes along the information lifecycle, particularly for its creation.

6.2.5.3 Previous versions of the documentation should be retained, versioned, archived and made readily available for future use. In addition, versions should be assigned a unique and persistent identifier for future unambiguous identification.

**6.2.6 Principle 6: Information must be discoverable, accessible and retrievable**

6.2.6.1 Information should be easy to find through the Web, and for this purpose, the publisher should share discovery metadata with a catalogue service. The catalogue service should include a Web Application Programming Interface (API) to be used by other applications in order to offer user-tailored search portals.

6.2.6.2 For information to be easily retrievable once discovered, it should be accessible using standard data exchange protocols.

**6.2.7 Principle 7: Information should be reusable**

6.2.7.1 In order to maximize the economic benefits of an information asset it should be made as widely available and as accessible as possible.

6.2.7.2 The WMO Unified Data Policy encourages the reuse of data and information through the open and unrestricted exchange of core WMO data. The WMO encourages the free and unrestricted exchange of information in all circumstances.

6.2.7.3 The publisher should provide an explicit and well-defined license for each information item or data set as part of the associated metadata.

6.2.7.4 The Findable, Accessible, Interoperable and Reusable (FAIR) data principles promote open data with the ultimate goal of optimizing reuse of data. These principles should be followed where possible.

Note: Information on the FAIR data principles can be found at: [FAIR Principles - GO FAIR (go-fair.org)](https://www.go-fair.org/fair-principles/)

**6.2.8 Principle 8: Information management is subject to accountability and governance.**

6.2.8.1 Information management processes must be governed as the information moves through its lifecycle. All information must have a designated owner, steward, curator and custodian. These roles may be invested in the same person but should be clearly defined at the time of creation. A WMO centre with responsibility for managing information must ascertain:

 General information management practices, procedures and protocols, including well-defined roles, responsibilities and restrictions on managing the information;

 Definition and enforcement of appropriate retention policy, taking into account stakeholder needs and variations in value over the information lifecycle;

 Licensing and defining and enforcing any access restrictions.

6.2.8.2 The designated owner should have budget and decision-making authority about preservation and data usage, including passing ownership to another authority.

**6.3 The information management lifecycle**

**6.3.1 Overview**

6.3.1.1 All information should be subject to a well-defined and documented lifecycle. The governance of this process is often referred to as the information management lifecycle and this process helps organizations manage information throughout its full lifecycle, from planning, creation and acquisition through usage and exchange to archival and disposal.

6.3.1.3 The following sections describe two overarching themes, governance and documentation, that apply to all stages of the information lifecycle and then provides high-level guidance split into five aspects:

 Planning, creation and acquisition

 Representation and metadata

 Publication and exchange

 Usage and communication

 Storage, archival and disposal

6.3.1.4 Governance covers the rules that apply to managing information in a secure and transparent manner, documentation covers the act of recording the reasons for, and detail of, all operations in the information management process.

**6.3.2 Overarching requirements**

***6.3.2.1 Governance***

6.3.2.1.1 Information management governance defines a set of organizational procedures, policies and processes for the management of information. This includes defining accountabilities and compliance mechanisms.

6.3.2.1.2 Effective governance helps ensure that all aspects of the information management process are conducted in a rigorous, standardized and transparent manner and that the information are secure, accessible and usable.

6.3.2.1.3 WMO centres should establish a board or leadership group to develop and regularly review such a governance structure and ensure compliance with its requirements.

***6.3.2.2 Documentation***

6.3.2.2.1 Documentation describing the who, what, why, when, where and how various actions are undertaken in the management of information is required to ensure the traceability and integrity of the information and to ensure operations can continue if key staff leave.

6.3.2.2.2 This documentation is required for all aspects of the information lifecycle and should be clear, well communicated, regularly updated, and easy to find. Guidance to the documentation should be provided to new staff taking on responsibilities for information management and be a key component of training.

**6.3.3 Aspects of the information management lifecycle**

***6.3.3.1 Planning, information creation and acquisition***

6.3.3.1.1 Before the creation or acquisition of new information a business case and information management plan should be developed, covering both the input information sources and any derived information. The plans should include:

 Why the information is required

 How it will be collected or created

 How it will be stored

 Whether it will be exchanged with other users and under what policy

 Where it should be submitted for long term archival

 Key roles and responsibilities associated with the management of the information

For externally sourced data the plans should include where the information has come from and what the licensing terms are.

6.3.3.1.2 Once information has been acquired it should be checked to ensure that the contents and format are as expected. This may be done using a compliance checker or validation service. Once these checks have been performed the information content should also undergo quality control checks using well documented procedures to identify any issues. A record of the checks should be kept and any issues detected should be documented and feedback to the originators. It is also important to subscribe to updates from originators so any issues identified externally can be taken into account.

6.3.3.1.3 Information created rather than acquired should undergo the same processes as the acquired information. The information created should undergo quality control and the resulting files checked against the specified format requirements. The results of the processes and checks should be documented.

6.3.3.1.7 To ensure traceability and reproducibility the information and documents at this, and subsequent stages, should be version controlled and clearly labelled with version information. Similarly, software, or computer code, used to generate or process information should be version controlled with the version information recorded in the documentation and metadata. Where possible, software should be maintained within a code repository.

***6.3.3.2 Representation and metadata***

6.3.3.2.1 The formats used to store and exchange information should be standardized to ensure its usability, both in the short and long term. It is essential that the information can be accessed many years after archival if required. To ensure this usability, the format and version information should be recorded in the metadata record for the information and should be included in the information where the format allows.

6.3.3.2.2 Information exchanged on the WMO Information System and between WMO centres is standardized through the use the formats specified in the WMO Manual on Codes (WMO-No. 306, Volume I.2) and the Manual on the WMO Information System (WMO-No. 1060). This includes the GRIB and BUFR formats for numerical weather prediction products and observational data and the WIS Core Metadata Profile for discovery, access and retrieval metadata. The format for the exchange of station and instrumental metadata, the WIGOS Metadata Data Representation, is also defined in the WMO Manual on Codes (WMO-No. 306, Volume I.3).

6.3.3.2.3 These formats have been developed within the WMO community to enable the efficient exchange of information between WMO centres and for the information to be interoperable between centres and systems. The formats, including detailed technical information, have also published openly through the WMO manuals, enabling use of the formats and information by other communities, promoting reuse of the information.

6.3.3.2.4 The WMO formats specified in the manuals are subject to strong governance processes, and changes to the formats can be traced through the versions of the manuals. The code tables and controlled vocabularies are also maintained in a code repository. To enable future reuse, the technical information, including detailed format specifications, should be archived alongside information for future access. This includes any controlled vocabulary, such as BUFR tables or WIGOS metadata code lists, associated with the format.

***6.3.3.4 Publication and exchange of information***

6.3.3.4.1 To maximize the benefits and return on investment in the acquisition and generation of information there needs to be a clear method as to how the information will be published, exchanged and accessed by users.

6.3.3.4.2 Information is published on the WMO Information System through the creation of discovery metadata records. These records are publicly searchable and retrievable via WMO cataloguing services, providing access to the records via the Web and via a Web Application Programming Interface (API). The metadata records should include information on how to access the described datasets and services (see also 6.3.3.4.4) and how to subscribe to receive updates and new data.

6.3.3.4.3 Guidance on the creation of these discovery metadata records is included in Part V of this Guide. Technical regulations are provided in the Manual on the WMO Information System (WMO-No. 1060). Before exchange and publication the metadata should be assessed using the WMO Core Metadata Profile Key Performance Indicators to ensure usable and high quality metadata in addition to metadata that conforms with the technical standard.

Note: Further information on the Key Performance indicators can be found on the WMO Community Website at https://community.wmo.int/activity-areas/wis/wis-metadata-kpis

6.3.3.4.4 Information is exchanged between WMO centres using methods defined in the WMO Manual on the Global Telecommunication System (WMO-No. 386) and the WMO Manual on the WMO Information System (WMO-No. 1060). Access to external users should be provided via the WMO centres using open Web standards, services and protocols.

6.3.3.4.5 The Web standards and protocols used should be adequately documented to enable users to find and retrieve the information. This should be possible both manually and automatically via machine-to-machine interfaces and should be standardized between centres.

6.3.3.4.6 Updates to the information exchanged on the WIS, including the publication of new information or the cessation of previously exchanged information, is published in the WMO Operational Newsletter.

Note: The newsletter is available from: https://community.wmo.int/news/operational-newsletter

***6.3.3.5 Usage and communication***

6.3.3.5.1 For information to have value it must inform users, aid knowledge discovery and have impact through informed decision-making. Ensuring that the user can make effective use of the information is an important step in the information management lifecycle. This takes two forms:

(1) Provision of suitable information within the discovery metadata (See 6.3.3.4), enabling users to discover and access the information and to assess whether it meets their requirements. This should include licensing information.

(2) Provision of user guides and documentation on the suitability of the information for different uses, including any technical caveats or restrictions on the use of the information.

6.3.3.5.2 For common types of information the guides may be generic or link to standard documentation. Information on the observations available from the WMO Integrated Global Observing System is provided within the Manual and Guide to the WMO Integrated Global Observing system, WMO-No. 1160 and WMO-No. 1165 respectively. This includes information on the expected uses and quality of the data, either directly or through links within. Similarly, information on the data and products available through the Global Data Processing and Forecasting System is provided in the Manual on the Global Data Processing and Forecasting System (WMO-No. 485).

6.3.3.5.3 For non-standard and specialist products targeted user guides may be more appropriate. These should include a plain text summary for the non-technical user and should also be accessible and retrievable via a link within the discovery metadata. Any user guide should be in addition to the technical documentation described under planning, information creation and acquisition (see 6.3.3.1).

6.3.3.5.4 Updates and the availability of new information should be announced and published via the WMO Operational Newsletter (see 6.3.3.4.6). Other communication methods may also be used but these should not be in place of the operational newsletter. It is also recommended to allow users to subscribe to receive updates directly.

6.3.3.5.5 The discovery metadata should include a valid point of contact, enabling users to provide feedback and ask questions about the information provided.

***6.3.3.6 Storage, archival and disposal***

6.3.3.6.1 The type of storage used should be appropriate to the type of information stored. Core information exchanged operationally should be stored and made available via high-availability and low latency media and services. For some operation critical information, such as hazard warnings, there is a requirement for the end-to-end global distribution of the information to be completed in two minutes. For other operational data there is a requirement for the global exchange to be completed in 15 minutes.

6.3.3.6.2 The storage requirements for non-operational services and information may be different but the guidance provided in this section applies equally. Further information on the performance requirements is provided within the WIS Technical Specifications listed in the Manual on the WMO Information System (WMO-No. 1060).

6.3.3.6.3 Backup policies and data recovery plans should be documented as part of the information management plan. These should be implemented either before or when the information is created or acquired and should include both the information and the associated metadata. The backup and recovery process should be routinely tested. Specific guidance on the expectations and requirements for WMO centres is provided under the operational guidance in Part VII of this Guide.

6.3.3.6.4 Business rules governing the access to and modification of the information should be clearly documented in the information management plan. This must include the clear specification of roles and responsibilities of those managing the information. Information on who can authorize the archival and disposal of the information and the processes for doing so should be included. The roles associated with an information resource are standardized as part of the WIS Core Metadata Profile, see Part V of this Guide for further information.

6.3.3.6.5 The archival and long-term preservation of an information resource should be identified and included in the information management plan. This may be at a national data centre and/or a WMO centre. The WMO centres are recommended for globally exchanged core data and include those centres contributing to the Global Atmosphere Watch, the Global Climate Observing System and the Marine Climate Data System (see Manual on Marine Meteorological Services, WMO-No. 558), as well as the WMO World Data Centres and those defined in the Manual on the WMO Information System (WMO-No. 1060) and those defined in the Manual on the Global Data Processing and Forecasting System (WMO-No. 485).

6.3.3.6.6 Earth system information, especially observational data, are often irreplaceable. Other information, whilst technically replaceable, is often costly to produce and therefore not easily replaceable. This includes output from numerical models and simulations. Before an information resource is marked for disposal careful consideration must be given to whether long term archival or disposal is more appropriate. This consideration must follow a clearly defined process documented in the information management plan.

6.3.3.6.6 When an information resource is marked for disposal the reasons for disposal, including the outcome of the consultation with stakeholders and users, must clearly be documented. The disposal must be authorized by the identified owner and custodian of the information. The information on the disposal must be included in the metadata associated with the information resource. The metadata must be retained for future reference.

**6.4 Other considerations**

**6.4.1 Technology and technology migration**

Information managers must be aware of the need to ensure that the technologies, hardware and software used do not become obsolete and must be aware of emerging data issues. This topic is discussed further in the WMO Guide to Emerging Data Issues (WMO-No. 1239).

**6.4.2 Information security**

Further information on information security and best practices can be found in the WMO Guide to Information Technology Security (WMO-No. 1115).

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

## Anexo 2 al proyecto de Resolución ##/1 (EC-76)

**PRINCIPALES INDICADORES DE EJECUCIÓN DE LOS REGISTROS   
DE METADATOS DEL SISTEMA DE INFORMACIÓN DE LA OMM**

Change Part V of the [*Guide to the WMO Information System*](https://library.wmo.int/doc_num.php?explnum_id=11213) (WMO-No. 1061) as follows.

~~5.9 Technical document~~

~~More details on the WCMP metadata can be found at~~ [~~https://community.wmo.int/activity-areas/wis/wcmp~~](https://community.wmo.int/activity-areas/wis/wcmp)~~.~~

**5.9 Key Performance Indicators of WIS metadata records**

5.9.1 The Key Performance Indicators (KPIs) of WIS metadata records support the evaluation of the WIS catalogue as a tool to discover and access data shared through WIS. For that purpose, they provide measurable rules to assess compliance to WCMP 1.3 and ISO 19115:2003/19139:2007 and evaluate the metadata's quality and effectiveness for discovery purposes. The primary aim of the KPIs is to provide a quantitative assessment of the WIS metadata records to be communicated to the data publisher for appropriate corrective actions resulting in a continuous improvement of the users’ discovery experience.

5.9.2 The WIS metadata KPIs are designed to help data publishers in the curation of discovery metadata. They should be computed at different stages of the publication process and by various participants to ensure an effective improvement process and reduce the number of metadata records with poor KPI scoring present in the WIS catalogue. The metadata KPIs should be computed

1. by the data publisher before providing the metadata to the relevant GISC;

2. by the GISC before inserting the data in the WIS catalogue;

3. by the Secretariat or relevant GISCs to analyse the content of the WIS catalogue and provide a summary and specific indications to the publishers on how to improve the metadata.

5.9.3 GISCs should perform the regular computation of metadata KPIs when new metadata are published and periodically on the entire catalogue. In addition, GISCs should request NCs and DCPCs in the area of responsibility to perform corrective actions to improve the quality of WIS metadata records when KPIs scores indicate doing so.

5.9.4 The WMO Secretariat shall provide, at least twice a year, a WIS metadata KPIs report providing an overview of the quality of the metadata in the available WIS catalogues. GISCs and data publishers will be notified of the publication of the report and requested to address issues concerning low KPI scores.

5.9.5 Tools to compute the WIS metadata KPIs are available at <https://github.com/wmo-im/pywcmp>, they are provided as open-source for the benefit of data publishers and GISCs to encourage the monitoring of compliance and quality at all the metadata publication stages.

5.9.6 Each KPI assesses a number of criteria associated with metadata quality, resulting in a raw score, as well as a percentage.

**5.9.7 KPI Measurements**

5.9.7.1 KPI-1: WCMP 1.3 compliance

Measurement

Requirements specified in the abstract test suite in Manual on WIS, Part C2, 2.1 that provide information about the quality of the metadata content.

Rational for measurement

This KPI assesses compliance with the requirements of the abstract test suite to ensure that the metadata record is valid, parseable and has base-level information for discovery and access. The metadata record should pass requirement 6.1.1 before further evaluations are performed. A metadata record not passing requirement 6.1.1 should not be accepted in the WIS catalogue.

Rules

| Rule | | Score |
| --- | --- | --- |
| Requirement 6.1.1 | Each WIS Discovery Metadata record shall validate without error against the XML schemas defined in ISO/TS 19139:2007. | Pass/Fail |
| Requirement 8.1.1 | Each WIS Discovery Metadata record shall include one gmd:MD\_Metadata/gmd:fileIdentifier attribute. | 1 |
| Requirement 8.2.1 | Each WIS Discovery Metadata record shall include at least one keyword from the WMO\_CategoryCode code list. | 1 |
| Requirement 8.2.2 | Keywords from WMO\_CategoryCode code list shall be defined as keyword type theme. | 1 |
| Requirement 8.2.3 | All keywords sourced from a particular keyword thesaurus shall be grouped into a single instance of the gmd:MD\_Keywords class. | 1 |
| 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. | 1 |
| 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. | 1 |
| 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 (where {uid} is a unique identifier derived from the GTS bulletin or file name): urn:x-wmo:md:int.wmo.wis::{uid}. | 1 |
| 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: gmd:otherConstraints) using one and only one term from the WMO\_DataLicenseCode code list. | 1 |
| 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: gmd:otherConstraints) using one and only one term from the WMO\_GTSProductCategoryCode code list. | 1 |

Total possible score: 9 (100%)

Guidance

Use WCMP templates and/or tools to generate the metadata record.

References

 Manual on WIS, Part C2 – Abstract Test Suite, Data Dictionary and Code Lists

XPaths

 /gmd:MD\_Metadata/gmd:fileIdentifier

 /gmd:MD\_Metadata/gmd:identificationInfo//gmd:descriptiveKeywords/gmd:MD\_Keywords/gmd:keyword

 /gmd:MD\_Metadata/gmd:identificationInfo//gmd:descriptiveKeywords/gmd:MD\_Keywords/gmd:type/gmd:MD\_KeywordTypeCode

 /gmd:MD\_Metadata/gmd:identificationInfo//gmd:descriptiveKeywords/gmd:MD\_Keywords/gmd:thesaurusName/gmd:CI\_Citation/gmd:title

 /gmd:MD\_Metadata/gmd:identificationInfo/gmd:MD\_DataIdentification/gmd:extent/gmd:EX\_Extent/gmd:geographicElement/ gmd:EX\_GeographicBoundingBox

 /gmd:MD\_Metadata/gmd:identificationInfo//gmd:resourceConstraints

 /gmd:MD\_Metadata/gmd:identificationInfo//gmd:resourceConstraints/gmd:MD\_LegalConstaints/gmd:otherConstraints

5.9.7.2 KPI-2: Good quality title

Measurement

The title of the product follows the principles of the WCMP guidance. The length is not too short or too long, contains less than three acronyms and is represented in title case. Spelling and grammar are correct.

Rationale for measurement

The title is the first element of metadata information displayed and helps with initial identification. Meaningful and relevant information makes it easier for users to understand the resource.

Rules

|  | Rule | Score |
| --- | --- | --- |
| 2.1 | The gmd:title element is not empty in the gmd:CI\_Citation class of gmd:MD\_DataIdentfication . | 1 |
| 2.2 | The title has three words or more. | 1 |
| 2.3 | The title has 150 characters or less. | 1 |
| 2.4 | The title only has printable characters (numbers and letters). | 1 |
| 2.5 | Words in the title are represented in "Title Case". | 1 |
| 2.6 | The title contains less than three acronyms (words with all upper case). | 1 |
| 2.7 | The title does not contain bulletin header (regular expression: [A-Z]{4}\d{2}[\s\_]\*[A-Z]{4}). | 1 |
| 2.8 | The title passes a basic spellcheck. | 1 |

Total possible score: 8 (100%)

Guidance

References

 5.8.1.1 Product title

XPaths

• /gmd:MD\_Metadata/gmd:identificationInfo//gmd:citation/gmd:CI\_Citation/gmd:title

5.9.7.3 KPI-3: Good quality abstract

Measurement

The length of the content in the abstract element is not too short or too long. The spelling and grammar are correct and does not contain HTML markup. Bulletin templates are not used to populate the abstract.

Rationale

The abstract must facilitate ease of understanding and discovery. The abstract is a critical element of metadata information displayed as part of search results. Complete and meaningful abstract information allows users to understand and properly evaluate a metadata record and its respective resource in support of product access, visualization and exploitation.

Rules

|  | Rule | Score |
| --- | --- | --- |
| 3.1 | Abstract has between 16 and 2048 characters. | 1 |
| 3.2 | Abstract does not contain HTML markup. | 1 |
| 3.3 | Abstract passes a basic spellcheck. | 1 |
| 3.4 | Abstract does not contain a bulletin template. | 1 |

Total possible score: 4 (100%)

Guidance

The abstract should provide a clear and concise statement that enables the reader to understand the content of the product. For guidance when completing the abstract, consider the following recommendations:

 State what the “things” are that are recorded.

 State the key aspects recorded about these things.

 State what form the data takes.

 State any other limiting information, such as time period of validity of the data.

 Add purpose of data resource where relevant (e.g. for survey data).

 Aim to be understood by non-experts.

 Do not include general background information.

 Avoid jargon and unexplained abbreviations.

Further recommendations:

 Avoid adding a scientific abstract.

 Limit information in the abstract to the specific resource that is being described.

 Describe the contents of the resource and the key aspects and/or attributes that are represented.

 Explain briefly what is unique about this resource and, if appropriate, how it differs from similar resources.

 Avoid citing external sources to this resource.

 Avoid spelling out commonly used acronym which are already understood by the general public.

 Spell out uncommon acronyms only once.

 Avoid including HTML/CSV tables, extra spaces or other markup to control display of text. Use simple paragraph(s) only.

 Avoid copying text from a journal article verbatim. This can lead to copyright violation concerns. Additionally, abstracts for journal articles are not intended to describe the provided resource and do not meet the metadata requirements. Related papers can be referenced from and/or tied to the metadata.

 Avoid using future verb tense when possible. Write using present or past tenses.

Spell checking recommendations:

 Dictionary by Merriam-Webster: <https://www.merriam-webster.com>

 Cambridge Dictionary: <https://dictionary.cambridge.org>

References

 5.8.1.2 Product abstract

 Manual on WIS, Appendix C, 8.2 Provision of information to support discovery within the WIS DAR metadata (WIS discovery metadata) catalogue

XPaths

 /gmd:MD\_Metadata/gmd:identificationInfo//gmd:abstract

5.9.7.4 KPI-4: Temporal information

Measurement

The temporal extent, frequency of resource updates and status elements are present.

Rationale for measurement

Temporal information is a significant characteristic of WMO data and it is critical for users to know the time periods that are covered by the products, how often new products are available and the status.

Rules

|  | Rule | Score |
| --- | --- | --- |
| 4.1 | The gmd:EX\_TemporalExtent class is present. | 1 |
| 4.2 | The gml:beginPosition and gml:endPosition elements are present. | 1 |
| 4.3 | The begin date time is less than or equal to the end date time. | 1 |
| 4.4 | The gmd:maintenanceAndUpdateFrequency elements are present. | 1 |
| 4.5 | The gmd:status element is present. | 1 |

Total possible score: 5 (100%)

Guidance

If it is not relevant or necessary to provide information regarding the product update frequency, gmd:MD\_MaintenanceFrequencyCode can be set to ‘asNeeded’

References

 5.8.1.5 Temporal extent

 5.8.1.13 Frequency of resource updates

XML Examples

Example for the product status using the gmd:MD\_ProgressCode codelist.

<gmd:status>  
 <gmd:MD\_ProgressCode codeList="https://standards.iso.org/iso/19139/resources/gmxCodelists.xml#MD\_ProgressCode" codeSpace="ISOTC211/19115" codeListValue="onGoing">onGoing</gmd:MD\_ProgressCode>  
 </gmd:status>

Example for product maintenance with ‘asNeeded’ code value.

<gmd:resourceMaintenance>  
 <gmd:MD\_MaintenanceInformation>  
 <gmd:maintenanceAndUpdateFrequency>  
 <gmd:MD\_MaintenanceFrequencyCode codeList="https://standards.iso.org/iso/19139/resources/gmxCodelists.xml#MD\_MaintenanceFrequencyCode" codeListValue="asNeeded"/>  
 </gmd:maintenanceAndUpdateFrequency>  
 </gmd:MD\_MaintenanceInformation>  
 </gmd:resourceMaintenance>

XPaths

• /gmd:MD\_Metadata/gmd:identificationInfo//gmd:temporalElement/gmd:EX\_TemporalExtent/gmd:extent

• /gmd:MD\_Metadata/gmd:identificationInfo//gmd:temporalElement/gmd:EX\_TemporalExtent/gmd:extent//gml:beginPosition

• /gmd:MD\_Metadata/gmd:identificationInfo//gmd:temporalElement/gmd:EX\_TemporalExtent/gmd:extent//gml:endPosition

• /gmd:MD\_Metadata/gmd:identificationInfo//gmd:resourceMaintenance//gmd:maintenanceAndUpdateFrequency

• /gmd:MD\_Metadata/gmd:identificationInfo//gmd:status

5.9.7.5 KPI-5: DOI citation

Measurement

A Digital Object Identifier (DOI) and citation instructions are present.

Rationale for measurement

DOIs are persistent identifiers that allow products to be accessible and citable. They make research data easier to access, reuse and verify, thereby making it easier to build on previous work, conduct new research and avoid duplicating already existing work.

Rules

|  | Rule | Score |
| --- | --- | --- |
| 5.1 | A DOI is present in the gmd:MD\_Identifier class of the data citation and encoded in the gmx:Anchor element. | 1 |
| 5.2 | The value in the xlink:title attribute is 'DOI'. | 1 |
| 5.3 | A DOI citation, with the same DOI as above, is present in the gmd:otherConstraints element. | 1 |

Total possible score: 3 (100%)

Guidance

• Preface the DOI value with doi:, for example, doi:<doi-identifier>.

• Preface the DOI citation with 'Cite as:'.

XML Examples

<gmd:identifier>  
 <gmd:MD\_Identifier>  
 <gmd:code>  
 <gmx:Anchor xlink:actuate="onRequest" xlink:href="https://dx.doi.org/10.14287/10000004" xlink:title="DOI">doi:10.14287/10000004</gmx:Anchor>  
 </gmd:code>  
 </gmd:MD\_Identifier>  
 </gmd:identifier>

<gmd:otherConstraints>  
 <gco:CharacterString>Cite as: WMO/GAW Ozone Monitoring Community, World Meteorological Organization-Global Atmosphere Watch Program (WMO-GAW)/World Ozone and Ultraviolet Radiation Data Centre (WOUDC) [Data]. Retrieved [YYYY-MM-DD], from https://woudc.org. A list of all contributors is available on the website. doi:10.14287/10000004</gco:CharacterString>  
 </gmd:otherConstraints>

XPaths

• /gmd:MD\_Metadata/gmd:identificationInfo//gmd:citation//gmd:identifier//gmd:code/gmx:Anchor/@xlink:href

• /gmd:MD\_Metadata/gmd:identificationInfo//gmd:citation//gmd:identifier//gmd:code/gmx:Anchor/@xlink:title

• /gmd:MD\_Metadata/gmd:identificationInfo//gmd:resourceConstraints//gmd:otherConstraints/gco:CharacterString

5.9.7.6 KPI-6: Keywords

Measurement

Keywords are present, grouped by type and referenced to controlled vocabularies or thesauri.

WCMP 1.3 defines other rules for keywords that are not included in this measurement.

Rationale for measurement

Encouraging metadata providers to make use of keywords that are published in controlled vocabularies will ultimately help the end user to search for well-known domain related terms.

Keywords are indexed by search engines to narrow down full text searches, adding to the user experience and making products easier to discover. Keywords can be user-defined or specified from controlled vocabularies.

Rules

|  | Rule | Score |
| --- | --- | --- |
| 6.1 | There are one to many gmd:keyword elements present. | 1 |
| 6.2 | The MD\_KeywordTypeCodeType is present. | 1 |
| 6.3 | The gmd:title element for the thesuarus name is present. | 1 |
| 6.4 | Keywords and thesaurus names are implemented in the gmx:Anchor element . | 1 |

Total possible score: 4 (100%) (4 for each gmd:MD\_Keywords class / count of gmd:MD\_Keywords classes)

Guidance

Examples of controlled vocabularies:

 [WMO Codes Registry](https://codes.wmo.int)

 [WMO Codelists](https://wis.wmo.int/2012/codelists/WMOCodeLists.xml)

 [General Multilingual Environmental Thesaurus (GEMET) - INSPIRE Spatial Data Themes](https://www.eionet.europa.eu/gemet/en/inspire-themes)

 [Global Change Master Directory (GCMD)](https://earthdata.nasa.gov/earth-observation-data/find-data/gcmd/gcmd-keywords)

 [Climate and Forecast (CF) Standard Names](https://cfconventions.org/standard-names.html)

 [Government of Canada Core Subject Thesaurus (CST)](https://canada.multites.net/cst)

References

 5.8.1.8 Descriptive keywords

XML Examples

The keyword value is included in a gmx:Anchor element with a resolvable HTTP URL.

<gmd:MD\_Keywords>  
 <gmd:keyword>  
 <gmx:Anchor xlink:href="http://wis.wmo.int/2012/codelists/WMOCodeLists.xml#WMO\_CategoryCode\_meteorology">meteorology<gmx:Anchor>  
 </gmd:keyword>  
 </gmd:MD\_Keywords>

The gmd:type of keyword is given in MD\_KeywordTypeCode element, the "codelist" indicates URL of the code list.

<gmd:type>  
 <gmd:MD\_KeywordTypeCode codeList="https://standards.iso.org/iso/19139/resources/gmxCodelists.xml#MD\_KeywordTypeCode\_theme" codeListValue="theme">theme</gmd:MD\_KeywordTypeCode>  
</gmd:type>

The thesaurus name is included in an gmx:Anchor element with a resolvable HTTP URL.

<gmd:thesaurusName>  
 <gmd:CI\_Citation>  
 <gmd:title>  
 <gmx:Anchor xlink:href="http://wis.wmo.int/2012/codelists/WMOCodeLists.xml#WMO\_CategoryCode">WMO\_CategoryCode</gmx:Anchor>  
 </gmd:title>  
 <gmd:date>  
 <gmd:CI\_Date>  
 <gmd:date>  
 <gco:Date>2016-05-26</gco:Date>  
 </gmd:date>  
 <gmd:dateType>  
 <gmd:CI\_DateTypeCode codeList="https://standards.iso.org/iso/19139/resources/gmxCodelists.xml#CI\_DateTypeCode" codeListValue="revision">revision</gmd:CI\_DateTypeCode>  
 </gmd:dateType>  
 </gmd:CI\_Date>  
 </gmd:date>  
 </gmd:CI\_Citation>  
</gmd:thesaurusName>

XPaths

 //gmd:MD\_DataIdentification/gmd:descriptiveKeywords/gmd:MD\_Keywords/gmd:keyword

 //gmd:MD\_DataIdentification/gmd:descriptiveKeywords/gmd:MD\_Keywords/gmd:type

 //gmd:MD\_DataIdentification/gmd:descriptiveKeywords/gmd:MD\_Keywords/gmd:thesaurusName

5.9.7.7 KPI-7: Graphic overview

Measurement

When the gmd:graphicOverview is present it contains a URL to a common Web image file type.

Rationale for measurement

Images provide the user with a high-level preview of the product which can assist in a visual assessment in the search results presentation in catalogues.

Rules

|  | Rule | Score |
| --- | --- | --- |
| 7.1 | The URL in the gmd:graphicOverview resolves successfully. | 1 |
| 7.2 | The URL in this element is a common Web image file type. | 1 |
| 7.3 | The URL is implemented in the `gmx:Anchor` element. | 1 |

Total possible score: 3 (100%)

Guidance

In addition to the presence of the graphic overview image it would also be valuable to provide consistent image dimensions (e.g. 800x800 pixels) such that all images are normalized and scaling/alignment of overview images can be applied consistently by Web applications rendering search results.

Examples of catalogues using graphic overview images are here:

• [GISC DWD](https://gisc.dwd.de)

• [EUMETSAT Product Navigator](https://navigator.eumetsat.int/search?query=MSG%20RGB)

References

 5.8.1.9 Product sample visualization URL

XML Examples

<gmd:graphicOverview>  
 <gmd:MD\_BrowseGraphic>  
 <gmd:fileName>  
 <gmx:Anchor  
 xlink:href="https://navigator.eumetsat.int/preview/meteosat-msg\_naturalenhncd.jpg">Meteosat MSG Natural Enhanced Color<gmx:Anchor>  
 </gmd:fileName>  
 </gmd:MD\_BrowseGraphic>  
</gmd:graphicOverview>

XPaths

• //gmd:identificationInfo/gmd:MD\_DataIdentification/gmd:graphicOverview/gmd:MD\_BrowseGraphic/gmd:fileName

5.9.7.8 KPI-8: Links health

Measurement

Links are valid (no 4xx or 5xx HTTP status errors) and are available through the HTTPS protocol.

Rationale for measurement

Broken links damage the user experience and gives the impression to users that a website is not maintained.

HTTPS is increasingly becoming a requirement for numerous agencies. Metadata records with non-HTTPS links often leads to mixed content errors in Web applications deployed via HTTPS. HTTPS supports secure, authoritative and trustworthy links as part of WIS metadata.

Rules

|  | Rule | Score |
| --- | --- | --- |
| 8.1 | The link resolves, when it is present in gmd:URL element, gmd:fileName element, xlink:href attribute, or codeList attribute. | 1 |
| 8.2 | Each link is a valid HTTPS URL. | 1 |

Total possible score: (resolved links + valid HTTPS links) / (total links \* 2) (100%)

Guidance

Ensure that all links are up to date in the metadata and are accessible via HTTPS. Don’t put URLs in the abstract or other elements that are intended for free text.

For more information about HTTP status errors, visit <https://httpstatuses.com>.

XML Examples

<gmd:CI\_OnlineResource>  
 <gmd:linkage>  
<gmd:URL>https://eumetview.eumetsat.int/mapviewer/?product=EO:EUM:DAT:MSG:SNOW</gmd:URL>  
 </gmd:linkage>  
</gmd:CI\_OnlineResource>

<gmd:graphicOverview>  
 <gmd:MD\_BrowseGraphic>  
 <gmd:fileName>  
 <gco:CharacterString>https://navigator.eumetsat.int/preview/0deg-snow.jpg</gco:CharacterString>  
 </gmd:fileName>  
 </gmd:MD\_BrowseGraphic>  
</gmd:graphicOverview>

<gmd:code>  
 <gmx:Anchor xlink:actuate="onRequest" xlink:href="https://dx.doi.org/10.14287/10000004" xlink:title="DOI">doi:10.14287/10000004</gmx:Anchor>  
</gmd:code>

<gmd:dateType>  
 <gmd:CI\_DateTypeCode codeList="https://standards.iso.org/iso/19139/resources/gmxCodelists.xml#CI\_DateTypeCode" codeListValue="revision" codeSpace="ISOTC211/19115">revision</gmd:CI\_DateTypeCode>  
</gmd:dateType>

XPaths

 //gmd:URL

 //gmd:graphicOverview//gmd:fileName

 //gmx:Anchor/@xlink:href

 //@codeList

5.9.7.9 KPI-9: Data policy

Measurement

Distribution URLs are present when the WMO\_DataLicenseCode code value is WMOEssential, codes values encoded with gmx:Anchor elements for resource constraints and keywords.

Rationale for measurement

KPI-1 evaluates a metadata record for compliance with Abstract Test Suite requirements 9.1.1, 9.3.1 and 9.3.2. This KPI evaluates additional practices that support information associated with the identification of the data policies.

In addition, products that qualify as available with "free and unrestricted international exchange", which is identified by the WMOEssential code, should have at least one distribution link present in the metadata.

Rules

|  |  |  |
| --- | --- | --- |
|  | Rule | Score |
| 9.1 | One to many distribution links are present when WMO\_DataLicenseCode is WMOEssential. | 1 |
| 9.2 | The code value otherRestrictions is present in the gmd:MD\_RestrictionCode element of the`gmd:MD\_LegalConstraints` class when there is a WMO\_DataLicenseCode or WMO\_GTSProductCategoryCode in the gmd:otherConstraints element. | 1 |
| 9.3 | The WMO\_DataLicenseCode, WMO\_GTSProductCategoryCode, WMO\_DistributionScopeCode, WMO\_DistributionScopeCode code values are implemented in the gmx:Anchor element, instead of the gco:CharacterString element. | 1 |

Total possible score: 3 (100%)

Guidance

The KPI checks that there is at least one gmd:resourceConstraints class that complies to the rules, but other gmd:resourceConstraints classes may exist. For example, additional free text explanations can be added to a gmd:useLimitation element or in additional gmd:MD\_LegalConstraint classes.

References

 Manual on WIS

o Appendix C, 9.3 Defining WMO data policy and GTS priority for data published for global exchange

o Abstract Test Suite

 Guide to WIS

o 5.8.1.10 Data policy information

XML Examples

<gmd:resourceConstraints>  
 <gmd:MD\_LegalConstraints>  
 <gmd:otherConstraints>  
 <gmx:Anchor xlink:href="https://wis.wmo.int/2012/codelists/WMOCodeLists.xml#WMO\_DataLicenseCode\_WMOEssential">WMOEssential</gmx:Anchor>  
 </gmd:otherConstraints>  
 </gmd:MD\_LegalConstraints>  
</gmd:resourceConstraints>

<gmd:MD\_DigitalTransferOptions>  
 <gmd:onLine>  
 <gmd:CI\_OnlineResource>  
 <gmd:linkage>  
 <gmd:URL>https://opendata.dwd.de/weather/wmc/icon-eps/data/grib</gmd:URL>  
 </gmd:linkage>  
 <gmd:protocol>  
 <gco:CharacterString>http</gco:CharacterString>  
 </gmd:protocol>  
 <gmd:name>  
 <gco:CharacterString>GISC Offenbach, Deutscher Wetterdienst</gco:CharacterString>  
 </gmd:name>  
 <gmd:description>  
 <gco:CharacterString>WMO Information System, download products/data through GISC Offenbach, Deutscher Wetterdienst</gco:CharacterString>  
 </gmd:description>  
 </gmd:CI\_OnlineResource>  
 </gmd:onLine>  
</gmd:MD\_DigitalTransferOptions>

Example for a code value that is implemented with the gmx:Anchor element, instead of the gco:CharacterString element.

<gmd:resourceConstraints>  
 <gmd:MD\_LegalConstraints>  
 <gmd:otherConstraints>  
 <gmx:Anchor xlink:href="https://wis.wmo.int/2012/codelists/WMOCodeLists.xml#WMO\_DataLicenseCode\_WMOAdditional">WMOAdditional</gmx:Anchor>  
 </gmd:otherConstraints>  
 </gmd:MD\_LegalConstraints>  
</gmd:resourceConstraints>

Example for gmd:otherRestrictions code value.

<gmd:resourceConstraints>  
 <gmd:MD\_LegalConstraints>  
 <gmd:useConstraints>  
 <gmd:MD\_RestrictionCode codeList="https://standards.iso.org/iso/19139/resources/gmxCodelists.xml#MD\_RestrictionCode" codeListValue="otherRestrictions">otherRestrictions</gmd:MD\_RestrictionCode>  
 </gmd:useConstraints>  
 </gmd:MD\_LegalConstraints>  
</gmd:resourceConstraints>

XPaths

 /gmd:MD\_Metadata/gmd:identificationInfo//gmd:resourceConstraints/gmd:MD\_LegalConstraints/gmd:otherConstraints

 /gmd:MD\_Metadata/gmd:distributionInfo/gmd:MD\_Distribution/gmd:transferOptions/gmd:MD\_DigitalTransferOptions/gmd:onLine/gmd:CI\_OnlineResource/gmd:linkage

 //gmd:identificationInfo//gmd:resourceConstraints/gmd:MD\_LegalConstraints/gmd:otherConstraints

 //gmd:identificationInfo//gmd:resourceConstraints/gmd:MD\_LegalConstraints/gmd:accessConstraints/gmd:MD\_RestrictionCode

 //gmd:identificationInfo//gmd:resourceConstraints/gmd:MD\_LegalConstraints/gmd:useConstraints/gmd:MD\_RestrictionCode

5.9.7.10 KPI-10: Distribution information

Measurement

Distribution information for accessing the data, data formats, and contact details are present.

Rationale for measurement

Distribution information allows the user to understand what formats are available, where to get them and who to contact for distribution details.

Rules

|  | Rule | Score |
| --- | --- | --- |
| 10.1 | The gmd:MD\_Format class is present. | 1 |
| 10.2 | The gmd:specification element in the gmd:MD\_Format class has an gmx:Anchor with a resolvable HTTP URL. | 1 |
| 10.3 | The gmd:organisationName element in the gmd:MD\_Distributor class is present. | 1 |
| 10.4 | The gmd:electronicMailAddress in the gmd:MD\_Distributor class is present. | 1 |
| 10.5 | One to many gmd:MD\_DigitalTransferOptions options are present. | 1 |

Total possible score: 5 (100%)

Guidance

• Include the relevant WMO data formats in the gmd:MD\_Format classes with a link to the specification of the data format.

• Include all relevant URLs in the gmd:MD\_DigitalTransferOptions class for accessing the data.

• A distributor contact does not have to be the same as the other contacts in the metadata and should always have a contact email.

References

• 5.8.1.11 Distribution information

XML Examples

<gmd:distributionInfo>  
 <gmd:MD\_Distribution>  
 <gmd:distributionFormat>  
 <gmd:MD\_Format>  
 <gmd:name>  
 <gco:CharacterString>FM 94 (BUFR)</gco:CharacterString>  
 </gmd:name>  
 <gmd:version>  
 <gco:CharacterString>XII EXT.</gco:CharacterString>  
 </gmd:version>  
 <gmd:specification>  
 <gmx:Anchor xlink:title="FM 94 (BUFR)" xlink:href="https://www.wmo.int/pages/prog/www/WMOCodes.html">FM 94 (BUFR)</gmx:Anchor>  
 </gmd:specification>  
 </gmd:MD\_Format>  
 </gmd:distributionFormat>  
 <gmd:distributor>  
 <gmd:MD\_Distributor>  
 <gmd:distributorContact>  
 <gmd:CI\_ResponsibleParty>  
 <gmd:organisationName>  
 <gco:CharacterString>NMC FRANCE - Météo-France</gco:CharacterString>  
 </gmd:organisationName>  
 <gmd:contactInfo>  
 <gmd:CI\_Contact>  
 <gmd:phone/>  
 <gmd:address>  
 <gmd:CI\_Address>  
 <gmd:deliveryPoint>  
 <gco:CharacterString>Direction des Systèmes d'Information, 42 avenue Gaspard CORIOLIS</gco:CharacterString>  
 </gmd:deliveryPoint>  
 <gmd:city>  
 <gco:CharacterString>TOULOUSE</gco:CharacterString>  
 </gmd:city>  
 <gmd:postalCode>  
 <gco:CharacterString>31057</gco:CharacterString>  
 </gmd:postalCode>  
 <gmd:country>  
 <gco:CharacterString>France</gco:CharacterString>  
 </gmd:country>  
 <gmd:electronicMailAddress>  
 <gco:CharacterString>gisc\_support@meteo.fr</gco:CharacterString>  
 </gmd:electronicMailAddress>  
 </gmd:CI\_Address>  
 </gmd:address>  
 <gmd:onlineResource>  
 <gmd:CI\_OnlineResource>  
 <gmd:linkage>  
 <gmd:URL>https://meteofrance.com</gmd:URL>  
 </gmd:linkage>  
 </gmd:CI\_OnlineResource>  
 </gmd:onlineResource>  
 </gmd:CI\_Contact>  
 </gmd:contactInfo>  
 <gmd:role>  
 <gmd:CI\_RoleCode codeListValue="pointOfContact" codeList="https://standards.iso.org/iso/19139/resources/gmxCodelists.xml#CI\_RoleCode">pointOfContact</gmd:CI\_RoleCode>  
 </gmd:role>  
 </gmd:CI\_ResponsibleParty>  
 </gmd:distributorContact>  
 </gmd:MD\_Distributor>  
 </gmd:distributor>  
 <gmd:transferOptions>  
 <gmd:MD\_DigitalTransferOptions>  
 <gmd:onLine>  
 <gmd:CI\_OnlineResource>  
 <gmd:linkage>  
 <gmd:URL>http://wispi.meteo.fr/openwis-user-portal/srv/en/main.home?urn=urn:x-wmo:md:int.wmo.wis::ISMN10LFPW</gmd:URL>  
 </gmd:linkage>  
 <gmd:protocol>  
 <gco:CharacterString>WWW:LINK-1.0-http--link</gco:CharacterString>  
 </gmd:protocol>  
 <gmd:name>  
 <gco:CharacterString>Permanent link</gco:CharacterString>  
 </gmd:name>  
 <gmd:description>  
 <gco:CharacterString>GISC Toulouse</gco:CharacterString>  
 </gmd:description>  
 </gmd:CI\_OnlineResource>  
 </gmd:onLine>  
 </gmd:MD\_DigitalTransferOptions>  
 </gmd:transferOptions>  
 </gmd:MD\_Distribution>  
</gmd:distributionInfo>

XPaths

• //gmd:distributionInfo//gmd:distributionFormat/gmd:MD\_Format

• //gmd:distributionInfo//gmd:MD\_DigitalTransferOptions//gmd:onLine//gmd:URL

• //gmd:distributionInfo//gmd:MD\_Distributor//gmd:organisationName

• //gmd:distributionInfo//gmd:MD\_Distributor//gmd:contactInfo//gmd:electronicMailAddress/gco:CharacterString

5.9.7.11 KPI-11: Codelists validation

Measurement

Each code value in the metadata is an exact match to the code in one of the authoritative codelists below.

• ISO Codelists: <https://standards.iso.org/iso/19139/resources/gmxCodelists.xml>

• WMO Codelists/ISO extensions: <https://wis.wmo.int/2012/codelists/WMOCodeLists.xml>

Rationale for measurement

WCMP records can reference codelists from several locations, for example, online copies of the authoritative sources. In many cases codes are included but are not identical to the official values on the codelists (e.g. spelling mistakes, case sensitivity errors, etc.). Software applications may look for exact matches to codelists and handle metadata incorrectly if they are not properly referenced.

Rules

|  | Rule | Score |
| --- | --- | --- |
| 11.1 | Code value is valid against authoritative codelists with an exact match. | 1 |

Total possible score: valid codes / total codes (100%)

Guidance

An exact match means that there are no differences with spacing or capitalization. For example, Other restrictions and other\_restrictions will not validate. Only the code value otherRestrictions from the MD\_RestrictionCode codelist will validate.

XPaths

| Codelist | XPath | Authoritative list | |
| --- | --- | --- | --- |
| CI\_DateTypeCode | //gmd:date/gmd:CI\_Date/gmd:dateType/gmd:CI\_DateTypeCode | | WMOCodeLists (ISO Extended) |
| CI\_RoleCode | //gmd:CI\_ResponsibleParty/gmd:role/gmd:CI\_RoleCode | | gmxCodelists (ISO) |
| MD\_KeywordTypeCode | //gmd:MD\_Keywords/gmd:type/gmd:MD\_KeywordTypeCode | | WMOCodeLists (ISO Extended) |
| MD\_RestrictionCode | //gmd:resourceConstraints//gmd:MD\_RestrictionCode | | gmxCodelists (ISO) |
| MD\_ScopeCode | //gmd:scope//gmd:MD\_ScopeCode | | gmxCodelists (ISO) |
| MD\_TopicCategoryCode | //gmd:topicCategory/gmd:MD\_TopicCategoryCode | | gmxCodelists (ISO) |
| WMO\_DataLicenseCode | //gmd:resourceConstraints//gmd:otherConstraints/[gco:CharacterString|gmx:Anchor] | | WMOCodeLists |
| WMO\_GTSProductCategoryCode | //gmd:resourceConstraints//gmd:otherConstraints/[gco:CharacterString|gmx:Anchor] | | WMOCodeLists |
| WMO\_CategoryCode | //gmd:descriptiveKeywords/gmd:MD\_Keywords/gmd:keyword/[gco:CharacterString|gmx:Anchor] | | WMOCodeLists |
| WMO\_DistributionScopeCode | //gmd:descriptiveKeywords/gmd:MD\_Keywords/gmd:keyword/[gco:CharacterString|gmx:Anchor] | | WMOCodeLists |

**5.10 Technical documents**

More details on the WCMP metadata can be found at <https://community.wmo.int/activity-areas/wis/wcmp>.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

## Anexo 3 al proyecto de Resolución ##/1 (EC-76)

**Cambios en la *Guía del Sistema de Información de la OMM* (OMM-Nº 1061) debidos a la reforma de la Organización Meteorológica Mundial**

**Introduction**

…

**Procedures for amending the Guide**

A detailed explanation of the procedures for amending WMO Guides that are under the responsibility of ~~the Commission for Basic Systems~~ Commission for Observation, Infrastructure and Information Systems (INFCOM) can be found in the appendix to the General Provisions of the *Manual on WIS*.

**Part II. Designation procedures for WIS centres**

**2.1 General**

Designation procedures for WIS centres are defined in the *Manual on WIS*, Part II. The Commission for Observation, Infrastructure and Information Systems (INFCOM)~~Commission for Basic Systems (CBS)~~ reviews relevant aspects of the *Manual on WIS* to ensure alignment of WIS user requirements, the WIS functional architecture and WIS compliance specifications. ~~The Commission for Basic Systems~~INFCOM is also developing monitoring procedures to complement the designation procedures of WIS and to ensure ongoing compliance of WIS centres with the agreed standards and practices.

**2.2 Procedure for a Global Information System Centre**

The procedure for designating a GISC is given in the *Manual on WIS*, Part II, 2.2, in keeping with the [*Technical Regulations*](https://library.wmo.int/index.php?lvl=notice_display&id=14073) (WMO-No. 49), Volume I, Part II. During the initial phase of WIS centre designation, ~~CBS~~INFCOM analyses GISC service offers and formulates a recommendation for designation.

**2.3 Procedure for a Data Collection or Production Centre**

The procedure for designating a DCPC is given in the *Manual on WIS*, Part II, 2.3, in keeping with the [*Technical Regulations*](https://library.wmo.int/index.php?lvl=notice_display&id=14073) (WMO-No. 49), Volume I, Part II. During the initial phase of WIS centre designation, ~~CBS~~INFCOM determines which centres should be integrated in WIS, analyses DCPC service offers and formulates a recommendation.

**Part VII. Operational guidance**

…

**7.6 Procedure for rolling review of WIS centres**

7.6.1 The *Manual on WIS*, Part II, 2.2.4 and 2.3.4, define how Members hosting GISCs and DCPCs are required to demonstrate to ~~CBS~~INFCOM their ability to provide WIS services in compliance with GISC or DCPC functions and responsibilities.

7.6.2 ~~The Commission for Basic Systems~~INFCOM recognizes that for WIS to remain fully functional regular reviews of each NC, DCPC and GISC are required, ensuring their ongoing compliance with the *Manual on WIS*. Recommended practices for this rolling review are provided in the annex to this paragraph (Appendix D).

**Appendix B. WIS technical specifications – use cases**

…

**Use Case B.11 – Reporting quality of service across WIS centres**

TABLE: Table with lines

|  |  |
| --- | --- |
| Use Case goal | Managers of WIS centres receive performance reports of operations against agreed quality of service indicators. |
| Actors | WIS centre managers |
| Preconditions | (1) Measurable quality of service indicators are agreed;  (2) Schedule of reporting and specifics of reporting formats are agreed. |
| Post‑conditions | WIS centre managers have the performance information needed to manage WIS operations across the range of GISC, DCPC and NC services. |
| Normal flow | Following a mutually agreed schedule, all WIS centre managers send performance reports of operations against agreed quality of service indicators. |
| Notes and issues | It can be anticipated that WIS will eventually have agreements that address quality of service requirements. These should include data and network security as well as performance and reliability. ~~CBS~~INFCOM is investigating monitoring processes and reviewing established procedures for the World Weather Watch. |
| Last updated | 30 June 2014 |
| Last updated by | WMO Secretariat |

**Appendix C. WIS demonstration test cases**

**General**

…

2. The guidelines for DCPCs and GISCs on how to demonstrate their compliance with the requirements established by ~~CBS~~INFCOM are available online at <https://community.wmo.int/activity-areas/wis>.

**Appendix D. Annexes to paragraphs 7.4.1, 7.5.1 and 7.6.2 AND 8.7**

**Annex to paragraph 7.4.1: Procedure for changing principal GISC**

…

4. The WMO Secretariat shall inform ~~CBS~~INFCOM of the change, with copy to the original and new principal GISC, and ask the Commission to prepare an update to the *Manual on WIS,* Appendix B.

**Annex to paragraph 7.6.2: Recommended practices for the rolling review of WIS centres**

~~Note: If the structure of CBS changes, all references to Open Area Programme Group (OPAG), Implementation Coordination Team (ICT), Expert Team (ET) or Task Team (TT) are intended to apply to successors of the named bodies.~~

**1. Background**

~~The Commission for Basic Systems~~INFCOM is responsible for certification of WIS centres’ compliance with the WIS technical specifications defined in the *Manual on WIS*, Appendix D. ~~The Commission for Basic Systems~~INFCOM will maintain ~~, within the structure of its OPAG on Information Systems and Services (OPAG‑ISS), or its successor,~~ a team to coordinate audits and certification of WIS centres. For the purpose of this Guide, the team or its equivalent group of experts is referred to as the Expert Team on ~~Centre~~ Audit and Certification (~~ET‑CAC~~ET-AC).

Audits and certifications will be carried out in line with the principles established in the [*Technical Regulations*](https://library.wmo.int/index.php?lvl=notice_display&id=14073) (WMO-No. 49), Volume I: General Meteorological Standards and Recommended Practices, Part VII.

**2. Auditing and certification**

Auditors and certifiers shall be or shall become members of ~~ET‑CAC~~ET-AC. New members must have relevant technical or auditing experience. They must be members (core or associate) of ~~an OPAG‑ISS expert team~~the Standing Committee on Information Management and Technology or have written commitment of the Permanent Representative of their country with WMO allowing them to participate as members of the ~~ET‑CAC~~ET-AC. New members will be mentored by a nominated existing expert. Note that regional diversity of members of ~~ET‑CAC~~ET-AC is essential.

Access to ~~ET‑CAC~~ET-AC workspace and online databases is restricted to ~~ET‑CAC~~ET-AC and the WMO Secretariat.

***2.1 GISC audits***

The Expert Team on ~~Centre~~ Audit and Certification, on behalf of ~~CBS~~INFCOM, is responsible for auditing and certification of GISCs.

…

**2.1.1 Scope of GISC audits**

Full audits will cover all aspects of WIS compliance and shall include site visits using practices in line with those of the ISO 9000 series standards.

Interim audits will focus on a particular subset of topics. Actual elements to be focused on will be determined by Expert Team on Audit and Certification ~~the Implementation Coordination Team on Information Systems and Services (ICT‑ISS)~~ or ~~its delegated expert team~~ in coordination with ~~ICT‑ISS~~other expert team members. Centres will be told in advance on which subset of topics the interim audit will focus. Possible areas for review in interim audits include:

(a) GISC to GISC backup;

(b) Security;

(c) Monitoring;

(d) Quality of service provided by the WIS;

(e) WIS core network (e.g. in 2014, this was the Regional Meteorological Data Communication Network – Next generation);

(i) Connectivity and management;

(ii) Caching of “Globally distributed data” content;

(f) Management of the GISC area of responsibility;

(i) Capacity development;

(ii) The AMDCN connecting the GISC to NCs and DCPCs in its area;

a. Caching of “Area of responsibility” content;

(iii) Participation in WIS coordination and planning mechanisms ~~(e.g. CBS Inter‑programme Expert Teams, Expert Teams and Task Teams).~~

***2.2 DCPC certification***

Data Collection or Production Centres are to be certified by the ~~ET‑CAC~~ET-AC. Where a DCPC is not using the infrastructure of its principal GISC, and its principal GISC is operational, it can be certified by ~~ET‑CAC~~ET-AC once the principal GISC has performed the necessary tests. However, if the principal GISC is not operational, the ~~ET‑CAC~~ET-AC will arrange for a suitable GISC to perform the tests. Where a DCPC uses the infrastructure of its principal GISC, it is certified as a part of the GISC certification process.

The certification of a DCPC requires only one ~~ET‑CAC~~ET-AC coordinator, who will ask a GISC to undertake tests with the DCPC. It is expected that the centre’s principal GISC will undertake those tests.

***2.3 Verification of compliance of NCs***

Compliance of NCs is the responsibility of the Permanent Representative with WMO of the Member accountable for the centre. Verification of compliance of an NC should be done by its principal GISC. The Expert Team on ~~Centre~~ Audit and Certification will monitor the NC compliance process in consultation with NCs and GISCs.

**3. The review cycle**

The review cycle should start from the date of ~~CBS~~INFCOM endorsement. For centres endorsed before 1 January 2012 (the date on which WIS became operational) the cycle will start on 1 January 2012. Audits should take place within the calendar year in which the cycle ends and their timing will need to be coordinated with the experts called upon to undertake them.

The ~~CBS~~INFCOM endorsement date should be recorded in the WIS centre database. The date on which the centre became operational should also be recorded if known.

Similarly to an ISO 9001:2008 audit process, the GISC audit will follow the principle of alternating intermediate and full audits aligned with the ~~CBS~~INFCOM/EC four‑year cycle:

(a) Intermediate audit (interim, four years): a mid‑cycle review of performance and compliance to provide, if necessary, opportunities to introduce corrective actions well in advance of a full audit;

(b) Full audit (every second audit, i.e. every eight years): this audit will result in a recommendation for confirmation or cancellation of endorsement.

…

**4. Ad hoc audits or reviews**

An ad hoc audit or review can be requested by the president of ~~CBS~~INFCOM due, for example, to non‑conformance causing problems with WIS operations.

**5. Audit or review outcome**

The outcome of the audit or review will be categorized as “endorsed”, “endorsed with qualification” or “not endorsed”. Audit or review recommendations will be provided to the president of ~~CBS~~INFCOM and to the Director of WIS.

**6. Format of report**

The Expert Team on ~~Centre~~ Audit and Certification will use a template for final reports, although the content will reflect the areas audited.

**7. Public notification of type of ~~CBS~~INFCOM endorsement**

The endorsement of ~~CBS~~INFCOM is based on continued successful audit outcomes. Centre endorsements are published only as “~~CBS~~INFCOM endorsed” with no public declaration of whether endorsement was with “qualifications”.

…

**8. Review of audits with qualification**

Global Information System Centres that were “endorsed with qualifications” have two years from the date of the audit to demonstrate that they have taken remedial action on the points of qualification.

The Expert Team on ~~Centre~~ Audit and Certification will investigate GISCs that were “endorsed with qualifications” and have not demonstrated that they have taken remedial action within two years of the date of audit. The Expert Team should report to ~~CBS~~INFCOM on progress in addressing the aspects that incurred the “qualification”, and can recommend to ~~CBS~~INFCOM that it revokes its endorsement.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_