Guidelines on the Preparation and Promulgation of the WMO Technical Regulations

World Meteorological Organization

Weather • Climate • Water

WMO-No. 1127

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EDITORIAL NOTE

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CONTENTS

GUIDELINES ON THE PREPARATION AND PROMULGATION OF THE WMO TECHNICAL REGULATIONS

1. INTRODUCTION

1.1 Historical perspective

The World Meteorological Organization (WMO) has a central role in the standardization of meteorological, hydrological and climatological activities worldwide. The standard-making role of WMO was established by the Convention (Article 2(c)), which clearly indicates that the purposes of WMO are to "promote standardization of meteorological and related observations and to ensure the uniform publication of observations and statistics". WMO belongs to the international standard-making organizations, a number of which are within the United Nations family (such as the International Civil Aviation Organization (ICAO), which is responsible for standardization concerning international civil aviation; the International Telecommunication Union, responsible for standardization related to international telecommunications; the World Health Organization (WHO), promulgating international health regulations, etc.). Many other organizations, both global and regional, develop standards and regulations in different areas of human activity, such as the International Organization for Standardization (ISO) and the European Committee for Standardization, which is responsible for developing standards in a wide variety of areas. All these organizations contribute to creating an international regulatory framework.

The WMO Convention stipulates that a function of World Meteorological Congress is "to determine regulations prescribing the procedures of the various bodies of the Organization, in particular the General, Technical, Financial and Staff Regulations" (Article 8(d)). The development of standards has been assigned to the technical commissions, in accordance with the WMO General Regulations, Annex III – Structure and terms of reference of technical commissions, which indicates (under "General terms of reference") that "each technical commission shall … develop, for consideration by the Executive Council and Congress, proposed international standards for methods, procedures, techniques and practices in meteorology and operational hydrology including, in particular, the relevant parts of the Technical Regulations, guides and manuals". Accordingly, standardization tasks have been included in the specific terms of reference of the Commission for Basic Systems (CBS), the Commission for Instruments and Methods of Observation, the Commission for Atmospheric Sciences, the Commission for Aeronautical Meteorology, the Joint Technical Commission for Oceanography and Marine Meteorology, etc.

The need for global standardization was realized from the very beginning of international cooperation in meteorology. The predecessor of WMO, the International Meteorological Organization (IMO), created a number of international regulations (called Technical Resolutions), which laid the foundation for the future regulation and standardization of meteorological practices and procedures worldwide. Owing to the non-governmental status of IMO, however, its regulations had no binding character for Members. Compliance was mostly on a voluntary basis and the desired level of global standardization of meteorological activities could not be achieved, in particular, that of observing and reporting procedures and practices. To overcome this weakness, there was a strong movement among National Meteorological Services to create a new intergovernmental organization that would give some binding character to its decisions and regulations. This was one of the driving forces behind the creation of the intergovernmental WMO as a successor to IMO. The status of WMO as a United Nations specialized agency gives the Organization more power and requires its Members to "do their utmost" to implement the decisions of Congress, including the regulations adopted.

The status of the IMO Technical Resolutions was reconfirmed by First World Meteorological Congress (First Congress) in 1951, which agreed that they should remain valid until their future amendment or repeal by an appropriate WMO body (Resolution 4 (Cg-I)).

Second Congress (1955) defined the WMO Technical Regulations by stipulating that they should cover "standard meteorological practices and procedures" and "recommended meteorological practices and procedures" (Resolution 17 (Cg-II)). Furthermore, Second Congress introduced the definition of WMO guides (Resolution 18 (Cg-II)), which is still valid (see *Resolutions of Congress and Executive Council* (WMO-No. 508). Second Congress also adopted the Technical Regulations (corresponding to current Volumes I and II, for implementation on 1 January 1956 and 1 July 1956, respectively) and directed the Executive Council (called the Executive Committee until 1983) to review them and recommend amendments thereto, as necessary, for consideration by Third Congress (Resolution 19 (Cg-II)). Thus, the need for continuous review and updating of the Technical Regulations was identified as early as 1955 and similar resolutions have been regularly formulated by subsequent sessions of Congress. Finally, Second Congress introduced the obligation for Members to notify deviations from standard meteorological practices and procedures (Resolution 20 (Cg-II)). Third Congress (1959) complemented this obligation by the requirement to include also a notification of compliance (Resolution 18 (Cg-III)).

Sixth Congress (1971) introduced the concept of manuals as annexes to the Technical Regulations. The global aspects of manuals would consist of standard meteorological practices and procedures and recommended meteorological practices and procedures, which would have the same status as the main volumes of the Technical Regulations. The layout of the manuals reflected the needs of the main components of the World Weather Watch – those of the Global Observing System (GOS), the Global Telecommunication System (GTS) and the Global Data-processing System (currently called the Global Data-processing and Forecasting System). Sixth Congress also adopted a new Volume III to the Technical Regulations – Hydrology (Resolution 2 (Cg VI)).

In conclusion, an efficient framework was put in place in 1971 to develop, update and implement the Technical Regulations which would ensure their relevance and compliance thereto by Members. The system is based on clearly distinguished roles of:

(a) The technical commissions, which identify requirements (in collaboration with Members and regional associations) and propose amendments to the Technical Regulations, as necessary;

(b) The Executive Council, which keeps the Technical Regulations under review and approves, on behalf of Congress under delegated authority, amendments to the annexes (manuals) and, if necessary, to the main volumes;

(c) Congress, which adopts amendments to the Technical Regulations;

(d) The Secretary-General, who arranges for the inclusion of approved amendments in the Technical Regulations, ensures the editorial consistency of the relevant publications and makes them available to Members; and

(e) Members, which implement the Technical Regulations, or if not feasible, file deviations.

Note: Congress delegates authority to the Executive Council to approve amendments on its behalf, in particular those whose implementation is considered to be urgent before the next session of Congress.

A new step towards strengthening the standard-making role of WMO was undertaken in establishing working arrangements between WMO and ISO and WMO was recognized as an international standardization body through ISO Council Resolution 43/2007.

1.2 Standards and regulations

There are many definitions as to what constitutes a "standard". It could simply be considered a rule aiming at ensuring quality. *ISO/IEC Directives*, Part 2: 2011 defines a standard as a "document established by consensus and approved by a recognized body that provides, for common and repeated use, rules, guidelines or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given context". Furthermore, it is indicated in

an associated note that "standards should be based on the consolidated results of science, technology and experience, and aimed at the promotion of optimum community benefits" (Definition 3.1.1 refers). In *ISO/IEC Directives*, Part 2: 2011, an "international standard" is defined as a "standard that is adopted by an international standardizing/standards organization and made available to the public" (Definition 3.1.2 refers). For WMO standards, the two preceding definitions apply.

In the wider world, standards are omnipresent in all fields of activities. Though quite different in formulation, they can be categorized in accordance with their main function. A convenient categorization of standards is given in the book *Standards – Recipes for Reality*, 2011:

(a) "Olympic" standards, which identify the "best";

(b) "Filter" standards, which contain a set of criteria with a view of eliminating the unacceptable;

(c) "Rank" standards, which rank things and aspects in a hierarchy; and

(d) "Division" standards, which organize things and aspects into classes or categories that are not ranked.

The provisions of the WMO Technical Regulations are aimed at establishing globally unified methods, practices and procedures in order to ensure the highest possible level of compatibility of measurements producing data and information and related products and services. In order to achieve this goal, the WMO Technical Regulations are issued in the form of "standard practices and procedures" or "recommended practices and procedures". Their meaning, differences and respective implementation requirements as defined by WMO Congress are explained in Chapter 2.

1.3 Rationale for development of the Guidelines

The need for keeping the Technical Regulations up to date and ensuring their smooth evolution in accordance with new requirements and technological advances has been emphasized frequently by WMO Congress. An analysis of the status of the regulatory material conducted before Sixteenth Congress (2011) revealed some issues regarding the currency, relevance, style and comprehensiveness of some parts thereof which have a negative effect on the overall quality of the Technical Regulations.

Problems may be attributed to a number of factors, such as: the lack of systematic review and updating of certain parts of the existing provisions; the lack of a mechanism for the timely deletion of some outdated parts (mostly because of a lack of clarity about which body is responsible for decisions regarding obsolete material); and the lack of consistency of new provisions with the existing provisions and across the different parts, volumes and annexes to the Technical Regulations. A more complete overview of these problems and inconsistencies is given in Table 1, which is based on a recent review of the Technical Regulations.

SIxteenth Congress called for a revision of regulatory material in a systematic manner so as to ensure that the published versions thereof could be used as reference documentation (Resolution 45 (Cg-XVI)). Such a revision had become particularly urgent in view of the recent approval by the 62nd session of the Executive Council (2010) of the inclusion of Volume IV – Quality Management – in the WMO Technical Regulations (Resolution 16 (EC-LXII)). Furthermore, new WMO programmes, which have recently been approved by Congress, such as the WMO Information System, the WMO Integrated Global Observing System and the Global Framework for Climate Services, need to be addressed appropriately in the Technical Regulations.

The development of these Guidelines was thus prompted by the need to establish some common understanding, as well as rules and procedures, for those engaged in the preparation and

promulgation of regulatory material in WMO. Their purpose therefore is to lay out principles and procedures with a view to improving the quality of the WMO Technical Regulations, Volume I to Volume IV and their annexes (manuals) and guides and ensure their consistency. The Guidelines are addressed to both technical commissions and other bodies drafting regulatory provisions (such as the Executive Council Panel of Experts on Education and Training) and the WMO Secretariat. They are expected to assist all those concerned to keep the Technical Regulations up to date and to suggest ways and means of keeping track of the level of implementation by Members in a systematic and timely manner.

Another objective is to foster an Organization-wide "culture of compliance".

Table 1. Problems occurring in the Technical Regulations and manuals

Issue	*Details*	*Action*
Structure of publication	• History of amendments not well recorded • Format of the table of contents not uniform	• Template prepared, included in Volume I
Formulation of provisions	• Provisions cannot be classified: - Various categories of provision (standards, recommendations and guidance) included in the same paragraph ("shall" and "should" are used in the same paragraph) - Non-standard substitutes ("must", "ought to") used instead of "shall" and "should" • Provisions not clearly addressed (it is not clear who is the implementing party), rendering their implementation difficult • Provisions containing non-technical requirements	• Addressed in Chapter 3 of this publication • Addressed in Chapter 3 of this publication • Addressed in Chapter 3 of this publication
Procedure of maintenance	• Publications issued in the wrong series • Irregular updates, lack of a systematic and regular review (result: provisions and references become obsolete)	• Addressed in Chapter 4 of this publication • Addressed in Chapter 4 of this publication

1.4 Explanation of terms used in these Guidelines

The following terms are used throughout these Guidelines with the meanings indicated below:

Manual. The term "manual" is generally used in these Guidelines, rather than "annex". Their regulatory status (being annexes to the Technical Regulations) is highlighted only where necessary.

Provision. The generic term "provision" is used throughout these Guidelines to designate standard practices and procedures; the recommended practices and procedures (contained in the Technical Regulations and their annexes); and the (non-regulatory) practices, procedures and specifications (contained in WMO guides).

Note: Such a use is consistent with *ISO/IEC Directives*, Part 2: 2011: the term "provision" covers requirements (standards), recommendations and statements conveying information, such as guidance and notes.

Recommendation. The term "recommendation" is used for brevity in place of "recommended practice and procedure".

Note: The term "recommended meteorological practice and procedure" was formerly used in the Technical Regulations.

Standard. The term "standard" is used for brevity in place of "standard practice and procedure".

Notes:
1. The term "standard meteorological practice and procedure" was formerly used in the Technical Regulations.
2. In the *Manual on Codes* (WMO-No. 306), the term "regulation" is currently used in lieu of "standard practice and procedure". The alignment of the terminology is being considered.

2. CLASSIFICATION OF WMO PUBLICATIONS AND PROVISIONS THEREIN

2.1 Classification of WMO provisions

2.1.1 *Types of provisions based on their legal status*

WMO provisions can be divided into two main categories:

(a) Regulatory provisions, comprising

  (i) Standard practices and procedures (SPP);

  (ii) Recommended practices and procedures (RPP);

(b) Non-regulatory provisions – practices, procedures and specifications.

The regulatory provisions, SPP and RPP, were defined by Second Congress (Resolution 17 (Cg-II) – Definitions of the Technical Regulations of the World Meteorological Organization) and updated consequently, as follows:

S***tandard*** *practices and procedures* (SPP):

(a) Shall be the practices and procedures which it is **necessary** that Members follow or implement and therefore;

(b) Shall have the status of **requirements** in a technical resolution in respect of which Article 9(b) of the Convention is **applicable**; and

(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.

Recommended *practices and procedures* (RPP):

(a) Shall be the practices and procedures which it is **desirable** that Members follow or implement and therefore;

(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.

SPP and RPP are contained in: *WMO Technical Regulations* (WMO-No. 49), Volume I (including certain parts of the various manuals) to Volume IV (under preparation).

The non-regulatory provisions were defined by Second Congress (Resolution 18 (Cg-II) – Definition of the guides of the World Meteorological Organization), as follows:

Practices, procedures and specifications in WMO guides:

In addition to the Technical Regulations of the World Meteorological Organization appropriate ***guides*** shall be published by the WMO which shall 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 (or Hydrological) Services in their respective countries. These guides shall be regarded as materials to which Article 9 of the Convention is ***not applicable***.

It is important to understand well the differences between SPP and RPP, which are described in Table 2:

Table 2. Characteristics of standard practices and procedures versus recommended practices and procedures

Standard *practices and procedures*	***Recommended*** *practices and procedures*
Necessary for Members to follow or implement	***Desirable*** for Members to follow or implement
Distinguished by the use of the term ***shall***	Distinguished by the use of the term ***should***
Status of ***requirements***	Status of ***recommendations***
Defined in a technical resolution	–
Members shall ***do their utmost to implement***	Members urged to comply with
Article 9(b) of the Convention is ***applicable***	Article 9(b) of the Convention is not applicable
Members ***shall inform*** the Secretary/General of inability or impracticability of implementation	No requirement
General Regulation 128 is ***applicable***	General Regulation 128 is ***not applicable***

A frequently asked question is why two different types of regulations are needed and what criteria are used in deciding if a regulation qualifies as an SPP or RPP. As there is currently no clear answer to this question in existing WMO publications, an explanation based on commonly accepted practices can be provided. First of all, it is clear that SPP ("standards") are stronger provisions to which Article 9 of the Convention applies in full, thus they are regarded as binding agreements for Members. The necessity of the implementation of standards comes from the need to ensure a global level of performance, where any non-compliance would lead to performance deterioration. Thus, the implementation of standards at national level is regarded as a part of an international global effort. For instance, the WMO standard for synchronous observations at the main synoptic hours (0000, 0600, 1200 and 1800 UTC) is a global performance requirement ensuring proper data input to numerical weather prediction (NWP) and other forecasting systems.

The other category of regulations, RPP ("recommendations") provides the possibility to promulgate less binding but highly desirable regulations, where the term "desirable" is related to performance, rather than to a subjective desire of the implementing parties. The main reason for announcing a regulation as an RPP and not SPP is its suitability for (immediate) global implementation. It should be remembered that Congress instructed technical commissions not to recommend that a regulation be a standard practice unless it is supported by a strong majority of Members. Even though "strong majority" is not strictly defined, it is expected that any new (or amended) standard proposed by a technical commission is based on consensus by the commission concerned. Provisions based on technology advances and best practices may not yet be mature for universal global implementation (they may require substantial financial investment which is not affordable for some Members). If implemented gradually by those Members which are prepared technically and institutionally and bring performance enhancement nationally, regionally or globally, however, they should be formulated and promulgated as RPP. It is expected that most RPP of a global nature would evolve into SPP once the benefits are known and on becoming affordable through technology development.

A good example of the "natural" evolution of the regulations is Volume II – Meteorological Service for International Air Navigation, which was first approved by Second Congress (1955) for implementation from 1 January 1956 (it was then called Chapter 12 of the Technical Regulations). In this first version, Congress designated all Technical Regulations related to aviation as "recommended meteorological practices and procedures". This was because these regulations were still in the making and there was no strong global agreement to most of them. Nevertheless, regulations were absolutely necessary in order to ensure relatively uniform provision of service to the industry, which was rapidly moving from mostly national and regional to global operations. Over the years, the Technical Regulations of Volume II (and the identical regulations in ICAO Annex III) have evolved and a number of them have reached the required maturity to become global standards. Thus, the current editions of Volume II, Annex III are composed of both SPP and RPP and a number of RPP are considered in each new edition (normally following the ICAO three-year amendment cycle) for "upgrade" to SPP.

A recent example of such an upgrade was the evolution of the provision spelling out a requirement addressed to Members' meteorological authorities to establish "… a properly organized quality system comprising procedures, processes and resources necessary to provide for the quality management of the meteorological information to be supplied to the users …" (Technical Regulations, Volume II, Part I, 2.2.3). This provision was introduced as an RPP in 2001 (following Amendment 72 to Annex 3). At the time of its promulgation, there was no global consensus on the necessity for the establishment of a quality-management system by all meteorological authorities, thus it was introduced as an RPP: having a recognized positive impact on performance, but not critical. Gradually, it became clear that a quality-management system was to become a critical component of the ICAO standard requirement for the establishment of a safety management system and it was thus necessary to "upgrade" the RPP to SPP. This was done with Amendment 75 to Annex III (2010), which established 15 November 2012 as the target date for implementation of the standard.

As stipulated above, WMO also develops a number of non-regulatory provisions that form guides and other publications intended to facilitate the implementation of the Technical Regulations. These provisions could also be considered as part of the evolutionary process and some material, initially put in a guide, could be "upgraded" to regulatory material.

2.1.2 *Types of provisions based on their scope*

With regard to their scope, WMO standards and recommendations can be divided into two broad types.

- Institutional and system requirements (standards) or recommendations:

  (a) Establishment of global, regional and national networks and facilities (with their scope, objectives and composition);

  (b) Establishment of an authority or a responsible body;

  (c) Human resources requirements (including education and training, competences, qualifications, etc.); and

- Technical requirements (standards) or recommendations of an operational, functional or procedural nature. Among these are the provisions specifying different products that serve users; the provisions related to the encoding and decoding of observing or forecasting data, contained in the WMO *Manual on Codes*; etc.

Examples of the two above types of requirements are given in Example 1.

Example 1. Examples of types of requirements

(a) System requirements

- Definition of a system (including its scope and composition):
  "The Global Data-processing and Forecasting System shall include World Meteorological Centres, Regional Meteorological Centres and National Meteorological Centres." (Technical Regulations, Volume I (WMO-No. 49), Part I, 2.1.1)
- Designation of national facilities/networks:
  "Each Member shall establish and maintain at least one reference climatological station." (*Manual on the Global Observing System* (WMO No. 544), Part III, 2.8.3).

(b) Technical requirements

- Operational nature>
  "The intermediate standard times for surface synoptic observations shall be 0300, 0900, 1500 and 2100 UTC." (*Manual on the Global Observing System* (WMO-No. 544), Part III, 2.3.1.4).

2.1.3 *Additional material contained in the Technical Regulations*

The Technical Regulations also contain material in addition to standards and recommendations, such as definitions, appendices and notes. Such provisions are included in order to complement the standards and recommendations. Their status is summarized in Table 3.

Table 3. Status of "definitions", "notes" and "appendices" contained in the Technical Regulations

Type	*Status*	*Content*
Definition	Regulatory	Defines terms used in a standard or a recommendation; the definition has the same status as the provision containing the defined term.
Appendix	Regulatory	The same status as the standard or recommendation to which it refers.
Note	Non-regulatory	Explanatory material (often including references to other parts of the publication or to other publications); not having a status of a standard nor a recommendation.
Attachment	Non-regulatory	Detailed guidelines related to standards and recommendations but not having regulatory status.

Note: The modal verbs "shall" and "should" if used in notes or attachments will have their ordinary meaning. To avoid confusion, however, "shall" and "should" are to be avoided in the non-regulatory sections of regulatory material.

Among these additional elements of the regulatory material, definitions play an important role. Each volume of the Technical Regulations and each manual should include a section containing relevant definitions and, as recommended in Chapter 3, the definition section of each volume or annex should be placed immediately after the introduction.

As a rule, each definition should appear in only one place (volume or annex) of the regulations, so there should be no repetition of definitions. To ensure this, Eighth Congress (1979) agreed that the definitions section of WMO-No. 49 should include only those definitions appearing in the text of the Technical Regulations, while other definitions should be placed in the respective manuals.

2.2 Hierarchy of WMO publications

As indicated in the foregoing section, Congress has established three types of WMO publications with a clearly distinguishable hierarchy listed in descending order:

(a) Technical Regulations (Resolution 17 (Cg-II));

(b) Manuals (as annexes to Technical Regulations) (Cg-VI, 2.6.2); and

(c) Guides (Resolution 18 (Cg-II)).

Note: There are other types of WMO publications (guidelines, compendia, etc.), which, being beyond the scope of this publication, are not addressed.

The types, characteristics and the corresponding approval processes of WMO regulatory material are summarized in Table 4:

Table 4. Types, contents, nature and approval processes of WMO regulatory material

Type	*Content*	*Nature of provisions*	*Adoption/approval by*
Technical Regulations	Standards, recommendations	Basic, conservative, requirement-driven	Congress or Executive Council (under delegated authority)[1]
Manuals (Global Aspects)	Standards, recommendations	Detailed, dynamic, technology-driven	Congress or Executive Council (under delegated authority)[1]
Guides	Practices, procedures and specifications (of a non-regulatory nature)	Implementation guidance, explanations, examples of good practice	Executive Council

[1] The President of the Organization may, on behalf of the Executive Council, take action on new provisions considered urgent (in conformity with Regulation 9(5) of the General Regulations).

It would appear from Table 4 that the provisions contained in the Technical Regulations and manuals have the same status as regulatory material, as both contain standards and recommendations. However, the rationale for the existence of these two levels of regulatory provisions in the Technical Regulations lies in the attempt to distinguish those regulations that are of a basic, fundamental nature, which should be fairly stable in time (amendments are infrequent) from those that state more specific and technical requirements, with a more dynamic amendment cycle. The former are the regulations included in the Technical Regulations, Volume I, where the main WMO systems and services are defined with their objectives, scope and basic structure; the latter are the regulations included in the manuals which are mostly technical and specific for a certain system or area of activity (such as the *Manual on the Global Observing System*). It is also expected that the development of the Technical Regulations in Volume I is mostly requirement-driven – designed to reflect agreed global, regional and national requirements for systems and services – while the provisions in manuals could also be driven by the evolving technology, hence, a more dynamic amendment cycle is necessary. It should also be mentioned that Volume II and Volume III of the Technical Regulations have appeared historically as separate volumes due to developments in highly specialized service areas: meteorological service for international air navigation, and hydrology.

Some manuals are composed of two volumes. It should be understood that only Volume I (covering global aspects) is part of the Technical Regulations; Volume II (covering regional aspects and national practices) does not form part of the Technical Regulations. The regional aspects in Volume II normally represent respective regional implementation plans (regional plans for GOS, GTS, etc.) and are applicable only to the Members of the regional association in question.

It should be well understood that the provisions in WMO guides have a fundamentally different legal status from those in the Technical Regulations and manuals. These provisions are of a non-regulatory nature (thus, they are not subject to Article 9 of the Convention) and no formal approval by Congress is required, which renders them more flexible and easier to update, as and when required. The material contained in the guides complements the regulatory framework established by the Technical Regulations with their annexes and provides guidance on approaches and practices to assist Members achieve compliance with the Technical Regulations in an effective and efficient manner.

Table 5 lists all the current volumes of the Technical Regulations and their annexes that are issued as manuals, as well as some principal guides which are referred to in the regulatory material.

Note: The WMO website (www.wmo.int) provides free access to all regulatory material at: http://www.wmo.int/pages/governance/policy/tech_regu_en.html

Table 5. List of WMO Technical Regulations (TR) and manuals[1] (M) contained in WMO Basic Documents No. 2

Type	*Location*	*Title*	*WMO-No.*
TR	Volume I	General Meteorological Standards and Recommended Practices	49
TR	Volume II[2]	Meteorological Service for International Air Navigation	49
TR	Volume III	Hydrology	49
TR	Volume IV[3]	Quality Management	49
M	Annex I	*International Cloud Atlas*, Volume I – Manual on the Observation of Clouds and Other Meteors (in part)	407
M	Annex II	*Manual on Codes*, Volume I.1 (Part A – Alphanumeric Codes); Volume I.2 (Part B – Binary Codes, Part C – Common Features to Binary and Alphanumeric Codes)	306
M	Annex III	*Manual on the Global Telecommunication System*, Volume I	386
M	Annex IV	*Manual on the Global Data-processing and Forecasting System*, Volume I	485
M	Annex V	*Manual on the Global Observing System*, Volume I	544
M	Annex VI	*Manual on Marine Meteorological Services,* Volume I	558
M	Annex VII	*Manual on the WMO Information System*	1060
M	Annex VIII	*Manual on the Implementation of Education and Training Standards in Meteorology and Hydrology*	1083

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1 All the manuals listed in Table 5 are annexes to Volume I.

2 Volume II is, mutatis mutandis, identical to ICAO Annex 3 – Meteorological Service for International Air Navigation.

3 Under preparation

Note: Volume II of some manuals containing regional aspects and national practices does not form part of the Technical Regulations.

WMO produces a wide variety of other guidance material, so it is useful to distinguish the guides that are referred to in the regulatory material (Technical Regulations and manuals), which complement the regulations directly from other guidelines and technical documents that are produced as deliverables of different WMO programmes and activities. This material, while useful for Members by providing knowledge and know-how in different areas, are currently not part of the regulatory framework.

Table 6. Some WMO guides referred to in the Technical Regulations and manuals

Title	*WMO No.*
Guide to Meteorological Instruments and Methods of Observation	8
Guide to Climatological Practices	100
Guide to Agricultural Meteorological Practices	134
Guide to Hydrological Practices	168
Guide on the Global Data-processing System	305
Guide to Marine Meteorological Services	471
Guide to the Global Observing System	488
Guide on Meteorological Observing and Information Distribution Systems for Aviation Weather Services	731
Guide to the Quality Management System for the Provision of Meteorological Service to International Air Navigation	1001
Guide to the WMO Information System	1061

Note: The above list of WMO guides is not exhaustive and there are also some publications published under other titles that contain guidance related to the Technical Regulations (*Manual on Stream Gauging* (WMO-No. 519), *Manual on Sediment Management and Measurement* (WMO-No. 948), for example) are de facto guides and should not be considered as manuals that are annexes to the Technical Regulations).

3. GUIDELINES RELATED TO THE DEVELOPMENT OF WMO PROVISIONS

3.1 Introduction

The regulatory material promulgated by WMO should be prepared in such a form as to facilitate common understanding and implementation by all Members. The straightforward and unambiguous interpretation and the internal consistency of the different volumes and annexes comprising the Technical Regulations, as well as the related guides, are of paramount importance.

To ensure the relevance of the regulations with the requirements and to avoid imposing an unnecessary burden on Members, Congress agreed on certain principles, as follows:

(a) Technical commissions should not recommend that a regulation be a standard practice unless it is supported by a strong majority[1] of Members;

(b) The 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 amendment to the Technical Regulations submitted by Members or constituent bodies should be communicated to all Members at least three months before it is submitted to Congress.

[1] There is no strict definition of "strong majority": the meaning is that there should be no strong objection from Members to the proposed standard and it is regarded as "implementable" by a majority of Members.

3.2 Guidance concerning structure and style

3.2.1 *General*

Section 3.2 provides guidance, based mainly on *ISO/IEC Directives,* Part 2: 2011, concerning the structure and style to be used when developing the provisions for inclusion in the Technical Regulations. It is also largely applicable for drafting guidance for inclusion in WMO guides.

Note: For more complete guidance, see *ISO/IEC Directives,* Part 2: 2011.

These Guidelines are addressed principally to the technical commissions. When drafting new provisions or amending existing ones, it is important to bear in mind that the provisions in the Technical Regulations should be related to the best practices concerning existing services and facilities; they should not describe projections of expected future developments.

3.2.2 *Structure of the publications and their parts*

When a new publication is being prepared, the desirability of dividing it, with the same publication number, into different volumes or parts, according to subject matter, should be considered. Such a practice has the advantage that each volume or part can be amended separately when the need arises. Since the publications are diverse, there are no simple rules that can be established. As a general rule, however, an individual volume or a separate part must be prepared for each subject to be standardized. In particular, provisions that are addressed to different parties (general meteorological services, climatological services, hydrological services) shall be clearly distinguished, preferably as parts of a publication or as separate publications.

Many examples using these principles can be found in the WMO Technical Regulations and annexes (see Example 2 concerning the *Manual on Codes* (WMO-No. 306)).

If the publication becomes too voluminous, a division into individual publications (volumes) should be considered. In most cases, however, a division into separate parts under the same publication number would be sufficient. Such a division is preferable in particular if:

(a) Subsequent portions of the content are interlinked;

(b) Portions of the publication are to be referred to in the provisions; or

(c) Portions of the publication are intended for certification purposes.

Example 2. Example of dividing a WMO publication into volumes and parts, according to subject matter

Manual on Codes (WMO-No. 306)
Volume I.1. International Codes
Part A – Alphanumeric Codes
Volume I.2. Regional Codes and National Coding Practices
Part B – Binary Codes
Part C – Common Features to Binary and Alphanumeric Codes

It is also advisable to regroup similar provisions together in one part of the publication, according to their nature:

- Safety requirements;
- Performance requirements;
- Maintenance and service requirements;
- Installation rules; and
- Quality assessment.

In WMO manuals and guides, the parts are subdivided into chapters, sections, subsections (where required) and paragraphs, as shown in Table 7. The chapters, sections and subsections are terms used for various levels of headings, while the paragraphs contain the provisions.

Table 7. Names of divisions and subdivisions of WMO Technical Regulations and guides

Term	*Template*	*Examples of numbering from WMO-No. 49, Volumes I and II*
Part	**PART N** (roman number)	**PART I. WORLD WEATHER WATCH**
Chapter	**n** (number)	**1. GLOBAL OBSERVING SYSTEM**
Section	n.n	1.1 Meteorological observing networks, stations and …
Subsection[1]	n.n.n	1.1.1 General – Scope, purpose and operation of the …
Paragraph	–[2] *or* n.n.n.n[3]	1.1.1.1 The Global Observing System shall be constituted
Appendix[4]	**APPENDIX X** (upper-case Latin letter, followed by Arabic numeral)	**APPENDIX A. VALUES OF SOME PHYSICAL FUNCTIONS AND CONSTANTS USED IN METEOROLOGY**
Attachment[5]	**ATTACHMENT Y** (upper-case Latin letter followed by Arabic numeral)	**ATTACHMENT C. SELECTED CRITERIA APPLICABLE TO AERODROME REPORTS**

[1] Only as required

[2] No number if the subsection contains only one paragraph.

[3] If the subsection contains more than one paragraph.

[4] To be included in the order in which they are cited in the text. They are normative (containing standards and recommendations).

[5] To be included in the order in which they are cited in the text. They are informative (containing guidance).

Currently, within individual publications, the structure varies from one publication to another as shown in Table 8.

Table 8. Current organization of elements preceding the provisions (Technical Regulations) in selected WMO publications

Publication	*Element I*	*Element II*	*Element III*
Technical Regulations – Volume I (WMO-No. 49)	General provisions	Contents	Definitions
Technical Regulations – Volume II (WMO-No. 49)	Introduction	Contents	Definitions
Technical Regulations – Volume III (WMO-No. 49)	Introduction	Contents	Definitions
Annex II (WMO-No. 306)	Contents[1]	Introduction	Definitions
Annex III (WMO-No. 386)	Contents	Introduction	
Annex V (WMO-No. 544)	Contents	Introduction	(Definitions)[2]
Annex VI (WMO-No. 558)	Contents	Introduction	
Annex VII (WMO-No. 1060)	Contents	Introduction	

[1] Preceded by a "preface"

[2] Definitions are in an appendix.

Table 8 shows that the order of elements (the structure) varies from one publication to another. In principle, there is no single correct structure and any one could be defended. It would be highly desirable, however, to aim to standardize the structure of WMO publications, which would substantially facilitate their use. In order to do this, it is important that the provisions be regrouped in an identical manner throughout the Technical Regulations. *ISO/IEC Directives,* Part 2: 2011 gives some guidance in this regard. The structure that has been developed is based on that guidance and is shown in the template given in Table 9. The table also lists the permitted content of each of the elements. The elements contained in WMO publications have been divided into two broad categories: informative (guidance) and normative (standards and recommendations) elements. In the Technical Regulations, the core of the publication is of a normative nature (standards and recommendations), while the bulk of informative elements are normally regrouped in the beginning of the publication: on the title page, in the table of contents and in the introduction. There may be additional informative elements within the publication, such as notes and attachments (WMO guides contain only informative elements). When drafting new WMO regulatory publications or updating existing ones, the structure presented in Table 9 should be used.

The table of contents should reflect the above structure in accordance with the arrangement of elements shown in Table 9, using the divisions and subdivisions as presented in Table 7. Additional guidance is provided in 3.2.3.

3.2.3 ***Style***

Technical Regulations should be written in simple, concise language, using short sentences. This is particularly important for those whose mother tongue is not one of the official languages of WMO. To achieve their objectives, new provisions should:

- Be precise, consistent, clear and unambiguous;
- Be as complete as possible within the limits specified by their scope;
- Take full account of the state-of-the-art;
- Provide a framework for future technological development;
- Be comprehensible to qualified persons who have not participated in their preparation.

Table 9. Template for a standard arrangement of elements to be used in the Technical Regulations

Type of element	*Arrangements of elements in a publication*	*Permitted content of elements in a publication*
Preliminary informative: elements that identify the publication, introduce its content and explain its background, its development and its relationship with other publications.	Title page	Title
	Table of contents	Contents
	Introduction	Text Notes
Normative: element that sets out the provisions	Definitions Symbols and abbreviated terms Provisions Appendices (normative)	Text Figures Tables Notes Examples References
Supplementary informative: element that provides additional information intended to assist in understanding or using the publication	Attachments (informative)	Text Figures Tables Notes
Key: plain bold type = mandatory element; plain roman type = normative element		

Notes:

1 It is essential that the tables, figures and appendices are always introduced by a sentence in the text.

2 Footnotes are not to be used.

3 Attachments are currently used in Volume II of the Technical Regulations.

Issues related to style are addressed item by item in these Guidelines. They are listed in the same order as the elements in the second column of Table 9.

Title page

The title page shall contain the title of the publication. The wording of the title shall be established with the greatest care: while being as concise as possible, it shall indicate, without ambiguity, the subject matter of the publication. The title should distinguish it from other publications. Any necessary additional particulars shall be given in the introduction.

Table of contents

The table of contents is a mandatory element in the Technical Regulations and annexes. The table of contents shall be entitled "Contents", shall list chapters and, if appropriate, sections with titles, and appendices. The order shall be as follows:

- Parts (starting from "Definitions");
- Chapters;
- Sections;
- Appendices;
- Attachments.

All the elements listed shall be cited with their full titles. Terms included under "Definitions" shall not be listed in the table of contents.

Introduction

The introduction shall appear in the Technical Regulations and manuals. It shall not contain requirements (standards), recommendations, figures or tables. The introduction gives information about: the purpose of the publication; the types of provisions included therein; the status of annexes (in the case of the Technical Regulations) and appendices; amendments; and its relationship with other publications.

Definitions

This is a conditional element giving definitions necessary for the understanding of certain terms used in the publication. The following introductory wording shall be used: "The following terms, when used in (name of the publication), have the meanings given below". Before introducing a definition in a publication, it is essential to verify whether the term has already been defined in other volumes: if that is the case, the need for it has to be carefully considered; if regarded as indispensable for understanding, the definition has to be aligned with the one already published. Definitions shall not include any abbreviations. The use of abbreviations and definitions should be kept to a minimum.

Note: Guidance related to the rules for the drafting and presentation of definitions can be found in Annex D of *ISO/IEC Directives,* Part 2: 2011.

Symbols and abbreviated terms

This is a conditional element giving a list of the symbols and abbreviated terms necessary for the understanding of the publication.

All the symbols should be listed in alphabetical order in the following sequence:

- Upper-case Latin letter followed by lower-case Latin letter (A, a, B, b, etc.);
- Letters without indices preceding letters with indices, and with letter indices preceding numerical ones (B, b, C, Cm, C2, c, d, dext, dint, d1, etc.);
- Greek letters following Latin letters (Z, ζ, ~~A~~, α, B, β, … , ~~A,~~ ~~λ,~~ etc.);
- Any other special symbols.

Abbreviated terms shall be used with care and their use shall be limited to those cases where it is not likely to cause confusion. The first time that a term is used, it shall be given in full with the abbreviated term following in parentheses. An abbreviated term shall be specified only if used subsequently in the publication. The general rule is that an abbreviated term comprises capital letters, without a full-stop after each letter. The WMO website (http://www.wmo.int) provides links to Meteoterm (http://www.wmo.int/pages/prog/lsp/meteoterm_wmo_en.html) and a list of acronyms (http://www.wmo.int/pages/themes/acronyms/index_en.html).

Provisions

This is a mandatory element that may contain standards, recommendations, figures, tables and notes. It is essential to make a clear distinction between normative elements (standards and recommendations) and informative elements (guidance material). The latter shall be placed in notes. It is important not to mix various types in one single provision. A provision must remain clearly identifiable: it is either a standard (with the modal verb "shall") or a recommendation (with the modal verb "should"). It is also important to consider when a new provision should be drafted as a standard or as a recommendation. Congress has stated that the technical commissions should not recommend that a provision be a standard unless it is supported by a "strong majority" of

Members (Technical Regulations (WMO-No. 49), Volume I, General provisions, 12(a)). In other words, any new standard should be mature for global implementation. If the provision cannot (yet) be implemented by a number of Members, it should be drafted as a recommendation. Such a recommendation may be "upgraded" to a standard in the future, as soon as an acceptable level of implementation has been reached among Members.

The implementation of normative elements should be supported by the development of appropriate instructions (guidance) to Members. Such guidance could be included in notes or in attachments included in the Technical Regulations or, when extensive, in a separate WMO guide.

In order to be able to claim compliance with a provision, a Member needs to be able to identify the requirements that it is obliged to satisfy. The Member also needs to be able to distinguish these requirements from other provisions where there is a certain freedom of choice. Clear rules for the use of verbal forms (including modal verbs) are therefore essential. Table 10 gives, in the second column, the verbal form that shall be used to express each kind of provision in the WMO Technical Regulations. The equivalent expressions given in the third column are equivalent expressions that shall not be used in the provisions. Table 10 is applicable to WMO provisions as far as regulatory texts (standards and recommendations) are concerned. With regard to non-regulatory material, such as guidance, there are no limitations for the expressions presented in the third column.

Table 10. Instructions concerning the use of verbal forms in WMO provisions

Type	*Correct verbal form*	*Equivalent expression not to be used in the provisions*
Standard (requirement)	shall	must is to is required to is required that has to only … is permitted it is necessary
	shall not	may not is not allowed/permitted/acceptable/permissible is required to be not is required that… be not
Recommendation	should	is recommended that ought to
	should not	is not recommended that ought not to
Guidance (notes): permission	may	is possible is permitted is allowed is permissible
	need not	is impossible is not required that no … is required
Guidance (notes): possibility and capability	can	be able to there is a possibility of is possible to
	cannot	be unable to there is no possibility of is not possible to

Figures should be used when they are the most efficient means of presenting information in an easily understandable form. It shall be possible to refer to each figure explicitly within the text. Figures shall be designated "Figure" and numbered with Arabic numerals, beginning with 1. This

numbering shall be independent of the numbering of the chapters and of any tables. A single figure shall be designated "Figure". The figure designation shall be centred horizontally below the figure.

Notes to figures shall be treated independently from notes integrated in the text. They shall be located above the designation of the relevant figure. A single note in a figure shall be preceded by "Note", placed at the beginning of the first line of the text of the note. When several notes occur in the same figure, they shall be designated "Notes" and numbered with Arabic numerals, beginning with 1. A separate numbering sequence shall be used for each figure. Notes to figures shall not contain requirements or any information considered indispensable for the use of the publication. Any requirements relating to the content of a figure shall be given in the text. References to notes to figures are not necessary.

Tables should be used when they are the most efficient means of presenting information in an easily understandable form. It shall be possible to refer to each table explicitly within the text. Neither a table within a table nor the division of a table into subsidiary tables is permitted. Tables shall be designated "Table" and numbered with Arabic numerals, beginning with 1. This numbering shall be independent of the numbering of the chapters and of any figures. A single table shall be designated "Table". The table designation shall be centred horizontally above the table.

The table designation and title shall be separated by a full stop. The units used in a given column shall generally be indicated under the column heading.

Notes to tables shall be treated independently from notes integrated in the text. They shall be located within the frame of the relevant table. A single note in a table shall be preceded by "Note" placed at the beginning of the first line of the text of the note. When several notes occur in the same table, they shall be designated "Note" and numbered with Arabic numerals, beginning with 1. A separate numbering sequence shall be used for each table. Notes to tables shall not contain requirements or any information considered indispensable for the use of the publication. Any requirements relating to the content of a table shall be given in the text. References to notes to tables are not necessary.

Notes and examples integrated in the text of a publication shall be used only for giving additional information to assist in the understanding or use of the publication. Footnotes should not be used. Notes and examples shall not contain requirements (with the modal verb "shall") or any information considered indispensable for the use of the publication, including instructions and recommendations (with the modal verb "should"). Notes may be written as a statement of fact. Notes should be used sparingly, mainly to give essential information related to standards and recommendations (such as references to guidance material). See Examples 3 and 4.

Example 3. Correctly drafted note

The example below comprises an extract of a chapter, together with a corresponding note. The note is correctly drafted since it contains additional information intended to assist the understanding of the publication.

"Each label shall have a length of between 25 mm and 40 mm and a width of between 10 mm and 15 mm.

Note: The size of the label was chosen to fit most sizes of syringe without obscuring the graduation marks."

Example 4. Incorrectly drafted notes

The following notes are drafted incorrectly, since they contain, respectively, a requirement, an instruction and a recommendation, none of which constitutes "additional information". The problematic text is given in italics and explained in parentheses after the respective example.

Note: In this context, a part *shall* be regarded as a separate publication … (a requirement expressed using the modal verb "shall").

Note: Where a laboratory is part of a larger organization, the organizational arrangements *should* be such that departments having conflicting interests … (a recommendation expressed using the modal verb "should").

Notes and examples should be placed after the paragraph to which they refer. Notes and examples are not numbered unless more than one appears in the same chapter, section, figure or table.

References to particular pieces of text shall be used instead of repetition of the original source material, since such repetition involves the risk of error or inconsistency and increases the length of the publication. If it is considered necessary to repeat such material, however, its source shall be identified precisely. The reference shall contain the official name of the publication, followed by the part(s), chapter(s), section(s) or paragraph(s), as appropriate; reference shall not be made to page numbers. Internal references within a publication include only the appropriate part(s), chapter(s), section(s) or paragraph(s), in accordance with the following forms:

- "in accordance with Chapter 3";
- "according to 3.1";
- "as specified in 3.1(b)";
- "details as given in 3.1.1";
- "see Annex B";
- "the requirements given in B.2";
- "see Note to Table 2";
- "see 6.6.3, Example 2";
- "see 3.1, Formula (3)".

It is unnecessary to use the terms "paragraph" or "section" before the number. Imprecise references such as "this paragraph" and "this annex" shall not be used.

Only references to the Technical Regulations and manuals (annexes) shall be included in the text, while other references (WMO guides, for example) shall be incorporated in notes.

Every figure and table included in the publication shall be referred to in the text, using, for example, the following forms:

- "shown in Figure 6";
- "(see Figure 3)";
- "given in Table 2";
- "(see Table 1)".

Appendices

Appendices shall be normative and give provisions additional to those in the body of the publication. Their presence is conditional. The normative status (as opposed to informative attachments, see below) shall be made clear by the way in which it is referred to in the text.

Attachments

Attachments shall be informative and give additional information intended to assist the understanding or use of the publication. They shall not contain requirements. Their presence is conditional. The informative status (as opposed to normative appendices, see above) shall be made clear by the way in which it is referred to in the text.

Note: Additional guidance concerning, inter alia, the representation of numbers and numerical values, quantities, units, symbols and signs and mathematical formula, are given in *ISO/IEC Directives*, Part 2: 2011.

3.3 Rules for drafting

3.3.1 *General principles*

In most publications, the aims of individual requirements are not usually indicated, although the purpose of a publication and of some requirements can be usefully explained in the introduction. It is essential, however, to identify these aims at the earliest possible opportunity to facilitate the taking of decisions regarding inclusion of the individual requirements.

In order to facilitate implementation by Members, the aspects which will be of separate interest to the various parties shall be clearly distinguished, either in separate chapters of the publication or, preferably, in separate publications or parts of a publication. A distinction shall be made, for example, between:

- Safety requirements;
- Performance requirements;
- Maintenance and service requirements; and
- Installation rules.

Members often make reference to standards in their national legislation and governmental regulations. Aspects which are expected to form part of governmental regulations, such as requirements dealing with safety, shall receive priority when preparing new standards.

Whatever the aims of a standard, only requirements that can be verified shall be included. Requirements in publications shall be expressed in well-defined values. Where appropriate, requirements should be formulated in terms of the performance of a system (performance-based standards). Vague phrases shall not be used (“regularly” or “at regular intervals” should be replaced by unambiguous statements, such as “every six months”). Furthermore, the use of ambiguous expressions such as “as necessary”, “as appropriate”, “if feasible” should be minimized.

If it is necessary to invoke a requirement elsewhere, this should preferably be done by reference, not by repetition.

3.3.2 *Practical rules with examples*

This subsection lists 10 rules for drafting, together with some examples from the existing Technical Regulations requiring corrective action. The rules are based on *ISO/IEC Directives,* Part 2: 2011, which provide additional guidance.

Rule 1: ***Favour performance-based provisions.*** Whenever possible, requirements shall be expressed in terms of performance rather than design or descriptive characteristics. This approach leaves maximum freedom to technical development. This is shown in Example 5.

Recommended action. Formulate provisions in terms of performance of a system or a facility, rather than its design or characteristics.

Example 5. How to draft performance-based provisions related to observing practices

In the case of specifications of the requirements for observations, express the specification in terms of required accuracy, frequency, sampling rate, averaging interval, etc. Avoid including the type of instrument or the description of the method of observation. It is important that the required performance is achieved: how it is done (technically) is of secondary importance .

Rule 2: ***Ensure the homogeneity of provisions.*** Uniformity of structure, style and terminology shall be maintained, not only within each publication, but also within a series of associated publications. To achieve this:

- The structure of associated publications and the numbering of their chapters shall, as far as possible, be identical;
- Identical wording shall be used to express identical provisions;
- The same term shall be used throughout each publication or series of associated publications to designate a given concept;
- The use of an alternative term (synonym) for a concept already defined shall be avoided;
- As far as possible, only one meaning shall be attributed to each term chosen.

These requirements are particularly important, not only to ensure understanding of the publication or series of associated publications, but also to derive maximum possible benefit through automated text-processing techniques and computer-aided translation.

Note: For historical reasons, there are non-homogeneous aspects in the Technical Regulations. They are gradually being addressed as the publications are updated.

Recommended action 1. Undertake an overview of the publication in which the new or amended provisions are to be included to ensure that the style and formulation are compatible with the publication concerned. If the publication is a manual (annex to the Technical Regulations), also check the compatibility of the proposed provisions with those in Volume I of the Technical Regulations.

Recommended action 2. Changes to the Technical Regulations must be identified in such a manner that they remain visible in any version of a session publication. Do not use the "track-changes feature" but rather strike-through for deletions and highlights for insertions (as shown in Example 9), not forming part of the "track-changes" feature of text-processing.

Rule 3: ***Maintain the consistency of publications.*** The text of every publication shall be in accordance with the provisions of existing regulatory material published by WMO. This relates particularly to:

- Standardized terminology;
- Principles and methods of terminology;
- Quantities, units and their symbols;
- Abbreviated terms;
- Bibliographic references; and
- Equivalence of official language versions (technically equivalent and structurally identical).

Recommended action. Verify the proposed terminology, abbreviations (to be kept to a minimum) and references to ensure that they are in accordance with those used in the publication concerned. If the publication is a manual (annex to the Technical Regulations), also carry out the verification against those used in Volume I of the Technical Regulations.

Rule 4: ***Consider fitness for implementation.*** A new provision in a WMO publication shall be drawn up in such a way as to facilitate its direct application and adoption without change as a regional or national standard. The style and language of a provision shall be carefully considered to make it clear for Members and fit for implementation.

Recommended action. Carry out a systematic review of all the new and amended provisions to ensure that they are fit to be implemented and that the Members can easily assess whether they comply with these provisions or not.

Rule 5: ***Define the addressee of a provision.*** Where feasible, the addressee of the provision shall be well defined to ensure implementation. If not defined, it remains unclear who should implement the provision. In general, provisions in the Technical Regulations shall be addressed to Members (General Regulation 128). If necessary, they could also be addressed to a regional facility – such as a Regional Specialized Meteorological Centre – but they should never be addressed to "Permanent Representative", "National Meteorological or Hydrological Service" or individuals, such as "meteorologists". Obligations addressed to Members or to a regional facility in one provision shall be enumerated in one provision using sub-paragraphs (a), (b), (c), etc.

Recommended action. Address the new or amended provisions clearly. If it is not clear from the context to whom they are addressed, the addressee has to be stated explicitly.

Rule 6: ***Ensure that references are made only to relevant publications.*** No reference should be made to outdated or non-existent material.

Recommended action. Systematically verify all the references in new or amended provisions to ensure that the publication referred to is valid and up to date. If this is not the case, the reference should not be included.

Rule 7: ***Ensure that there are no extraneous definitions in the publication.*** The list of definitions (which should be part of each regulatory publication) should include only definitions

that are used in that publication. In this respect, Eighth Congress requested the technical commissions concerned to review the respective definitions in Volumes I and III of the Technical Regulations with a view to eliminating definitions of terms not appearing in the text and transferring them, as appropriate, to the relevant manuals (annexes). For terms that appear in more than one publication, the definition should be included in the publication where it appears for the first time (consultation between the responsible bodies for the respective publications might be necessary).

Recommended action. Systematically verify all the definitions in new or amended provisions to ensure that the definitions concerned are included in the publication concerned. If this is not the case, the definition should not be included.

Rule 8: ***Minimize the use of abbreviations.*** To facilitate the readability and understanding of the Technical Regulations, the use of abbreviations should be minimized. This is of particular importance as the Technical Regulations are high-level legal publications which are not addressed exclusively to specialists. The correct way of drafting is given in Example 6.

Recommended action. Review all the proposed abbreviations in the new or amended text: only introduce them if they are considered absolutely necessary; otherwise replace them by unabbreviated words or text.

Example 6. The correct way of avoiding abbreviations

In Volume I of the Technical Regulations, the term "World Weather Watch" is systematically written in full, never abbreviated as "WWW".

Rule 9: ***Ensure that all the proposed provisions can be classified unambiguously.*** A provision can only be a standard (always with the modal verb "shall"); a recommendation (always with the modal verb "should"); or guidance material (never with the modal verbs "shall" or "should"). The various types shall be separated and cannot, in any circumstances, be placed in one single provision. Furthermore, descriptive material (and guidance) should not be "embedded" in the requirements. Such material should be transferred to appendices or to relevant guides (see Examples 7, 8 and 9). In Example 9, two alternative rectifications are proposed: both are correct from the formal point of view but they differ as far as the status of the provision is concerned and have therefore to be carefully assessed before deciding.

Recommended action. Review each new or amended provision to ensure that its status is unambiguous: it must be either a standard (with the modal verb "shall"), a recommendation (with the modal verb "should") or guidance material (never with modal verbs "shall" or "should"). A provision containing elements of varying status should be split into two or more provisions.

Example 7. Incorrect inclusion of standards, recommendations and guidance in one hypothetical provision

Existing text (added comments are in italics):

"Global data coverage should be provided for the benefit of WMO World Meteorological Centres, Regional Specialized Meteorological Centres and a number of WMO Members engaged in global NWP (*defines users – correct verbal form*). Availability of global data *is required* without gaps in coverage or time (*requirement for spatial and temporal coverage – wrong verbal form*). For global NWP applications, data are required no later than four hours, and with a goal of one hour, after the instrument has made the observation (*requirement for temporal resolution of data – wrong verbal form*). This *can be achieved* with polar-orbiting satellites by on-board storage and successive transmission when in view of command and data-acquisition stations or by regional retransmission services from a network of direct broadcast receiving stations or by using data-relay satellites or by a combination of these systems (*guidance – wrong verbal form in a recommended practice and procedure*)".

Amended text (assuming that the provision is a recommendation):

"Global data coverage should be provided for the benefit of WMO World Meteorological Centres, Regional Specialized Meteorological Centres and a number of WMO Members engaged in global NWP. Global data *should be available* without gaps in coverage or time. For global NWP applications, data *should be available* no later than four hours, and with a goal of one hour, after the instrument has made the observation.

Note: This *may be* achieved with polar-orbiting satellites by on-board storage and successive transmission when in view of command and data-acquisition stations or by regional retransmission services from a network of direct broadcast receiving stations or by using data-relay satellites or by a combination of these systems.

Example 8. Hypothetical regulatory provisions without "shall" or "should" (using "may", "can" or other verbal form)

Existing text (verbal forms indicated in italics for emphasis):

"An instrument height of between 1.25 m and 1.75 m above ground is considered satisfactory to obtain representative air-temperature measurements (*requirement for the instrument height – wrong verb*). At a station where considerable snow cover may occur, however, a greater height *is permissible* or, alternatively, a movable support can be used, allowing the thermometer housing to be raised or lowered in order to keep the correct height above the snow surface (*guidance for specific circumstances*)."

Amended text (assuming that the provision is a standard):

"An instrument height of between 1.25 m and 1.75 m above ground *shall be used* to obtain representative air-temperature measurements. At a station where considerable snow cover may occur, however, a greater height *shall be used*.

Note: A movable support *may be used,* allowing the thermometer housing to be raised or lowered in order to keep the height between 1.25 m and 1.75 m above the snow surface."

Example 9. Three examples of hypothetical provisions incompatible with Rule 9. Two possible corrections are suggested after each example (the verbal forms are indicated in italics for emphasis; those changed are highlighted).

(a) Incorrect combinination of a standard and guidance in one provision.

"In the absence of wind instruments, the wind speed *shall* be estimated on the basis of the Beaufort wind scale. The Beaufort number obtained by estimation *is converted* into metres per second or knots by the use of the wind-speed equivalent columns of the Beaufort scale, and this speed *is reported*.

Correction without changing the verbal forms used (separating guidance into a note):

"In the absence of wind instruments, the wind speed *shall* be estimated on the basis of the Beaufort wind scale.

Note: The Beaufort number obtained by estimation is converted into metres per second or knots by the use of the wind-speed equivalent columns of the Beaufort scale and this speed is reported."

Correction that upgrades guidance into a standard and maintains the two sentences in one provision:

"In the absence of wind instruments, the wind speed *shall* be estimated on the basis of the Beaufort wind scale. The Beaufort number obtained by estimation ~~*is*~~ *shall be* converted into metres per second or knots by the use of the wind-speed equivalent columns of the Beaufort scale, and this speed ~~*is*~~ *shall be* reported.

(b) Incorrect splitting of a requirement into a standard and a note:

"Code figures 00, 01, 02, 03 of the code table *shall* be considered to represent phenomena without significance.

Note: All present weather and past weather, including phenomena without significance observed at sea, shall be reported in the SHIP message."

Correction without changing the modal verbs used (combining two requirements in one standard):

"Code figures 00, 01, 02, 03 of the code table *shall* be considered to represent phenomena without significance. ~~Note:~~ All present weather and past weather, including phenomena without significance observed at sea, *shall* be reported in the SHIP message."

Correction that maintains the types of provisions unchanged (a standard and a note):

"Code figures 00, 01, 02, 03 of the code table *shall* be considered to represent phenomena without significance.

Note: All present weather and past weather, including phenomena without significance observed at sea, ~~shall be~~ *is* reported in the SHIP message."

(c) Incorrect combination of guidance and two requirements:

"If more than one form of weather is observed, the highest applicable code figure shall be selected. Other weather *may* be reported in Section 3. In any case, code figure 17 shall have precedence over figures 20–49."

Correction without changing the verbal forms used (separating guidance into a note):

"If more than one form of weather is observed, the highest applicable code figure *shall* be selected. ~~Other weather may be reported in Section 3.~~ In any case, code figure 17 *shall* have precedence over Figures 20–49.

Note:

Other weather may be reported in Section 3".

Correction that upgrades guidance into a standard and maintains the three sentences in one provision:

"If more than one form of weather is observed, the highest applicable code figure *shall be* selected. Other weather ~~may~~ *shall* be reported in Section 3. In any case, code figure 17 shall have precedence over figures 20–49."

Rule 10: ***Ensure that the Technical Regulations and their annexes include only provisions of a technical nature.*** By definition, any new or amended provisions considered for inclusion in the Technical Regulations should be of a technical nature. A provision that is non-technical and which should not be included in the Technical Regulations is given in Example 10.

Recommended action. Assess the new and amended provisions to ensure that they are of a technical nature: if not, do not propose their inclusion in the Technical Regulations.

Example 10. Hypothetical example of a non-technical provision, which should not be included in the Technical Regulations.

"Each Member shall ensure that meteorological personnel … are accorded status, conditions of service and general recognition within that country commensurate with the technical and other qualifications required for the fulfilment of their respective duties."

4. LOGICAL FRAMEWORK OF THE WMO REGULATION-MAKING PROCESS

This chapter describes all the steps required from the identification of a requirement until its adoption as a WMO regulation by Congress or approval by the Executive Council and implementation by Members. It is important to note that the completion of each step requires a minimum time: it is therefore essential that the time frames required are respected by all those concerned.

These Guidelines provide an attempt to develop a systematic approach to the process of establishing new regulatory material and maintaining the existing material with relevant amendments. It should be understood that the respective rules and procedures should be further

refined and established good practices should be properly reflected in order to set up an Organization-wide logical framework of the regulation-making process.

The logical framework should contain at least five steps:

1. Identification of requirement;

2. Preparation of a technical proposal;

3. Consultation with relevant communities and stakeholders;

4. Adoption;

5. Promulgation and Implementation.

Each of these five steps contains processes that are broadly described in different WMO publications (General Regulations, Technical Regulations, manuals, internal rules and procedures of constituent bodies, etc.). Owing to the complexity of the interaction and responsibilities of different stakeholders in the regulation-making process, there is a need to mainstream and describe these processes in further detail. The material in this chapter of the Guidelines should be considered as the first attempt in this direction.

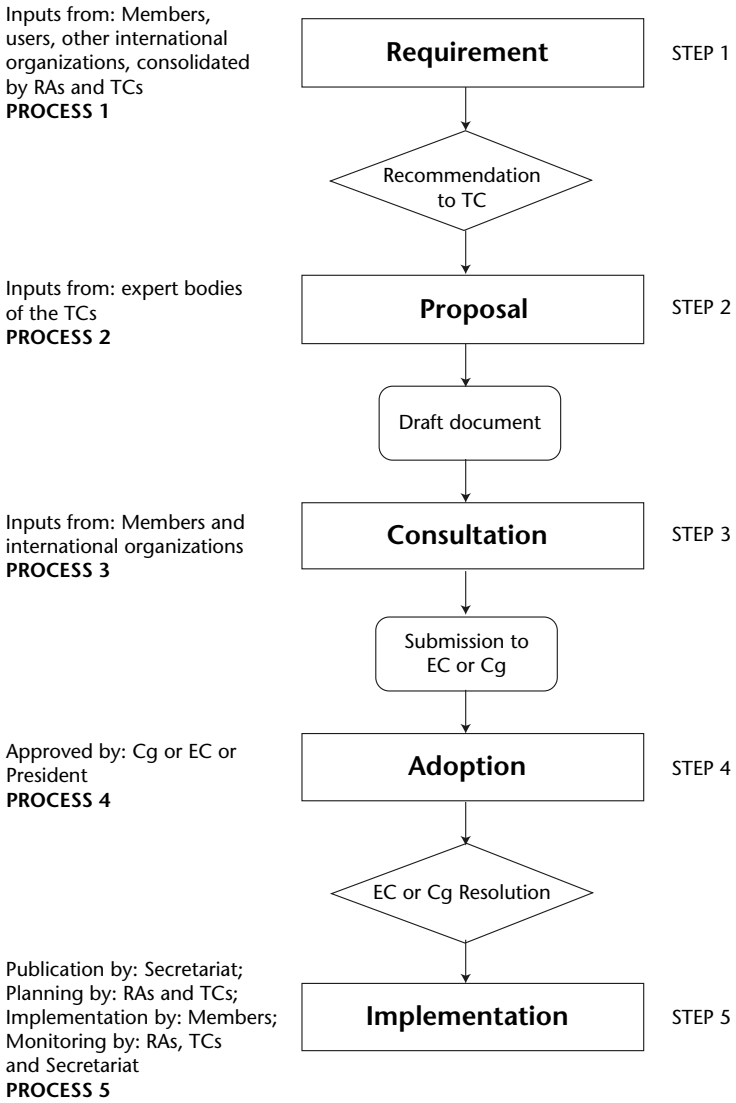

Figure. Processes from identification to implementation of a WMO provision

The Figure describes schematically the five steps involved in the regulation-making process. It is applicable to all the Technical Regulations, including the annexes, except for Volume II: the amendments thereto are synchronized with those to Annex 3 of the International Civil Aviation Organization, which are undertaken following a three-year cycle.

The *first step* consists of the establishment of a new requirement. A new draft requirement is normally proposed by a Member (or group of Members), a user (or user group) of the service concerned or an international organization. The identification of a requirement is a complex process that may involve, at different stages, the regional associations or the technical commissions. The regional associations have the task of studying the needs and consolidating requirements by their Members and forwarding the identified requirements to the relevant technical commissions. On their side, the technical commissions conduct studies and identify requirements based on user needs and technology development, such as the Rolling Review of Requirements process conducted by CBS in collaboration with other commissions. As stipulated by Congress, no major changes should be made to the Technical Regulations without consulting the appropriate technical commissions: this consultation provides an indication of the acceptance and relevance of the new requirement. Any requirement defined through existing mechanisms should therefore be submitted to an appropriate technical commission for further consideration. For instance, the regional association could submit identified new requirements during its session through a decision recorded in the general summary of the abridged final report.

The technical commissions play the central role in the *second step*, in which a draft proposal addressing the identified requirement is prepared. The technical commission concerned has to carry out a thorough study of the requirement and validate its relevance. Furthermore, the technical commission may assign a task to one of its expert groups to prepare a relevant proposal concerning the technological and procedural aspects and the respective new or amended regulatory material. In so doing, the expert body concerned should ensure that the formulation of the new regulatory material is in conformity with these Guidelines. In order to ensure that the new or amended regulations will be implementable, it is essential that the expert bodies carry out an assessment of financial implications for Members, together with related capacity-development needs, before proceeding with a proposed new regulation. If considered appropriate and cost-effective by the expert bodies, the second step will result in the issuance of a publication that includes the draft regulatory text. The WMO Secretariat should also ensure that relevant departments are aware of the proposed amendments to the Technical Regulations in case there are some coordination requirements or impacts. The importance of the Secretariat's involvement in this step is that it would allow any editorial inconsistencies to be corrected before the draft proposal is forwarded to the governing bodies for approval or adoption.

The *third step* consists of consultation with Members and international organizations concerned. It is strongly recommended that the expert body/bodies, tasked by the respective technical commission to develop the draft proposal, should try to engage the technical community, including experts from other international bodies, as necessary, in a broad consultation process. In order to ensure that the requirement is supported by a "strong majority" of Members, any amendments to the Technical Regulations submitted by Members or constituent bodies should be communicated to all Members at least three months before they are submitted to Congress. This consultation should culminate at the session of the technical commission concerned, where the draft requirement planned to be included in the Technical Regulations should be endorsed. This ensures global coordination of the new draft requirement. The third step is completed with the adoption of a recommendation for an amendment to the Technical Regulations at sessions of technical commissions if Members express broad support for the new draft regulation. Such a recommendation shall subsequently be submitted to Congress or the Executive Council for approval.

During the *fourth step*, the amendments to the Technical Regulations are normally approved by Congress. In accordance with Article 14(c) of the Convention, however, approval by the Executive Council is possible if the change is considered urgent because its implementation is necessary before the next session of Congress. Amendments to the manuals (annexes) proposed by the appropriate technical commissions are nevertheless normally approved by the Executive Council.

A "fast-track" procedure is envisaged in a case where the change is considered urgent and approval cannot be deferred until the next session of the Executive Council. In such a case, the President of the Organization may approve a change on behalf of the Executive Council (in accordance with General Regulation 9(5)). An implementation date is established, together with the approval of the amended Technical Regulations.

The *fifth step* of the process of introducing a new requirement is its announcement with a call for implementation. The WMO Secretariat publishes the new or amended regulation and makes sure that it is made available to all Members. In so doing, sufficient time should be given to Members to prepare for the implementation of the amendment. General Regulation 127 stipulates that "decisions concerning changes in the Technical Regulations, together with relevant publications, shall be sent to Members in sufficient time to allow a period of at least nine months between the receipt of these documents and the date of implementation". The implementation itself has to be carried out by Members. In order to ensure a harmonized and synchronized implementation process, however, the regional associations and technical commissions concerned should undertake the necessary planning, including regional implementation plans. Finally, the level of implementation is monitored by both the regional associations and technical commissions concerned and the WMO Secretariat. This monitoring is based largely on the Members' obligation to notify the WMO Secretariat if they cannot comply with the new requirement.

Three terms are used in the foregoing process:

(a) Amendment. The term "amendment" is used to designate an approved change to the Technical Regulations (both to the main volumes and manuals (annexes);

(b) Edition. The term "edition" refers to any consolidated updated publication, published after each Congress, containing all amendments approved since the time of the previous Congress. The edition is indicated by the year of the respective Congress; and

(c) Update. The term "update" is used to identify an updated publication, published after approval by the Executive Council of one or more amendments to the Technical Regulations and their annexes. The updates are numbered sequentially, followed by the year of approval.

The preceding process works quite well for new requirements but does not ensure that obsolete material contained in the Technical Regulations is deleted in a timely manner. It is therefore, important to assign responsibilities amongst the technical commissions to deal with obsolete material.

5. GUIDELINES CONCERNING MEMBERS' COMPLIANCE

Through the issuance of the Technical Regulations, WMO has established a global regulatory framework enabling a harmonized and standardized conduct of meteorological, hydrological and climatological activities. Within this framework, it is expected that all Members align their national practices with the standards (an obligation) and recommendations (desirable). This alignment is achieved through the conversion of the Technical Regulations into appropriate national legislation or regulation, which should, in principle, enforce the implementation of the WMO Technical Regulations. Members should endeavour to either reproduce or include references to the relevant WMO provisions in their national regulations. The alignment should be strongly promoted by the WMO Secretariat, including through providing guidance to Members, as necessary, when new Technical Regulations have been adopted or existing ones amended.

In practice, however, the foregoing alignment is not always carried out by Members. There are a number of reasons for this: there is no well-defined meteorological "regulator" (authority) at a national level responsible for the enforcement of the international meteorological regulations; there are few legal implications in some of the regulatory areas (apart from aviation, where the legal implications are significant; monitoring of implementation is weak and does not include

respective corrective measures; and/or there is no systematic approach towards resolving identified deficiencies. All these circumstances, together with a systematic lack of resources in some countries (in particular, developing and Least Developed Countries), compromise the overall level of compliance of WMO Members with the Technical Regulations and thus have negative effects on performance, harmonization and interoperability. In trying to resolve such a situation, it is useful to make a comparison with some other international organizations creating regulations, as shown with ICAO and WHO in Table 11.

Table 11. Mechanisms contributing to the implementation of international provisions promulgated by WMO, ICAO and WHO

Mechanism	*WMO*	*ICAO*	*WHO*
Existence of a national regulator	No	Yes: meteorological authority in all States	Yes: national ministries of health
Exposure to liability	Low	High	High
Monitoring of implementation	In some areas, but generally weak	Yes: universal safety oversight audit programme	Yes: regular reporting by Members
Approach to resolve identified deficiencies	Non-systematic	Yes: maintenance of lists of deficiencies by regional offices	Through regional and country offices

In view of the foregoing, it is essential to promote an enhanced "culture of compliance" with the Technical Regulations among Members throughout the Organization. This goal can be met only if regulatory material and related guidance are improved and updated regularly, following a pre-fixed cycle. An increased engagement of Members in the development and pre-approval phase of the Technical Regulations is essential. After the adoption of new or amended Technical Regulations, all the deviations must be systematically registered by the Secretariat and those that are considered "critical" singled out with a view to their timely elimination.

The introduction of the "culture of compliance" requires that the following four steps are followed:

Step 1. *Systematic notification of compliance by Members*

In order to be able to address the issue of non-implementation, it is essential, as the first step, to know in detail the actual level of implementation by all Members. The full knowledge of the implementation is a prerequisite for the enhanced culture of compliance. In this regard, a system of notification of compliance by Members established since the beginning of the regulatory process of WMO has not, however, been strictly followed by Members. The Convention (Article 9 relating to the execution of Congress decisions) stipulates that "(a) all Members shall do their utmost to implement the decisions of Congress"; and "(b) If, however, any Member finds it impracticable to give effect to some requirement in a technical resolution adopted by Congress, such Member shall inform the Secretary-General of the Organization whether its inability to give effect to it is provisional or final, and state its reasons therefor".

Concerning the notification of non-compliance (deviation), the General Regulations (Regulation 128) indicate that "a Member which is unable to give effect to a requirement in a technical resolution which has been adopted by Congress, or by the Executive Council on behalf of Congress, and to which the provisions of Article 9(b) of the Convention and of these Regulations have been specifically stated to apply, shall so inform the Secretary-General in writing within a period of 90 days after the notification of the decision by the latter. The Member concerned must indicate, in its communication to the Secretary-General, whether its inability to give effect to the resolution is provisional or final and state its reasons therefor".

The same regulation also deals with the notification of compliance by stating that "Members shall specifically notify the Secretary-General in writing of their intention to apply the "standard practices" of the Technical Regulations except for those for which they lodge specific deviations.".

Finally, the same regulation addresses the notification of change by indicating that "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", as previously notified and of the effective date of the change".

In conclusion, the system of notification of compliance forms part of the WMO Technical Regulations but is not being done systematically. One of many examples of this situation is that few Members have notified a non-implementation of Volume I, Part III, 2.4.8 of the *Manual on the Global Observing System*, requiring that upper-air observations shall be made twice a day (at 0000 and 1200 UTC). Meanwhile, it is well known from international monitoring that a number of Members carry out upper-air observations only once a day. Based on the foregoing, it is clear that the systematic notification of deviations by Members needs to be implemented.

Recommended action. In routine correspondence with Members related to amendments to the WMO Technical Regulations, the WMO Secretariat should include a paragraph reminding Members of their obligation to indicate all deviations from the standards.

Step 2. *Establishment of a database containing Members' compliance with the Technical Regulations*

In this regard, the General Regulations (Regulation 127) require that "decisions concerning changes in the Technical Regulations, together with relevant documents, shall be sent to Members in sufficient time to allow a period of at least nine months between the receipt of these documents and the date of implementation". Moreover, the General Regulations (Regulation 202 – General functions of the Secretariat") stipulate that the Secretariat should "maintain records of the extent to which each Member implements the decisions of the Organization". It can be seen that the second step is already envisaged by the WMO Regulations. The WMO Secretariat should, therefore, create routine procedures for evaluating Members' compliance with the standards and on the degree of their implementation. Regional associations and technical commissions should play a major supporting role in this undertaking.

Recommended action. The WMO Secretariat should establish a database containing the full list of deviations from the standards contained in the Technical Regulations (including their annexes).

Step 3. *Identification of "critical deviations" (deficiencies)*

In order to address the most urgent deviations as a matter of priority, it is essential that a thorough review of all the deviations filed should be undertaken in order to identify those that can be considered "critical". The deviations that have impacts on safety nationally or internationally (non-implementation of an early-warning system, for example) or that adversely affects other Members, preventing them from providing the required global, regional or national services and facilities in a satisfactory manner, should be considered critical. Such critical deviations are to be considered deficiencies with emphasis on their negative impact on the performance of established national and international systems, as well as on harmonization and interoperability. A similar system is already in place within ICAO: the safety oversight audits result in a systematically maintained database of deficiencies.

Recommended action. Based on the notifications of deviations received from Members and any other available methodology for monitoring compliance with the Technical Regulations, the WMO Secretariat should identify which of the deviations constitute deficiencies. These are critical deviations that seriously affect either: (a) the provisions of safety-related services nationally; or (b) the overall performance of required regional or global services and facilities. The deficiencies identified should be recorded and regularly reviewed by the bodies concerned in order to establish respective resolution actions.

Step 4. *Feedback and support by the WMO Secretariat to Members in view of eliminating the deficiencies identified*

As a last step, it is essential that the WMO Secretariat and Members concerned do their utmost to contribute towards the elimination of the deficiencies identified. The WMO Secretariat should approach the Members experiencing deficiencies, requesting them to strive for their prompt elimination. Furthermore, the list of unresolved deficiencies with their ownership (Members) should play an important role in setting priorities in the capacity-development strategy and in channelling technical/institutional assistance.

Recommended action. The WMO Secretariat should: (a) request Members concerned to do their utmost to resolve the deficiencies as a matter of priority; and (b) give priority in the capacity-development strategy to Members which are not in a position to resolve the deficiencies that have been identified.

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