|  |  |  |
| --- | --- | --- |
| WEATHER CLIMATE WATER | **World Meteorological Organization**  **COMMISSION FOR OBSERVATION, INFRASTRUCTURE AND INFORMATION SYSTEMS**  **Second Session** 24 to 28 October 2022, Geneva | **INFCOM-2/INF. 5.3** |
| Submitted by: President of INFCOM  13.X.2022 |

## DRAFT INFCOM STRATEGIC IMPLEMENTATION PLAN 2022-2027

# Table of Contents

[1. Introduction 2](#_Toc115954824)

[2. Background 2](#_Toc115954825)

[3. Drivers and Goals 3](#_Toc115954826)

[4. INFCOM Mandate 3](#_Toc115954827)

[5. Strategic Approach 4](#_Toc115954828)

[6. Core Principles 5](#_Toc115954829)

[7. INFCOM Priorities 6](#_Toc115954830)

[WIGOS 6](#_Toc115954831)

[WIS 6](#_Toc115954832)

[GDPFS 7](#_Toc115954833)

[Cross Cutting priorities 7](#_Toc115954834)

[8. Medium Term Objectives and Deliverables 7](#_Toc115954835)

[WIGOS 7](#_Toc115954836)

[WIS 8](#_Toc115954837)

[GDPFS 9](#_Toc115954838)

[Cross Cutting Priorities 10](#_Toc115954839)

[9. Long Term Objectives and Deliverables 11](#_Toc115954840)

[WIGOS 11](#_Toc115954841)

[WIS 11](#_Toc115954842)

[GDPFS 11](#_Toc115954843)

[Cross Cutting Priorities 12](#_Toc115954844)

[10. Concluding Remarks 12](#_Toc115954845)

[Annex 1 – Terms of Reference of INFCOM 13](#_Toc115954846)

[Annex 2 – WMO Application Areas 17](#_Toc115954847)

[Annex 3 – INFCOM Work Plan 18](#_Toc115954848)

[Annex 4 – Glossary 19](#_Toc115954849)

# Introduction

As a specialized agency of the United Nations, WMO is dedicated to international cooperation and coordination in understanding the state and behaviour of the Earth’s atmosphere, its interaction with the land and oceans, the weather and climate it produces, and the resulting distribution of water resources. Its mission is outlined under Article 2 of the WMO Convention as to facilitate worldwide cooperation on monitoring and predicting changes in weather, climate, water, and other environmental conditions through the exchange of data, information and services, standardization, application, research and training.

The Commission for Observation, Infrastructure, and Information Systems (INFCOM) is one of two Intergovernmental Technical Commissions of the WMO supporting this Mission – the other being the Commission for Weather, Climate, Water and Related Environmental Services & Applications (SERCOM). INFCOM contributes to:

* The development and implementation of globally coordinated systems for acquiring, processing, transmitting, and disseminating Earth system observations, and setting related standards;
* The coordination of the production, distribution and use of standardized analysis and model forecast fields; and
* The development and implementation of sound data and information management practices for all WMO Programmes and their associated application and services areas.

The purpose of this document is to describe the work of INFCOM over the next five years (2022-2027), and how it will support the Mission and Goals of the WMO. It will identify the drivers for its work, and the desired objectives, strategic approach, and guiding principles of that work. It will identify key priorities in the medium and longer term, and the planned activities of INFCOM to address those priorities. It is intended to be read and understood by the expert and non-expert alike.

# Background

WMO was created with the ratification of the WMO Convention in 1950. Every four years the World Meteorological Congress meets to approve the WMO Strategic and Operational Plans and Budgets for the next four years. The WMO Strategic Plan articulates the high-level vision, mission, core values, overarching priorities and long-term goals of the Organization and it drives the WMO Operating Plan that defines specific actions and outputs to be delivered and annual milestones to be achieved. The Budget indicates the resources available, how they will be spent, and outlines performance indicators intended to measure progress in achieving the long-term goals. These Plans are developed and implemented through the Secretariat and WMO’s subsidiary bodies and supporting organizations (Technical Commissions, Research Board (RB), Programmes, Projects and Regional Associations and Offices), as well as through synergistic public-private partnerships.

INFCOM is a relatively new subsidiary body of the WMO and was the result of a restructuring and streamlining of WMO Governance as directed by the 18th World Meteorological Congress per [Resolution 7 (Cg-18)](https://library.wmo.int/doc_num.php?explnum_id=9827/#page=41), which saw a reduction in the number of Commissions from eight to the present two, and the addition of RB. Regardless, the two new Commissions take their direction in the same manner as the previous eight – through the Resolutions and Decisions of Congress. Further direction on the implementation of these Resolutions and Decisions can come from the annual Executive Council meetings. The work of INFCOM is guided by the President of the Commission and its Executive Management Group.

This Strategic Implementation Plan is the result of a review of all the relevant Plans, Resolutions, Decisions and Directions from WMO’s governance structure, including the work done to develop the next WMO Strategic Plan draft for 2024 – 2027, organized into a coherent integrated strategy for the activities of INFCOM for the next five years.

# Drivers and Goals

As recognized in the WMO Strategic Plan 2020-2023, the 2030 Agenda for Sustainable Development, the Paris Agreement on climate change, and the Sendai Framework for Disaster Risk Reduction are driving national and international environmental policy and action. This agenda is expected to create unprecedented demand for actionable, accessible, and authoritative science-based information. Increasing threats of extreme weather and climate requires action for resilience, mitigation, and adaptation at the same time as a growing capacity gap in Member capabilities threatens global infrastructure and economies. Rapid advancements in science and technology, and the changing landscape of data and service delivery are opportunities for the WMO to better serve its Members through improved guidance, services and innovative partnerships.

In particular, the science to observe, understand and predict the environment is evolving and improving. Driven by the top National Meteorological and Hydrological Services (NMHS) around the world and academia, complex interactions with the hydrosphere, cryosphere, geosphere and biosphere are being observed and modelled to continuously improve the quality of meteorological forecasts and warnings. Climate projections and climatological reanalysis is also benefitting from this “Earth System” approach. The WMO recognizes the compelling need to go beyond traditional meteorology to consider the entire Earth System in its work, including atmospheric composition, oceans, cryosphere, and detailed land and hydrometric basin characterizations and their interactions.

In response to these global drivers, the WMO Strategic Plan 2020-2023 identifies the following high-level Long-Term Goals:

**Long Term Goal 1**: Better serve societal needs: Delivering authoritative, accessible, user-oriented, and fit-for-purpose information and services.

**Long Term Goal 2**: Enhance Earth system observations and predictions: Strengthening the technical foundation for the future.

**Long Term Goal 3**: Advance targeted research: Leveraging leadership in science to improve understanding of the Earth system for enhanced services.

**Long Term Goal 4**: Close the capacity gap on weather, climate, hydrological and related environmental services: Enhancing service delivery capacity of developing countries to ensure availability of essential information and services needed by governments, economic sectors, and citizens.

**Long Term Goal 5**: Strategic realignment of WMO structure and programmes for effective policy- and decision-making and implementation.

Each Goal is supported by a number of Strategic Objectives. The following section illustrates how the work of INFCOM responds to these drivers and aligns with these Goals and Objectives.

# INFCOM Mandate

[Annex 1](#_Annex_1_–) provides the Terms of Reference for INFCOM as per [Resolution 7 (Cg-18)](https://library.wmo.int/doc_num.php?explnum_id=9827/#page=41). The work of the Commission encompasses all approved WMO application areas (see [Annex 2](#_Annex_2_–)), as identified in the Rolling Review of Requirements (RRR), as well as emerging observing, information and infrastructure requirements.

The activities of the Commission are guided by the WMO Strategic Plan. INFCOM is directly addressing the following Strategic Objectives of Goal 2:

Objective 2.1 Optimize the acquisition of Earth system observation data through the WMO Integrated Global Observing System (WIGOS).

Objective 2.2 Improve and increase access to the exchange and management of current and past Earth system observation data and derived products through the WMO Information System (WIS).

Objective 2.3 Enable access to and use of numerical analysis and Earth system prediction products at all temporal and spatial scales from the WMO seamless Global Data Processing and Forecasting System (GDPFS).

INFCOM also supports the other Long-Term Goals, sometimes in more indirect and strategic ways given the importance of the core WIGOS/WIS/GDPFS infrastructure to all activities:

Long Term Goal 1 depends on a robust WIS with a strong inclusive data policy to make accessible the products and services resulting from the WIGOS/GDPFS to all Members. A particular focus for INFCOM here will be on the infrastructure necessary for hydrological services for sustainable water management and adaptation.

Long Term Goal 3 is directly supported by the Research Board (RB) which in turn puts requirements on INFCOM to ensure the needs of research are met and provides guidance on enhancement of infrastructure, in particular as it relates to standardized, accessible Earth observations (WIGOS) and modelling infrastructure (GDPFS).

Long Term Goal 4 is promoted through guidance and training to build the capacity in the developing world to be able to contribute to, access and make effective use of WIGOS/WIS/GDPFS.

Long Term Goal 5 is supported through the work of INFCOM (and also SERCOM and RB) to ensure that none of the outstanding work of the previous eight Commissions is left behind, that their supporting working structures align well with the Organization as a whole and its partners, and that goals related to effective and inclusive governance, and environmental sustainability are met.

# Strategic Approach

In developing this Plan, the Commission seeks to assure integration of the Commission activities across all Earth System domains. The strategic approach of the Commission follows these key thrusts:

* Maintain momentum on ongoing activities necessary for operational systems and ensure that ‘new’ activities that flow from the constituent body process are appropriately integrated in the work of the Commission;
* Accelerate activities linked to current implementation as decided by recent Congress and Executive Council Resolutions and Requests (e.g. the Global Basic Observing Network (GBON)/ Systematic Observations Financing Facility (SOFF), WMO Unified Data Policy Resolution 1 Cg-EXT 2021, WMO Plan of Action for Hydrology Res 4, Cg-EXT 2021, etc);
* Support innovation in Member Services through transitioning research into operational applications (e.g. Polar Predictions Project, subseasonal-to-seasonal prediction project, etc); and
* Continue the work of integrating domain activities across different levels of the Earth System (i.e. on timescales from minutes to decades, and geographically from global to urban).

To achieve this, Standing Committees, Study Groups and Advisory Groups have been formed as follows:

(a) Standing Committee on Earth Observing Systems and Monitoring Networks (SC-ON);

(b) Standing Committee on Measurements, Instrumentation and Traceability (SC-MINT);

(c) Standing Committee on Information Management and Technology (SC-IMT);

(d) Standing Committee on Data Processing for Applied Earth System Modelling and Prediction (SC-ESMP);

(e) Joint Study Group on Greenhouse Gas Monitoring (JSG-GHG);

(f) Advisory Group on the Global Cryosphere Watch (AG-GCW);

(g) Advisory Group on Oceans (AG-Ocean).

The work of the Standing Committees can also be supported by a number of Expert Teams and Task Teams, some of which are “Joint” teams that cross organizational lines. This sub‑structure that supports the work of INFCOM is regularly reviewed at INFCOM meetings and is constantly evolving to meet the needs of the Organization.

Coordination with other entities is also key to implementing the strategic approach, including but not limited to:

1. Assuring the consideration of requirements for relevant data and products from **SERCOM**;
2. Assuring the evolution of measurement, data exchange, data processing, modelling technology and services using state-of-the-art science and innovations by working with the research community and the **Research Board (RB)**;
3. The provision of appropriate support at the regional and national levels and for assisting in the development of capacities of WMO Members, in particular the Least Developed Countries (LDCs) and the Small Island Developing States (SIDS), through engagement with the **Regional Associations (RAs)** **and support from the WMO EC Capacity Development Panel (EC-CDP)**;
4. Assuring effective coordination across Earth System domains by working with **the Hydrological Coordination Panel (HCP)** andother relevant organizations (e.g. the Global Ocean Observing System (GOOS), Global Climate Observing System (GCOS), etc.); and
5. Making best use of infrastructure and knowledge provided by the private sector as identified through **WMO Public-Private Engagement**.

# Core Principles

The Commission promotes the development of integrated systems to cover all application areas wherever possible, and ensures that these systems respect the following core principles:

1. Are user-driven and provide Earth system observations, processed data and relevant services, products, and information to all Members;
2. Are based on user requirements as developed in coordination with SERCOM and the RB as well as the RAs;
3. Are applicable, accessible and life-cycle managed;
4. Are built on modular and scalable principles to the extent possible;
5. Respect existing WMO and other relevant standards and regulations;
6. Build on partnerships with key players (UNDP, UNEP, FAO, UNESCO, satellite organizations, etc);
7. Grow the partnerships with organizations for other domains such as GOOS and GCOS to improve coordination with these other domains necessary to the Earth System approach;
8. Make use of and promote public-private engagement where advantageous;
9. Incorporate state-of-the-art optimal and fit-for-purpose technology and techniques;
10. Are building upon existing partnerships and networks among communities of practice within the application areas, which are beneficial for WMO Members;
11. Understand and manage the environmental footprint of WMO infrastructure to contribute to environmental sustainability as a pillar of WMO activities;
12. Ensure Geographic/gender balance across the Commission and its working structure; and
13. Ensure a balanced workload across the Commission and its working structure.

# INFCOM Priorities

The WMO Strategic Plan guides the establishment of priorities for the work of INFCOM over the next five years. The WMO Strategic Plan will be renewed at the next Congress in 2024, so the planned longer-term work of INFCOM takes into account the preparatory work that has been done for the next Plan (the recently approved [Decision 10 (EC-75)](https://meetings.wmo.int/EC-75/_layouts/15/WopiFrame.aspx?sourcedoc=/EC-75/English/2.%20PROVISIONAL%20REPORT%20(Approved%20documents)/EC-75-d04(1)-APPROACH-TO-THE-STRATEGIC-PLAN-2024-2027-approved_en.docx&action=default) – Approach to the Strategic Plan 2024-2027) and, to a certain extent, anticipates new directions in which global circumstances may push the WMO. However, in a reciprocal sense, it should be recognized that future Strategic Plans of the WMO can also be informed by the work of its constituent bodies (including INFCOM) particularly through the evolving RRR process.

As the Commission responsible for the basic infrastructure necessary for all services to Members, priorities focused on the establishment of robust infrastructure will always contribute to any overarching priority that may be identified. With this in mind, INFCOM identifies the following overarching priorities for its main areas of work.

WIGOS

* Accelerate establishment of WIGOS across Earth System domains, working towards the WIGOS Vision 2040;
* Implement and consider extending GBON for other domains (hydrology, cryosphere, oceans, greenhouse gas monitoring), and provide technical support to SOFF on infrastructure matters; and
* Implement the evolved RRR process for better addressing the identified WIGOS gaps and the evolution of global observing systems in all Earth System domains.

WIS

* Continue the implementation of WIS 2.0 and improve discovery and accessibility for all Members;
* Improve interoperability of data exchanged under WMO auspices with expanded data standards for other domains (Oceans, Atmospheric composition, Hydrological, Cryosphere, and Space weather); and
* Improve data stewardship and life-cycle management.

GDPFS

* Continue implementation of the Seamless GDPFS Earth Systems approach;
* Promote the use of new technologies such as artificial intelligence (AI) and Machine Learning (ML) in operational systems to improve prediction skill;
* Enhance the availability of products to support response, adaptation and mitigation to hazardous weather, water, climate, environmental and space weather events; and
* Improve knowledge of User needs through a RRR process for GDPFS products and services, learning from the WIGOS experience with its RRR for observations process, including extension to other domains (e.g. hydrology, oceans, as appropriate).

Cross-Cutting priorities

* Maintain the integrity of operational systems;
* Transition the work of the previous Commissions to the new structure (INFCOM, SERCOM, RB), and ensure the working structure of INFCOM optimally supports the Organization and its goals;
* Implement the WMO Unified Data Policy and monitor compliance;
* Contribute to Capacity Development;
* Integrate the Plan of Action for Hydrology into INFCOM plans;
* Integrate the Study Group-Cryosphere recommendations into INFCOM plans; and
* Contribute to ocean activities (GOOS, the United Nations Decade of Ocean Science for Sustainable Development 2021-2030[[1]](#footnote-2)).

While addressing these INFCOM priorities, all work will include respecting the core principles identified in the previous section.

# Medium Term Objectives and Deliverables

This section identifies the objectives and activities of INFCOM for 2022-23 as it relates to the priorities for WIGOS/WIS/GDPFS and cross-cutting activities. Much of this is the ongoing work required to maintain operational systems, keep the momentum going for initiatives already underway, and laying the groundwork for more recent directions from Congress for new initiatives to be pursued in the longer term.

WIGOS

**Continued implementation of the WIGOS Vision 2040** (SC-ON and SC-MINT):

* Adopt High-Level Guidance on the Evolution of Global Observing Systems in response to WIGOS Vision 2040 and develop the regulatory material;
* Engage with RAs to accelerate WIGOS implementation;
* Engage with the Regional and Marine Instrument Centres to review and improve their governance and assessment processes;
* Harmonize terminology and definitions across WMO;
* Harmonize Quality Assurance/Quality Control procedures, learning from the Global Atmosphere Watch (GAW) community, and others;
* Protect radio frequencies, especially with regard to new and competing technologies and space weather;
* Monitor the progress of the advancement of the WIGOS 2040 Vision space component;
* Expand Virtual Laboratory for Meteorological Satellite Education and Training (VLab) modules on utilization of satellite data;
* Investigate establishing a Regional WIGOS Centre for Antarctica, whose role would essentially be to facilitate collection of WIGOS metadata in OSCAR[[2]](#footnote-3)/Surface, monitor quality of Antarctic observing stations, their impact on Earth System predictions, and provide feedback to Members as appropriate;
* Integrate more Earth System observations across all domains in WIGOS (e.g. GAW, oceans, hydrology, cryosphere etc.);
* Facilitate the establishment of Greenhouse Gas (GHG) monitoring infrastructure;
* Develop strategy and guidance for urban observations;
* Further integrate GCOS networks into WIGOS;
* Develop a scalable Tiered Networks approach (defined as a tiered system composed of reference, baseline, and comprehensive networks), including Technical Regulations and Guidance;
* Leverage new technologies and techniques e.g. commercially-sourced data, crowd-sourced data and social media data, low cost and 3D printable sensors and systems, Uncrewed Aircraft Systems (UAS), etc;
* Maintenance of the World Radiometric Reference;
* Collaborate with the International Bureau of Weights and Measures (BIPM) on guidance for uncertainty and traceability of measurements;
* Collaborate with the International Standards Organization (ISO) on a review and establishment of new common standards as warranted.

**GBON implementation and extension in other domains** (INFCOM MG): set up a Task Team under INFCOM and propose initial GBON design. Focus on the following activities in the next two years:

* Implement GBON per current Technical Regulations (TT-GBON);
* Expand GBON in other domains (SC-ON);
* Develop the concepts of the next stage of GBON (MG) and set it up for continuous operational mode;
* Provide technical support to SOFF (TT-GBON) building on GBON requirements and provide guidance and training to the LDCs and SIDS on how to use SOFF;
* Provide tools to SOFF in order to perform gap analyses.

**Implement RRR for WIGOS** (SC-ON):

* Continue the review of the RRR process considering WMO’s Earth System approach;
* Continue the implementation of the new RRR process as described in Requirements for Observational Data in the Framework of the WMO Earth System Approach: The Rolling Review of Requirements.

WIS

**Implement WIS 2.0** (SC-IMT):

* Develop tools and organizational structure to monitor the transition from GTS to WIS 2.0;
* Finalize WIS 2.0 Architecture and technical specifications;
* Close WIS 2.0 Demonstration projects;
* Establish and monitor WIS 2.0 pilot projects for:
  + WIS 2.0 Global Infrastructure
  + National Centres and Data Collection and Production Centres
  + WMO discipline areas and domains as required by the WMO Unified Data Policy
* Release WIS 2.0 in a box version 1.0 and establish a governance for the development of the open-source project in alignment with WIS 2.0 architecture and technical specifications;
* Deliver workshops and training on WIS 2.0 to the WMO Regions, in coordination with RAs.

**Improve data interoperability and implement data standards to other domains**

* Integrate hydrology data from WMO Hydrological Observing System (WHOS);
* Integrate cryosphere data into WIS 2.0.

**Improve data stewardship and Life-Cycle Management**

* Harmonize the [*Manual on the High-quality Global Data Management Framework for Climate*](https://library.wmo.int/index.php?lvl=notice_display&id=21686)(WMO-No. 1238) and the [*Climate Data Management System (CDMS) Specifications*](https://library.wmo.int/index.php?lvl=notice_display&id=16300) (WMO-No. 1131) into the WIS technical regulations and guidance;
* Lead the development and implementation of Open CDMS in accordance with WIS 2.0 architecture and implementation plan.

GDPFS

**Continue implementation of the Seamless GDPFS** (SC-ESMP):

* Finalize the Roadmap for the Seamless GDPFS (S/GDPFS);
* Renew the Guide to GDPFS;
* Engage RAs in implementing S/GDPFS;
* Gain an improved understanding of issues Members have with accessing GDPFS products and determine requirements for changes to existing mandatory products (GDPFS Symposium 2022) and to update the GDPFS Manual;
* Initiate a process for amending the [*Manual on the Global Data-processing and Forecasting S*](https://library.wmo.int/index.php?lvl=notice_display&id=12793)*ystem* (WMO-No. 485), to be submitted to the World Meteorological Congress in 2023;
* Continue development of the GDPFS web portal;
* Finalize the development of the Guidelines on high-resolution Numerical Weather Prediction (NWP);
* Complete the development of the compliance review process of Regional Specialized Meteorological Centres (RSMC), finalize the compliance review schedule and start the compliance review of RSMCs;
* Identify issues on the accessibility and usability of GDPFS products and develop a guidance to solve these issues such as the quality on the metadata;
* Involve RSMCs in the monitoring of observations for the WIGOS Data Quality Management System (WDQMS);
* Review contents & reporting methods of WMO Technical Progress Reporting on GDPFS & NWP Research in collaboration with the World Weather Research Program (WWRP) and the Working Group on Numerical Experimentation (WGNE);

**Integrate innovative new technology**

* Evaluate the potential benefit of Artificial Intelligence/Machine Learning to improve GDPFS predictive skill.

**Enhance the availability of products to support response, adaptation and mitigation to hazardous weather, water, climate, environmental and space weather events**

* Work with the research community to develop S/GDPFS Pilots (e.g. WWRP Probabilistic Tropical Cyclone Forecast Products Project);
* Improve the working structure of SC-ESMP to cover all Earth system domains;
* Contribute to development of a technical guide on the measuring, monitoring and modelling of the Urban Heat Island (UHI) effect;
* Support the implementation of the Global Hydrological Status and Outlook System (HydroSOS);
* Integrate cryosphere specific functions in S/GDPFS systems;
* Establish Expert Team on Space Weather activities.

**Implement a RRR process for GDPFS**

* Improve user satisfaction with GDPFS products and services by taking steps towards establishing an RRR for GDPFS, learning from the WIGOS experience (SC-ESMP).

Cross-Cutting Priorities

**WMO Unified Data Policy implementation & compliance monitoring (MG TT)**

* Map shared implementation activities across INFCOM SC’s and other bodies;
* Set up the periodic review process;
* Provide draft technical regulations to support the implementation of the data resolution, to be submitted to the World Meteorological Congress in 2023;
* Keep the RAs informed of initiatives related to the implementation of the data resolution and consulted on developments as necessary;
* Address emerging data issues:
  + Ensure that the next generation of WWW systems are fit-for-purpose for the evolving and increasingly disruptive data paradigm that WMO and its Members are facing
  + Prioritize the development of appropriate practical measures to monitor and assess a compliance-based approach to data, including identification of barriers to compliance, and related capacity development actions
  + Consider new approaches to encourage sharing of commercially-sourced data, crowd-sourced data and social media data, in order to allow greater access to non-traditional sources of data or data not owned by governments
* Make Global Numerical Weather Prediction (GNWP) products available (with guidance);
* Assist developing countries on implementation of the data policy;
* Update Technical Regulations reflecting core data in other domains (SC-ON)**:**
  + Continue developing technical regulations in relation to the data policy for the domains not yet covered by GBON, i.e. hydrosphere, cryosphere, atmospheric chemistry, Space weather, and marine observations building on work already done for cryosphere, and the process for working with the space agencies on weather and climate data.

**Capacity Development**: Work with the research community, SERCOM, and private partners (e.g. the Hydro-Meteorological Equipment Industry (HMEI)) on providing practical advice to Developing Countries to address the growing gaps between developed and developing countries in terms of capability:

* Provide technical guidance to the Country Support Initiative in translating WMO standards and recommendations into operational advice tailored to the needs of developing Member countries and territories.

**Integration of Plan of Action for hydrology into INFCOM plans as appropriate**

* Implement HydroSOS;
* Develop technical regulations on water quality and sediments;
* WHOS implementation;
* World Hydrological Cycle Observing System (WHYCOS) implementation;
* Global water information platform implementation.

**Integration of the Study Group-Cryosphere recommendations into INFCOM plans**

* Update the terms of reference of AG-GCW to reflect a stronger and broader mandate, by incorporating the recommendations of the report;
* Ensure that the Standing Committee workplans of INFCOM include actions aimed at the systematic integration of the cryosphere in the WIGOS/WIS/GDPFS, with sustained expert support facilitated through AG-GCW.

**Contribution to ocean activities (GOOS, Ocean Decade)**

* Promote understanding of the value chain and provide support in evaluating priority investment areas through the GOOS Ocean Decade programme;
* Use the power of WMO’s regulatory environment to help improve exchange of ocean data in Exclusive Economic Zones.

**Continue to refine the working structures and processes for INFCOM to ensure effective alignment with both internal and external structures and organizations.**

**Standardize auditing processes for regional and global centres, Earth observing systems and measurement (SC-ESMP, SC-MINT, SC-ON).**

# Long Term Objectives and Deliverables

This section identifies the objectives and activities of INFCOM for 2024-27, organized under the priorities for WIGOS/WIS/GDPFS and Cross-cutting activities. It takes the longer view of work, anticipating and informing the priorities, objectives and goals of a new WMO Strategic Plan to be adopted at Cg-19 in 2023.

WIGOS

* Continue development of high-level guidance and regulatory material in response to WIGOS Vision 2040;
* Continue the further expansion of GBON in other domains;
* Transition GBON into operational mode led by SC-ON;
* Ensure WIGOS supports climate adaptation and mitigation;
* Collaborate with BIPM on uncertainty and traceability of measurements;
* Identify new and low-cost technologies and develop appropriate guidance;
* Integration of different types of observations into WIGOS (across domains, in situ vs space observations, etc.) to increase their usage;
* Develop guidance and technical regulations on observing network clusters and Tiered Networks;
* Develop easy to understand guidance on how to best design and operate an observing network for flood forecasting and warning purposes (location of gauges, reporting frequency, etc.);
* Enhance the visibility of WMO to the International Telecommunications Union (ITU) and the needs of its global community to establish better leverage for long term protection of radio frequencies utilized by current systems and for emerging technologies.

WIS

* Transition from GTS to WIS 2.0 in support of all domains and application areas;
* Update existing and develop new guidance on Information Management for WMO programmes;
* Promote seamless data and metadata access and sharing for service providers (meteorological, hydrological, cryospheric, climatological and oceanographic) through WIS;
* Finalize WIS 2.0 Pilot Projects:
  + Start pre-operational phase
  + Global Information System Centres (GISC), with the support of RAs, engage the transition of their Area of Responsibility toward WIS 2.0
  + The WIS Discovery, Access, and Retrieval (DAR) Catalogue is ‘frozen’
* Migration projects in LDCs and SIDS: Start operational phase and transition GTS to WIS 2.0;
* WIS 2.0 training in all RAs.

GDPFS

* Make more GDPFS data available to Members, aligned with WMO’s Earth System approach;
* Expand GDPFS activities to introduce missing core data defined in the WMO Unified Data Policy into the GDPFS Manual;
* Promote Earth system modelling to integrate earth system components into the GDPFS aiming to producing seamless prediction products;
* Integrate hydrological modelling into the GDPFS in accordance with its concept and support regional implementation of HydroSOS;
* Develop GDPFS activities in Earth System domains (e.g. Cryosphere) through S/GDPFS Pilots;
* Continue to evaluate the potential benefit of AI/ML for improving skill of GDPFS forecasts;
* Promote and facilitate GAW integration in GDPFS;
* Support sustained climate projection activities;
* Support reanalysis activities;
* Support downscaling of climate scenarios.

Cross-Cutting Priorities

* Environmental sustainability across all operational activities for all domains; develop and provide guidance to Members & training to developing countries;
* A global framework for GHG modelling using the best available satellite and in situ data established;
* Align hydrology activities with broad themes under the Action Plan for Hydrology developed by the HCP;
* Implement the recommendations of the SG-Cryo;
* Work with the research community to assess the impact of data on modelling at all time scales from minutes to decades;
* Contribute to the WMO Science Conference 2025;
* Explore how best to incorporate the WMO Coordination Mechanism to support the humanitarian activities of the United Nations and other organizations in relevant WMO frameworks and normative documents;
* Collaborate with the RB on new elements to contribute to RRR (e.g. tools for impact of observation studies, use of emerging technologies including AI/Exascale computing).

# Concluding Remarks

This document outlines the work of the Commission for Observation, Infrastructure, and Information Systems (INFCOM) for the next five years. It is an ever-green document, in that it will require updates every few years to reflect the direction coming from WMO Congress and the ongoing Strategic Planning process, the WMO Executive Council and the work of the Management Group. In particular, regular updates will be provided to the detailed INFCOM Work Plan found in [Annex 3](#_Annex_3_–) by the various working structures of INFCOM (SCs, AGs, SGs, and TTs).

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

# Annex 1 – Terms of Reference of INFCOM

Excerpt from Annex 1 to [Resolution 7 (Cg-18)](https://library.wmo.int/doc_num.php?explnum_id=9827/#page=41)

TERMS OF REFERENCE OF TECHNICAL COMMISSIONS

Note: The General Terms of Reference of Technical Commissions provided in Annex III to the General regulations will remain unchanged.

**A. Commission for Observation, Infrastructure and Information Systems**

***General mandate***

The overall scope and specific terms of reference for the Commission for Observation, Infrastructure and Information Systems (Infrastructure Commission) shall be in accordance with the purposes of the Organization defined in Article 2 of the Convention, in particular, items (a) through (c) and (e), and Regulations 180 to 196 of the General Regulations.

The Commission shall contribute to: the development and implementation of globally coordinated systems for acquiring, processing, transmitting and disseminating Earth system observations, and related standards; the coordination of the production and use of standardized analysis and model forecast fields; and the development and implementation of sound data and information management practices for all WMO Programmes and their associated application and services areas.

The work of the Commission shall encompass all approved WMO application areas, as listed in RRR, as well as updated and emerging observing, information and infrastructure requirements.

The Commission shall promote the development of integrated systems to cover all application areas wherever possible, and shall ensure that these systems:

1. Are user-driven and provide Earth system observations, processed data and relevant services, products and information to Members;
2. Are applicable, accessible and with life-cycle management across the full range of WMO Members;
3. Are built on a modular and scalable principle to the extent possible;
4. Make full use of existing WMO and other relevant standards and regulations;
5. Make use of and promote public-private engagement where advantageous;
6. Incorporate state-of-the-art optimal and fit-for-purpose technology and techniques;
7. Are based on user requirements developed in coordination with the Services Commission and RB;
8. Are building upon existing partnerships and networks among communities of practice within the service areas, which are beneficial for WMO Members.

The activities of the Commission shall be guided by the WMO Strategic Plan.

***Specific terms of reference***

1. Development and maintenance of WMO normative material related to integrated observing systems, data transmission and dissemination systems, data management systems, and data processing and forecast systems as specified in WMO Technical Regulations – the Commission shall:
2. Coordinate the development of new systems and infrastructure-related regulatory material in all application areas of its scope;
3. Promote and pursue the integration of existing regulatory material;
4. Keep regulatory material up to date through regular amendments, as necessary;
5. Ensure the consistency of new and amended regulatory material across the application areas;
6. Consider relevant scientific and technological developments to ensure the currency of the regulatory material;
7. Together with the Services Commission and RB, coordinate linking science, infrastructure and services interactively;
8. Accompany each recommendation for new and amended regulatory material with its own impact, cost-benefit, and risk analysis;
9. Common infrastructure and systems attributes – the Commission shall:
10. Promote a culture of compliance with standards and relevant regulatory material among all Members;
11. Further develop and promote the use of RRR for the assessment of user requirements, the assessment of available capabilities, and the development of gap mitigation strategies in order to further improve the overall systems capabilities of WMO;
12. Develop and promote a unified approach to data management across all disciplines and WMO application areas;
13. Develop common methodologies for quality assurance of observations and other data products across all application areas;
14. Actively seek engagement from Earth system observational data providers from all relevant government entities, international organizations, the private sector, and academia.
15. Assistance to Members to enhance systems capabilities and enable effective implementation and compliance – the Commission shall:
16. Consult with RAs and Members to identify need for improvement in observing, measurement, data transmission and data management capabilities services and develop the required implementation strategies;
17. Consult with RAs to identify experts who can participate in technical commission teams, to facilitate the implementation and uptake of evolving technical systems, standards and regulations at national and regional levels;
18. Facilitate the regional and national implementation of systems under its remit by developing guidance material aligned with new and amended regulatory material;
19. In consultation with RAs, identify Members’ needs for assistance in improving their capabilities and providing relevant guidance and capacity building, including training;
20. Propose pilot and demonstration projects as necessary;
21. Facilitate the transfer of knowledge by supporting relevant events and through communication and outreach activities;
22. Provide standards and regulations for the basic measurement of variables characterizing water quantity, quality and sediments;
23. Support the technical aspects of the Hydrological Status and Outlook System and the state of the water report;
24. Cooperation and partnership – the Commission shall:

(i) Establish a close coordination and efficient working mechanisms with the Commission for Weather, Climate, Water and Related Environmental Services and Applications (Services Commission), relevant international organizations in the area of meteorological, hydrological, oceanic, cryospheric, climatological and other environmental observations, information and infrastructure;

1. Establish and maintain close collaboration and coordination with WMO co-sponsored systems and programmes, and other major international observing programmes and initiatives;
2. Establish in collaboration with RB consultative mechanisms with relevant scientific and operational user organizations to receive feedback and advice on new systems capabilities;
3. Seek opportunities for leveraging resources through the establishment of joint, including inter-agency, bodies and projects addressing common areas of system development.

***Composition***

The composition of the Commission shall be in accordance with General Regulation 183.

Participation of leading technical experts in Earth system observations, information management and prediction in the fields of meteorology, hydrology, climatology, oceanography, cryospheric, atmospheric environment and other fields covered by the terms of reference shall be ensured by Members.

UN, international organization partners, and private partners of WMO may be invited to nominate technical experts in their areas of expertise to participate in the work of the Commission in accordance with General Regulation 183 (as amended by Resolution 75 (Cg‑18)).

***Working procedures***

The Commission shall elect a president and up to three co-vice-presidents among the experts on the Commission and determine which of the co-vice-presidents should serve as Acting President in accordance with General Regulation 12.

The Commission shall establish effective and efficient working mechanisms and related necessary time-limited subsidiary bodies:

* 1. Establish effective and efficient working mechanisms through an adequate number of subsidiary bodies;
  2. Make an effective use of a broad community of practice encompassing Members’ collective expertise, including the private and academia sectors;
  3. Establish a work programme with concrete deliverables and timelines, aligned with the Organization-wide Strategic and Operating Plan and monitor progress regularly using appropriate performance indicators and targets for reporting to the Executive Council and Congress;
  4. Use electronic forms of coordination and collaboration effectively;
  5. Establish effective coordination with other technical commissions, RB, the Joint WMO-IOC Collaborative Board and other relevant bodies in particular through the Executive Council’s Technical Coordination Committee (TCC), as appropriate;
  6. Organize effective communication and outreach to inform the WMO community of ongoing work, achievements and opportunities;
  7. Apply a system for the recognition of achievements, promotion of innovation and the participation of young professionals;
  8. Ensure regional and gender balance and inclusiveness in all its structures and work plans;
  9. Ensure adequate representation and consultation with communities of practice among the service areas.

# Annex 2 – WMO Application Areas

From RRR

|  |  |
| --- | --- |
| ***Earth System Application Category*** | ***Application Area1,2*** |
|
| 1. Space Weather Applications | 1.1 Space Weather |
| 1.2 Energetic Particle Forecasting & Monitoring |
| 2. Atmospheric Applications | 2.1 Global NWP & Real-time Monitoring |
| 2.2 High-Resolution NWP |
| 2.3 Nowcasting / Very Short Range Forecasting (VSRF) |
| 2.4 Sub-Seasonal to Longer Predictions (SSLP) |
| 2.5 Atmospheric Climate Monitoring and Forecasting |
| 2.6 Atmospheric Composition Forecasting & Monitoring*3* |
| 2.7 Atmospheric Composition information services in urban and populated areas*3* |
| 2.8 Aviation Meteorology |
| 2.9 Agricultural Meteorology*3* |
| 2.10 Atmospheric Disaster Risk Reduction |
| 3. Oceanic Applications | 3.1 Ocean Mesoscale Forecasting & Real-Time Monitoring |
| 3.2 Wave Forecasting |
| 3.3 Oceanic Climate Monitoring |
| 3.4 Tsunami Monitoring & Detection |
| 3.5 Oceanic Disaster Risk Reduction |
| 4. Hydrological  & Terrestrial Applications | 4.1 Hydrology Forecasting & Real-Time Monitoring |
| 4.2 Hydrological and Terrestrial Climate Monitoring |
| 4.3 Hydrological and Terrestrial Disaster Risk Reduction |
| 5. Cryospheric Applications | 5.1 Terrestrial Cryosphere Forecasting and Monitoring*4* |
| 5.2 Sea Ice Forecasts |
| 5.3 Cryospheric Climate Monitoring |
| 5.4 Cryospheric Disaster Risk Reduction |
| 6. Integrated Earth System Applications | 6.1 Earth System Forecasting & Monitoring*5* |
| 6.2 Understanding Earth System processes*1* |

Footnotes:

1 Each Application Area considers its requirements for observations, not only for operational activities but also for the research that will enable its future activities and evolving usage of observations. Application Area “6.2 Understanding Earth System processes” considers the requirements for observations of all WMO research activities not covered in any other Application Area;

2 The list of Application Areas is intended to include all WMO uses of observations, it needs to be checked periodically for completeness and updated accordingly;

3 The Atmospheric Composition and Agricultural Meteorology application areas, numbered 2.6, 2.7 and 2.9, have some activities which may have an affinity with other Categories. Each application area may consider whether to split into components to belong in different Categories, in the way that Disaster Risk Reduction and Climate Monitoring are split into different Categories;

4 Application area 5.1 “Terrestrial Cryosphere Forecasting and Monitoring” includes snow, glaciers and permafrost;

5 Application area 6.1 deals with the integrated Earth System, including all domain interfaces between components of the integrated Earth System.

# Annex 3 – INFCOM Work Plan

[To be inserted here based on expected INFCOM-2 Resolution 5.1/1]

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

# Annex 4 – Glossary

AG – Advisory Group

AG-GCW – Advisory Group on the Global Cryosphere Watch

AG-Ocean – Advisory Group on Oceans

AI – Artificial Intelligence

BIPM – International Bureau of Weights and Measures

CDMS – Climate Data Management System

Cg – WMO Congress

Cg-EXT – Extraordinary Congress

DAR – Discovery, Access, and Retrieval

FAO – Food and Agriculture Organization

GAW – Global Atmosphere Watch

GBON – Global Basic Observing Network

GCOS – Global Climate Observing System

GDPFS – Global Data Processing and Forecasting System

GHG – Greenhouse Gas

GISC – Global Information System Centre

GNWP – Global Numerical Weather Prediction

GOOS – Global Oceans Observing System

GTS – Global Telecommunications System

HCP – Hydrological Coordination Panel

HMEI – Hydro-Meteorological Equipment Industry

HydroSOS – Global Hydrological Status and Outlook System

INFCOM – the Commission for Observation, Infrastructure, and Information Systems

ISO – International Standards Organization

ITU – International Telecommunications Union

JSG-GHG – Joint Study Group on Greenhouse Gas Monitoring

LDC – Least Developed Countries

ML – Machine Learning

NWP – Numerical Weather Prediction

CDMS – Climate Data Management System

OSCAR – Observing Systems Capability Analysis and Review Tool

QA/QC – Quality Assurance/Quality Control

RA – Regional Association

RB – Research Board

RRR – Rolling Review of Requirements

RSMC – Regional Specialized Meteorological Centre

SC – Steering Committee

SC-ESMP – Standing Committee on Data Processing for Applied Earth System Modelling and Prediction

SC-IMT – Standing Committee on Information Management and Technology

SC-MINT – Standing Committee on Measurements, Instrumentation and Traceability

SC-ON – Standing Committee on Earth Observing Systems and Monitoring Networks

SG – Study Group

S/GDPFS – Seamless GDPFS

SERCOM – the Commission for Weather, Climate, Water and Related Environmental Services and Applications

SIDS – Small Island Developing States

SOFF – the Systematic Observations Financing Facility

TT – Task Team

TT-GBON – Task Team GBON

UAS – Uncrewed Aircraft Systems

UNDP – United Nations Development Programme

UNEP – United Nations Environment Programme

UNESCO – United Nations Educational, Scientific and Cultural Organization

VLab – Virtual Laboratory

WDQMS – WIGOS Data Quality Monitoring System

WGNE – the Working Group on Numerical Experimentation

WHOS – WMO Hydrological Observing System

WHYCOS – World Hydrological Cycle Observing System

WIGOS – WMO Integrated Global Observing System

WIS – WMO Information System

WMO – World Meteorological Organization

WWRP – World Weather Research Programme

WWW – World Weather Watch

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

1. <https://www.oceandecade.org/> [↑](#footnote-ref-2)
2. OSCAR, the Observing Systems Capability Analysis and Review tool, is a web-based platform that provides an overview of all observational assets available under WIGOS [↑](#footnote-ref-3)