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| WEATHER CLIMATE WATER | **World Meteorological Organization**  **COMMISSION FOR OBSERVATION, INFRASTRUCTURE AND INFORMATION SYSTEMS**  **Third Session** 15 to 19 April 2024, Geneva | **INFCOM-3/Doc. 7.2** |
| Submitted by: Co-Chairs of SG-GHG  21.II.2024  **DRAFT 1** |

**AGENDA ITEM 7: STRATEGIC PRIORITIES**

**AGENDA ITEM 7.2: Implementation plan for the Global Greenhouse Gas Watch**

# Implementation plan for the Global Greenhouse Gas Watch

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| **Summary** |
| **Document presented by:** Co-Chairs of the joint Study Group on WMO Greenhouse Gas Monitoring (SG-GHG) in response to the request by the nineteenth World Meteorological Congress (2023)  **Strategic objective 2024–2027:** 2.1, 2.2, 2.3, 3.3  **Financial and administrative implications:** within the parameters of the Strategic and Operating Plans 2024–2027.  **Key implementers:** INFCOM, in consultations with SERCOM and Research Board (RB)  **Time frame:** 2024–2027  **Action expected:** review and adopt the proposed draft Recommendation to the Executive Council |

# DRAFT RECOMMENDATION

## Draft Recommendation 7.2/1 (INFCOM-3)

### Implementation Plan for the Global Greenhouse Gas Watch

THE COMMISSION FOR OBSERVATION, INFRASTRUCTURE AND INFORMATION SYSTEMS,

**Recalling** [Resolution 5 (Cg-19)](https://library.wmo.int/viewer/67177/?offset=#page=65&viewer=picture&o=bookmark&n=0&q=) - Global Greenhouse Gas Watch, which requested the Commission for Observation, Infrastructure and Information Systems (INFCOM), the Commission for Weather, Climate, Hydrological, Marine and Related Environmental Services and Applications (SERCOM), and the Research Board (RB), via the joint Study Group, to further develop the concept of the Global Greenhouse Gas Watch (G3W) through a detailed implementation plan, building on existing capabilities and ongoing activities under the Global Atmosphere Watch (GAW), including the Integrated Global Greenhouse Gas Information System (IG3IS), and other relevant international framework,

**Reaffirming** that WMO has a unique role in establishing best practices for measurement, data, and reporting standards, validation and intercomparison of information products, and other best practices needed to support global greenhouse gas monitoring infrastructure,

**Emphasizing** the need for integration of the components of the Global Greenhouse Gas Watch within appropriate WMO-coordinated systems, the WMO Integrated Global Observing System (WIGOS), the WMO Information System (WIS), and the WMO Integrated Processing and Prediction System (WIPPS),

**Taking note** of the outcomes of the modelling (Bonn, Germany, 19–21 September 2023) and measurement (Geneva, Switzerland, 3–5 October 2023) workshops organized in support of the development of the G3W Implementation Plan and results of the Member survey on national capacities for implementation of the Global Greenhouse Gas Watch,

**Having examined** the draft implementation plan for Global Greenhouse Gas Watch developed by the joint Study Group,

**Recommends** to the Executive Council the adoption of the Implementation Plan for the Global Greenhouse Gas Watchthroughthe draft resolution provided in [Annex](#Annex_to_draft_Recommendation) I to the present recommendation;

**Decides** to form an advisory group co-chaired by those designated by INFCOM and GAW, to guide the implementation of the plan, with the appropriate involvement of external stakeholders with the terms of reference presented in [Annex II](#_Annex_II_to) to the present recommendation.  *[This will be adopted as part of the Annex to* [*draft Resolution 6.2/1 (INFCOM-3)*](https://meetings.wmo.int/INFCOM-3/English/Forms/AllItems.aspx?RootFolder=%2FINFCOM%2D3%2FEnglish%2F1%2E%20DRAFTS%20FOR%20DISCUSSION&FolderCTID=0x0120004D58D6EBC5C7054898FF36E91D58C193&View=%7B84F6CC21%2D2DD6%2D403B%2DB16A%2D97A4B833DE2B%7D)*]*

See [INFCOM-3/INF. 7.2](https://meetings.wmo.int/INFCOM-3/_layouts/15/WopiFrame.aspx?sourcedoc=%7b9F619996-3500-4D1E-B759-F8597E25D435%7d&file=INFCOM-3-INF07-2-IMPLEMENTATION-PLAN-FOR-G3W_en.docx&action=default) for the full implementation plan.

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[Annexes: 2](#Annex_to_draft_Recommendation)

## Annex I to draft Recommendation 7.2/1 (INFCOM-3)

**Draft Resolution ##/1 (EC-78)**

THE EXECUTIVE COUNCIL,

**Recalling** the WMO Strategic Plan 2024–2027,

**Recalling further** [Resolution 5 (Cg-19)](https://library.wmo.int/idviewer/67177/208) – Global Greenhouse Gas Watch, which requested the Commission for Observation, Infrastructure and Information Systems (INFCOM), the Commission for Weather, Climate, Hydrological, Marine and Related Environmental Services and Applications (SERCOM), and the Research Board (RB), via the joint Study Group, to further develop the concept of the Global Greenhouse Gas Watch (G3W) through a detailed implementation plan, building on existing capabilities and ongoing activities under the Global Atmosphere Watch (GAW), including the Integrated Global Greenhouse Gas Information System (IG3IS), and other relevant international framework, and bring the draft plan to the Executive Council for its review and approval,

**Having examined** Recommendation 7.2/1 (INFCOM-3),

**Recognizing** the significant policy implications of greenhouse gas monitoring data, and thus the need for any greenhouse gas monitoring to be carried out in international coordination, with full transparency, and in accordance with [Resolution 1 (Cg-Ext(2021))](https://library.wmo.int/idviewer/57850/9) – WMO Unified Policy for the International Exchange of Earth System Data, and its call for free and unrestricted International Exchange of Earth System Data,

**Noting** that in the conclusion of the fifty-ninth session of the Subsidiary Body for Scientific and Technological Advice (SBSTA59) that took place during the twenty-eighth Conference of the Parties (COP28, Dubai, 30 November – 13 December 2023) SBSTA “noted the new Global Greenhouse Gas Watch initiative, aimed at establishing sustained, routine global monitoring of greenhouse gas concentrations and fluxes. It recognized that this initiative is intended to improve the quantification of both natural and anthropogenic greenhouse gas sources and sinks, and to complement emission inventories, noting that reporting and greenhouse gas inventory guidelines are as adopted under the Convention and the Paris Agreement”*;*

**Noting with appreciation** the work of the joint Study Group on WMO Greenhouse Gas Monitoring (SG-GHG) between INFCOM, SERCOM, and RB undertaken for the development of the implementation plan,

**Noting further with appreciation** complementing efforts of international scientific and user communities in the development of the plan through the modelling (Bonn, Germany, 19‑21 September 2023) and measurement (Geneva, Switzerland, 3–5 October 2023) workshops,

**Endorses** the implementation plan for the Global Greenhouse Gas Watch of which the executive summary is attached as the [annex](#Annex_to_draft_Recommendation) to the present resolution, noting that an advisory group was established by INFCOM to guide the implementation of the plan;

**Decides** to utilize the Climate Policy Advisers Group for the high-level positioning and outreach with adjustments to the terms of reference and membership to comprehensively cover the G3W topics, and to resort to the advisory group for any specialized advice that may be needed;

**Urges** Members to contribute to the implementation of the plan, through the working groups of INFCOM and relevant WMO bodies, and in consultation with their United Nations Framework Convention on Climate Change (UNFCCC) and Paris Agreement national focal points;

**Requests** INFCOM to lead the implementation of the plan, and regularly report progress, through its president, as sessions of the Executive Council and the Policy Advisory Committee;

**Recognizing** that the implementation of the Global Greenhouse Gas Watch is subject to the outcome of resource mobilization efforts or the Secretary-General being able to identify efficiencies,

**Requests** the Secretary-General:

(1) To ensure, within existing budgetary provisions and administrative arrangements, adequate cross-cutting activities in the Secretariat, to support the implementation of the plan;

(2) To further strengthen collaboration and coordination with relevant United Nations agencies and other international partners engaged in greenhouse gas monitoring and modelling activities and mobilize partner resources to implement the Global Greenhouse Gas Watch;

(3) To engage with stakeholders at international forums, such as the Conference of the Parties to UNFCCC (COP), to promote the uptake and use of the data and products generated by this infrastructure;

**Calls on** partner organizations to contribute to the implementation of the plan for the Global Greenhouse Gas Watch.

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[Annex: 1](#Annex_to_Resolution)

## Annex to draft Resolution ##/1 (EC-78)

**Global Greenhouse Gas Watch – G3W**

*Implementation Plan, Executive Summary*

*Joint Study Group on Greenhouse Gas Monitoring*

1. **Introduction and background**

The World Meteorological Congress at its nineteenth session (Cg-19, 22 May – 2 June 2023) approved the concept note and established a new global greenhouse gas monitoring initiative that aims to support WMO Members in mitigation actions undertaken to implement the Paris Agreement. This concept has been developed in a close collaboration between WMO and partner organizations dealing with greenhouse gases and carbon cycle.

The Global Greenhouse Gas Watch (GGGW or G3W, hereafter G3W) fills critical information gaps and provides an integrated, operational framework that brings together all observing systems, as well as modelling and data assimilation capabilities in relation to greenhouse gas monitoring, striving to reduce the uncertainty in assessing the efficacy of climate action.

G3W will provide a comprehensive monitoring framework of GHG and thereby address the urgent need for information that helps to understand and access the impact of mitigation actions taken by the Parties to the United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement on the state of climate. Such information will be produced in a timely manner and will take into consideration both human and natural influences on the levels of greenhouse gases in the atmosphere.

Initial focus will be on the three most important Greenhouse Gases (GHGs hereafter) influenced by human activities, namely carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O). Increasing abundances of these gases in the atmosphere are the dominant cause of the observed climate change and related impacts according to the Intergovernmental Panel on Climate Change (IPCC AR6 WG1 Report). Recent (post-industrialization) increases in atmospheric concentrations of CO2, CH4 and N2O have been documented to be driven by human activities. The Paris Agreement, adopted by 196 Parties at the UNFCCC Conference of the Parties in 2015, sets specific targets for maximum rise in global mean temperature and indicates that the means to achieve this target is through the net reduction of GHG emissions.

The twenty-eighth Conference of the Parties (COP28, Dubai, 30 November – 13 December 2023) hosted the fifty-ninth session of the Subsidiary Body for Scientific and Technological Advice (SBSTA59). In its conclusions the Subsidiary Body for Scientific and Technological Advice (SBSTA) expressed appreciation for progress made and noted under Research and Systematic Observations (FCCC/SBSTA/2023/L.10):

“*The SBSTA noted the new Global Greenhouse Gas Watch initiative, aimed at establishing sustained, routine global monitoring of greenhouse gas concentrations and fluxes. It recognized that this initiative is intended to improve the quantification of both natural and anthropogenic greenhouse gas sources and sinks, and to complement emission inventories, noting that reporting and greenhouse gas inventory guidelines are as adopted under the Convention and the Paris Agreement.* “

The COP28’s reference to G3W in SBSTA substantially enhances the operational orientation of climate change mitigation actions, from the twenty-seventh Conference of the Parties (COP27, Sharm El Sheikh, 6–20 November 2022), when the Parties recognized that *“{…} limiting global warming to 1.5°C requires rapid, deep and sustained reductions in global greenhouse gas emissions of 43% by 2030 relative to the 2019 level*;” (Decision -/CP.27). It further “*Emphasizes {…} the need to enhance coordination of activities by the systematic observation community and the ability to provide useful and actionable climate information for mitigation, adaptation and early warning systems, as well as information to enable understanding of adaptation limits and of attribution of extreme events*”. Access to improved harmonized information on the concentrations and budgets of GHGs, in part already collected by existing infrastructures, is needed to help countries to establish their commitments and to monitor progress toward meeting emission reductions targets. Responding to COP 27 call requires an effort from multiple agencies and communities to work together, to establish new or to update existing agreements and arrangements between international and national agencies and different bodies under WMO.

The objectives and outputs of G3W are formulated in the concept note approved and included in the nineteenth World Meteorological Congress’ report[[1]](#footnote-2). The first [Global Stocktake](https://unfccc.int/topics/global-stocktake)4 (GST-1) presented at COP28, already made use of some of the systems that will be foundational for G3W and highlighted the limited progress towards meeting the goals of the Paris Agreement, and this outcome underpins the need for accelerating ambition in their next round of climate action plans due in 2025.

A diagram of a greenhouse

Description automatically generatedIt is anticipated that ongoing and new research to develop capabilities to further separate these net fluxes into source-apportioned emissions will lead to additional operational products in the future. Per WMO's data policy ([Resolution 1 (Cg-Ext(2021)](https://library.wmo.int/doc_num.php?explnum_id=11113#page=9)) and in the interest of maintaining transparency as required under the Paris Agreement, the data are expected to be made available to all interested users on a free and unrestricted basis.

**Figure 1. G3W infographic of the Implementation timeline, scope, and context. For purpose of simplification, only CO2 is presented, while all three gases (CO2, CH4, and N2O) are the focus of the G3W implementation plan.**

The G3W Implementation Plan (G3W-IP hereafter) is organized in a way that allows WMO Members to understand and facilitate the actions required within the current financial period (2024–2027) to advance the G3W Implementation and Pre-operational Phase (G3W-IPP) (Figure 1). The G3W Initial Operational Phase (G3W-IOP) is foreseen in the next financial period (2028–2031), including the consolidation of the G3W systems configuration for the second [Global Stocktake](https://unfccc.int/topics/global-stocktake) (GST-2) and this is provided in the outlook section.

The vision for G3W develops beyond 2032 in full compliance with the Paris Agreement Enhanced Transparency Framework (ETF) cycle, that will provide progress assessments towards the climate neutrality goal and ambition. G3W will aim at providing actionable information assisting the countries in their Long-Term-Low greenhouse gas Emission Development Strategies (LT-LEDS), that are providing the long-term horizon for the Nationally Determined Contributions (NDCs).

This phase of the G3W development is labelled Enhanced Operational Phase (G3W-EOP) and it aims at integrating maturing technologies from satellite remote sensing, ground-based networks, conventional and data driven modelling approaches stemming from artificial intelligence, with the goal of reducing uncertainties, and increasing the reliability of the GHGs monitoring systems.

The implementation of the plan requires establishment of the working structure that would be tasked with coordination of implementation activities outlined in the different sections to ensure that they are on track and to report to the Commission on Infrastructure on the progress towards the goals articulated in the plan. The working structure needs to include technical experts in GHG infrastructure.

In addition, a group dealing with the outreach and resource mobilization activities is also needed. As engagement of WMO Executive Management is vital, therefore G3W must be reporting directly ongoing and planned activities to the WMO’s Executive Council.

Two governance actions have been recommended by the Joint Study Group on Greenhouse Gas Monitoring (SG-GHG):

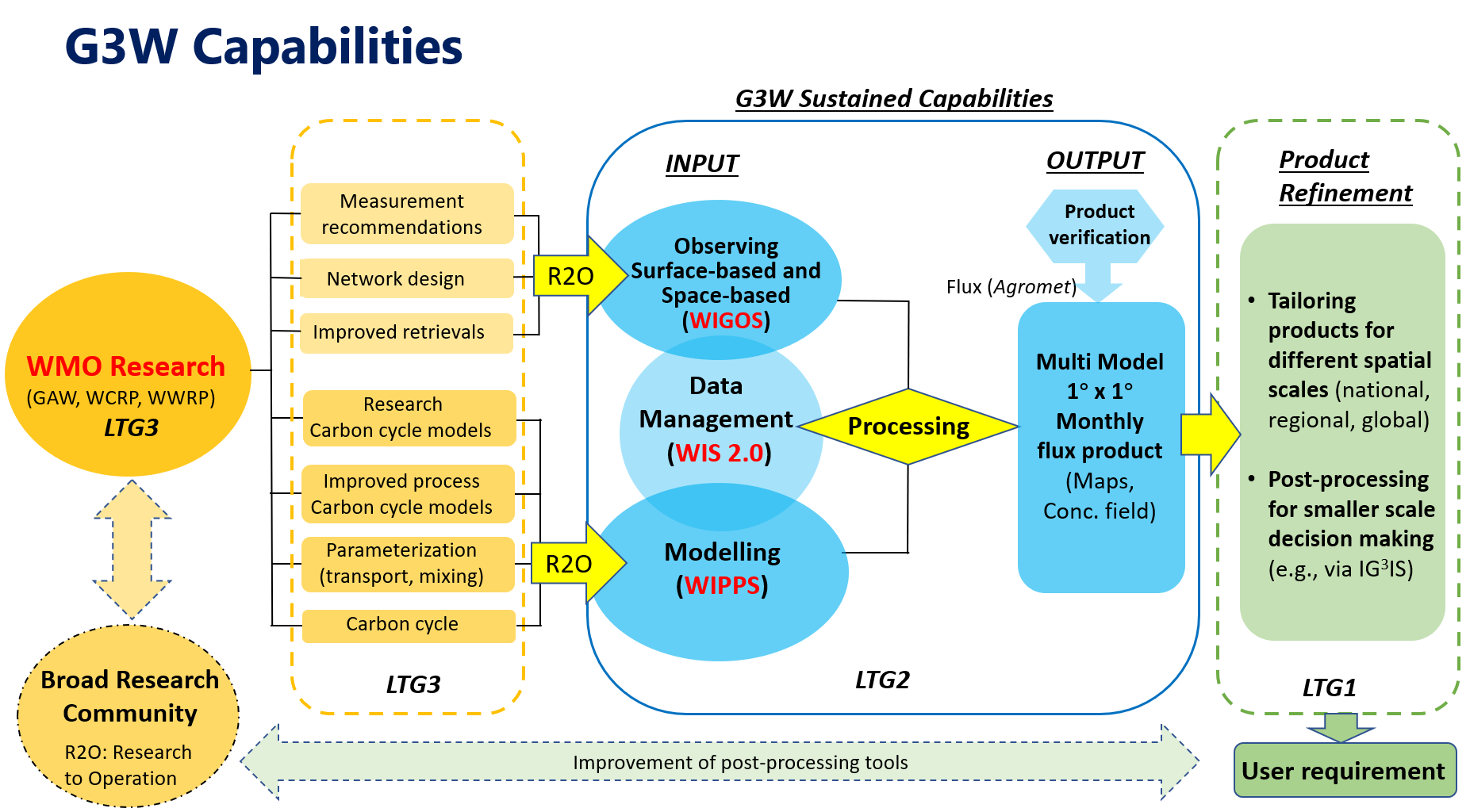
**Action GOV1:** Create a working structure under Commission for Observation, Infrastructure and Information Systems (INFCOM) for coordination of technical implementation activities. The G3W Advisory Group should be co-chaired by those designated by INFCOM and the Global Atmosphere Watch (GAW) and is expected to consist of up to 20 members, representing, the Commission for Weather, Climate, Hydrological, Marine and Related Environmental Services and Applications (SERCOM), and the Research Board (RB) and different areas of the expertise in greenhouse gases.

**Action GOV2**: Utilize the WMO Climate Policy Advisers Group for the high-level positioning and outreach with adjustment to the Terms of Refence (ToRs) and membership to comprehensively cover the G3W topics.

1. **Foundations of G3W and gaps**

The concept note articulates in detail the existing components of G3W that form the foundation for the implementation (Figure 2). Two technical workshops were conducted to further evaluate the status of current capabilities and their readiness level, and to define the most critical gaps that need to be addressed to advance G3W implementation. The observational workshop was attended by about 130 experts on site with additional 70 participating virtually, while the modelling workshop was organized “by invitation” and included 30 experts in person and 20 experts online.

Key outcomes and recommendations are formulated in the reports of the respective meeting, and they are available in the WMO library.



**Figure 2. G3W implementation diagram outlining G3W capabilities, research to operations (R2O), and services alignment to WMO long-term goals (LTG1, LTG2, and LTG3)[[2]](#footnote-3).**

The SG-GHG is a joint study group composed by 35 world renown multi-disciplinary experts invited by WMO in August 2022 after the EC-75 to develop the G3W-IP. G3W-SG Sub-groups have led the development of different building blocks that compose this document.

The G3W building blocks are articulated in the following six sections. It is well recognized that capacity building including training are relevant for all the activities listed in the technical sections of the document. Moreover, while G3W is focused on the operational deployment, it is acknowledged that the research and service components are quality requirements for the continuous operations and a necessity for all the building blocks.

1. **Observing system**

Observations are fundamental for G3W, which serve as pillars as well as modelling. They are described in detail in the concept note.

The following action items were identified as priority activities for the advancement of implementation of G3W. These action items are organized in several blocks, covering cross-domain and cross-platform (i.e. in situ ground-based platforms and satellites) action items, followed by domain specific action items. The details of activities, performance period and connections between action items are listed in the full Implementation plan.

**3.1. Theme: Cross-domain observing network design principles**

**Action O1: Create an exhaustive inventory of existing surface-based GHGs measurements.**

The measures of success include:

* Comprehensive inventory of GHG measurements that can be used in G3W
* A gap analysis comparing the variables and coverage needed for inversion models (Actions P1-P3) to the variables currently measured and their coverage

**Action O2: Develop GHG monitoring standards and revise and reconcile existing GHG measurement requirements.**

The measures of success are inclusion of established observational requirements Observing Systems Capability Analysis and Review Tool (OSCAR) database, library of Quality Assurance/Quality Control (QA/QC) guidelines and specifications of the tired network.

**Action O3: Develop a roadmap for longer-term GHG observing activities.**

The measure of success will be a long-term strategy for the sustainable observing system.

**3.2 Theme: Ground-based, near-surface, in situ measurements of GHGs (atmosphere)**

**Action O4: Address existing spatiotemporal data gaps in ground-based near-surface GHG observations (atmosphere).**

The measures of success include a network design, updated technical regulations, and a list of deployment opportunities.

**Action O5: Develop sustainable high-quality reference GHG network (Tier 1) (atmosphere).**

The measures of success include:

* Definition and technical regulation regarding Tier 1 network are included in the WMO Technical Regulations
* Measurement guidelines/Standard Operating Procedures for highest tier network are produced.

**Action O6: Develop basic (“fit-for-purpose”) GHG network (Tier 2) (atmosphere).**

The measures of success include:

* Guiding documentation of “fit-for-purpose” observing system
* Engagement strategy for “community of practice”
* Training materials for the “community of practice”

**3.3 Theme: Vertically resolved GHG observations, in situ and remote sensing (atmosphere).**

**Action O7: Expand number of sites with vertically resolved and remote sensing GHG observations.**

The success indicator is the availability of the set annual targets for profiling observations at sites according to prescribed timeline and including specification of the deployment methods.

**3.4.** **Theme: Surface-Based ocean observations**

**Action O8: Formalize and enhance a sustained surface ocean CO2 observational network.**

The measures of success are:

* Established governing body for surface ocean CO2 NETwork (SOCONET)
* Roadmap for sustained funding for surface ocean CO2 observations
* Plan for addressing observing gaps in data-poor regions
* Increased observational coverage in data-poor regions
* Initiation and evaluation of value of CH4 and N2O observations at critical sentinel sites and regions (e.g. areas of high concentration and flux such as continental margins, areas of methane clathrate (frozen methane) vulnerability and exposure, and high latitudes)

**Action O9: Deliver routine global gridded products of air-sea CO2 flux.**

The measures of success include:

* Established governance structure for Surface Ocean CO2 Atlas (SOCAT) - as part of GOOS infrastructure under the GOOS Biogeochemistry Panel/ IOCCP
* Sustained funding for surface ocean GHG data management and products
* Defined spatial coverage and frequency of surface ocean CO2 observations
* Demonstrated clear pathway for timely, integrated, seamless, and interoperable dataflow in the G3W

**3.5 Theme: Space-based observations of GHGs and related variables**

**Action O10: Liaise and prioritize with Committee on Earth Observation Satellites (CEOS) -** **Coordination Group for Meteorological Satellites (CGMS) for direct GHG observations from space.**

The following measures of success are proposed:

* Joint Expert Team with CEOS on GHG activities
* Prioritized list of space-based GHG observations requiring continuity
* Prioritized list of space-based observations of co-emitted species requiring continuity
* Prioritized list of new space-based GHG observations filling observations gap
* Comprehensive, documented, and consistent set of data requirements for supporting Monitoring and Verification System model inversions over land, ocean, and ice

**Action O11: Liaise and prioritize with CEOS-CGMS for indirect GHG observations from space (required to infer GHG fluxes).**

The following measures of success are proposed:

* Joint expert team with GCOS/ Terrestrial Observation Panel for Climate (TOPC) and CEOS Agriculture, Forestry and Other Land Use (AFOLU)
* Prioritized list of space-based observations requiring continuity relevant for AFOLU –related carbon stocks, changes, and fluxes
* Prioritized list of new space-based observations filling gaps relevant for AFOLU –related carbon stocks, changes, and fluxes
* List of required space-based observations of Essential climate variables (ECVs) supporting the science basis in GHG Monitoring
* Comprehensive, documented, and consistent set of data requirements for supporting Monitoring and Verification System model inversions

**Action O12: Liaise and prioritize with CEOS-CGMS for required space-based observations to monitor changes in the carbon cycle in a (future) changing climate.**

The following measures of success are proposed:

* Prioritized list of (future) space-based observations requiring continuity
* Prioritized list of (future) new space-based observations filling gaps
* Report describing expected changes in the carbon cycle and how to observe them from space.

1. **Modelling system**

Global modelling and data assimilation systems will be other pillars of the core of the G3W and described in the concept note. The participating centres will benefit from the G3W coordination and efforts to produce guidelines and best practices will be pursued as described in the actions below.

**Action M1: Establishment of requirements for operational centres and data products**

The main measures of success of this activity are an established regulatory framework under WMO Integrated Processing and Prediction System (WIPPS) for the operational centres as well as documentation of required products and outputs from the participating modelling systems.

**Action M2: Documentation of the operational centres**

The measures of success are documentation produced by modelling centres adopting established standards and documentation of comparison protocols.

**Action M3: Continuous development and operations (including Rolling Review of Requirements)**

The measures of success are documentation and sharing of planning documents and development of capability to collect user feedback (e.g. user forums, website helpdesk).

**Action M4: Observations acquisition and pre-processing**

The measures of success are that good practices and protocols for acquisition and pre-processing are shared between centres.

**Action M5: Implementation/pre-processing of prior emissions**

The measures of success are sharing of intermediate data products and pre-processing software and good practices on the preparation of priors.

**Action M6: Common approaches in operations of operational centres**

The measure of success is shared operational plans of the operational centres.

**Action M7: Evaluation and quality control of the modelling products**

The measures of success are adopted good practices across operational centres and establishment of a “good metrics” for model performance.

1. **Prior information**

The core of the G3W is model ingestion of observational data to estimate and reduce the uncertainty in the GHG fluxes. This analysis depends critically on the quality of ancillary data, prior flux information, and estimates of their uncertainty.

The global modelling/ production centres that will participate in G3W should as much as possible follow independent methods from each other to generate and use the prior information for their data assimilation systems to ensure independence of the products.

**Action P1: Identify data-stream needs on prior emission and absorption of CO2.**

The measures of success include a list of requirements that is made available by / to the operational centres and a comprehensive documentation of variables.

**Action P2: Identify data-stream needs on prior emission and absorption of CH4.**

The measures of success include a list of requirements that is made available by / to the operational centres and a comprehensive documentation of variables.

**Action P3: Identify data-stream needs on prior emission and absorption of N2O.**

The measures of success include a list of requirements that is made available by / to the operational centres and a comprehensive documentation of variables.

**Action P4: Characterize the various fluxes hosted by the repository across time scales.**

Measures of success is a synthesis of what is known about the error variances and what is unknown that is made publicly available.

1. **Data management**

Data management plays an important role in the implementation of G3W. Appropriate data management should be established as a matter of priority.

The action items below build around four stages of data management from the instrument to data assimilation, models quality assurance and data provision to user community.

**Action D1: Data management life cycle stage 1; from raw instrument data to characterized product acceptable for international data exchange**

The measures of success include:

* Periodic inspection of national centres (infrastructure, equipment, and standards) by its regional centre
* Periodic inspection and renewal of accreditation of regional centres by responsible WMO constituent bodies, namely Standing Committee on Information Management and Technology (SC-IMT) and Standing Committee on Measurements, Instrumentation and Traceability (SC-MINT)
* The percentage of data sent from each station, the quality of this data and its contribution to the final products
* Good practices on preparation of raw data for international data exchange are published

**Action D2: Data management life cycle stage 2; Getting observational data from providers to operational centres for assimilation**

The measures of success include a detailed data architecture design and the efficiency of the data transfer system and its speed, and whether all the required data is made available to all centres with the same efficiency.

**Action D3: Data management life cycle stage 3; Making model output data from operational centres available for intercomparisons**

The measure of success is reduction in labor and computational cost/time for model intercomparison activities.

**Action D4: Data management life cycle stage 4; Model data discovery and distribution to end users**

The measures of success include:

* Number of users who use the data products
* Number of peer-reviewed publications using G3W datasets
* Media presence of G3W datasets
* Number of data products showing up in external discovery catalogs, such as Information Exchange (IE), International Oceanographic Data and Information Exchange (IODE), and Ocean Data and Information System (ODIS)

**Action D5: Data repository for the prior emission and absorption fluxes**

The measures of success include:

* Data size estimated
* Reduced data transfer and access costs
* Commitment from a chosen infrastructure obtained

**Action D6: Definition of prior data providers**

The measure of success is a list of criteria for the providers of prior data and set of tool and regulations on how these will be assessed.

**Action D7: Definition of the data policy for the repository of prior fluxes**

The measure of success is a public availability of the data policy.

1. **Research and Development needs of G3W**

A strong research component is required to continuously support and improve the operational infrastructure. The action items below describe the main collaboration activities between G3W and research.

**Action R1: Establish G3W Research to Operation (R2O) Task Team within the Research Board.**

The measures of success are the established working group and presentation of the strategy to RB.

**Action R2: Advance observations and data exchange capabilities.**

The measures of success include:

* Publication of statement of guidance
* Measurement technology report/publication
* Tools for automated QA/QC

**Action R3: Advance GHG modelling and flux inversion capabilities.**

The measures of success are research outputs that can be implemented in the operational systems.

1. **User engagement and uptake of G3W**

Consistent information about greenhouse gas sources and sinks is required at various scales. The action items below put the way forward towards utilization of G3W outputs.

**Action U1: Provide support to the Global Stocktake (GST).**

The measures of success include:

* Formal recognition of G3W in GST process
* Number of G3W presentations during Technical Dialogues and Earth Information Days
* Utilization of G3W output through publications in IPCC assessments
* Utilization of G3W output as an independent reference in a COP inventory submission

**Action U2: Develop guidance on regional products.**

The measures of success include:

* Number of Parties using G3W outputs for GST
* Supports is provided for negotiation
* Citation by official reports/assessments
* Comparability with IPCC inventories or other estimation

**Action U3: Establish relationship between G3W and Integrated Global Greenhouse Gas Information System (IG3IS), SERCOM. Establish the pathway to stakeholder engagement.**

The measures of success include:

* Joint demonstration project between the mentioned bodies
* Joint workshop & sessions
* Relationship between G3W and IG3IS is articulated in the ToRs of G3W Advisory Group

**Action U4: Develop user interface guidelines.**

The measures of success include:

* Defined requirements for G3W information services built, and have been communicated back to operational
* Guidelines developed for how G3W data and products are to be used
* Documented examples of how the G3W data products are enabling inventory evaluation.

1. **Capacity building**

The implementation of the G3W must be accompanied by a comprehensive capacity building and training programme. Action items below list the actions under which the activities will be implemented towards reaching the required capacity of Members for G3W implementation:

**C1: Establish a competence framework for participation in G3W.**

**C2: Continuous evaluation of the GHG capacities contributing to G3W**

**C3: Develop capacities among the Members regarding use of G3W data.**

**C4: Establish GHGs training programmes for Member.**

**C5: Develop twinning and exchange programmes between countries to develop national capacities in GHGs observations, modelling, data management and data utilization.**

1. **Financial estimates and funding sources**

The cost estimates are articulated in, (i) costs for the G3W coordination that can be precisely assessed based on projected Full-Time Equivalents (FTEs) and logistics expenditure that are cluster under the label “Workforce” and include both Capacity Development and Coordination (ii) costs for the observations, modelling and data management building blocks that are clustered under the label “Infrastructure”, where estimates rely on sectoral studies by reputable sources.

It is fully acknowledged that the global efficiency for G3W will be achieved by the complementarity of efforts supported by centralized and regionalized investments, with funding sources detailed in section 11, and do not involve directly the NMHSs, if not as voluntary donors.

The Flagship level funding scenario at 1 B$ over the financial period 2024–2027 period is a target of the G3W resource mobilization, while lower funding scenarios are illustrated in the full implementation plan to illustrate the resources partitioning in case of partial attainment. Note that these resources are expected to come from the financial sectors, including the World Bank, Central Banks, Multilateral Development Banks, Insurances and Reinsurances, Philanthropies, Climate finance grants, Loss and damage funds, as well as from Industrial sectors via Environmental, Social, and Governance (ESG) practices alongside more traditional financial measures driven by socially responsible investing.

The G3W Flagship level costed plan identified as top priority the surface-based observations, representing 70% of the investment, followed by 14% in observations integration, modelling and data management, 10% in regional demonstration projects, 7% in additive research, 3% in public-private-partnership (PPP) development, and 1% in the central coordination by the WMO Secretariat.

The G3W economic benefits from the surface-based observations network are expected to be well above 25 times the value of the investment*[[3]](#footnote-4)* and compared to the estimated cost of surface-based and space-based operational weather observations of 10 B$ per year, it represents less than 2.5% increase in the annual costs.

1. **Resource mobilization**

Resource mobilization for G3W is part of the broader WMO wide activities to raise voluntary contributions for its strategic objectives, including those in support of climate change mitigation. The WMO Resource Mobilization Strategy is aligned with the G3W-IPP 2024 – 2027, coordinated by WMO, in response to the World Meteorological Congress resolution. As such, G3W does not have a separate resource mobilization strategy. The G3W, together with Early Warnings for All (EW4All) and the Global Basic Observing Network (GBON), are among the priority initiatives of WMO that include a set of activities for climate action support and assessment at the service of the UNFCCC. Alike other initiatives, its funders may include traditional and emerging donors, climate funds —including the Systematic Observations Financing Facility (SOFF), multilateral development banks (MDBs), philanthropy and the private sector, recognizing that climate change mitigation is not only a necessity for sustainability but also a corporate duty in many countries (e.g. Environmental, Social, and Governance (ESG)). The G3W resource mobilization actions will aim at covering running costs of G3W infrastructure and services and therefore will be WMO wide.

In particular, the resources will fulfil the needs of technical, coordination, monitoring and communications leadership of G3W, as well as for non-WMO contributions to G3W, to help ensure that climate action and development support and investments are built robustly on science and services for society according to the needs of WMO Members.

**A diagram of a financial sustainability

Description automatically generated**

**Figure 3. G3W funding mechanisms for financial sustainability**

1. **Outlook**

The G3W outlook covers the G3W Implementation and Pre-operational Phase (G3W-IPP) in the financial period 2024–2027 with the first two years dedicated to ramp up the human and financial resources required, both in the WMO Secretariat and in the Operational Centres, so that the entire chain is interlinked and set in motion and keys observational assets are becoming available with agreed standards. It is envisaged that the G3W-IPP will embed substantial progress and adjustment to achieve and/or gain efficiency.

The G3W Initial Operational Phase (G3W-IOP) begins in the next financial period (2028–2031), and it includes the consolidation of the G3W systems configuration for the second GST which is a key moment in the Paris Agreement Enhanced Transparency Framework (PA-ETF), since it will permit to measure progress with respect to the first GST.

The G3W-IOP will be at service of the Nations in setting new NDCs and evaluating the uncertainties in the assessment of the GHGs growth/abating rates. Within the G3W-IOP in 2030 an extensive assessment of the state of climate change mitigation shall be produced to guide the requirements and ambitions of the Enhanced Operational Phase G3W-EOP, in full compliance with the needs of the PA-ETF.

The G3W-EOP will aim at providing actionable information assisting the Nations, Parties to the United Nations Framework Convention on Climate Change, in their LT-LEDS, providing also support for the long-term horizon of the NDCs with the ambitions of tackling the climate and inequality crises at the same time, so that no one is left behind.

There is a lot of activities that have to be implemented beyond the initial four years. These are related to enhancement of the observational and modelling capabilities. Many of those actions are cover ocean and terrestrial domain as the initial focus of G3W is on getting net fluxes.

The detailed outlook for the specific components of G3W is presented in the full Implementation Plan.

## Annex II to draft Recommendation 7.2/1 (INFCOM-3)

*[This will be adopted as part of the Annex to* [*draft Resolution 6.2/1 (INFCOM-3)*](https://meetings.wmo.int/INFCOM-3/English/Forms/AllItems.aspx?RootFolder=%2FINFCOM%2D3%2FEnglish%2F1%2E%20DRAFTS%20FOR%20DISCUSSION&FolderCTID=0x0120004D58D6EBC5C7054898FF36E91D58C193&View=%7B84F6CC21%2D2DD6%2D403B%2DB16A%2D97A4B833DE2B%7D)*]*

**Advisory Group on Global Greenhouse Watch (AG-G3W)**

**Terms of Reference**

**Purpose**

Under the authority of the management group of the Commission, the Advisory Group on Global Greenhouse Watch (AG-G3W) will provide oversight, coordination and monitoring of the Implementation Plan for the Global Greenhouse Gas Watch (G3W IP) that is to be approved by the Executive Council in June 2024.

Specifically, AG-G3W will focus on the integration of infrastructure elements of the G3W into the WMO Integrated Global Observing System (WIGOS), the WMO Information System (WIS), and the WMO Integrated Processing and Prediction System (WIPPS), towards a better representation of greenhouse gases in the modelling systems.

AG-G3W will function under the general terms of reference of advisory groups and:

(a) Act as the entry point for the matters related to operational observations, data management and modelling of greenhouse gases;

(b) Advise the management group on the research and services needs from operational greenhouse gases observations, data management and modelling;

(c) Oversee, coordinate and monitor the implementation of G3W IP;

(d) Advise the management group and standing committees on optimal working structure and engagement of domain experts to address specific deliverables required by the IP, promoting the integration of observing system, data exchange and management and prediction functions into WIGOS, WIS and WIPPS, while ensuring the necessary coordination within domain experts;

(e) With the support of the WMO Secretariat, provide advice to the management group, standing committees and other bodies as appropriate, on the alignment of the G3W deliverables with the objectives of the WMO Strategic Plan;

(f) Work with the Panel on Capacity Development of the Executive Council, through the Coordinator on Capacity Development, on capacity development including trainings;

(g) Advise the management group and assist the vice-president representing the domain on engagement opportunity to further solicit inputs and build partnerships for the implementation of G3W IP, with relevant organizations of the United Nations system, IPCC, UNFCCC, IOC among others;

(h) Establish working relationship with IG3IS Steering committee and the Standing Committee on Climate Services of the Services Commission, for implementation of the tasks related to user and policy engagement;

(i) Through the management group, provide inputs on technical matters to the WMO Climate Policy Advisers.

**Composition**

AG-G3W will be comprised of up to 20 experts covering required expertise in greenhouse gases across domains and functions.

AG-G3W will be led co-chaired by those designated by INFCOM and the Global Atmosphere Watch (GAW), who will be members of the management group of the Commission. All WMO Regions should be represented.

**Modalities of work**

Most of the work will be conducted by electronic correspondence and tele/video conference, with the possibility of holding face-to-face meetings when deemed appropriate by the co-chairs and if resources are available.

**Deliverables**

Deliverables aligned with the work programme of the Commission.

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1. <https://library.wmo.int/records/item/67177-world-meteorological-congress>

   4 <https://unfccc.int/sites/default/files/resource/cma2023_L17_adv.pdf> [↑](#footnote-ref-2)
2. https://library.wmo.int/records/item/68578-wmo-strategic-plan-2024–2027 [↑](#footnote-ref-3)
3. The Value of Surface-based Meteorological Observation Data, D. Kull et al., 2021, World Bank, https://doi.org/10.1596/35178 [↑](#footnote-ref-4)