

# Global Greenhouse Gas Watch - G3W

Gianpaolo BALSAMO, Dr. Prof., G3W

18<sup>th</sup> - 21<sup>st</sup> March 2024, Global Methane Forum, Geneva



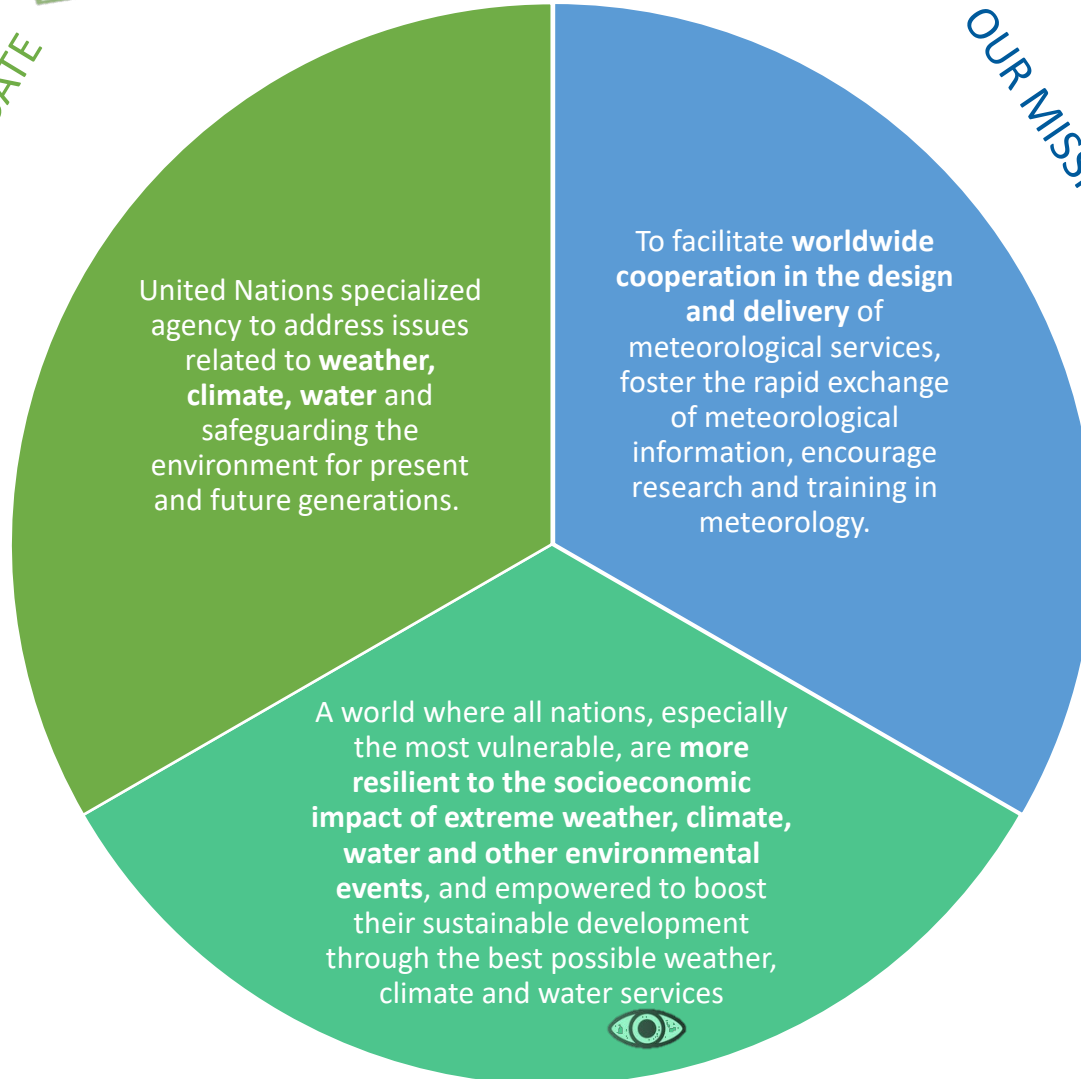
WORLD  
METEOROLOGICAL  
ORGANIZATION



# WMO – the World Meteorological Organization in a



OUR MANDATE 



United Nations specialized agency to address issues related to **weather, climate, water** and safeguarding the environment for present and future generations.

To facilitate worldwide cooperation in the design and delivery of meteorological services, foster the rapid exchange of meteorological information, encourage research and training in meteorology.

A world where all nations, especially the most vulnerable, are **more resilient to the socioeconomic impact of extreme weather, climate, water and other environmental events**, and empowered to boost their sustainable development through the best possible weather, climate and water services

OUR MISSION 

WMO plays a role as a **global coordinator** for Member countries, harmonizing and supporting the work done across National Meteorological and Hydrological Services around:

**Protection of Life and Property**  
**Safeguarding the Environment**

Contributing to **Sustainable Development**

Monitoring the earth system (collecting and sharing **Data & Information**)

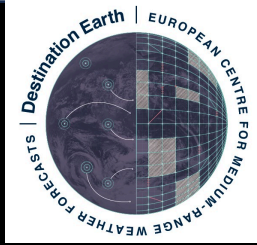
Defining **Best Practices**

Promoting targeted **Science** to improve **Infrastructure, Service delivery** and supporting **Policymaking**

Contributing to **Capacity development**, seeking to reduce the development gaps

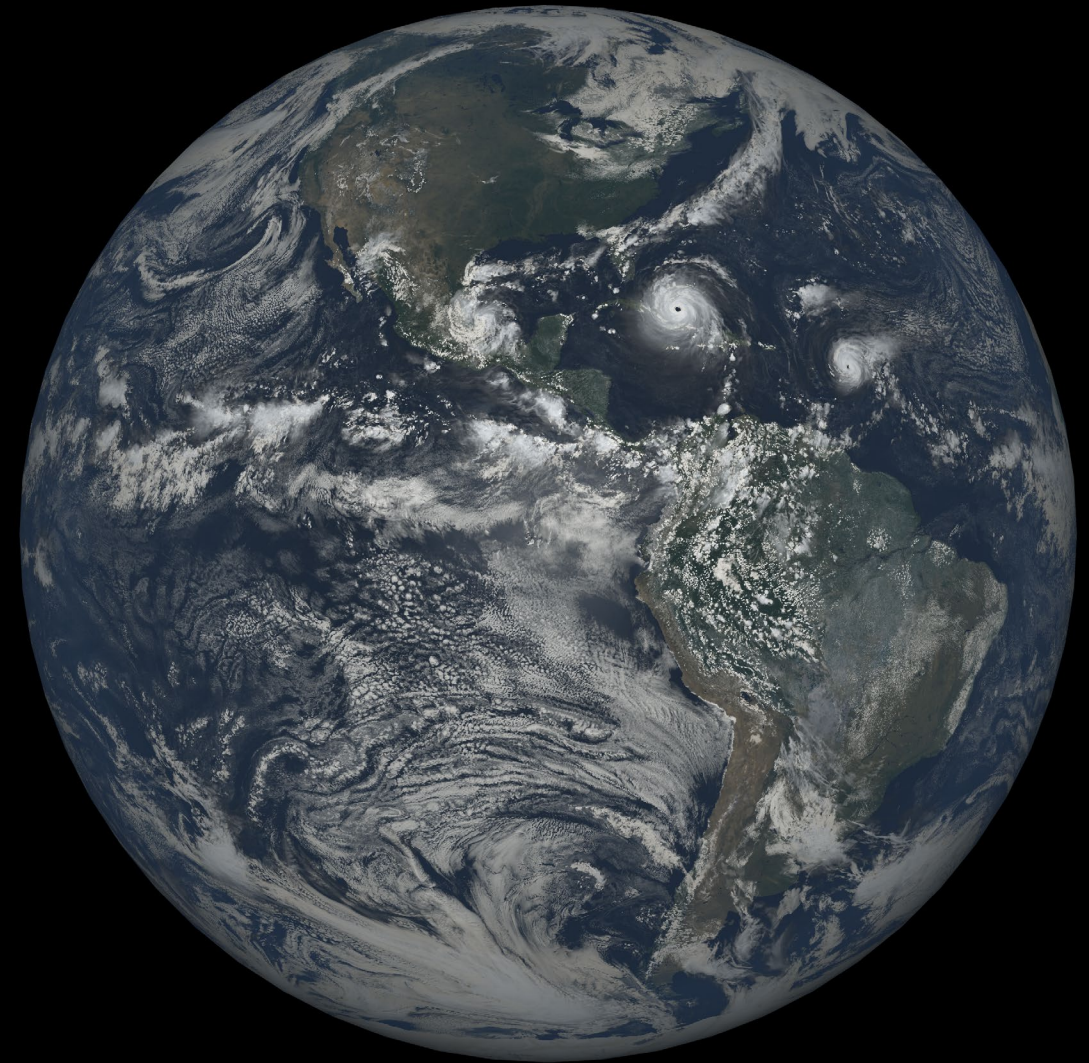
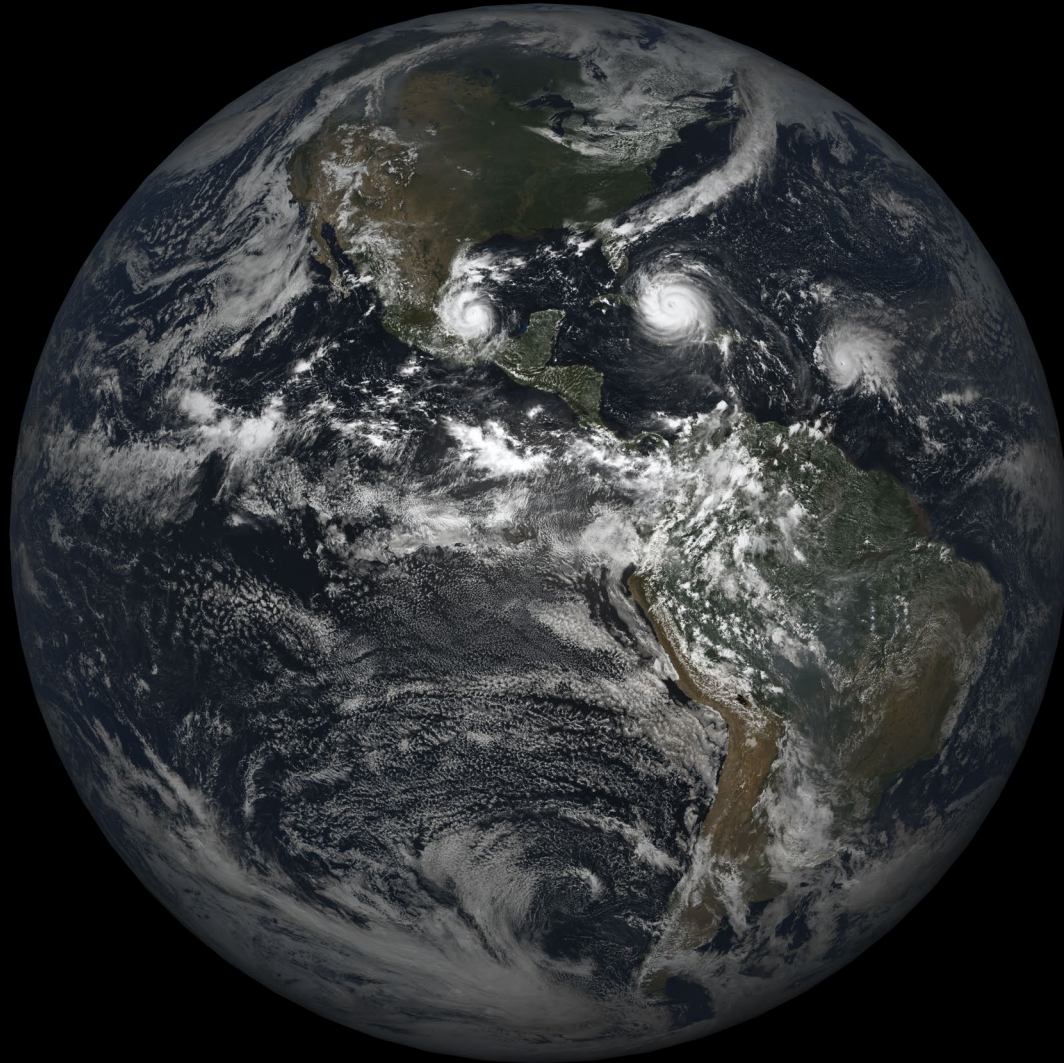
## WMO convention

# How do we drive change with a **Digital Twin of the Earth-system?**



GOES16\_ABI CH2\_3\_1 composite 20170908 1800 UTC

IFS FC+18h at 2.5 km



*Philippe Lopez*

**RTTOV-MFASIS: simulated imagery in the visible..**

# EW4All –the Early Warning for All Flagship in a



The EW4All Flagship will ensure every person on Earth is protected by lifesaving early warning systems by 2027

How?



### Disaster risk knowledge

Systematically collect data and undertake risk assessments

- Are the hazards and the vulnerabilities well known by the communities?
- What are the patterns and trends in these factors?
- Are risk maps and data widely available?



### Detection, observations, monitoring, analysis and forecasting of hazards

Develop hazard monitoring and early warning services

- Are the right parameters being monitored?
- Is there a sound scientific basis for making forecasts?
- Can accurate and timely warnings be generated?



### Preparedness and response capabilities

Build national and community response capabilities

- Are response plans up to date and tested?
- Are local capacities and knowledge made use of?
- Are people prepared and ready to react to warnings?



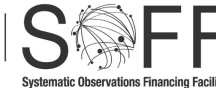
### Warning dissemination and communication

Communicate risk information and early warnings

- Do warnings reach all of those at risk?
- Are the risks and warnings understood?
- Is the warning information clear and usable?



## Early Warnings for All



Pillar 2 is focused on delivering 5 outcomes:

- Increased availability of quality observation data to assess and monitor priority hazards.
- Enhanced data exchange and access for forecasting and warning systems.
- Increased capabilities to forecast all priority hydrometeorological hazards.
- Impact-based forecasts and warnings are produced for all priority hazards.
- Strengthened relevant policy, institutional mechanisms, and stakeholder engagement processes in place to support MHEWSs

The delivery of Early Warnings for All requires scale up and coordinated investments and action across the four essential pillars of end to end, people-centred Multi-Hazard Early Warning Systems



GREEN CLIMATE FUND



Global Status of Multi-Hazard Early Warning Systems 2023



# G3W – the Global Greenhouse Gas Watch Flagship in a

The G3W Flagship respond to UN sustainability's call, via **Climate Action** (mitigation) for **Climate Neutrality Goal**

- **G3W Master-Plan**

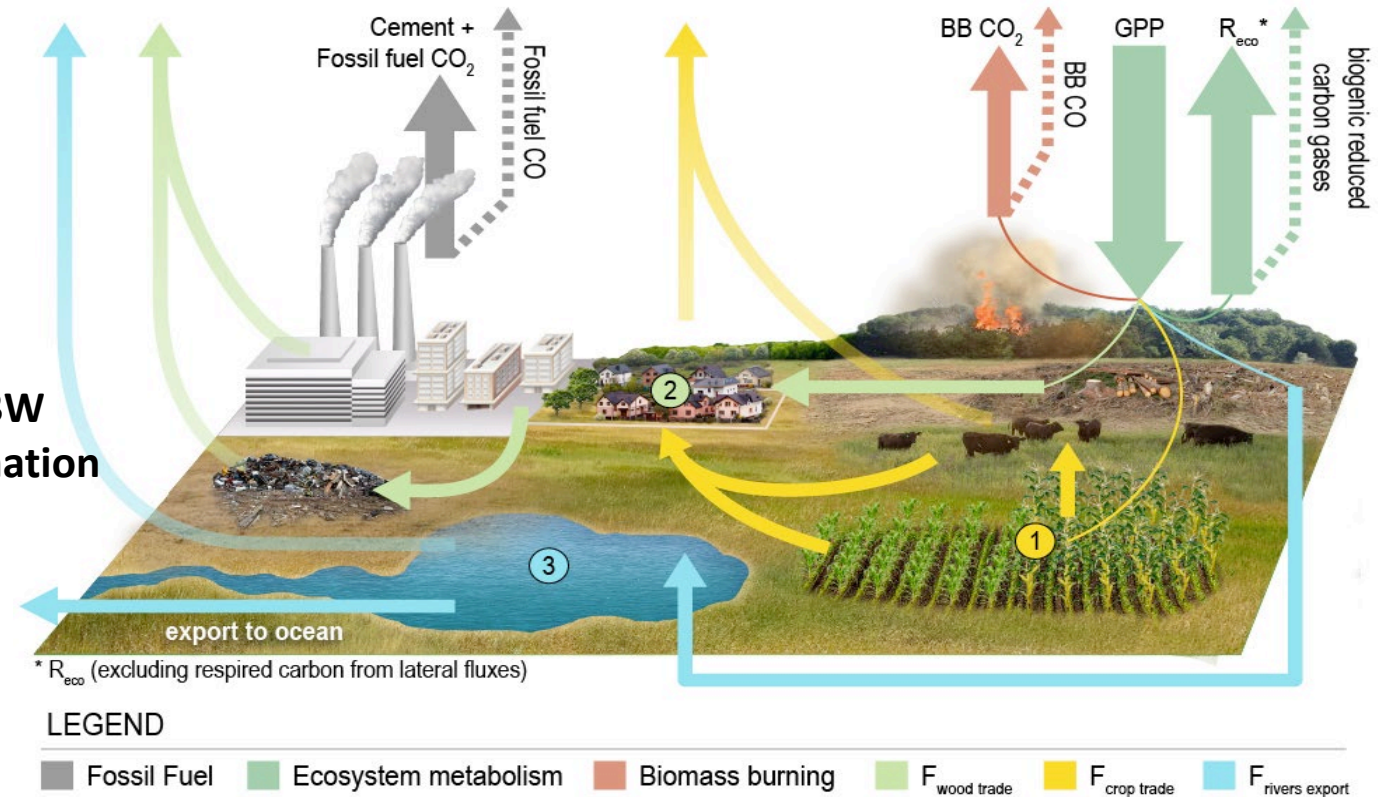
G3W-IPP Implementation & Pre-Oper Phase **2024-27**  
 G3W-IOP Initial Operational Phase **2028-31 (GST-2)**  
 G3W-EOP Enhanced Operational Phases **2032-50**

- **G3W Financial Sustainability**

WMO-RMS the Resources Mobilisation Strategy for **G3W**  
 1 B\$ : 70% Observations, 29% Integration, 1% Coordination

- **G3W Working Structure**

- INFCOM-SC-ET Expert Teams
- INFCOM-AG from the WMO-G3W-SG
- EC-Panel (with identified champions)
- WIGOS / WIPPS / WIS synergy



*Byrne et al. 2022 ESSD*

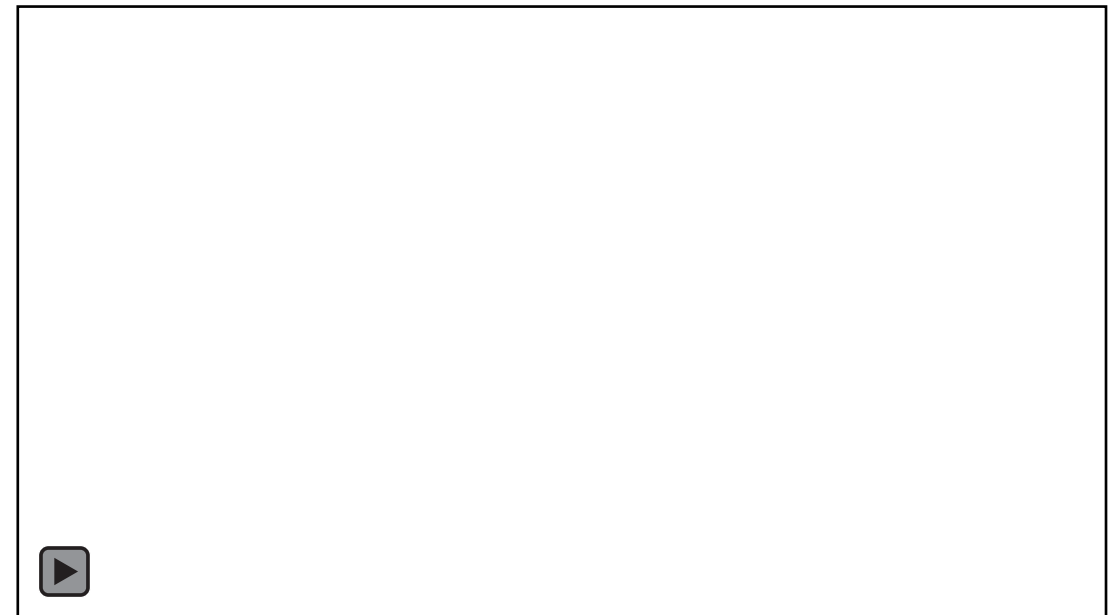


# The “What, How & Why” for the G3W Flagship

**What:** The Global Greenhouse Gas Watch - **G3W** fills critical information gaps on greenhouse gases (GHGs), via an integrated **operational framework** that optimally combine **Earth Observations** with **Earth System Models** using **Data Assimilation & Artificial Intelligence** techniques to **reduce uncertainty** in assessing the efficacy of **Climate Action**.

**How:** a **Timely Policy-relevant information** on GHGs concentrations and fluxes allowing to assess both the **Natural & Human** influence on climate change <https://wmo.int/activities/global-greenhouse-gas-watch-g3w>

**Why :** an **Earth System Approach** is a must-have because **Earth’s climate responds to the laws of Climate Physics** and depends Atmospheric GHGs, NOT on Claimed Offset of Carbon emissions or to Good-will of Pledges.



# G3W Plan in Action

In 2023 two WMO key events

- 1<sup>st</sup> WMO GHGs Monitoring Symposium  
**G3W reaches broad science support**
- 19<sup>th</sup> World Meteorological Congress  
intergovernmental agreement approved  
**G3W proceeds with development**

**COP28** raised the profile of the  
**Global Greenhouse Gas Watch – G3W**

- WMO prominent exposure at COP28 in particular at the Earth Information Day
- **G3W is noted by 196 Nations** in the [SBSTA-59](#), providing a successful closure of COP28 for G3W



2023

2024 -- 2027

2028 -- 2031

2032 -- 2050

Cg-19 → G3W  
WMO Congress

G3W – IPP  
Implementation Pre-Oper Phase

G3W – IOP  
Initial Operational Phase

G3W – EOP  
Enhanced Operational Phase

GST-1  
COP28

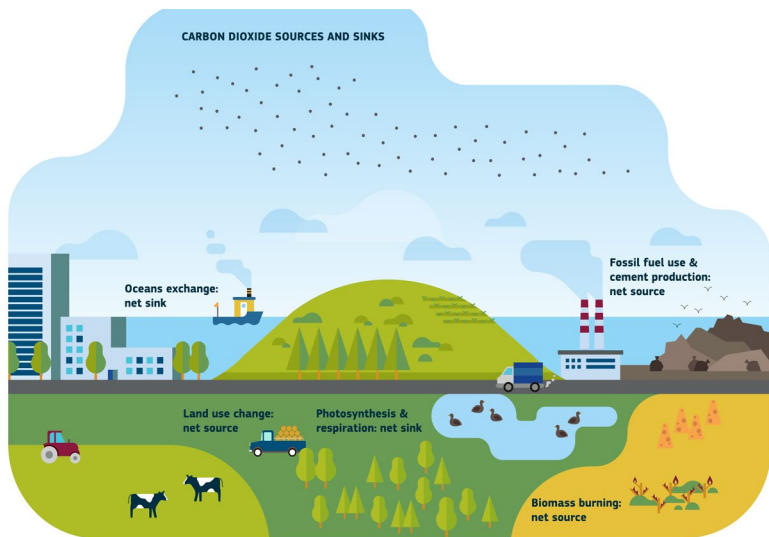
Initial Monitoring Systems

GST-2  
COP33

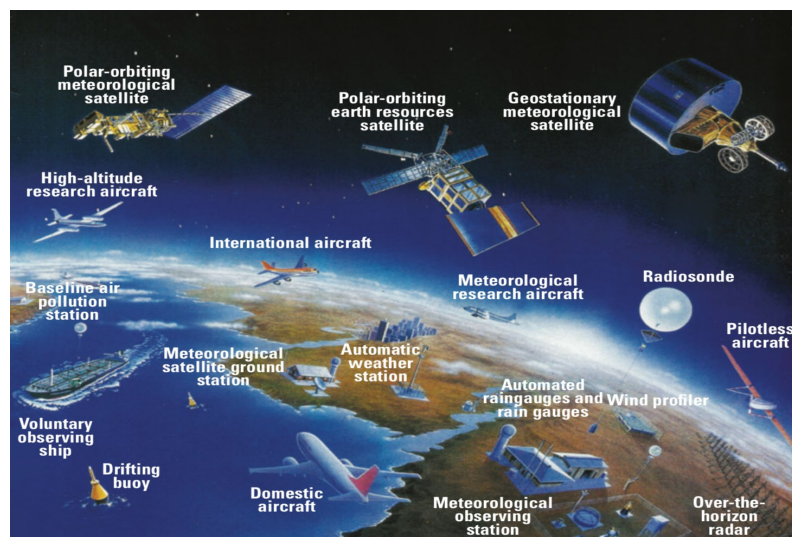
Enhanced Systems

GST-n  
ETF, NDCs

*“for Measuring, Understanding, and Managing the Earth’s Climate”*



CO<sub>2</sub>, Carbon dioxide



GHGs Earth's Observing Systems is building on Weather experience

UN family  
IPCC-IOC-  
UNEP-UNFCCC-  
WHO-WMO-WTO

UNFCCC  
COP-SBSTA

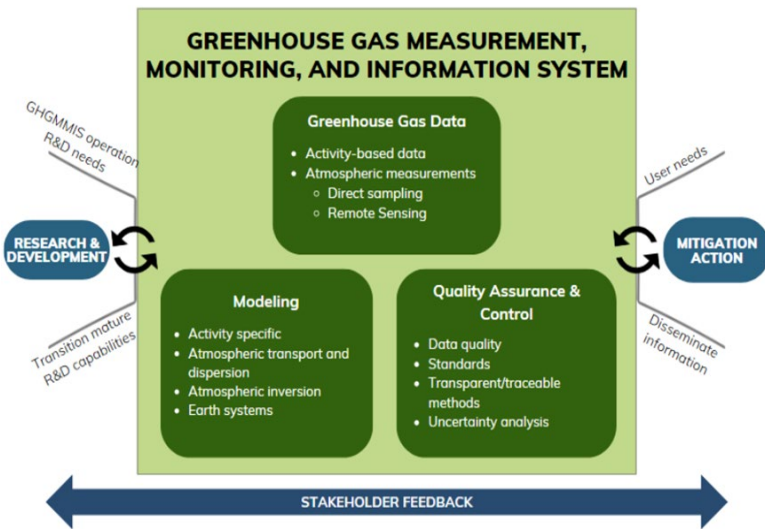
WMO  
WIGOS-WIS-WIPPS



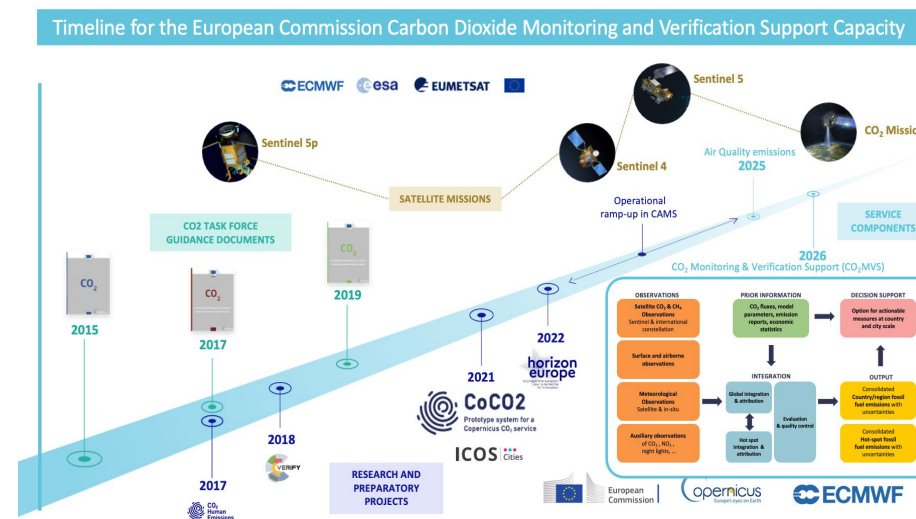


# Synchronizing with National & Regional efforts

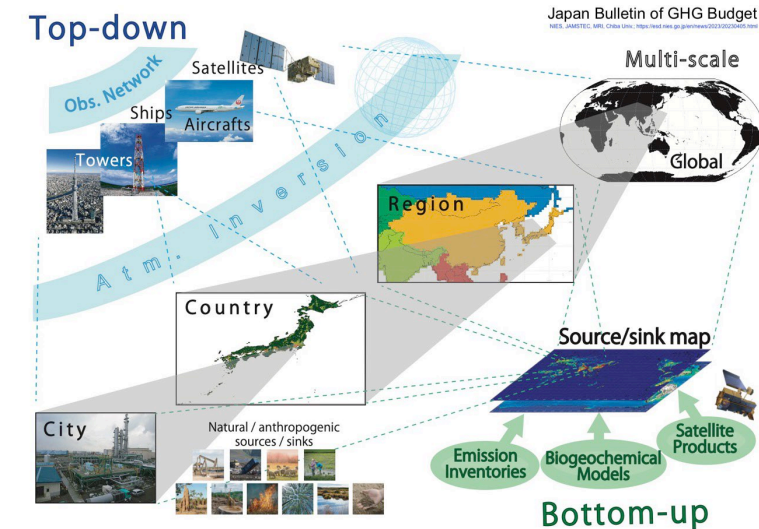
- In 2024 the **G3W Implementation Plan**, the **G3W Sustainability Strategy** documents.
- In 2025 & 2026 the **Ramp up Operations** with sustained funding sources (WMO + External).
- This is in good alignment with fast-track GHGs information efforts, such as in EU, JAPAN, US, ...



US GHGMMIS, 2023



EU COPERNICUS, 2023

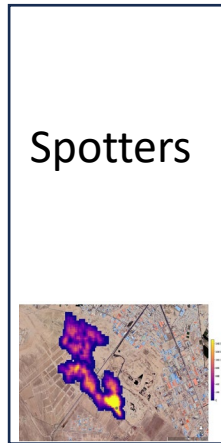
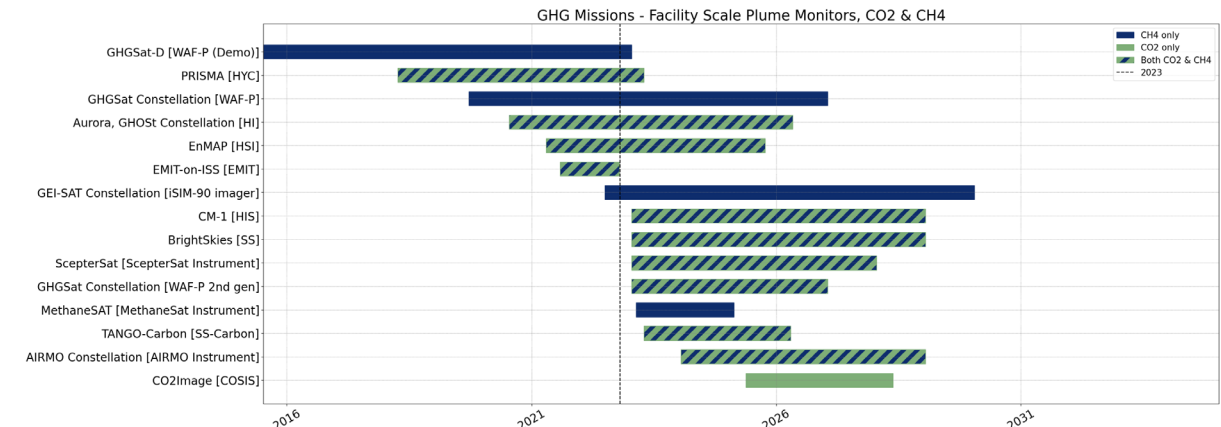
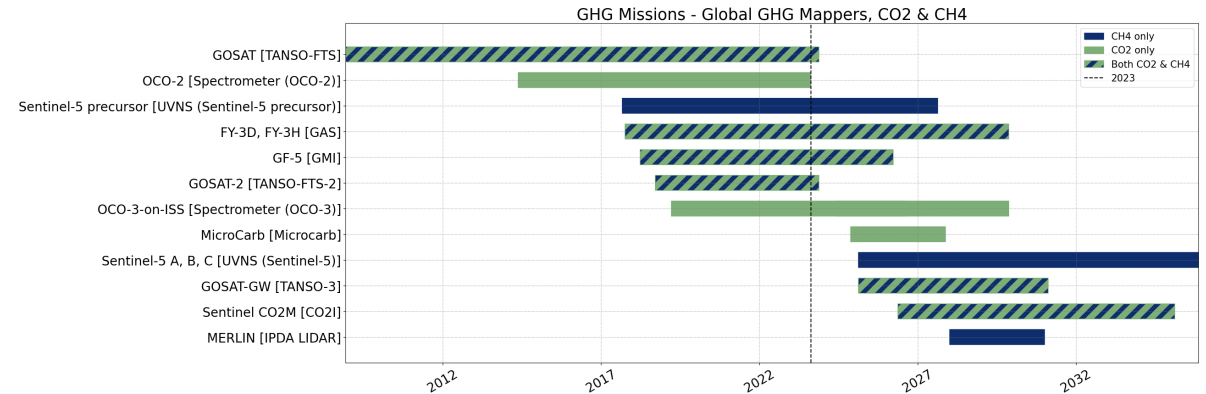
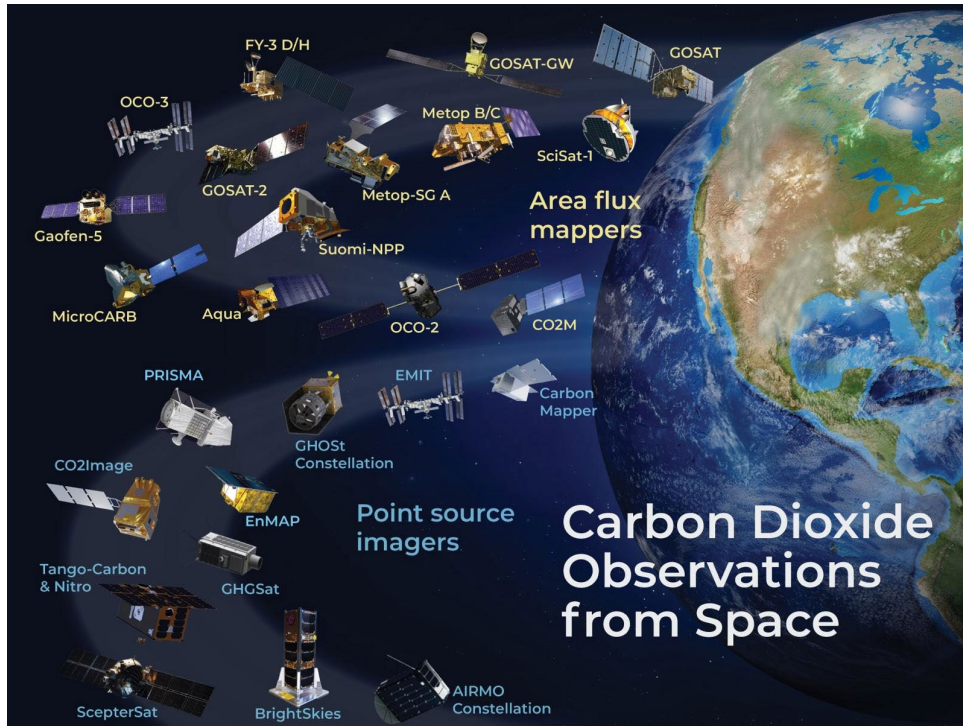


JAPAN NIES, 2023



# Synchronizing with Space Agencies

- In 2024-27 the **G3W IPP Implementation and Pre-operational Phase**, it is crucial for the global coverage of local relevance that **G3W Space Remote Sensing** components are well coordinated.
- This is thanks to **CEOS** and to **CGMS**



**CEOS – Committee on Earth Observations Satellites**



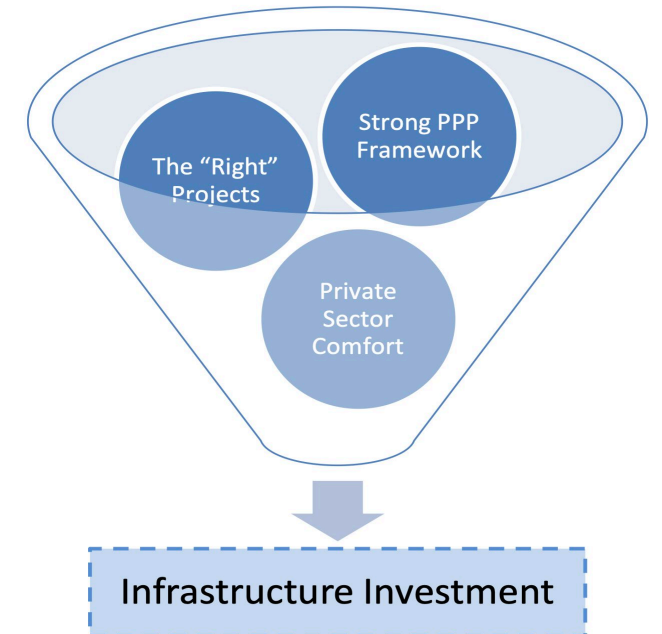
**CGMS – Coordination Group on Meteorological Satellites**

# Synchronizing with Private Funding Opportunities

To address infrastructure / service needs G3W aims at Mobilising **significant resources increase in 2024-2027**.

**Funding mechanisms** include 3 pathways:

- **G3W initial WMO-funds**, approved by the 19<sup>th</sup> World Meteorological Congress (Cg-19) [Resolution 5](#) of in 2023.
- **G3W trust-fund**, managed by WMO, with two Champions Nations contributing in 2023 and more expected from Public & Private sources from 2024.
- **Specialized G3W financial vehicle** to facilitate wider private sector contributions and activities, such as impact investing, that can be hosted outside of the UN system.



[World Bank, 2016a, #3553](#)

# WMO Global-Coordination: Space Agencies in Geneva 2024

- **G3W** presented at 15th Session of Consultative Meetings on **High-Level Policy on Satellite Matters**
- **G3W** to be presented to **CEOS** and to **CGMS** and to **INFCOM-3** Intergovernmental session in **April 2024**





# Thank you. 🌻

Take Home 🏠 message



*CLIMATE ACTION NEEDS*

*SCIENCE DRIVEN – CONSENSUS BASED*

*CLIMATE DATA – INFORMATION - KNOWLEDGE*

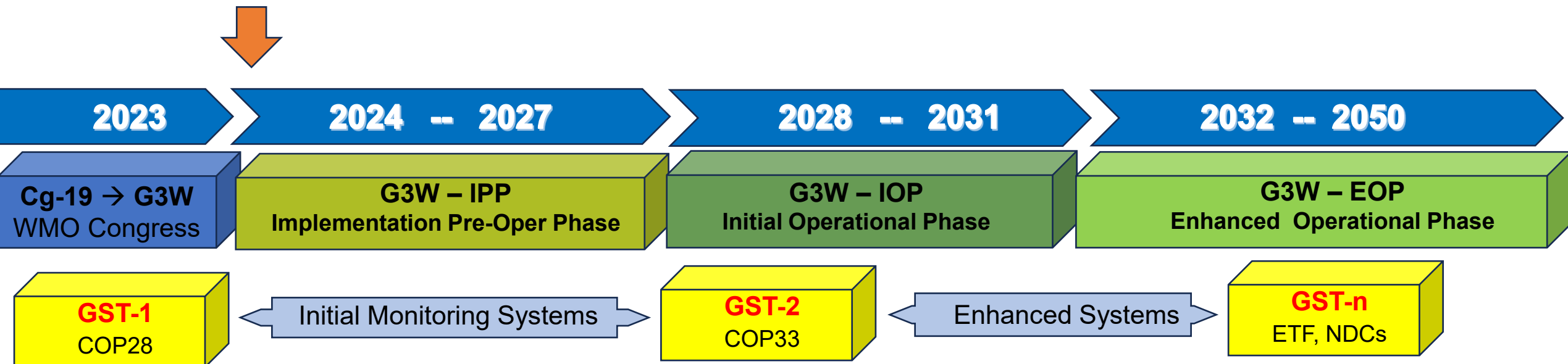


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wmo.int

# G3W Implementation Plan: Progress in 2024

- A 1<sup>st</sup> complete draft of G3W IP with WMO RMS contribution on the 18<sup>th</sup> of January 2024.
- G3W-SG & G3W-Team worked to consolidate the G3W IP up to the 22<sup>nd</sup> of January 2024
- G3W IP v1.0 published on the web, for an **Open-Community-Review** on the 23<sup>rd</sup> of January 2024
- G3W IP v2.0 presented to INFCOM-Management on the 7<sup>th</sup> of February 2024
- G3W to be presented to WMO INFCOM-3 in the week of the **15<sup>th</sup> of April 2024**.
- G3W to be presented to WMO EC-78 in the week of the **10<sup>th</sup> of June 2024**.



### Section 3 Observing System – O (12)

- O1 – Observation inventory
- O2 – Obs. standards & requirement
- O3 – Longer term Obs.
- O4 – Surface-based Obs. Design
- O5 – Reference Network Development
- O6 – Basic (“fit-for-purpose”) network
- O7 – RS & vertically-resolved Obs.
- O8 – Ocean network design
- O9 – Gridded Air-Sea CO<sub>2</sub> flux
- O10 – Space-based Obs. with CEOS-CGMS, direct
- O11 – Space-based Obs. with CEOS-CGMS, indirect
- O12 – Space-based Obs. with CEOS-CGMS, future

### Section 5 Prior Information – P (4)

- P1 – Identify needs – CO<sub>2</sub>
- P2 – Identify needs – CH<sub>4</sub>
- P3 – Identify needs – N<sub>2</sub>O
- P4 – Fluxes characterization

### Section 7 R&D Needs – R (3)

- R1 – G3W R2O Task Team establishment
- R2 – Advance Obs. & data exchange capabilities
- R3 – Advance modelling and flux inversion capabilities

### Section 9 Capacity Building – C (5) (Overarching)

- C1 – Technical participation framework
- C2 – Continuously capacities evaluate

### Section 4 Modelling System– M (7)

- M1 – Modelling center & data
- M2 – Modelling center-documentation
- M3 – Continuous Operations (RRR)
- M4 – Obs. acquisition and pre-processing
- M5 – Prior Implementation
- M6 – Production centers common approaches
- M7 – Modelling products evaluation

### Section 6 Data Management – D (7)

- D1 – Data from Raw to Exchange
- D2 – Data from providers to assimilation
- D3 – Data for model intercomparisons
- D4 – Data discovery and distribution
- D5 – Data repository for prior and fluxes
- D6 – Definition of prior data providers
- D7 – Data policy for the repository of prior fluxes

### Section 8 User Engagement & Uptake – U (4)

- U1 – Support the GST
- U2 – Guidance on regional products
- U3 – Establish relationship & pathway
- U4 – Develop user interface guidelines

- C3 – Members’ capacities in data use
- C4 – Capacity development programs for Member
- C5 – National capacities development

# G3W Plans’ Building Blocks

- **Section 3 – Section 8** outline the technical building blocks, actions, overarching activities
- **Section 9** presents the Capacity Building
- **Section 10 – Section 11** are on the G3W funding and resources mobilization needed to cover workforce & infrastructure costs within G3W.

### Section 10 Financial estimates & Funding sources

- Highly centralized / low regionalized investment
- Medium centralized / regionalized investment
- Low centralized / highly regionalized investment

### Section 11 Resource Mobilization

- G3W initial WMO-funds
- G3W trust-fund
- Specialized G3W financial vehicle



# G3W Communication

G3W has 3-level of communications

1. the **internal communication (KPI-based)**
2. the **external collaborators (Milestones/Delivery based)**
3. the **public (broadcast and outreach/positioning based)**

- **G3W Team member's informal seminar as Informal example**

- One topic/activity weekly or fortnight with a Team-coffee/tea
- One email/teams update every week (beginning/end)

- **G3W News bulletin as formal communication example**

- One newsletter with few bullet points every Quarter (4 per Year)

- **G3W blogs as informal public communication example**

- *One blog every quarter formal WMO blog*
- *"There is no Planet B" informal G3W blog*

- **G3W General Assembly**

- *One per year in-person + online*



**Global Greenhouse Gas Watch**

*Three Globes, One Mission. Time to Act, Time to Save.*

**Dear Esteemed Contributors of the G3W,**

I trust this message finds you well. The G3W team extend our deepest appreciation for your unwavering commitment to drafting the G3W implementation plan. Through this Newsletter, we would like to inform you the important updates on G3W which we were able to achieve. **Thanks to you All!**

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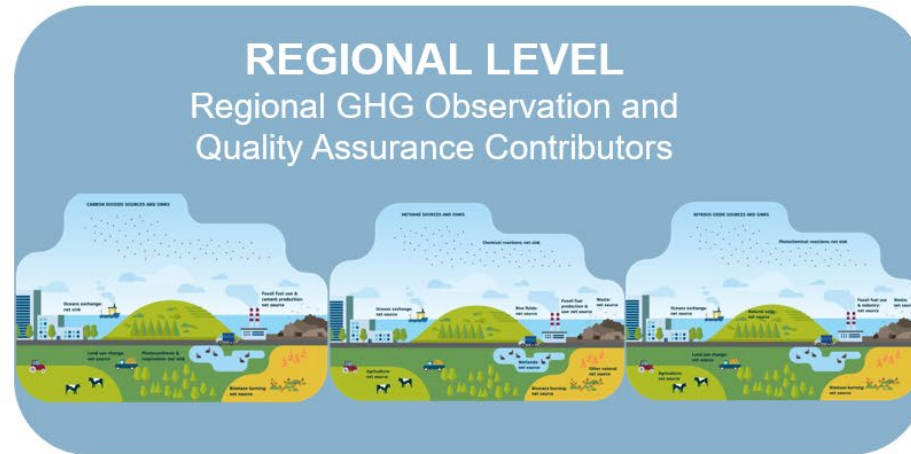


***Read WMO blog recently published***



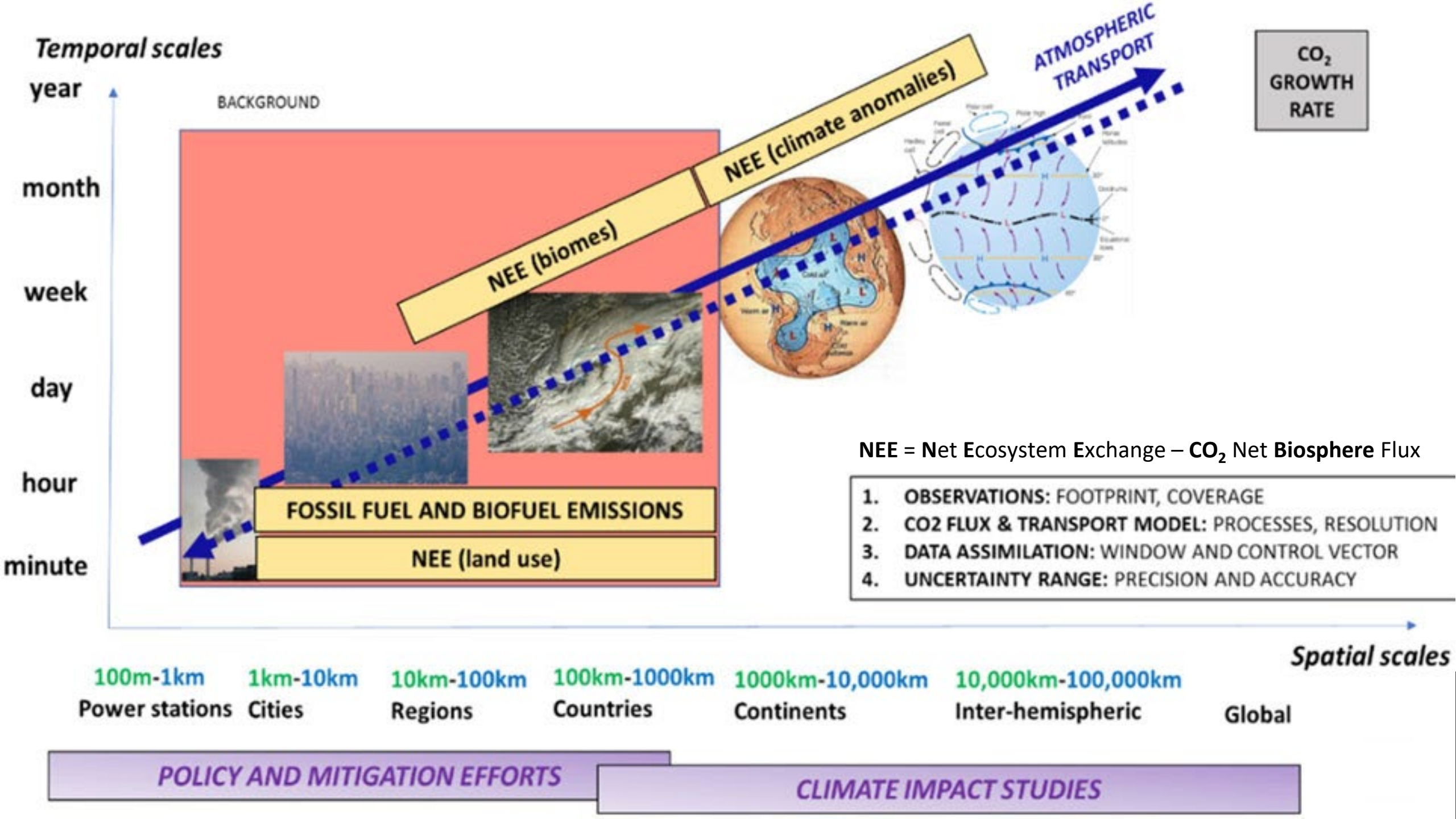
# G3W in Practice: A Region-First Approach

The G3W will develop strategic actions to fund systematically infrastructure+workforce, beyond opportunity-based and development-based funding mechanisms.



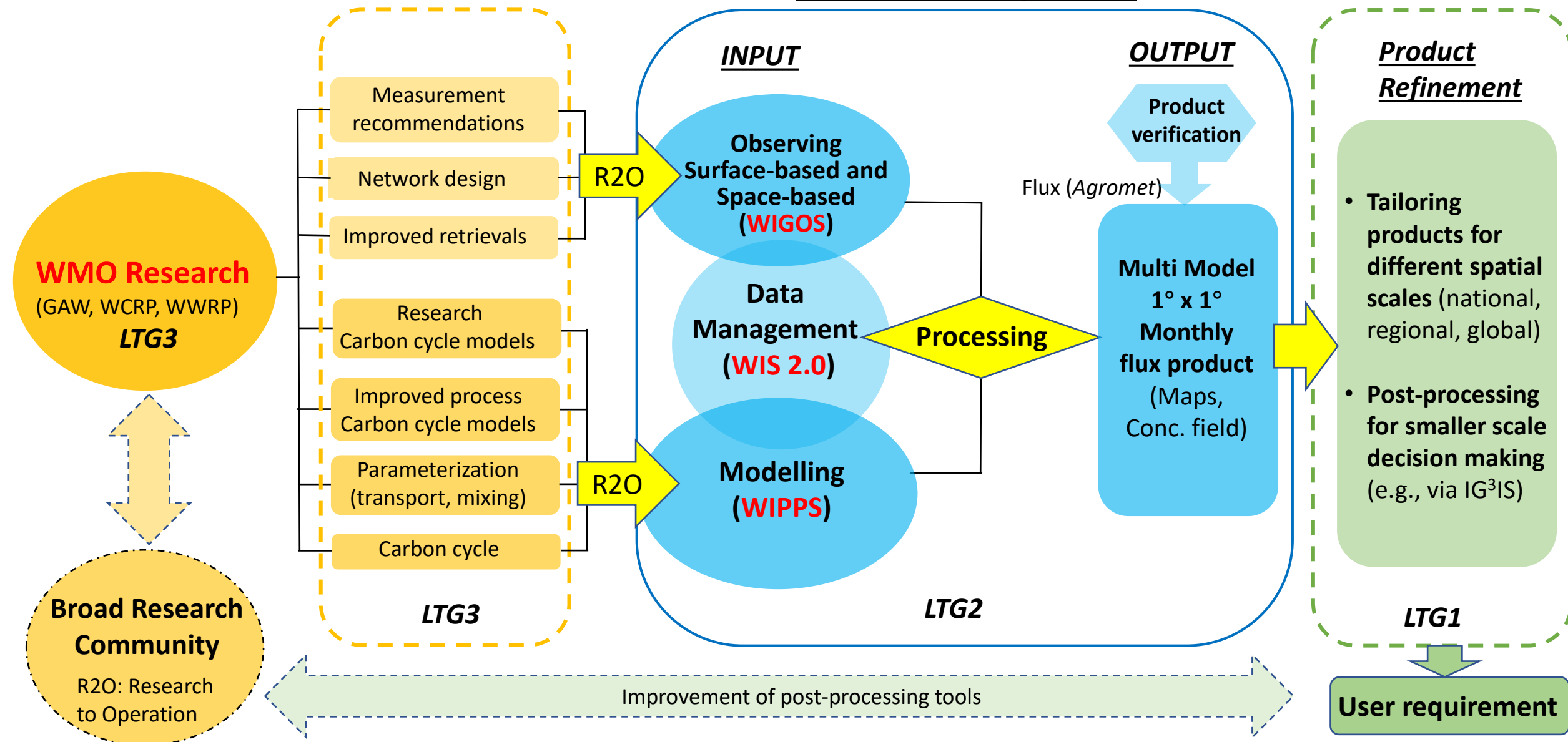
The G3W Flagship-level costed plan identified as a top priority for Climate Change mitigation action:

- 70%** of the investment in the **surface-based observations**
- 14%** in **observations integration, modelling and data management**
- 10 %** in **regional demonstration projects**
- 7%** in **additive research to support G3W emerging priorities**
- 3 %** in **public-private-partnership (PPP) development**
- 1%** in the **central coordination by WMO secretariat**

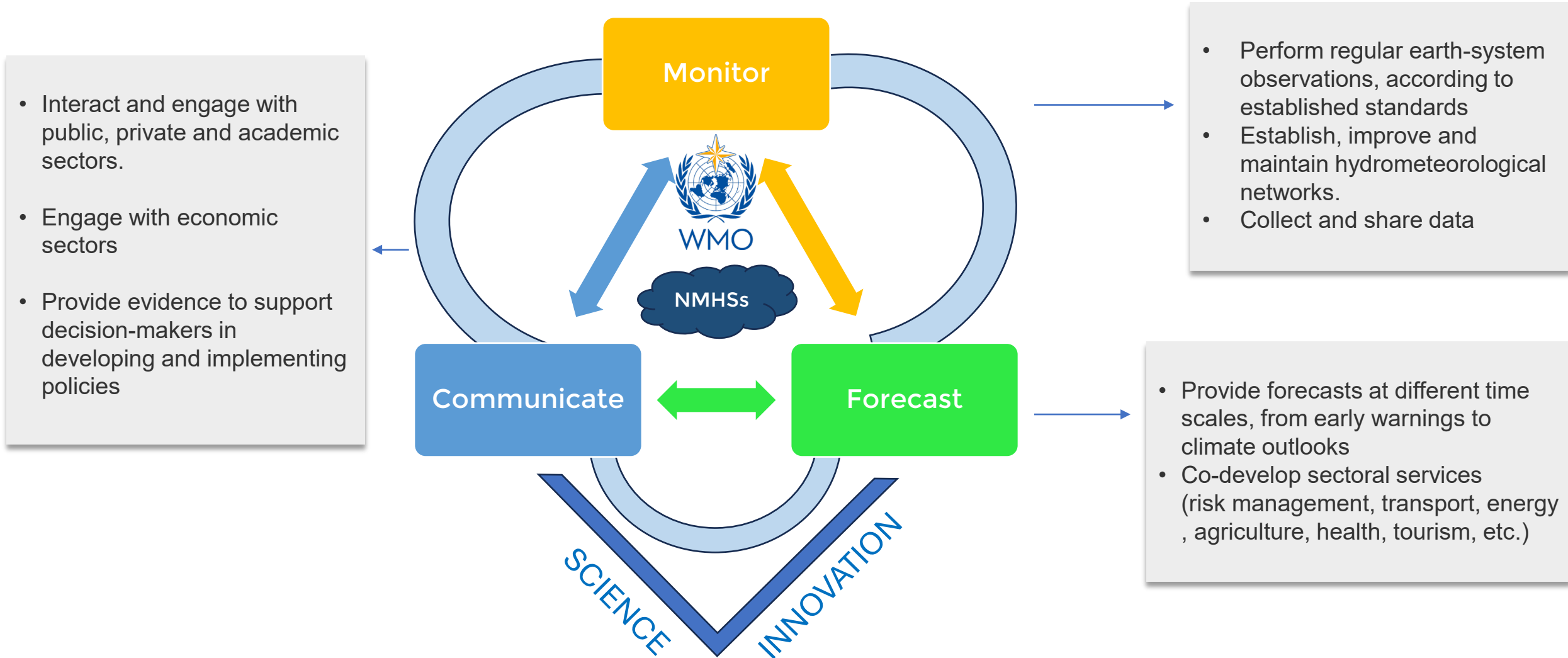


# G3W Infrastructure, Service, and R&D capabilities

## G3W Sustained Capabilities



# G3W Governance – Learning from Hydro-Met. Services





# Verbier Summit Sustainable Finance Book Series

**NEW SERIES** from 2024 Verbier Summit 15<sup>th</sup> March 2024

*Contributed Volume Open to All Verbier Participants*

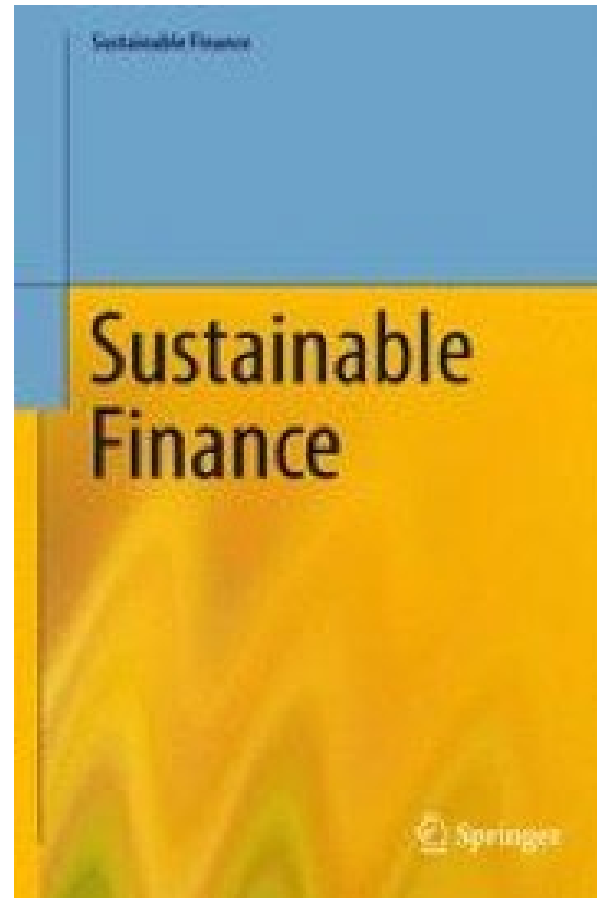
*Dr Karen WENDT (Springer, Nature) and Dr. Prof. Gianpaolo BALSAMO (WMO, ECMWF, Polito)*



<https://verbiersummit.com/>



<https://www.springer.com/series/15807>



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# WMO

For More information,  
Comments or Questions



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