# The WMO Global Atmosphere Watch (GAW) programme

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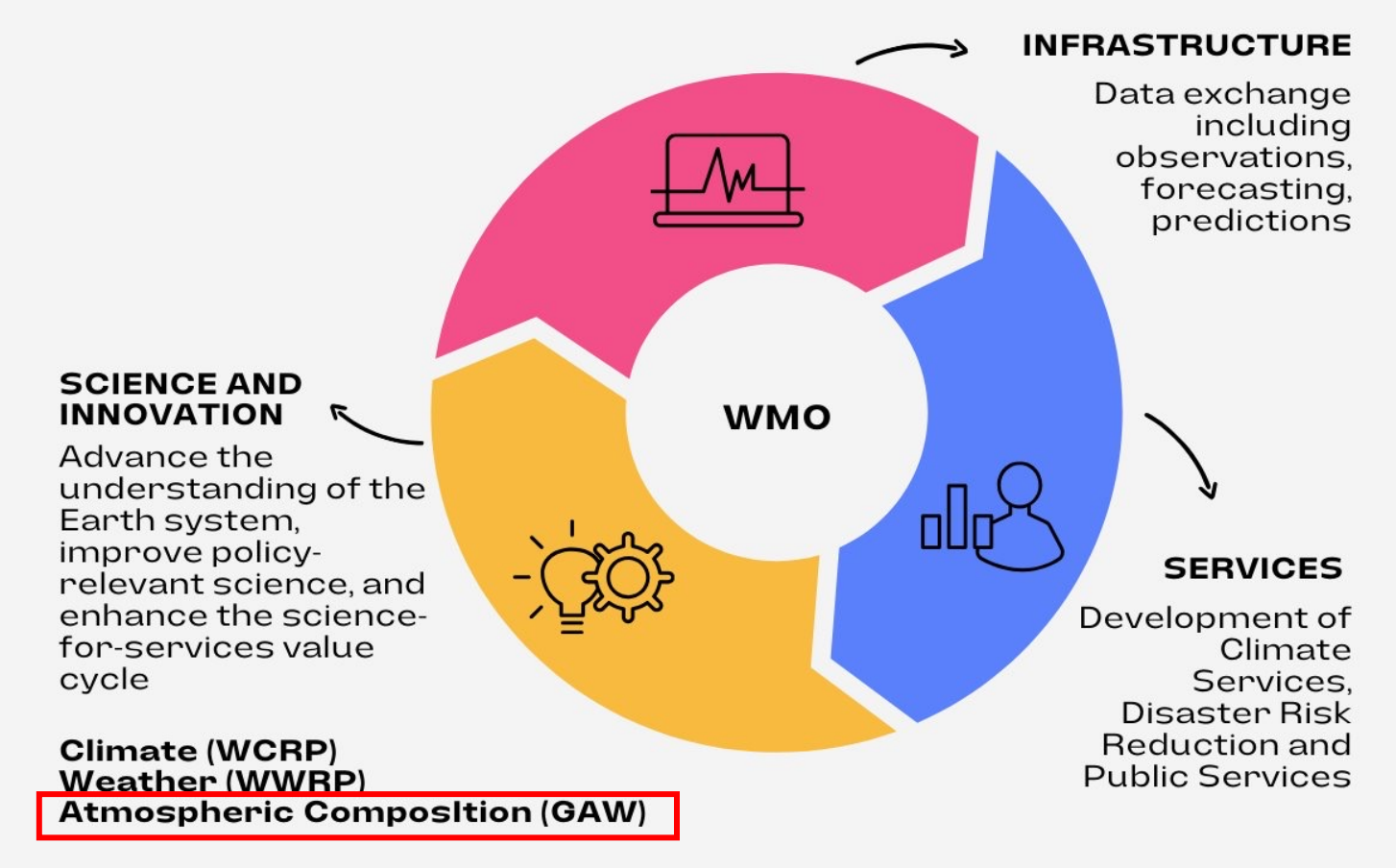
WORLD METEOROLOGICAL ORGANIZATION

# World Meteorological Organization (WMO)

- UN specialized agency on weather, climate and water.
- It's supported by 193 Members and the headquarters is in Geneva (Switzerland).
- Coordinates work of > 300,000 national experts from meteorological and hydrological services, academia and private sector.
- Co-Founder and host agency of IPCC.




WMO Reseach-Operations Departments

# The WMO Global Atmosphere Watch (GAW) Programme

**Advance and enhance science, services and infrastructure related to atmospheric composition,** and support policies for society through applied research aimed at improving the understanding of the roles of aerosols, reactive gases, stratospheric ozone and greenhouse gases and their interactions in the Earth System


GLOBAL ATMOSPHERE WATCH

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# Support to international conventions and SDGs

- The Convention on Long-range transboundary Air pollution (LRTAP)
- The Montreal Protocol and Vienna Convention (*ozone*)
- The UN Framework Convention on Climate Change (UNFCCC)
- Climate and Clean Air Coalition (CCAC)
- The Convention on Biodiversity
- The Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP)
- UN Coalition for Combating Sand and Dust Storms

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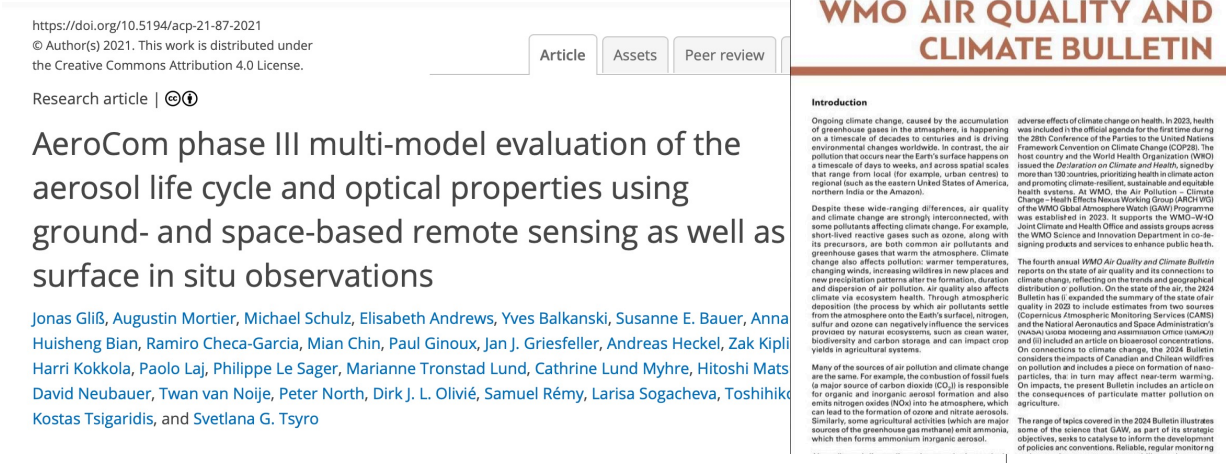
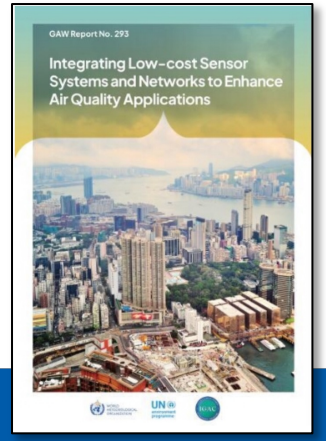
# The GAW Programme: 4 pillars

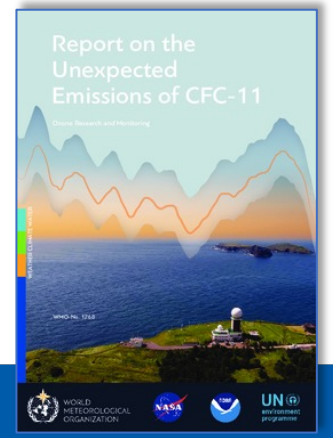
- **Scientific assessments**: advancing scientific understanding through analysis of global data sets,
- **Monitoring Infrastructure**: provision of atmospheric composition data;
- **Capacity Building and education**: provide training opportunities for all GAW users from all regions
- **Science-for-Services Initiatives**: engage with user communities for supporting services and policies,

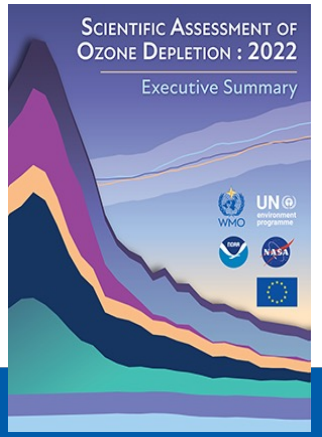
# GAW Scientific Assessments

- Publish community assessment reports and high-level scientific papers on the state of the atmosphere and its evolution,
- Provide technical recommendations for monitoring atmospheric composition and modelling
- Contribute to international reports

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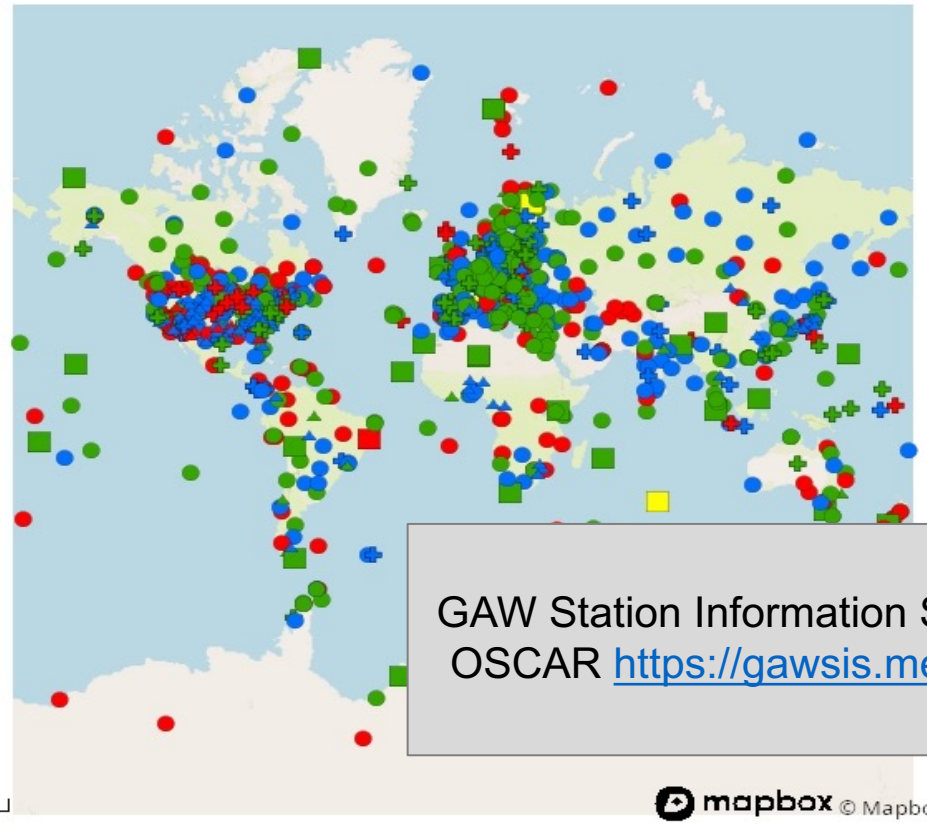
# GAW: Monitoring Research Infrastructure

*Strengthen the atmospheric composition measurement and data infrastructure* and contribute to ***understanding trends and variability and extremes.***

- More than 200 parameters
- Intercomparisons
- Measurement guidelines
- World Data Centers

*Open access with emphasis in QA and QC*

Filling gaps:
**LCS and satellites, but also National AQ networks**
*Integration!*




GAW Station Information System (**GAWSIS**) part of OSCAR https://gawsis.meteoswiss.ch/GAWSIS/#/

World Meteorological Organization
Weather · Climate · Water

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

Federal Department of Home Affairs FDHA
Federal Office of Meteorology and Climatology MeteoSwiss

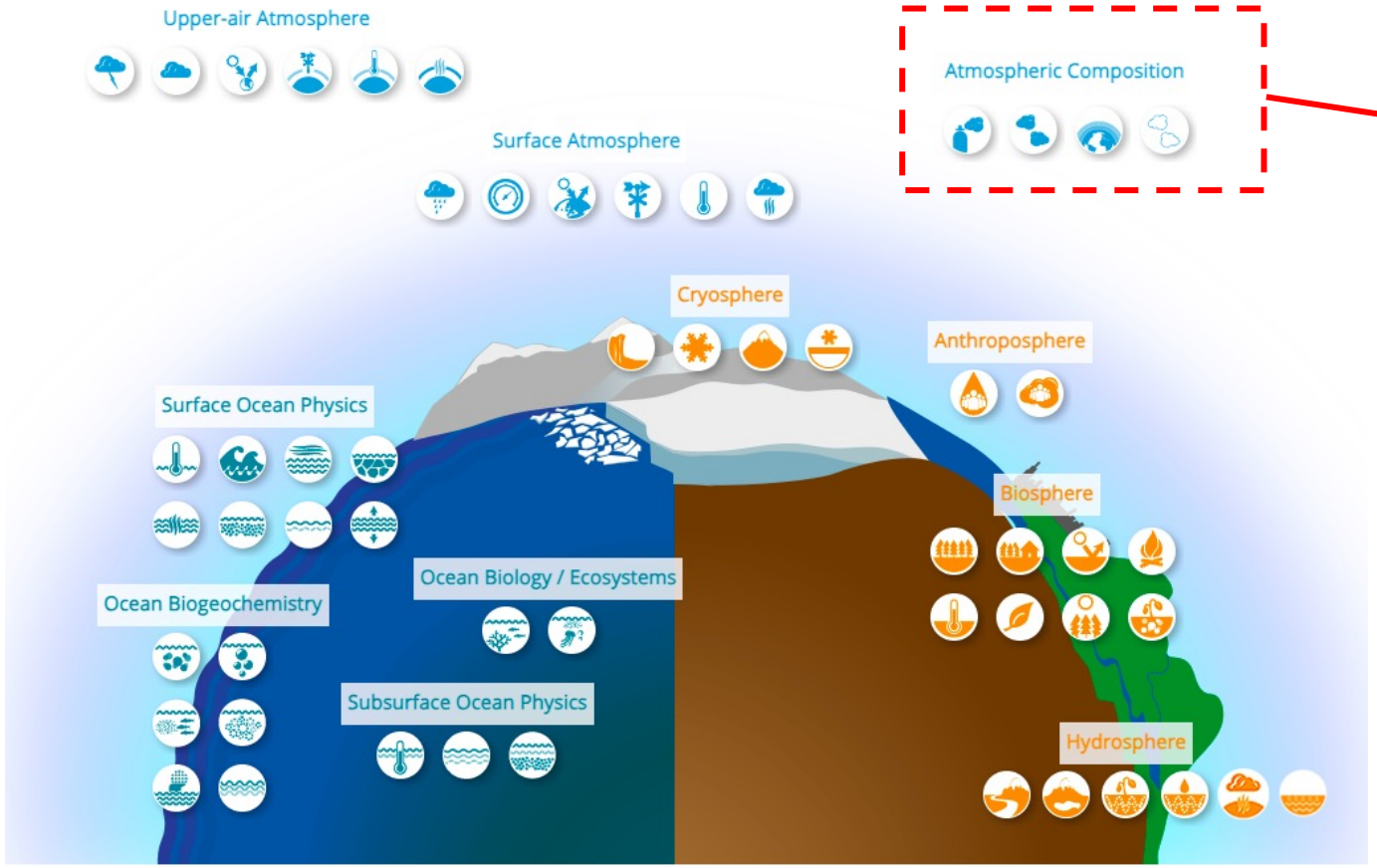
# GCOS – Global Climate Observing System

- GCOS regularly assesses the status of global climate observations and produces guidance for its improvement. GCOS works towards a world where climate observations are accurate and sustained, and access to climate data is free and open.
  - GCOS expert panels maintain definitions of **Essential Climate Variables (ECVs)**.
  - It is GCOS' task to make sure, that the totality of all climate observation networks **is more than the sum of the individual networks**, forming together the one Global Climate Observing System, providing the full picture of our climate.

GCOS | WMO | IOC | International Science Council | UN environment

https://gcos.wmo.int/en

# GCOS – Global Climate Observing System
# Essential Climate Variables




**Atmospheric composition Focal Areas**

- ***Aerosols (chemical and physical properties, AOD)***
- Carbon Dioxide, Methane & Other Greenhouse Gases
- Ozone and vertical ozone distribution
- Precursors for Aerosols and Ozone (CO, SO2, NO2)

GAW Research Infrastructure

https://gcos.wmo.int/en/essential-climate-variables

https://gcos.wmo.int/en

# Capacity Development

- Provision of training to GAW station operators through the Global Atmosphere Watch Training & Education Centre (GAWTEC)
- GAW stations instrument intercomparison and calibration campaigns
- Training on data quality control, data use, modelling tools and quality assurance procedures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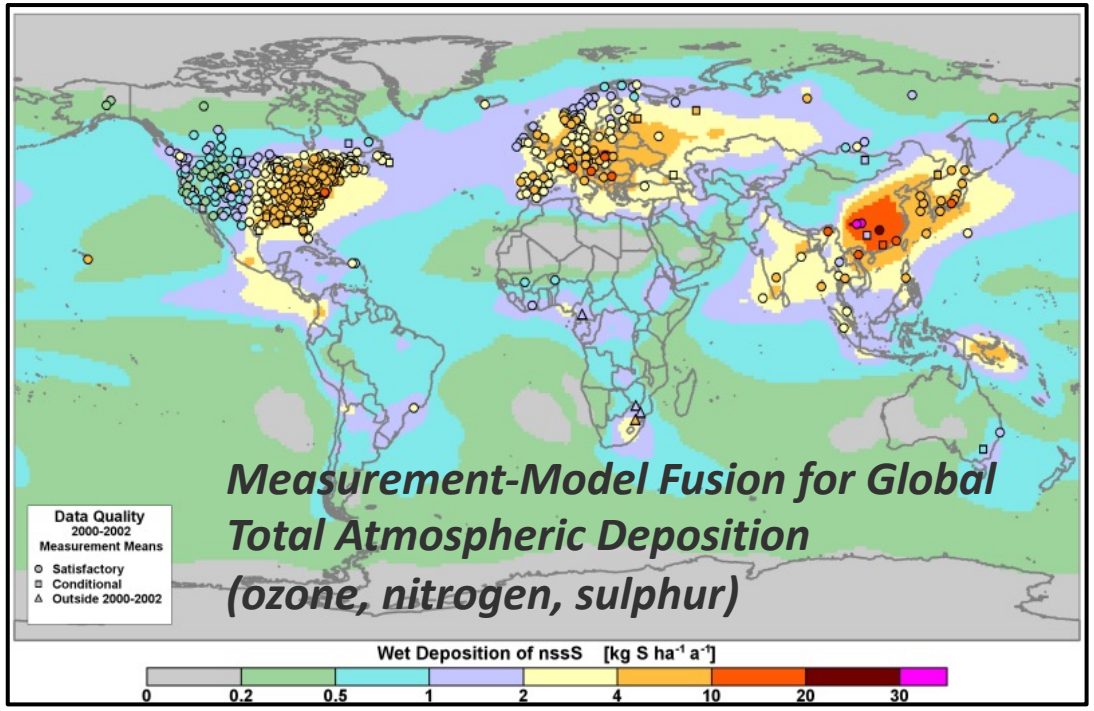
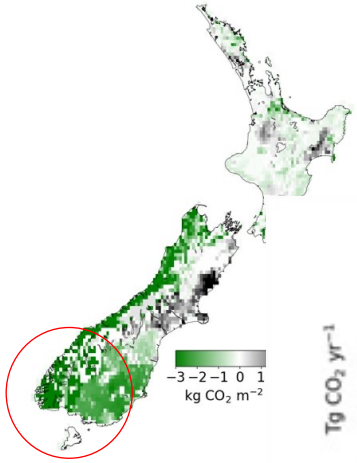
# Science for Services

*Advance the application of atmospheric composition information in support of policies and conventions, and expand **societal services** related to air quality, human and ecosystem health, **climate change** and food production.*

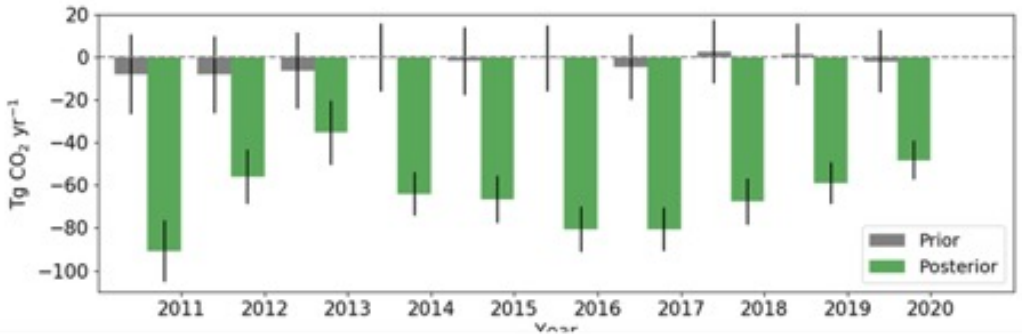
**Deposition to ecosystems and crops + climate action**




***Measurement-Model Fusion for Global Total Atmospheric Deposition (ozone, nitrogen, sulphur)***




*Integrated Global Greenhouse Gas Information System*

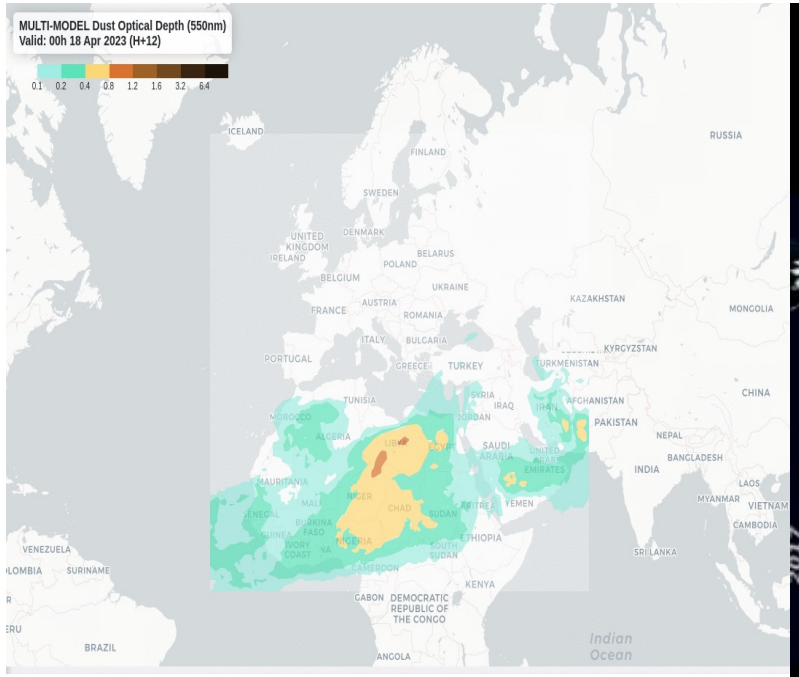



*Aotearoa New Zealand's terrestrial carbon uptake*

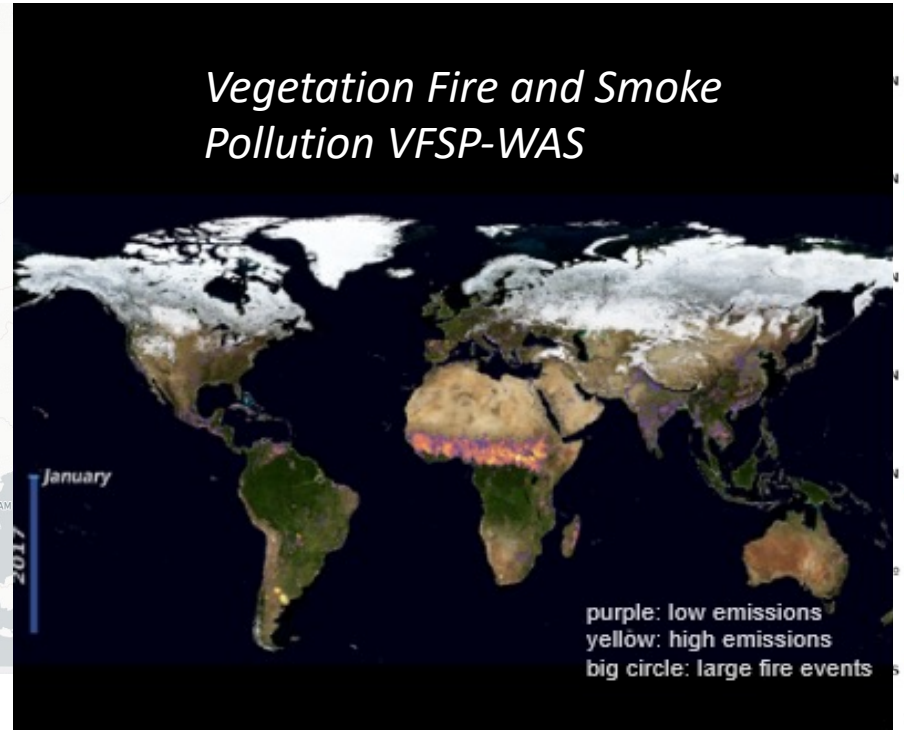
# Science for Services

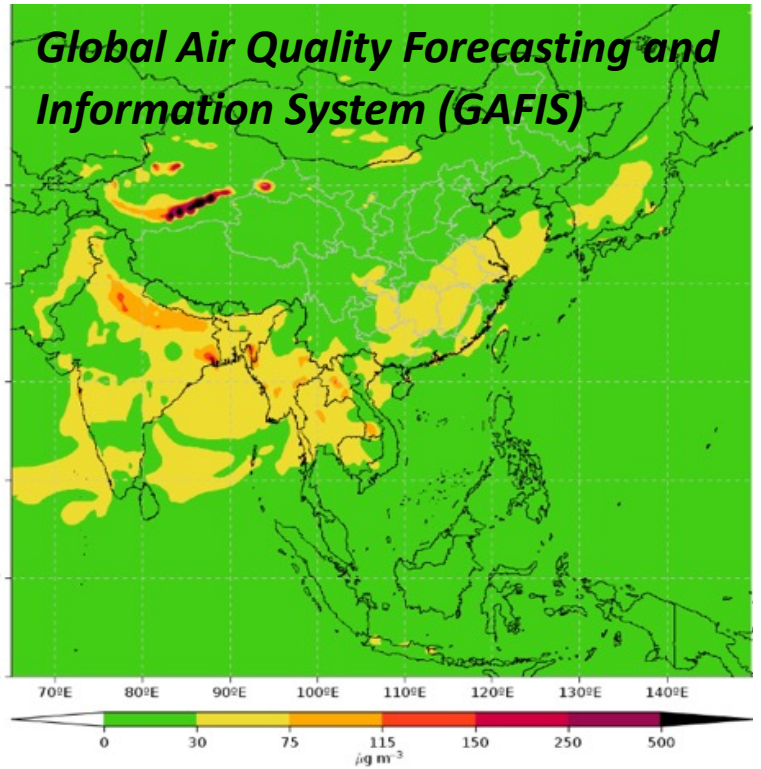
*Advance the application of atmospheric composition information in support of policies and conventions, and expand **societal services** related to air quality, human and ecosystem health, climate change and food production.*

**Warnings and Forecasting Services**
**Model intercomparisons**

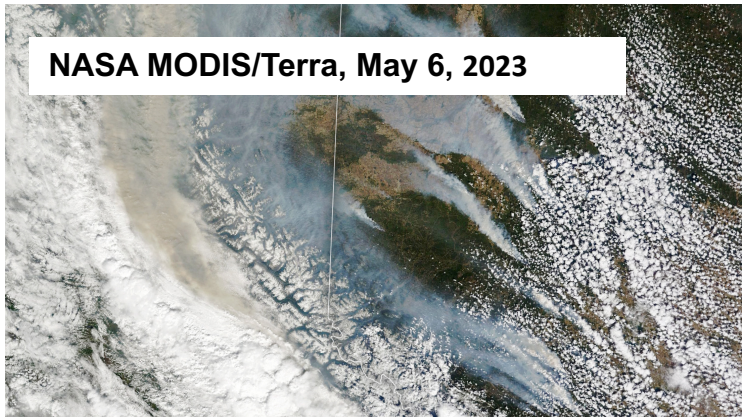


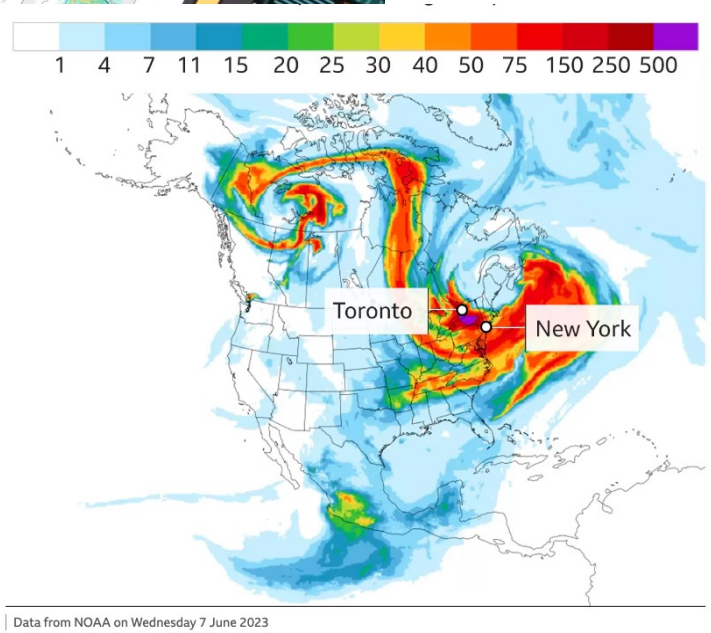

***Sand and Dust Storm SDS-WAS***



# WMO-GAW Warning Advisory and Assessment Systems (SDS-WAS and VFSP-WAS)


**International coordination of research for weather and climate**

**Identification and assessment of SDS and VFSP impacts**

**Promoting the use of current available products (observations and monitoring)**

**Building capacity and facilitate access to the available services**

**Dissemination and awareness**

https://community.wmo.int/en/activity-areas/gaw/

# Infrasctructure for the provision of Services

**Monitoring**

746 active global/regional/urban/ stations in 112 countries

**Central Facilities**

13 countries are hosting GAW central facilities

**Forecasting**

21 countries providing daily forecasts

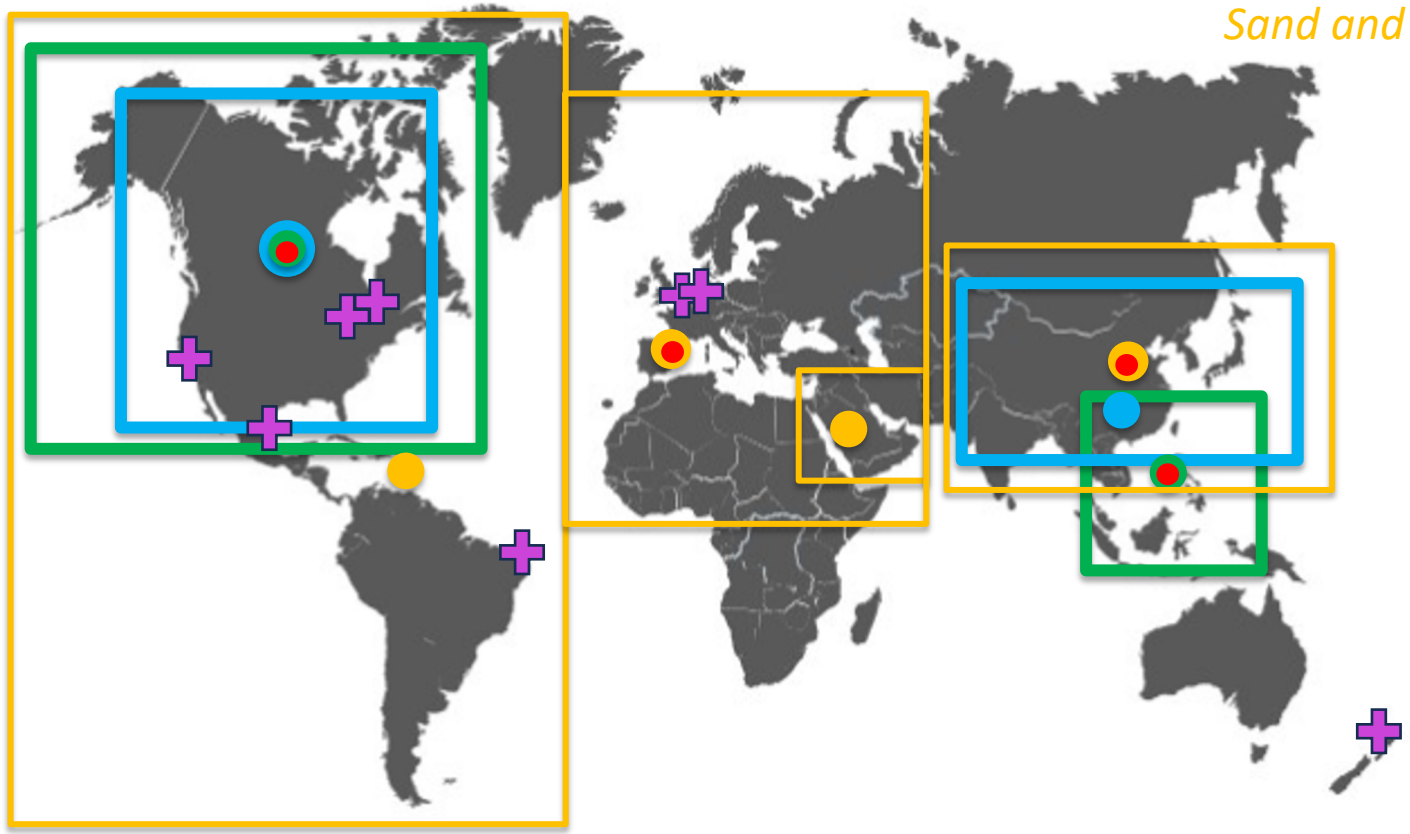
*GHG emission information systems – IG3S city projects*

**Forecasting - Model Intercomparisons:**

*Sand and Dust Storms*

*Wildfires*

*Air Quality*



**WMO INFRASTRUCTURE - WIPPS**

Regional Specialized Meteorological Center with activity specialization ASDF and VFSPF

# Ongoing Cross-cutting Urban discussions

Early Warnings for All

Integrated Air Quality Forecasting services

MAP-AQ

GAFIS

Impact-based forecasts

Methods for urban GHG emissions verifications

IG3IS

End-users

Warning and Advisory Systems

Wildfires
Sand and Dust Storms

Monitoring

GCOS
KEEPING WATCH OVER OUR CLIMATE

WCRP

Seamless Predictions
(weather/climate)

Multi-hazard Assessments

Air Quality, Climate and Health

ARCH

SAG App

Modelling capabilities to support Air Management Strategies (including satellites, reanalysis, predictions and forecasting)

AI/ML Applications

GURME

Seamless Predictions
(regional/urban)

Urban Meteorology and Air quality

WORLD METEOROLOGICAL ORGANIZATION

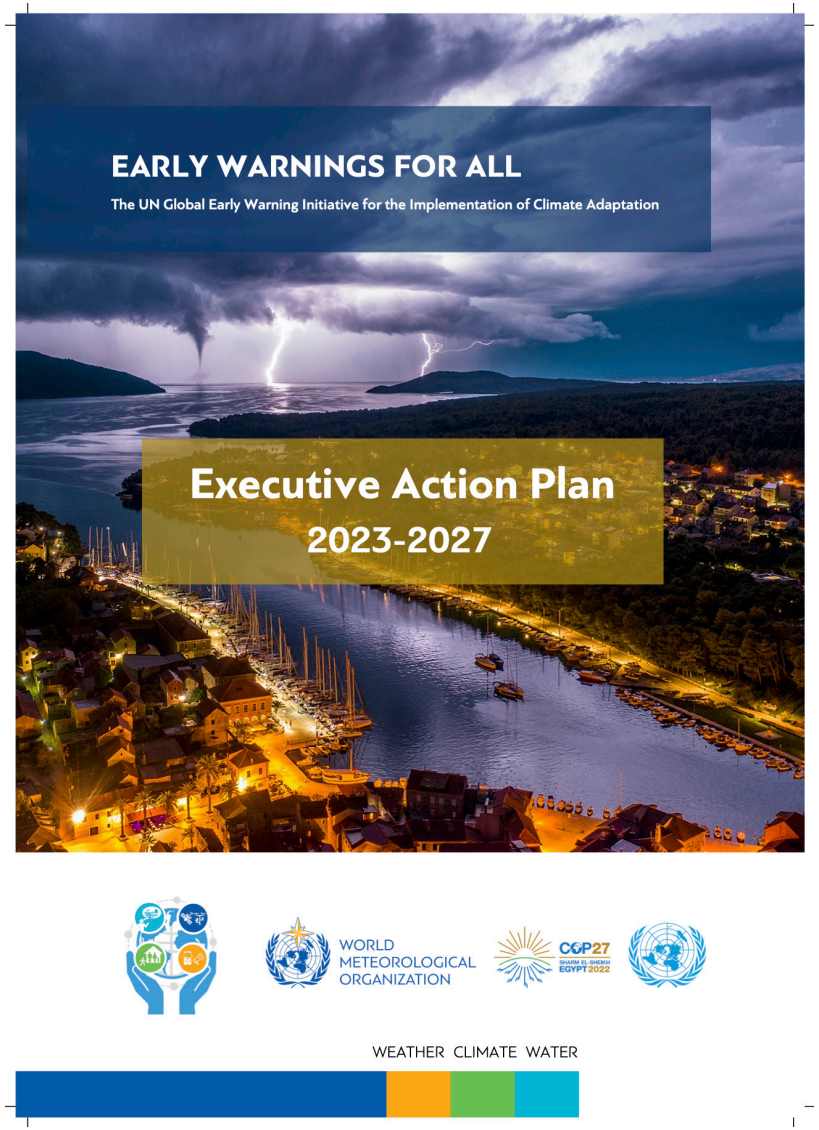
World Health Organization

JOINT OFFICE FOR CLIMATE AND HEALTH

WCRP

WWRP WORLD WEATHER RESEARCH PROGRAMME

# UN Early Warning for All | EW4All




https://library.wmo.int/

***"The facts are clear. Early warnings save lives and deliver vast financial benefits. I urge all governments, financial institutions and civil society to support this effort."*** – *UN Secretary-General António Guterres*

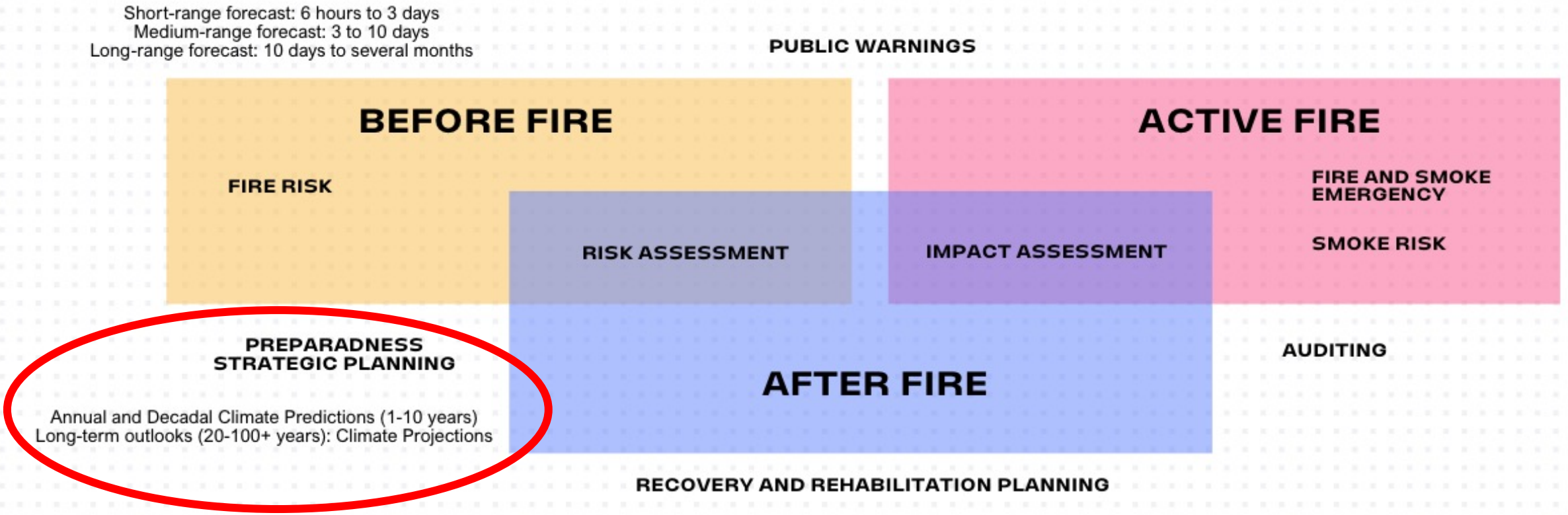
WORLD METEOROLOGICAL ORGANIZATION | UNDRR UN Office for Disaster Risk Reduction | IFRC | ITU

Strategy build in 4 pillars:

1. Disaster risk knowledge and management
2. Detection, observation, monitoring, analysis, and forecasting
3. Warning dissemination and communication
4. **Preparedness** and response capabilities

50% of countries not protected by Early Warnings
In the list of hazards are SDS and wildfires

# Early Warning Services, e.g. wildfires



# GAW community

Subscribe to the **GAW Newsletter** for staying to date on our actitivies


https://community.wmo.int/en/activity-areas/gaw/news

# WGNE and GAW discussion points

- **Bridging Observations and Modelling:** How can GAW observational networks and datasets be more effectively integrated into WGNE model development and evaluation to close gaps between observed and simulated atmospheric composition?
- **Model Evaluation and Verification:** What joint methodologies or metrics can GAW and WGNE develop to systematically evaluate and improve the representation of key atmospheric composition processes in models?
- **Coupled Processes and Earth System Integration:** How can GAW observations support WGNE efforts to better represent chemistry–meteorology–climate interactions, such as aerosol–cloud–radiation feedbacks, in coupled models?

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