



PROGRAMME
DE RECHERCHE
CLIMAT

WEBINAIRE TRACCS

TRANSFORMER LA MODÉLISATION DU CLIMAT POUR LES SERVICES CLIMATIQUES

CHANGEMENT DE PARADIGME POUR LA FOURNITURE DES SERVICES CLIMATIQUES EN AFRIQUE-CARAIBES-PACIFIQUE

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Organisation Météorologique Mondiale (OMM)

→ Vendredi 26/04/2024 de 11h à 12h

1

**Cadre opérationnel et
méthodologique de
fourniture des services
climatiques**

2

**Leviers de
transformation et
changement de
paradigme**

3

**Applications dans les
régions Afrique-
Caraïbes-Pacifique**

Contexte



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?

United Nations Early Warning for all (EW4ALL) initiatives



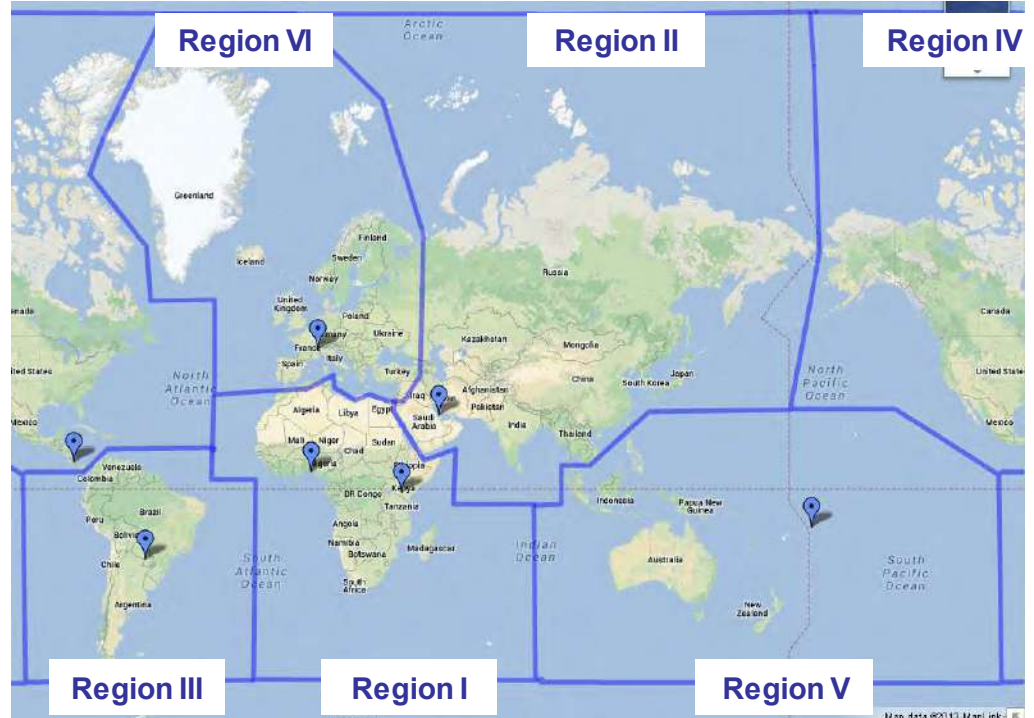
Organisation Météorologique Mondiale (OMM)

Mieux répondre aux besoins de la société
Fournir des informations et des services qui font autorité, accessibles, orientés vers l'utilisateur

Améliorer les observations et les prévisions du système terrestre
Renforcer les bases techniques et infrastructures

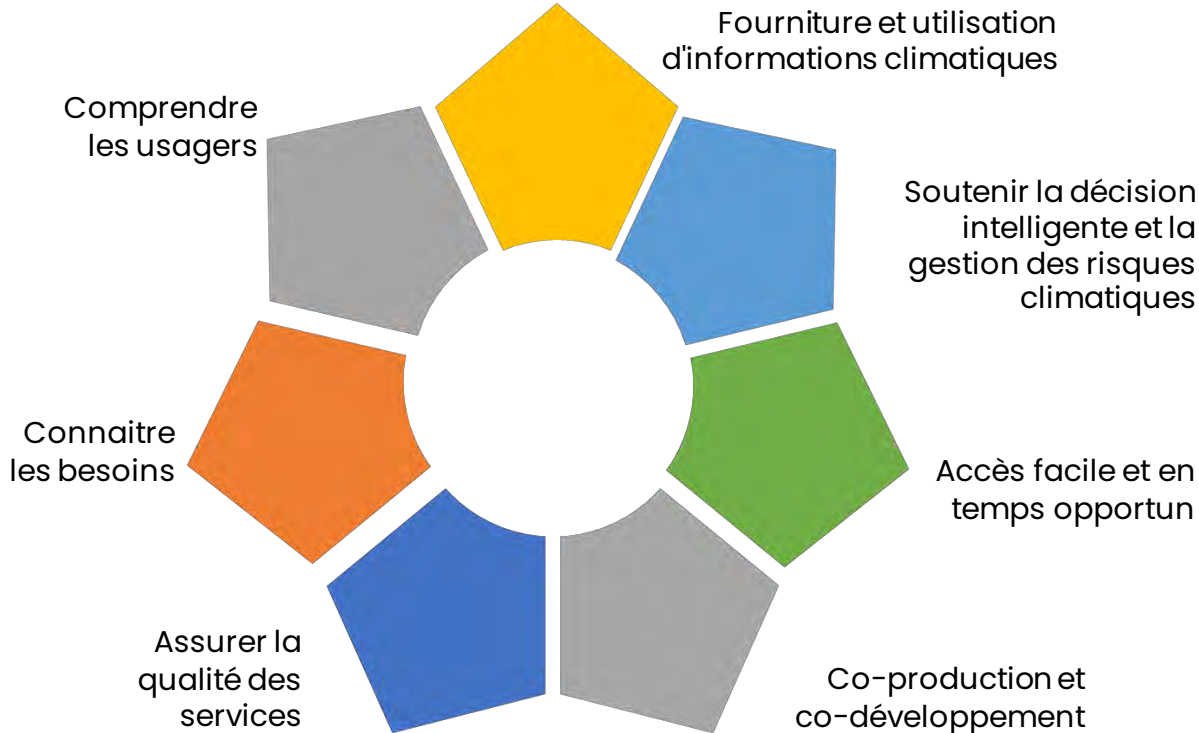
Faire progresser la recherche ciblée
Améliorer la compréhension du système climatique en vue de services améliorés

Comblent le fossé des capacités
Renforcer la capacité de prestation de services des pays en développement pour garantir la disponibilité des informations et des services essentiels

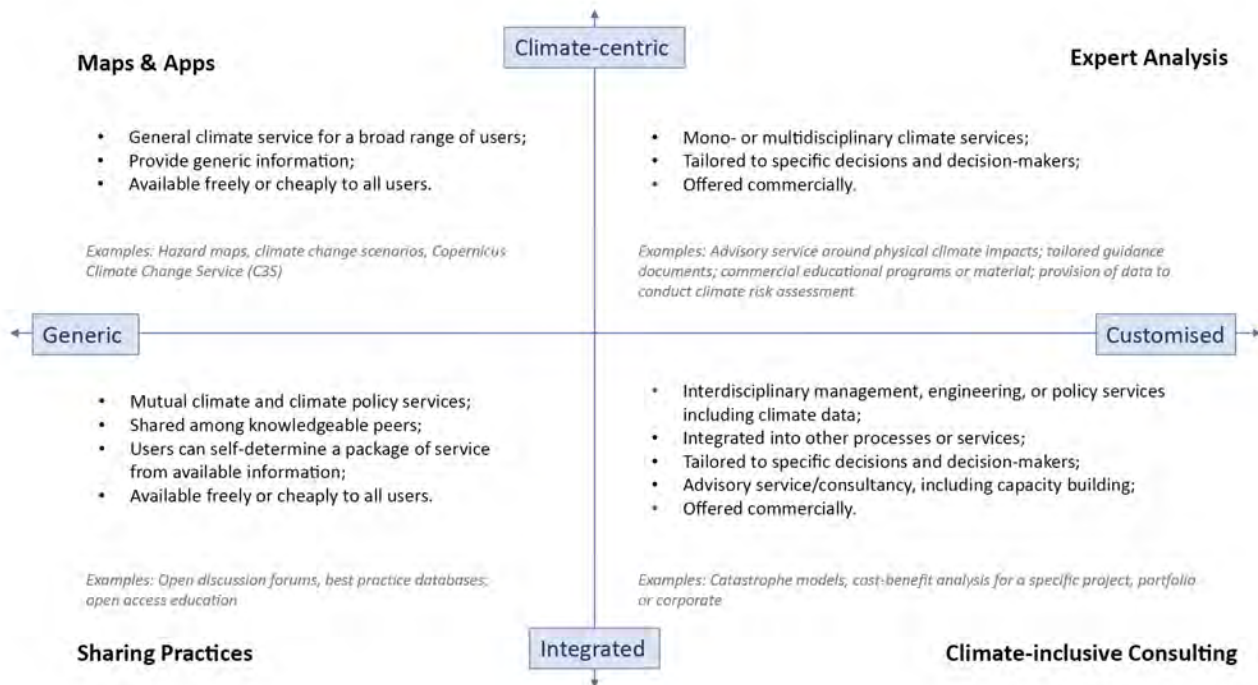


1. Cadre opérationnel et méthodologique de fourniture des services climatiques

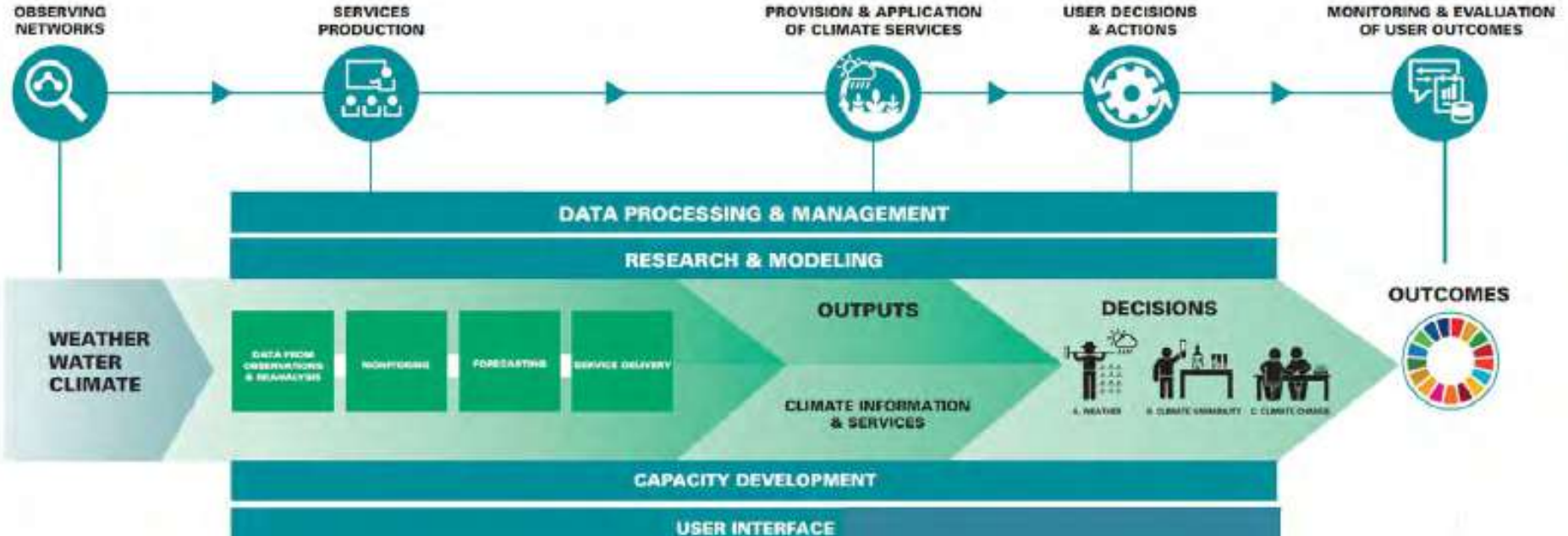
Services climatiques/climatologiques en quelques mots



Typographie des services climatiques



Chaîne de valeur des services climatiques



Cadre mondial pour les services climatologiques (GFCS)

- **Partnership** of governments and organizations
- Strengthens and coordinates the **development, delivery and use** of climate services
- Incorporation of **science-based climate information and prediction** into planning, policy and practice.
- Address global, regional and national scales
- Ensure **availability and access** to climate services
- All countries to benefit
- Operational climate services is core
- Develop and deliver services in **five priority areas**



Recentrage du cadre des services climatiques

1

Strengthen national climate service capacity and capability

- Improve availability of, access to, and use of, climate information, providing scientific and technical support
- Establish National Frameworks for Climate Services, and National Climate Fora, and link to regional structures

2

Support climate policy and finance with authoritative scientific information

- Produce regular reports and advice to support adaptation and mitigation (such as Global and Regional State of Climate reports; State of Climate Services; ENSO Bulletins; Climate Updates. Build on IPCC knowledge)
- Provide tools and expertise to help incorporate climate science into actions and investments

3

Develop Standards, Quality Management and Training

- Assess and develop Climate Service capacities (basic ⇒ essential ⇒ full ⇒ advanced) and needs
- Produce guidance on standards and competencies (through WMO's SERCOM and INFCOM)

4

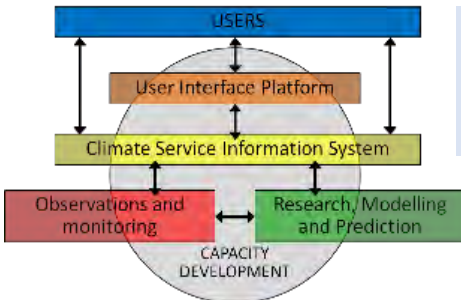
Develop the climate services value chain/cycle

- Scientific capability (including Obs., data, WCRP) ⇔ climate services information ⇔ user engagement
- Generate value and enable actions

5

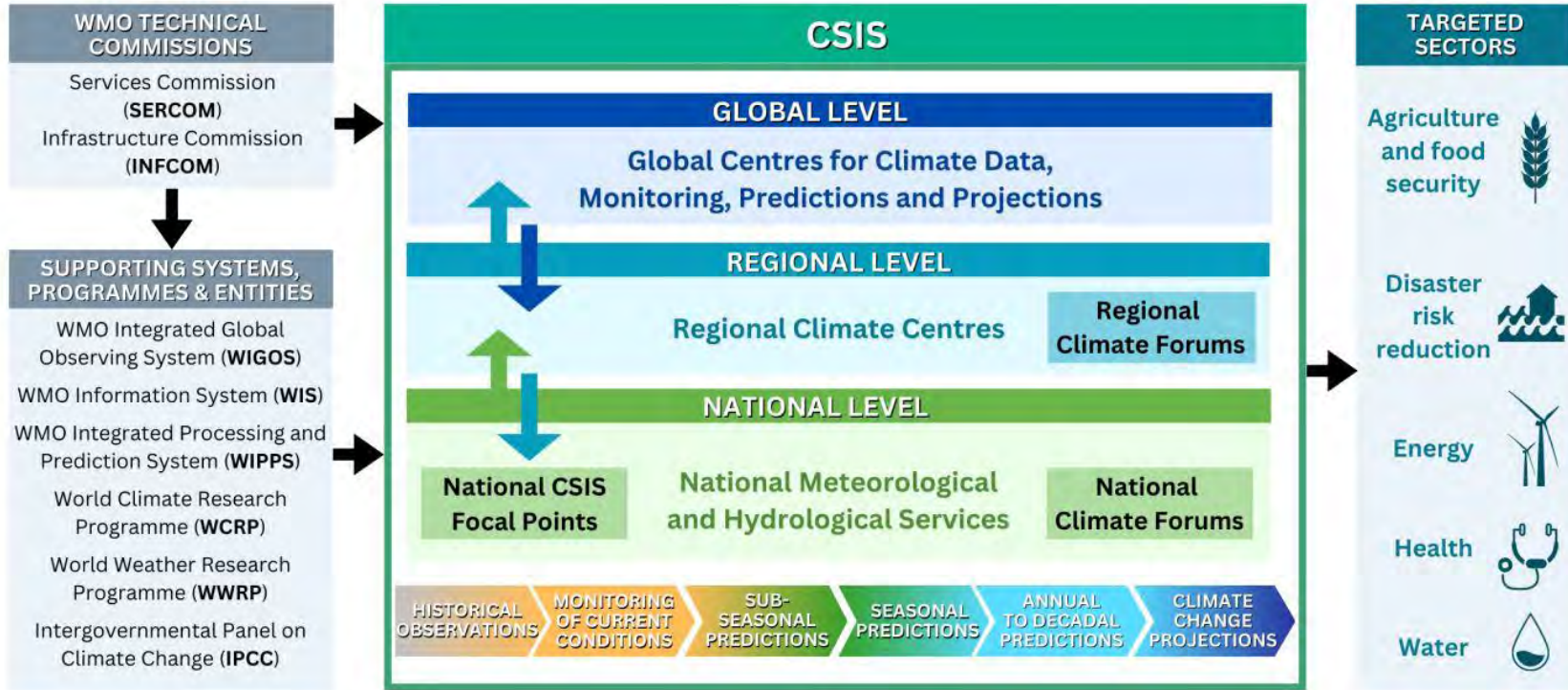
Improve visibility and effectiveness of GFCS, promote coordination

- Climate services are essential for society. Needs global-regional-national coordination
- Provide a forum for stakeholder communication, knowledge sharing, collaboration



2. Leviers de transformation du paradigme

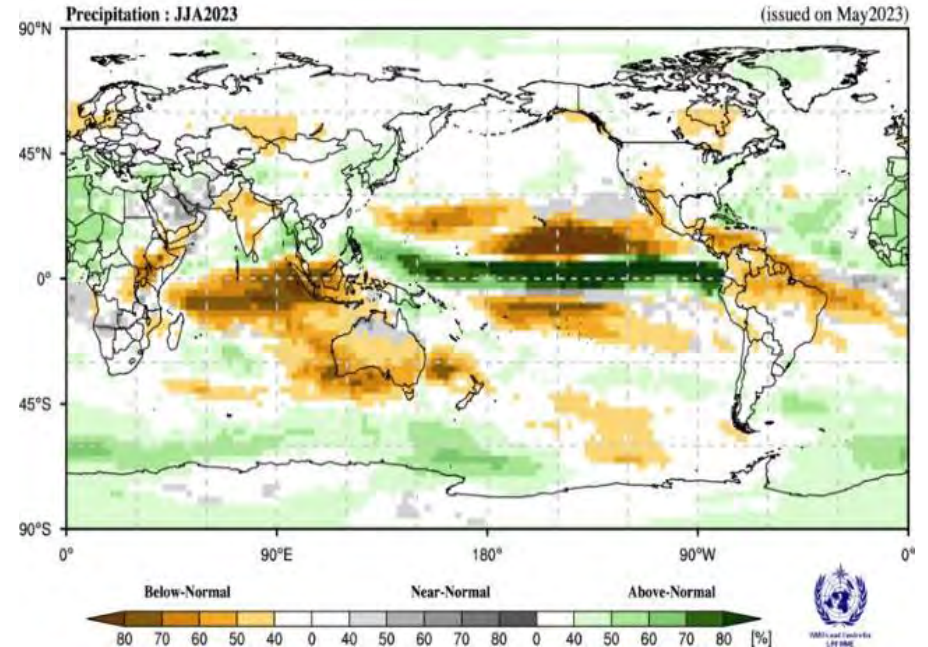
Systemes d'information pour services climatiques



Systèmes de prévision climatique opérationnelle et planétaire



- 15 Global Producing Centres (GPCs) for **Long-Range Forecasts**
- 5 GPCs for Annual to **Decadal Climate Prediction**
- Lead Centre for Long-Range Forecast Multi-Model Ensemble
- Lead Centre for Annual to Decadal Climate Prediction
- Lead Centre for Sub-Seasonal Forecast



Probabilistic multi-model ensemble precipitation forecast for June-July-August 2023

Exemples de résultats de prévision climatique

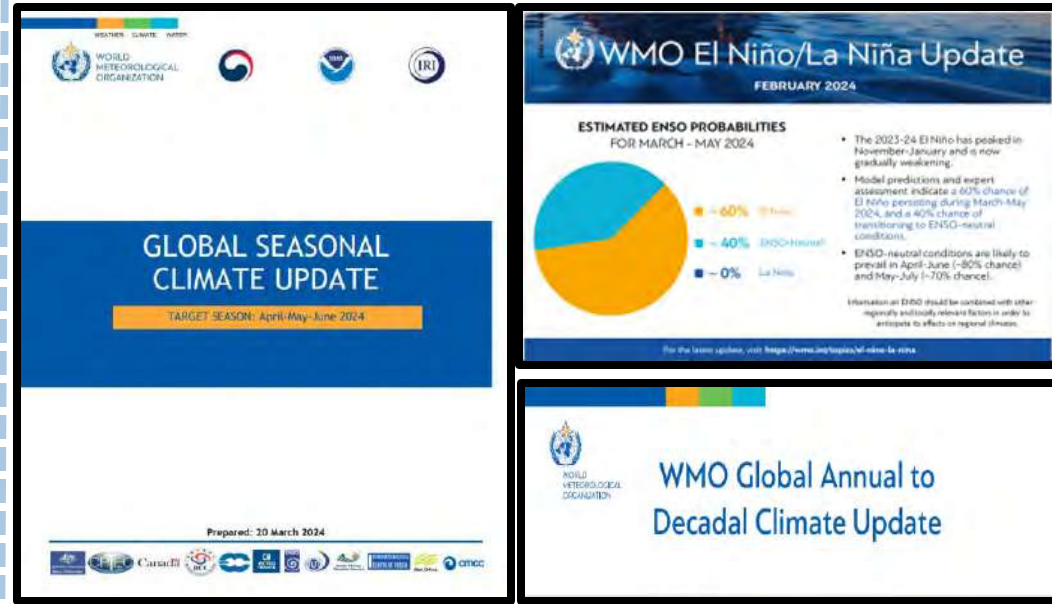
17 May 2023 - Global temperatures set to reach new records in next 5 years

*“There is **66% chance** that annual global surface temperature will temporarily exceed 1.5 °C above pre-industrial levels for at least one of the next five years .”*

*“There is a **98% likelihood** that **at least one of next five years will be warmest on record.**”*

“El Niño and climate change will likely combine to fuel global temperature increase.”

“Arctic heating is predicted to be more than three times higher than the global average.”



Échelles temporelles des projections climatiques



Site-specific report

Get an instant climate change overview for any location world-wide.



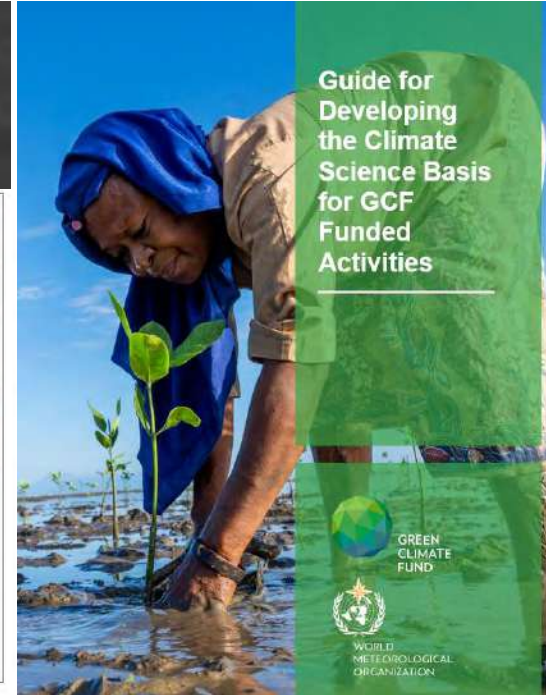
Data Access Platform

Download pre-calculated climate indicators and explore interactive maps and graphs.



Climpact

Calculate climate indicators using your own weather and climate data.



<https://climateinformation.org/>

Centres climatiques régionaux

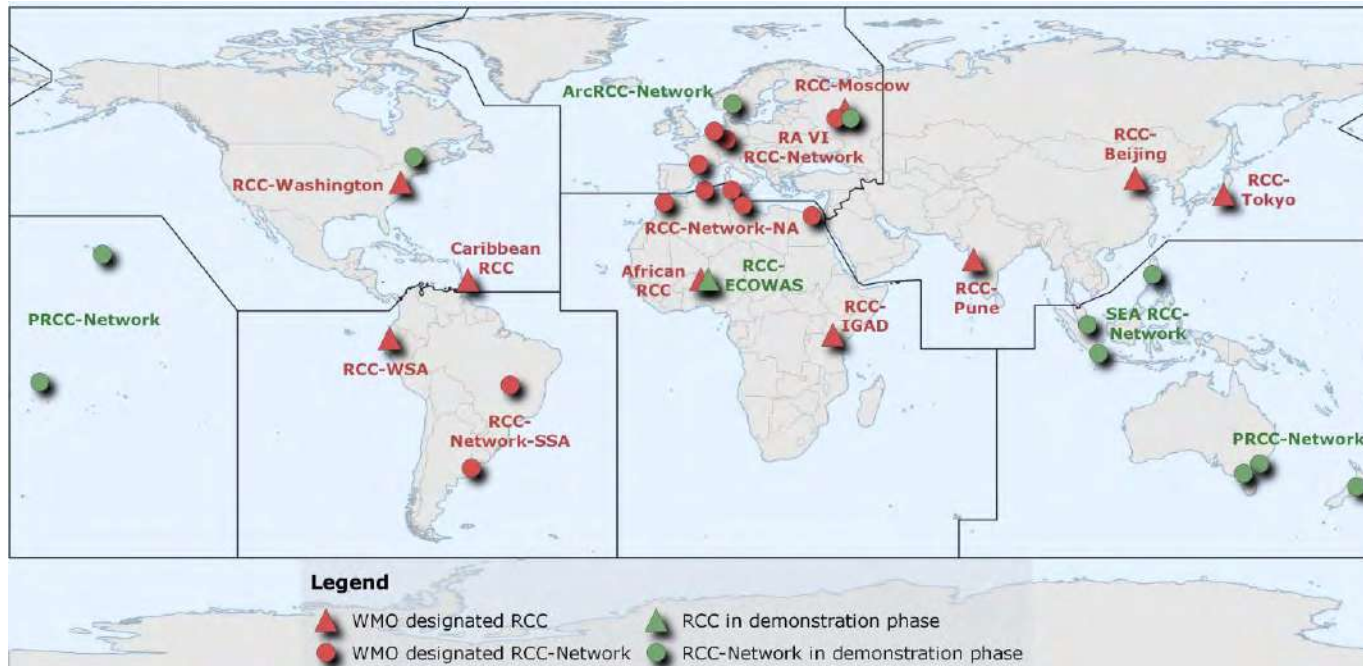
Centres of Excellence to create regionally-oriented products and serve countries

Mandatory functions

- Long-Range Forecasting
- Climate monitoring
- Data services
- Training

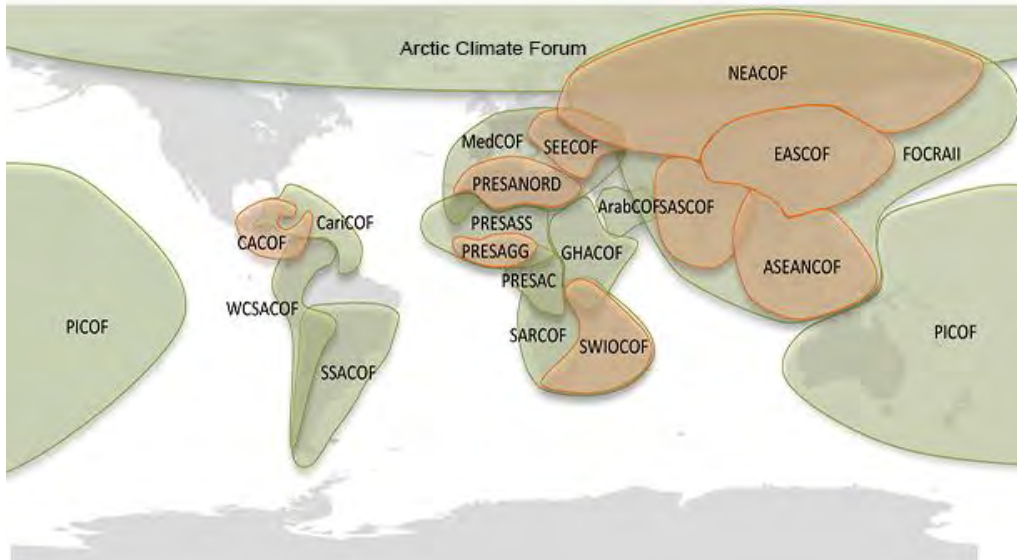
Highly recommended functions

- Climate prediction and projection
- Non-operational data services
- Coordination
- Training and capacity building
- Research and development



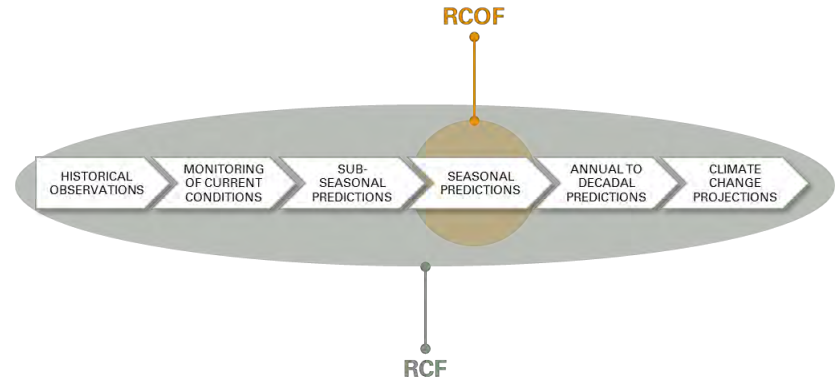
Forums climatiques régionaux

WMO Regional Climate Outlook Forums (RCOFs)

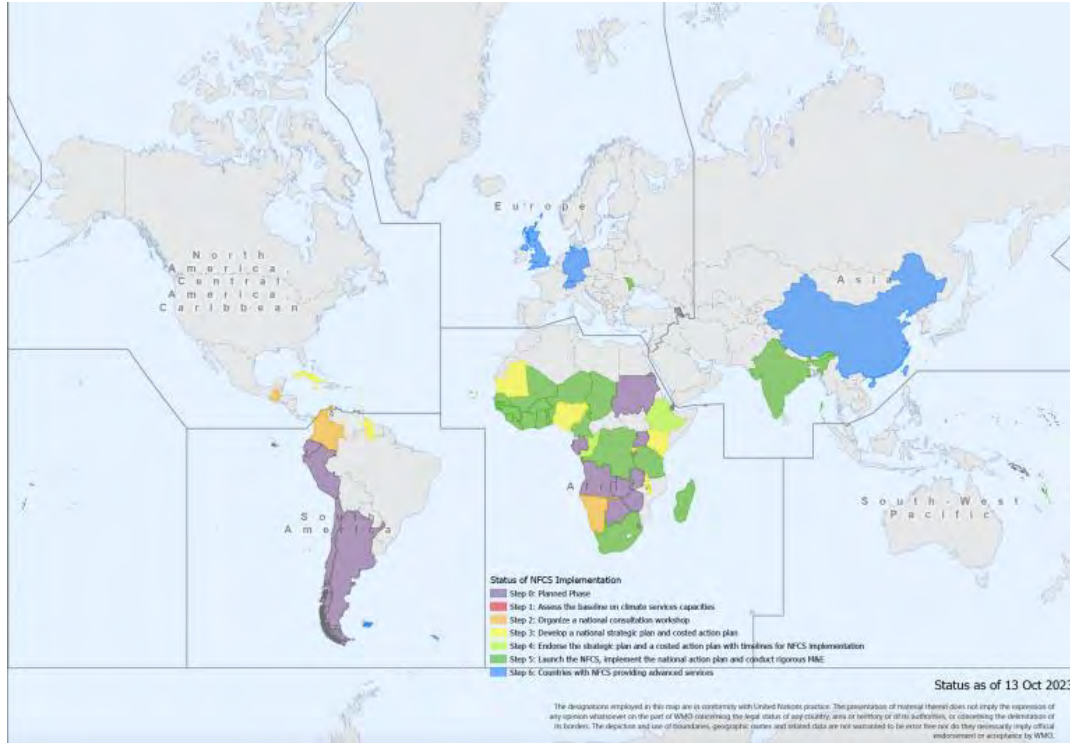


Regional Climate Forums (RCFs)

Evolve RCOF concept to RCF to encompass a range of products beyond seasonal time scale and better address Members' requirements.



Cadres nationaux pour les services climatiques



National Framework for Climate Services (NFCS)

Multi-stakeholder user interface platforms enabling the development and delivery of climate services at country level



India NFCS stakeholder Consultation Workshop, 5 – 6 Oct 2023

Co-conception et opérationnalisation de produits ciblés

Service delivery track	System operationalization track
Identification of priority products and services across sub-region (e.g. from national plans, NDCs, etc.)	Assess NMHS and WMO regional centre systems and services to identify capacity development and technical assistance needs
Regional sector-specific workshops/processes to develop tailored product specifications	Design/propose measures to enhance data and products availability through greater systems operationalization on sub-regional scales
Preparation of additional national datasets as needed for tailored products	Use Regional Climate Forums (RCFs) to plan and prepare for operational release of priority tailored products identified under the service delivery track
Country-level service delivery system/communication channels identified/established (NMHS partnership with sector stakeholders)	Introduce priority products operationally at national level, with support from the WMO Regional Centre and GPCLRFs
Delivery of tailored products and user feedback	Assimilation of feedback for forecast system and tailored product improvements
Assessment of socio-economic benefits (essential for sustainability)	Assessment of country-level climate services capacity improvements

Recherche, modélisation et prévision

WCRP Lighthouse Activities

New Core Projects with potential to enhance climate services and guide research based on societal needs

WCRP Coupled Model Intercomparison Project (CMIP)

WCRP Coordinated Regional Climate Downscaling Experiment

Basis for quantitative climate service information and input for adaptation and mitigation

Artificial Intelligence/Machine Learning (AI/ML) methods

Convergence of High-Performance Computing (HPC), big data, and Artificial Intelligence (AI) methodologies

Kilometre-scale earth system modelling



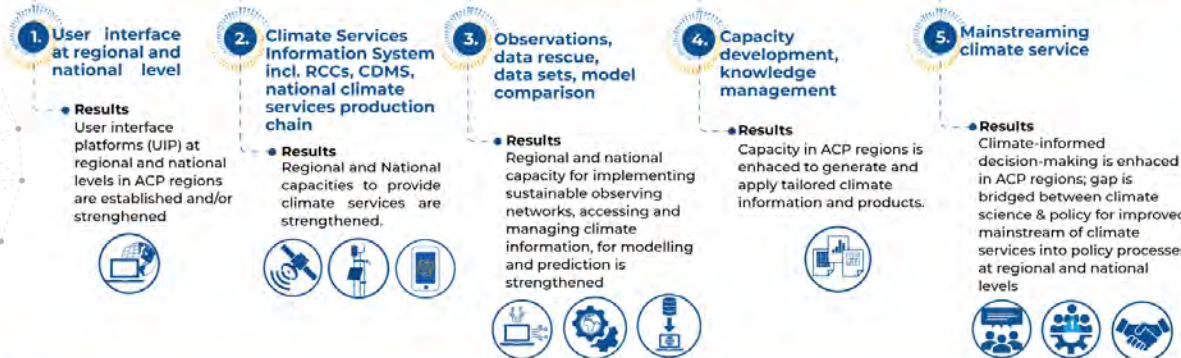
Left: picture from space taken by Apollo 17 astronauts on 7 December 1972. Right: Simulated visible satellite image from a 1.25 km resolution simulation of the ICON model initialized with reanalysis fields on 5 December 1972 by NVIDIA., WMO Bulletin vol 7(29, 2023)

3. Applications dans les régions Afrique-Caraïbes-Pacifique

Intra-ACP Climate Services and Related Applications (ClimSA)

Overview

Outputs



Outcome

Broadened provision of policy-and-decision-supporting climate information services

Overall Objective

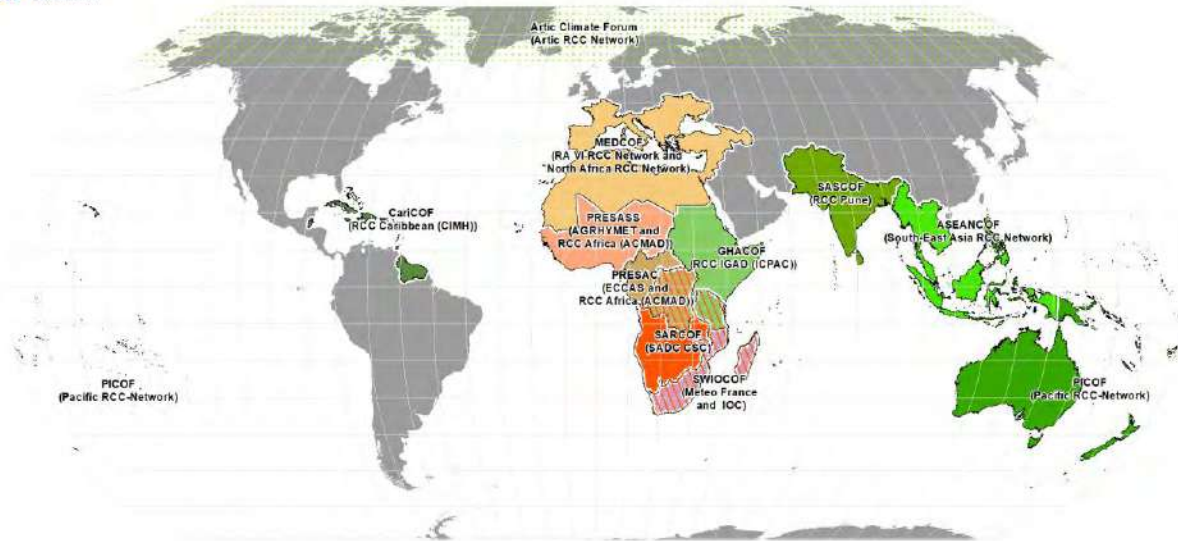
Decision makers in climate-sensitive sectors take information and evidence-based actions that help society to adapt to climate variability and change.

Global Framework for Climate Services

Guides pour la prévision saisonnières objectives



WMO RCOF domains



Dynamical climate models, including multi-model ensembles

Quality controlled regional observational databases for forecast verification

Improved understanding of climate variability and predictability

Global model evaluation and selection

Regional calibration and bias correction

Tailored seasonal forecast products



GHACOF (ICPAC)



Deliverables:

Output 2 - Operational status and capacities of RCC-IGAD: an evaluation and recommendations for future development (Oct 2023)

Output 3 - Guidance for production of objective seasonal forecasts for the Greater Horn of Africa (GHA) region (Apr 2021)

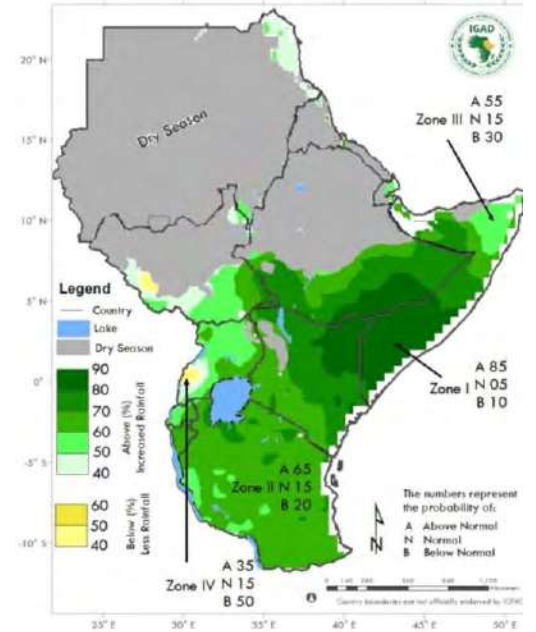


Priorities 2024-2026

- Gap filling in the observation network & temperature monitoring
- Climate Watch
- KMD calibration laboratories (ISO 17025)
- Launch of Kenya NFCS

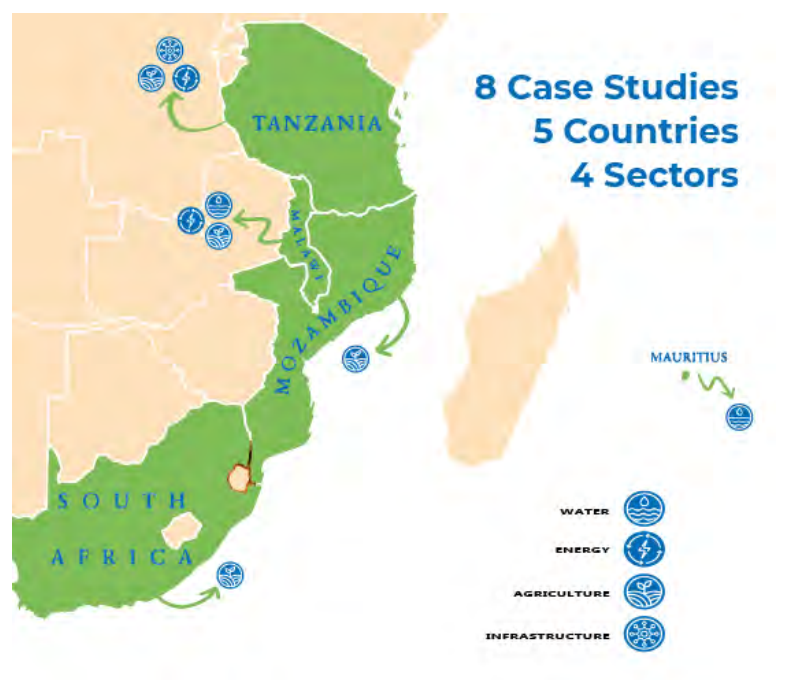


UK Met Office



October-December (OND) 2023
 RAINFALL OUTLOOK

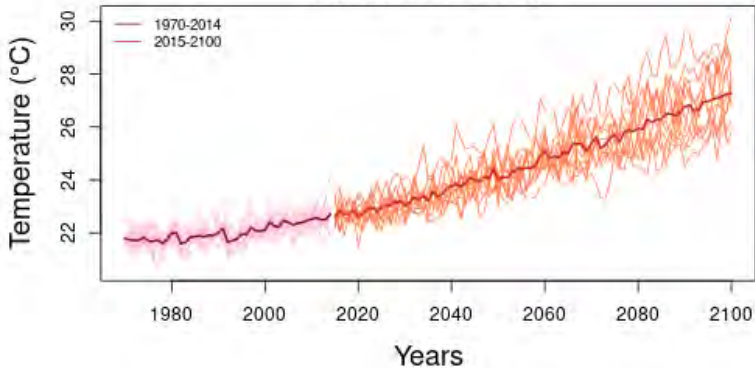
Full value-chain Optimized Climate User-centric Services for Southern Africa (FOCUS-Africa)



- ❑ Partners: WEMC, TMA, TANESCO, UKMO, Lgi
- ❑ Key findings
 - User engagement and collaboration – Tanzania November 2023
 - Hydropower model
 - Wind and solar
 - Downscaled seasonal climate information
- ❑ Challenges
 - Observational data
 - Sustainability
- ❑ Next steps
 - Model performance
 - Incorporation of dam level and installed capacity

Full value-chain Optimized Climate User-centric Services for Southern Africa (FOCUS-Africa)

Bias-corrected tas CMIP6: ssp585
Interannual variability



CASE STUDY - ENERGY & WATER

MALAWI

CONTEXT

Malawi is projected to experience growing and sustained risks, particularly in the north.

Malawi heavily relies on hydropower, which is projected to be increasingly impacted by climate variability.

The study is based on data from the French Republic of Malawi, the Malawi Meteorological Service, and other stakeholders.

TOOLS & APPROACH

Hydrological model (HIM) | Multi-model ensemble (MME) | Downscaling | Statistical downscaling (SD) | Bias correction (BC) | Hydrological model (HM) | Multi-model ensemble (MME) | Downscaling | Statistical downscaling (SD) | Bias correction (BC)

EXPECTED RESULTS

1. A better understanding of the variability of the hydrological cycle and water availability.
2. Assessment of future climate change impacts on water resources and the hydrological cycle.
3. Identifying the climate change impacts on the hydrological cycle and water availability.
4. Assessing the hydrological cycle variability and water availability under different climate change scenarios.

CLIMATE SERVICES

The information for each climate service is as follows:

- Hydrological model (HM)
- Multi-model ensemble (MME)
- Downscaling
- Statistical downscaling (SD)
- Bias correction (BC)

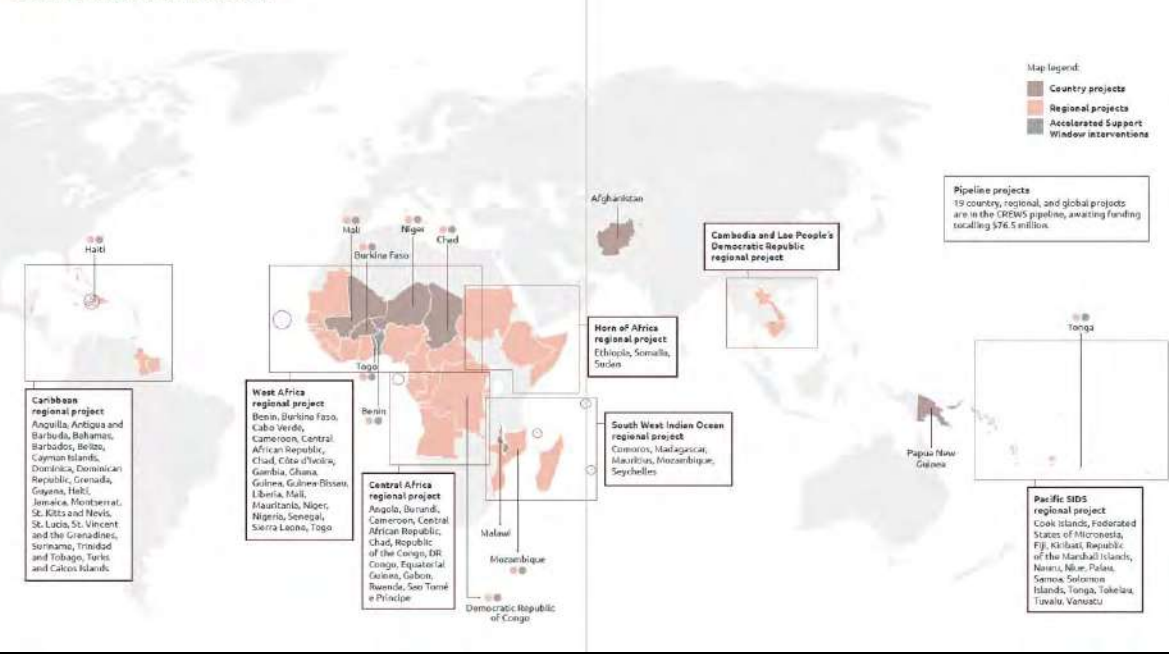
THE TEAM

RESEARCHER: EDF, WITS, UCT, WEMC, DCCMS
SERVICE PROVIDER: THE USER
FOCUS-AFRICA

- ❑ Partners: EDF, WITS, UCT, WEMC, DCCMS
- ❑ Key findings
 - Bias-corrected projections show an increase in temperature (+3.5°C by 2100 for SSP5-8.5)
 - Enhanced precipitation cycle (+30% in autumn by 2100 for SSP5-8.5)
 - Downscaled seasonal climate information
- ❑ Challenges
 - Running hydrological model with 4 SSPs x 11 GCMs climate change scenarios
 - Sustainability
- ❑ Next steps
 - Produce hydro-climatic indicators and Fact Sheets to feed the Climate Service

Climate Risks & Early Warning Systems (CREWS)

CREWS Initiative in action



9 CREWS Members

- Canada joined by pledging 10 million CAD over next 4 years

18 country, regional and global projects – up from 15 in 2021

- 3 short-term, quick impact interventions
- 20 regional, national and global projects in pipeline or to launch

282 million extra people to have stronger weather and climate services via 3 new multi-year country and regional projects

23 countries' supported by CREWS affected by **conflict or fragility**

8 countries with stronger governance on hydro-met and climate services

- 3 decrees adopted in DR Congo, Mozambique and Togo
- 5 Pacific countries validated national strategic plans and/or frameworks

16 natural hazards posing risk to life for which CREWS is increasing forecasting capacity through projects

111 million more people better protected by new early warning systems and forecasting put in place with CREWS support

- Covering mainly drought, floods, sand and dust, coastal inundation and other marine hazards in 15 countries

15 countries in Central and West Africa used best alerting practice to issue warnings with CREWS support

- Forewarning 271 million people in total on different hazards to enable timely life-saving action

US\$ 105.6 million received to date in signed contributions to CREWS Trust Fund since 2015

- A 36% increase since 2021 – and another \$36 million pledged

US\$ 155 million more needed by 2025 to scale up CREWS early warning action and meet immediate demands



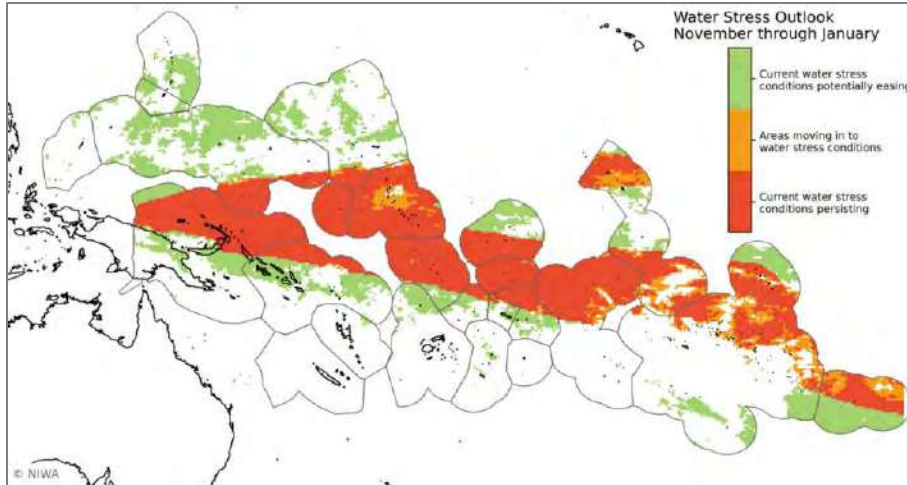
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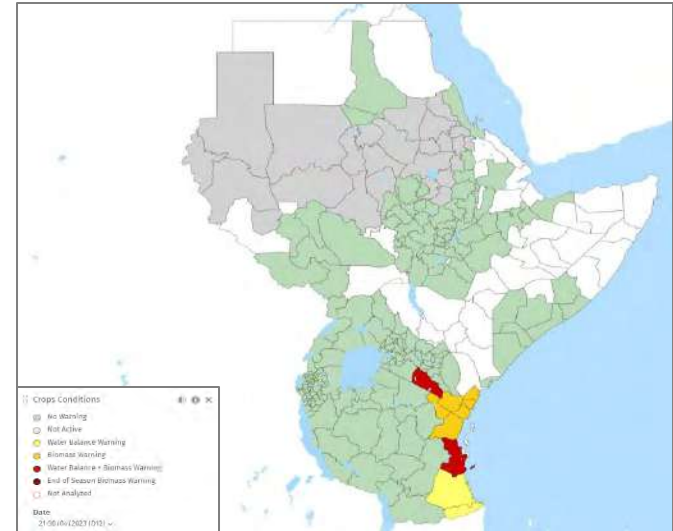
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Exemples d'applications sectorielles ciblés



Water stress outlook
Source: Pacific RCC-Network



Crop conditions
Source: WMO RCC-IGAD