The World Meteorological Organization's perspective on climate services



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WMO OMM

World Meteorological Organization Organisation météorologique mondiale

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OUTLINE

1. FOUNDATION

2. MECHANISMS AND ENTITIES FOR LONG RANGE FORECASTS



CLIMATE

LIMAT

remps

3. REGIONAL CLIMATE OUTLOOK FORUMS

WMO OMM

4.OBJECTIVE SEASONAL FORECASTS

World Meteorological Organization Organisation météorologique mondiale

ABOUT WMO

- UN Specialized Agency on weather, climate & water with 193 Member States
- International Maritime Organization (IMO), 2nd oldest UN Agency, 1873- with science and technology based action
- WMO established 23 March 1950
- Coordinates work of > 200 000 national experts from meteorological & hydrological services, academia & private sector





Co-Founder and host agency of IPCC

WMO REGIONAL STRUCTURE





WMO – ROLE AND MANDATE

VISION 2030

OVERARCHING

By 2030, a world where all nations especially the most vulnerable, are more resilier to the socioeconomic impact of extreme weathe climate, water and other environmental events, and empowered to boost their sustainable development through the best possible services whether over land, at sea or in the air



	PRIORITIES	CORE VALUES	LONG-TERM GOALS	STRATEGIC OBJECTIVES 2020-2030 FOCUS
s,	Enhancing preparedness for, and reducing losses of life and property from hydrometeorologi cal extremes	Accountability for Results and Transparency	Better serve societal needs Delivering authoritative, accessible, user-oriented and fit-for-purpose information and services	 Strengthen national multi-hazard early warning/alert systems and extend reach to better enable effective response to the associated risks Broaden the provision of policy- and decision-supporting climate information and services Further develop services in support of sustainable water management Enhance the value and innovate the provision of decision-supporting weather information and services
, nt			Enhance Earth system observations and predictions Strengthening the technical foundation for the future	 Optimize the acquisition of observation data through the WMO Integrated Global Observing System Improve and increase access to, exchange and management of current and past Earth system observation data and derived products through the WMO Information System
er,	Supporting	Collaboration and Partnership		 Enable access and use of numerical analysis and prediction products at all temporal and spatial scales from the WMO seamless Global Data Processing and Forecast System
	climate-smart decision-making to build resilience and adaptation to climate risk		Advance targeted research Leveraging leadership in science to improve understanding of the Earth system for enhanced services	 Advance scientific knowledge of the Earth system Enhance the science-for-service value chain ensuring scientific and technological advances improve predictive capabilities Advance policy-relevant science
; 5,	Enhancing socioeconomic value of weather, climate, hydrological and related environmental services	Inclusiveness and Diversity	Close the capacity gap Enhancing service delivery capacity of developing countries to ensure availability of essential information and services	 Address the needs of developing countries to enable them to provide and utilize essential weather, climate, hydrological and related environmental services Develop and sustain core competencies and expertise Scale-up effective partnerships for investment in sustainable and cost-efficient infrastructure and service delivery
			Strategic realignment of WMO structure and programmes Effective policy- and decision- making and implementation	 Optimize WMO constituent body structure for more effective decision-making Streamline WMO programmes Advance equal, effective and inclusive participation in governance, scientific cooperation and decision-making

CLIMATE RISK MANAGEMENT – ADAPTATION ACTIONS



Forecast lead-time

CLIMATE SERVICES CAPACITY WORLDWIDE

CLIMATE SERVICES

- No unique definition
- Climate service is the provision of climate information for use in decision-making.
- Number and diversity of organizations that make up the landscape of climate services is growing and evolving.



GLOBAL FRAMEWORK FOR CLIMATE SERVICES

- User Interface Platform: Means for users and climate service providers to interact.
- Observations and monitoring: Climate observations necessary to meet the needs of climate services are generated.
- Research, Modeling and Prediction: Needs of climate services within research agendas
- **Capacity building:** Development of necessary institutions, infrastructure and human resources to provide effective climate services



MECHANISMS AND ENTITIES FOR LONG-RANGE FORECASTS

Seasonal forecasts can help reduce the socio-economic losses associated with seasonal variability, and protect life and property.

WEATHER AND CLIMATE PREDICTION REVOLUTION



Adapted from White et al. 2017

GLOBAL DATA-PROCESSING AND FORECASTING SYSTEM

Manual on the Global Data-processing and Forecasting System

Annex IV to the WMO Technical Regulations

2019 edition





WORLD METEOROLOGICAL ORGANIZATION

- International mechanism that coordinates Member capacities to meet the forecasts needs of users
- Worldwide network of operational centres operated by WMO Members
- Manual on the Global Data-processing and Forecasting System - Annex IV to the WMO Technical Regulations
- Enables delivery of harmonized services
- Enables scientific and technological advances made in meteorology and related fields to be accessible and exploitable by WMO Members
- Facilitate cooperation and the exchange of information, thereby also contributing to capacity development among developing countries

CLIMATE SERVICES INFORMATION SYSTEM



Operational and institutional mechanisms to collate, process, exchange and disseminate information about past, present and future climate nationally, regionally and globally

A Regional Approach to Implementing the Climate Services Information System (CSIS-R)

🛞 WMO



GLOBAL ENTITIES FOR LONG-RANGE FORECASTS (GPCs)



GLOBAL ENTITIES FOR LONG-RANGE FORECASTS (LEAD CENTRE)



GLOBAL PRODUCING CENTRES - SEASONAL CLIMATE OUTLOOK

Probabilistic Multi-Model Ensemble Forecast

Beijing, CPTEC, ECMWF, Exeter, Melbourne, Montreal, Moscow, Offenbach, Seoul, Tokyo, Toulouse, Washington

Precipitation : SON2021



C3S multi-system seasonal forecast

Prob(most likely category of precipitation)

ECMWF/Met Office/Météo-France/CMCC/DWD/NCEP/JMA/ECCC

SON 2021

SUPPORT FOR HUMANITARIAN ACTION-GLOBAL SEASONAL CLIMATE UPDATE & ENSO UPDATE



	Countries / regions	Historically, when La Niña shifts rainfall patterns (months)	Historical La Niña impacts on rainfall (dry/wet) [3]	3-4 month seasonal forecast [4]	
1		[2]			
2	Asia-Pacifc				
63	Colombia	Jun to Mar	wet	Above-normal	
64	Peru (northwest)	Jun to Apr	dry	Below-normal	
65	Africa				
66	Somalia	Jul to Sep	dry	Below-normal	
67	Ethiopia (southwest)	Nov to Mar	dry	Below-normal Below-normal	
68	Ethiopia (north)	Jul to Sep	wet		
69	South Sudan (southeast)	Nov to Mar	dry	No signal and below-normal in border regions	
70	South Sudan (north)	Jul to Sep	wet	No signal and above-normal central north	
71	Sudan	Jul to Sep	wet	Normal and no signal in extreme S	
72	Djibouti	Jul to Sep	wet	Below-normal	
73	Eritrea	Jul to Sep	wet	Below-normal	
74	Chad	Jul to Sep	wet	Normal	
75	Central African Republic	Jul to Sep	wet	No signal	
76	Niger	Jul to Sep	wet	Normal	
77	Nigeria	Jul to Sep	wet	Normal to below-normal in SE	
78	Cameroon	Jul to Sep	wet	No signal and below-normal in W and SE	
79	Mali	Jul to Sep	wet	Normal and below-normal in SW	
80	Burkina Faso	Jul to Sep	wet	Normal	
81	Benin	Jul to Sep	wet	Normal	
82	Тодо	Jul to Sep	wet	Normal	
83	Ghana	Jul to Sep	wet	Below-normal	
84	Cote d'Ivoire	Jul to Sep	wet	Below-normal in E and above-normal in W	
85	Mauritania	Jul to Sep	wet	Below-normal and normal in E	
86	Senegal	Jul to Sep	wet	Below-normal	

WMO GLOBAL ANNUAL TO DECADAL CLIMATE UPDATE

Ensemble mean forecast for 2021-2025

surface temperature





Probability of above average surface temperature





REGIONAL ENTITIES FOR LONG-RANGE FORECASTS (RCC)



19

WMO REGIONAL CLIMATE CENTRES - FUNCTIONS



LONG RANGE FORECASTS

- Interpret and assess LRF
- Generate tailored Products
- Perform verification of LRF
- Provide on-line access to RCC products/services
- Assess use of RCC products
- Generate consensus statemer on sub-regional forecasts



- Perform climate diagnostics
- Hstorical reference climatology
- Regional climate watch

HIGHLY RECOMMENDED

- Climate prediction and projection
- Research and development
- Non-operational data services
- Coordination functions

TRAINING - RCC PRODUCTS

- Provide information on methodologies and product specifications
- Coordinate training for RCC users

REGIONAL CLIMATE OUTLOOK FORUMS

Platform that brings together climate experts and sector representatives from countries in a climatologically homogenous region to provide climate prediction and information – with the aim to gain socio-economic benefits in climate sensitive sectors

REGIONAL CLIMATE OUTLOOK FORUM



MOVING FROM CLIMATE OUTLOOK FORUM TO CLIMATE FORUM

1. Use of consensus/subjective based forecast with drawbacks

- a. Traceability and reproducibility
- b. Usability and digital format
- c. Mechanical blending process
- d. Advances in sub-seasonal and seasonal forecasting

2. EC-69 Decision 4.5/2 decided to:

 "consider the adoption of objective sub-seasonal and seasonal forecasts as an overarching technical strategy, particularly at regional and national levels, promoted through RCOFs ..."

3. 2017 Global review of RCOFs

 An expanded product portfolio, based on standardized operational practices, including sub-seasonal products, and climate change-related products such as observed trends and attribution of extreme events

NATIONAL FRAMEWORK FOR CLIMATE SERVICES – 5 STEPS APPROACH

Step-by-step Guidelines for Establishing a National Framework for Climate Services

Assessing the baseline on climate services at national level to identify users and Step 1 their needs, providers and their capacities and map existing services Initial National Consultation Workshop to identify gaps and key priorities for Step 2 climate services Step 3 Joint Development of National Strategic and Action plan Step 4 High-level endorsement of the National Strategic and Action Plan Launch of the Framework at the national level, National Strategic and Action Step 5 Plan, rigorous monitoring and evaluation

OBJECTIVE SEASONAL FORECASTS

Seasonal forecasts produced through well-documented procedure, amenable to verification

OBJECTIVE SEASONAL FORECASTS - RATIONAL

Guidance on Operational Practices for Objective Seasonal Forecasting

2019 edition



WORLD METEOROLOGICAL ORGANIZATION

- Follow a **traceable**, **reproducible**, and welldocumented procedure, amenable to verification.
- Use dynamical climate models, including multimodel ensembles
- Establish quality controlled **observational databases** for forecast verification
- Identify, assess and monitor drivers of predictable climate variability
- Follow forecast verification standards
- Provide forecast information together with historical performance
- Use non-technical language to communicate uncertainty
- Provide seasonal forecasts as well as regular updates on a fixed operational schedule
- Establish user feedback and product upgrade mechanisms

WMO-No. 1246

DECISION 9 (EC-72) - OPERATIONALIZATION OF OBJECTIVE SEASONAL FORECASTS AND TAILORED PRODUCTS ON SUB-REGIONAL SCALES

- 1. To endorse the proposal on operationalization of **objective seasonal forecasts and tailored products** on sub-regional scales with country-level service delivery
 - a) Guide development of climate services information system
 - b) Development of normative and regulatory material

2. Requests:

- a) Technical Coordination Committee to **identify activities and coordination mechanism**
- b) Regional Associations to facilitate collection of **users requirements** and develop a roadmap **resources mobilization**
- c) Climate Coordination Panel to **oversee implementation, monitor and manage progress**
- d) INFCOM and SERCOM to provide technical coordination for implementation
- e) Research Board to facilitate transition of research into operation incl. S2S
- f) WMO Secretary General to facilitate assistance of RCCs, RCFs and NMHSs

PROJECT OVERVIEW – STRENGTHENING CAPACITY OF RCC AND NMHS



- Strengthen country-level capacity to produce and deliver tailored products and services and addressing **national** and sub-regional priority needs
- Target **priority sectors** including water, agriculture, disaster risk reduction, energy and health, all identified in countries NDCs
- Co-develop and co-design tailored climate information relevant for climate sensitive sectors including hydrological tailored products and services

 Facilitate access, use, verify, exchange, analyze and interpret high quality, relevant and skillful probabilistic seasonal forecasts at regional and national levels

Communicate information to country-level and educate users and stakeholders

• Assess **socio-economic benefits**

IMPLEMENTATION PHASE – WHICH BODIES TO ENGAGE WITH?

WP5

WP 6

WP 7

WP 8

	COMPONEN	NTS	COMPONENTS		
[Regional standard observational dat	aset for routine verification	Regional climate outlook stat	ement standardized	
WP 1	Data rescue & digitization, data exchange (WIS), data management system (CDMS), reference observational databases	<mark>INFCOM</mark> , <mark>SERCOM (SC-</mark> CLI), RB, RA, SECRETARIAT, PARTNERS	Co-design of communication and outreach material	SERCOM (SC-CLI, SC-AGR, SC- DRR, SG-HEA, SG-ENE, SG-URB),, HYDROLOGY (SC-HYD), PARTNERS (C3S, GFCS)	
	Enhanced RCCs and NMHSs capacity	on objective LRF	High priority tailored products routinely delivered at country level		
WP 2	Long Range Forecasts, climate drivers, model performance, reliability, calibration, probability forecast, verification, downscaling	<mark>INFCOM</mark> , <mark>SERCOM (SC- CLI)</mark> , RB , RA, SECRETARIAT, PARTNERS	NMHS capacity to generate and interpret tailored seasonal prediction products, National Climate Forums (NCFs); Co-product	SERCOM (SC-CLI, SC-AGR, SC-DRR, SG-HEA, SG-ENE, SG-URB),, HYDROLOGY (SC-HYD), PARTNERS (C3S, GFCS)	
	Subset of models established for use predictions at regional and national	in ensemble seasonal	Climate outlook updated monthly at regional and national levels		
WP 3	Refinement of models ensemble, predictability, seasonal forecasts, global-regional-national data exchanges	<mark>INFCOM</mark> , <mark>SERCOM (SC-CLI)</mark> , RB, SECRETARIAT, PARTNERS, WCRP	Monthly prediction updates tailored to the decision-support context, digital data access through WIS and GDPFS	INFCOM, SERCOM (SC-CLI, SC-AGR, SC-DRR, SG-HEA, SG-ENE, SG-URB),, HYDROLOGY (SC-HYD), RA, PARTNERS	
	Calibration and downscaling approaches identified for use in		Verification and upgrading mechanism established		
WP4	Bias correction, calibration and downscaling	INFCOM, SERCOM (SC- CLI),, HYDROLOGY (SC-HYD) RB, SECRETARIAT, PARTNERS, WCRP	Standard Operating Procedures at the regional and national levels, and a system of annual status reports to facilitate monitoring and evaluation	<mark>INFCOM,</mark> <mark>SERCOM (SC-CLI),</mark> , PARTNERS	

OBJECTIVE SEASONAL FORECASTS – GREATER HORN OF AFRICA





PROGRESS AND ONGOING EFFORTS



DEVELOPING TAILORED PRODUCTS FOR SECTORS – NDC ANALYSIS + WORKSHOPS





- Co-planned stakeholder Workshops on Developing Tailored Products with partners (e.g. FAO).
- Identification of **national priorities** across each subregion
- Review NDCs of the countries covered in a specific subregion to identify the most common hazard and sector priorities
- Specifications for tailored products
- Approved Decision 6.1/2 by RA II-17(II) Facilitate collection of users' requirements

TWO-TRACKS IMPLEMENTATION STRATEGY

OBJECTIVE SEASONAL FORECASTS AND TAILORED PRODUCTS ON SUB-REGIONAL SCALES

SERVICE DELIVERY SYSTEM OPERATION Identification of priority products and services Assess NMHS and WMO regional centre systems across sub-region (e.g. from national plans, and services to identify capacity development NDCs, etc.) and technical assistance needs Design/propose measures to enhance data and **Regional sector-specific workshops/processes** products availability through greater systems to develop tailored product specifications operationalization on sub-regional scales Use Regional Climate Forums (RCFs) to plan and Preparation of additional national datasets as prepare for operational release of priority tailored needed for tailored products products identified under the service delivery track



Priority products operationally at national level, with support from the WMO RCCs and GPCLRFs



Assimilation of feedback for forecast system and tailored product improvements

Assessment of country-level climate services capacity improvements



<u>[</u>

Country-level service delivery communication channels established (with sectors)

Delivery of tailored products and user feedback

Assessment of socio-economic benefits

NEEDS FOR MANAGING CLIMATE RISKS

- 1. Tailored climate information products and advisory services
- 2. Capacity development of professionals and communities on production and **effective application of climate services**
- 3. Improved, **standardized**, **and quality controlled sector** monitoring data that is compatible with environmental and climate information
- 4. Monitoring and evaluation of the appropriate, **effective**, and costeffective use of climate information for sector decisions
- 5. Research and **prediction of sector impacts** associated with climate variability and climate change, in collaboration with the climate research community
- 6. Sustainable financial and technical support
- 7. Better **collaboration with the climate community** for interdisciplinary policy, practice and research

WEATHER CLIMATE WATER TEMPS CLIMAT EAU



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Thank you

REGIONAL CLIMATE OUTLOOK FORUMS



