

Climate and (Water)

Actual WMO priorities



WMO OMM

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Organisation météorologique mondiale

	Carbon (as CO ₂)	Carbon (as GtC)	Remaining!	
66% chance < 2°C	1000 (1010)	272 (275)	272 (275)	IPCC AR5 SPM (confirm by Rogelj et al. 2016)
2011-2015	160 (160)	44 (44)	228 (231)	Updated from Anderson 2015 (thru 2014 from Rogelj et al. 2016)
Deforestation	60 (0)	16 (0)	212 (231)	Low estimate, Anderson 2015 (not specified by Rogelj et al. 2016)
Cement use	150 (0)	41 (0)	171 (231)	Cement processing only, Anderson (not specified by Rogelj et al. 2016)
Non-CO ₂ forcing	(0) 260	(0) 71	(171) 160	(Not addressed by Anderson 2015) Rogelj et al. 2016: 66%, TAB, peak
Permafrost carbon	185	50	121 110	Shuur et al 2015, 100 GtC to end of century, assume 50% by 2050
Present emission rates, GtC / yr		8 10		Corrected for cement & deforestation LeQuéré et al. cited by Rogeli et al.

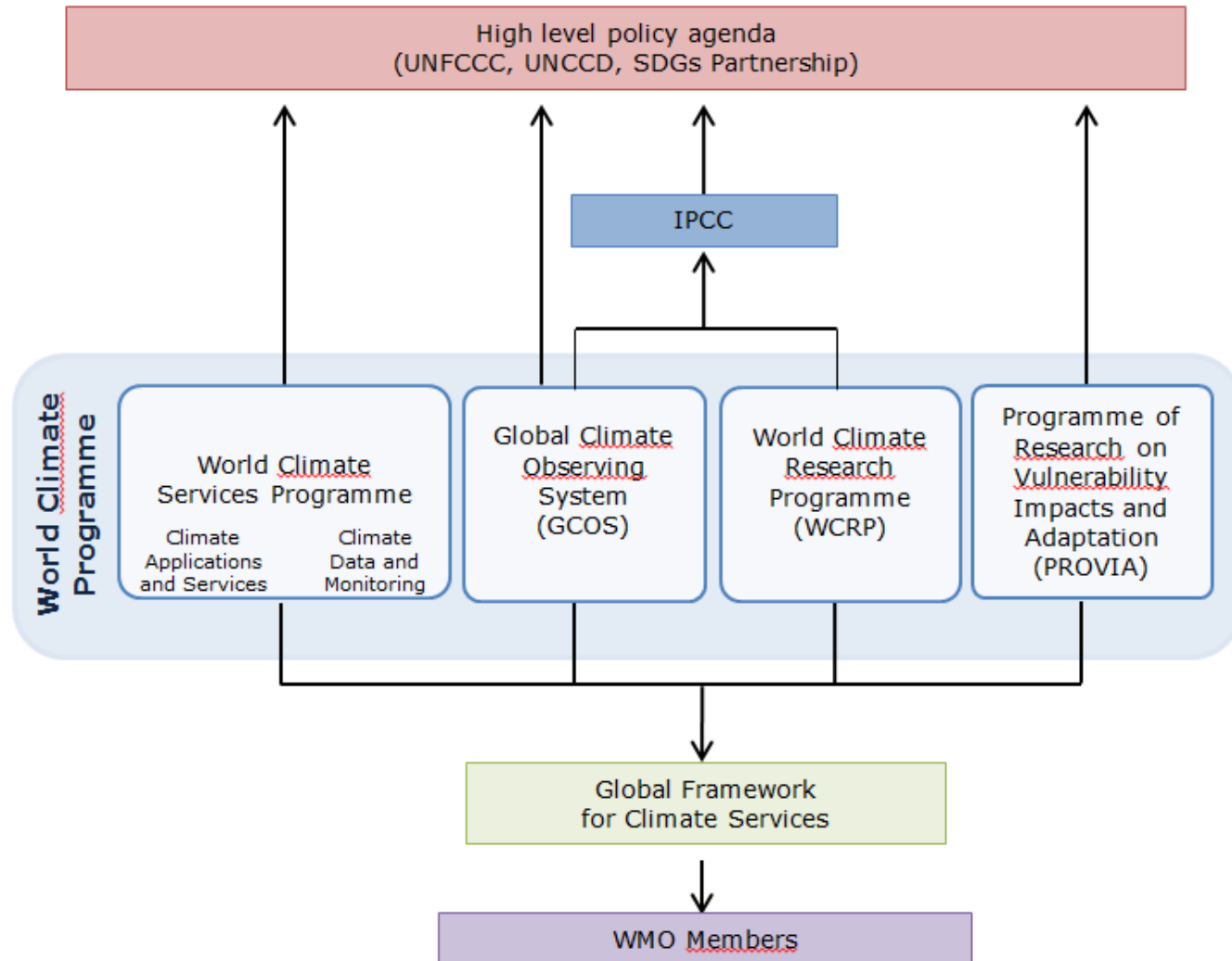
By end of century!

120: 15 years at 8 GtC per year

110: 11 years at 10 GtC per year

Years before we lose 66% chance of staying below 2°C

World Climate Programme



GFCS background

- Proposed during the third World Climate Conference in 2009
- Endorsed by 13 heads state or government, 81 ministers and 2,500 scientists
- Seeks to guide the development and application of science-based climate information and services in support of decision-making in climate sensitive sectors
- Member state governance structure
 - Inter-governmental Board on Climate Services
- Partners Advisory Committee of international organizations
 - World Bank, WHO, FAO, WFP, UNDP, IFRC, European Commission, WBCSD et al.
- 10-year initial implementation plan designed over four years by dozens of experts, backed by initial financing, in fourth year of implementation
- WMO strategic priority

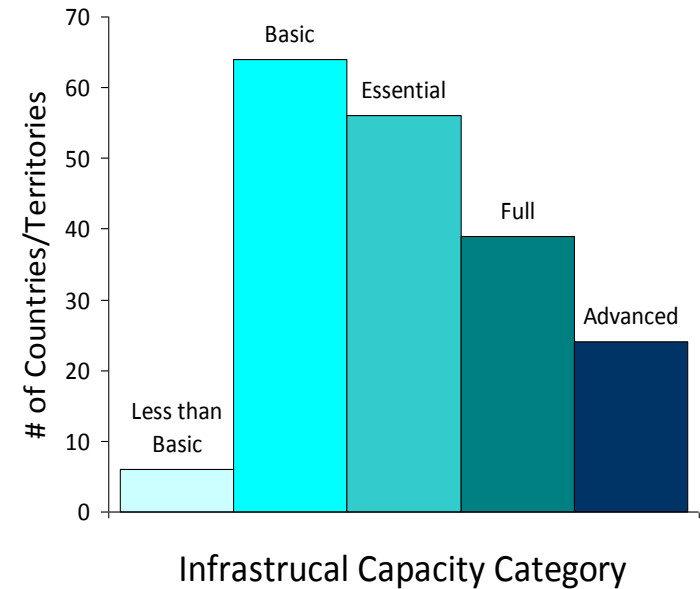
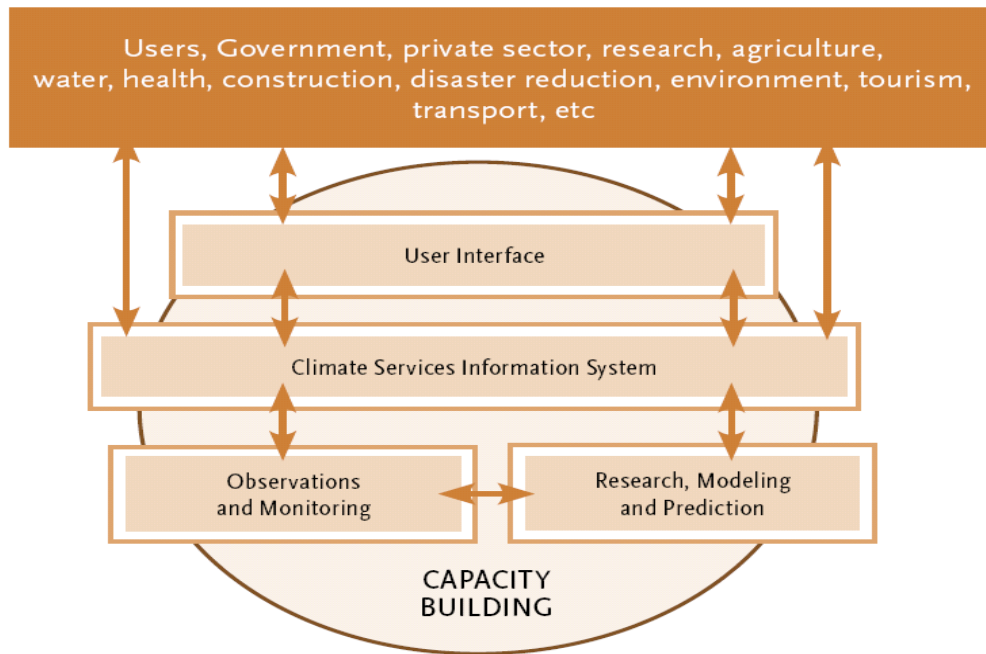


Priority areas

- ✓ **Water**
- ✓ **Disaster risk reduction**
- ✓ **Health**
- ✓ **Agriculture/food security**
- ✓ **Energy (including renewables)**



GFCS Pillars



Many countries lack the infrastructural, technical, human and institutional capacities to provide high-quality climate services.

What are Climate Services?

- Information on past, present and future climate, and on its impacts on natural and human systems
 - Historical climate data sets
 - Climate monitoring
 - Climate watches
 - Monthly/Seasonal/Decadal climate predictions
 - Climate change projections
- Improved climate-related outcomes
 - Access to the right products for decision making
 - Appropriate use, including aspects of uncertainty



Photo Credits: NASA, Pedro Sanchez, Renzo Taddei

GFCS Implementation

Five Step Approach

- Step 1: Assessing the baseline
- Step 2: Initial National Consultation Workshop
- Step 3: Joint Development of the National Action plan on Climate Services
- Step 4: High-level endorsement of the National Action Plan on Climate Services by all entities
- Step 5: Launch of the Framework at the national level, followed by implementation of the priority activities of the National Action Plan, rigorous monitoring and evaluation

GFCS Implementation

Step 1: Assessing the baseline

- What are the capacities of the country in the 5 GFCS pillars?
- Which actors make-up the national chain for climate services? Who are the stakeholders/users/clients/partners?
- What climate services are currently being provided? What are the needs? What gaps exist in climate service delivery?

Note: questionnaires are available to guide this process

GFCS Implementation

Step 2: Initial National Consultation Workshop

- Convene a workshop that brings together all national actors in the climate services space
- Workshop outcomes
 - Enhanced understanding of the needs for climate services in different user sectors
 - Improved knowledge of the existing interface mechanisms and recommendations for improvements
 - Clear understanding of capacity development needs to implement the GFCS
 - Strategic guidance on institutional arrangements, partnerships and processes required to operationalize the GFCS at national level

GFCS Implementation

Step 3: Development of the National Action plan on Climate Services

- Map the national chain for climate services specifying mandates/roles
- List ongoing climate service initiatives, baseline assessments, and list priority activities
- Establish a Governance mechanism for the National Framework, which will bring together all actors (multi-ministerial)
- Draft legislation to clarify the legal framework

GFCS Implementation

Step 4: Endorsement of the National Action Plan

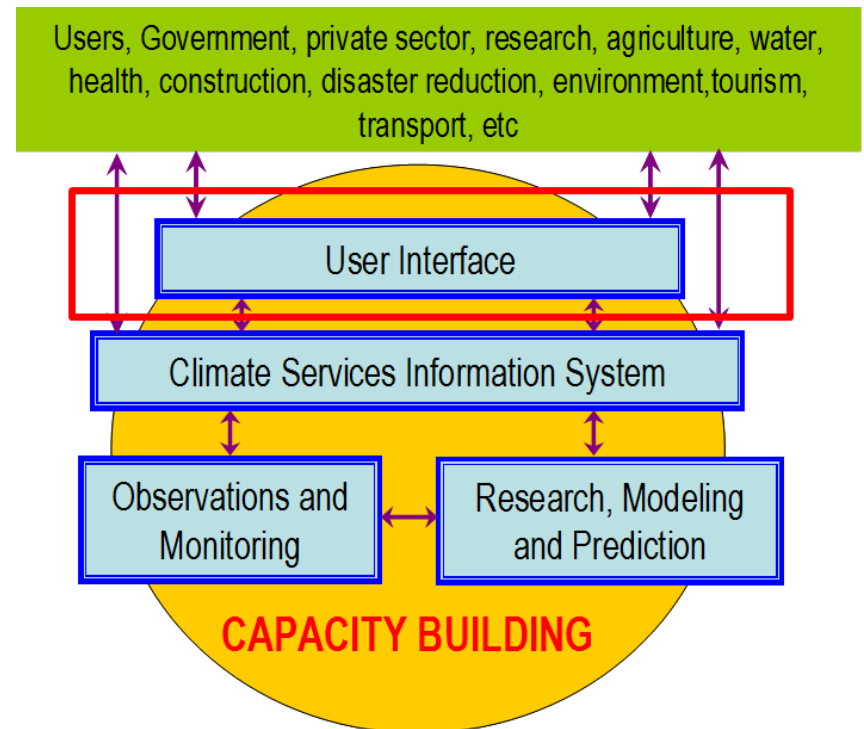
- Convene a high-level meeting with all national partners
- Purpose: Validate the National Action Plan, secure funding and agree on steps for implementation

Step 5: Launch the National Framework

- Decree creating NGCS is proposed to the national governmental authorities for ratification

User Interface within GFCS

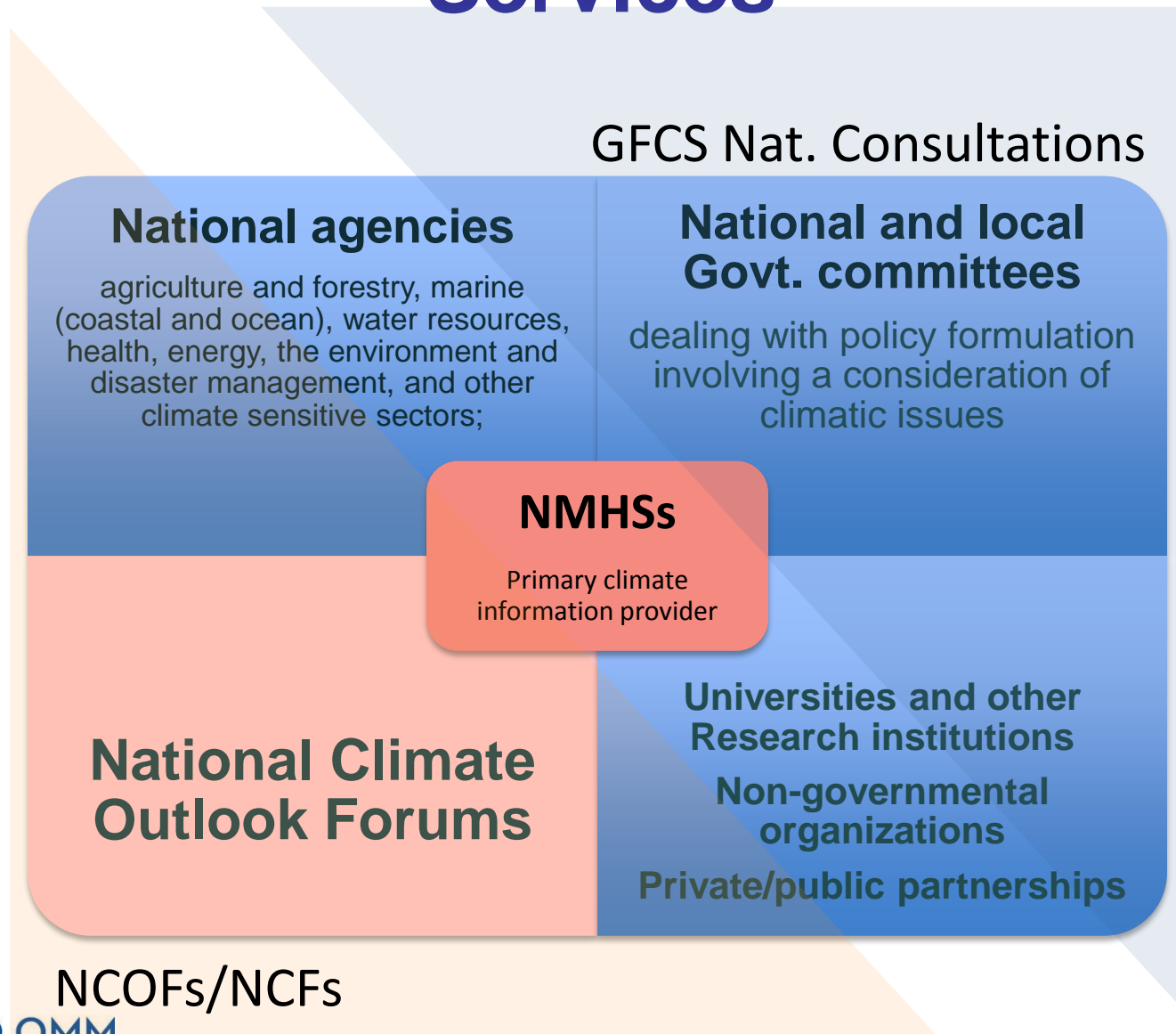
- **User Interface Platform** - to provide a means for users, user representatives, climate researchers and climate service providers to interact
- **Climate Risk Management** defined as a **systematic and coordinated process** in which climate information is used to **reduce the risks** associated with **climate variability and change**, and to **take advantage of opportunities**, in order to **improve the resilience** of social, economic and environmental systems.



User Interface

- **Feedback** – allows providers to obtain information on how needs for services are being met
- **Dialogue** - discussion and interpretation, improving the “service chain” through research and coordination
- **Evaluation** – monitor, verify systematically the delivery and effectiveness of services
- **Outreach** – improve communication and dissemination (both policy makers and downstream users)

National Level Components of Climate Services



NCOF Aim

- National Climate Outlook Forums (NCOFs) are envisioned as an essential mechanism for promoting inter-agency coordination and **regular multi-stakeholder dialogue between information provider and users** at the national level, which will support national level implementation of both the Climate Services Information System (CSIS) and the UIP pillars of the GFCS.
- NCOFs facilitate provision of **standardized climate products** based on high quality climate information from Global Producing Centers (GPCs), Regional Climate Centers (RCCs) and relevant Climate Outlook Forums (RCOFs) at **user-relevant scales**.

NCOF Examples

- Pilot NCOFs conducted in Mexico (Aguascalientes, November 2013), Mozambique (Maputo, March 2014), Belize (June, 2014), Bhutan (October 2015), etc. as well as similar forums being convened by NMHSs in other countries successfully demonstrated the importance of creating a regular platform for linking climate information being generated by NMHSs with key stakeholder institutions.

Climate Service Information System (CSIS)

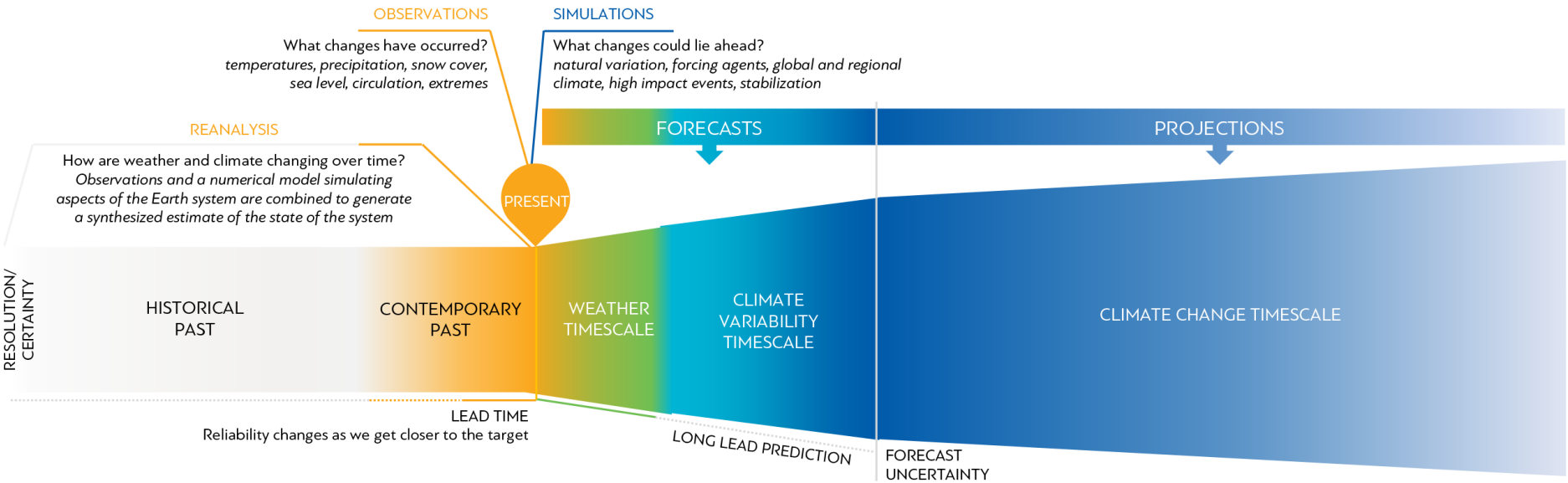
- The CSIS is the component of the GFCS most concerned with the generation and dissemination of climate information.
- It is the 'operational centre' of the GFCS. It will include climate data, monitoring, prediction (monthly, seasonal, decadal) and projection (centennial) activities.
- HLT report: 'The Climate Services Information System is the system needed to collect, process and distribute climate data and information according to the needs of users and according to the procedures agreed by governments and other data providers.'

CSIS structure

What does the CSIS consist of and
what does it do?

CLIMATE SERVICES INFORMATION SYSTEM

Data and Products for Climate Services



DATA

Historical data consists of
Instrumental data - century-long measurements of surface temperature and precipitation, records of daily data
Paleoclimate data - derived from natural sources such as tree rings, ice cores, corals, and ocean and lake sediments

Monitoring
Uses data from recent past and the present

Sub-seasonal to Seasonal
Flash flood guidance
Severe weather forecasting
Tropical cyclone forecasting

Interannual
Climate Change Indices

PRODUCTS

Past climate
Climate trends, Extreme climate indices, Sector-specific climate indices, Reanalyses, Return periods of extremes, Climate Normals, World Weather Records

Weather
Initial conditions

Climate variability
Boundary conditions (sea surface, snow cover, land), Climate monitoring and watch

Multi-decadal

Projections
Operational projections on climate change timescales

TOOLKIT - facilitates operations and used typically by forecasters

TAILORED PRODUCTS FOR DECISION SUPPORT – products can either be tailored in space and time or according to the decision relevance

DECISION SUPPORT APPLICATIONS – climate services apply past climatological records, contemporary monitoring and expected future conditions to socio-economic sectors

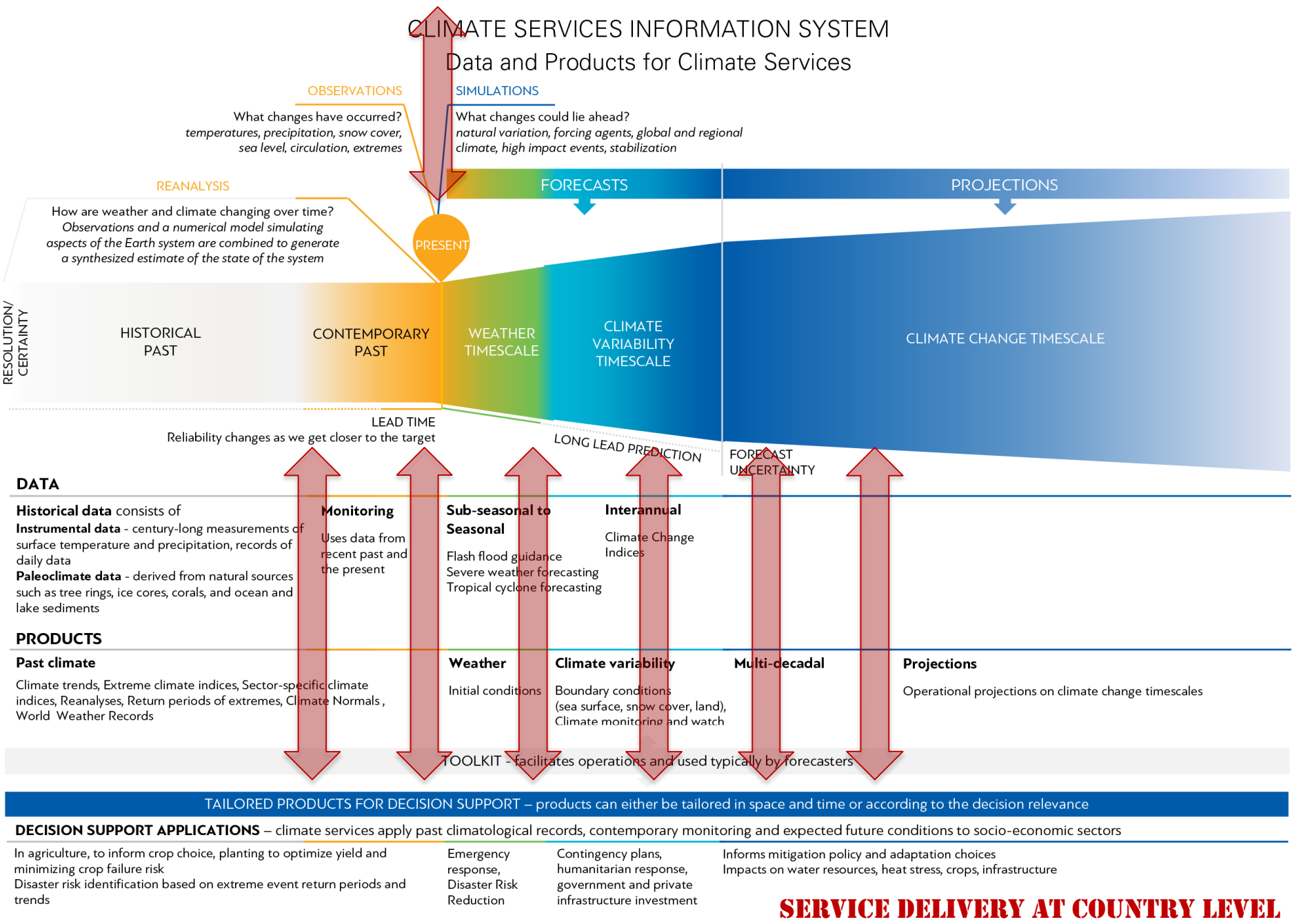
In agriculture, to inform crop choice, planting to optimize yield and minimizing crop failure risk
Disaster risk identification based on extreme event return periods and trends

Emergency response,
Disaster Risk Reduction

Contingency plans, humanitarian response, government and private infrastructure investment

Informs mitigation policy and adaptation choices
Impacts on water resources, heat stress, crops, infrastructure

INDICATORS FOR GLOBAL POLICY PROCESSES, E.G. GLOBAL STOCKTAKE, SDG 13



CLIMATE SERVICES INFORMATION SYSTEM

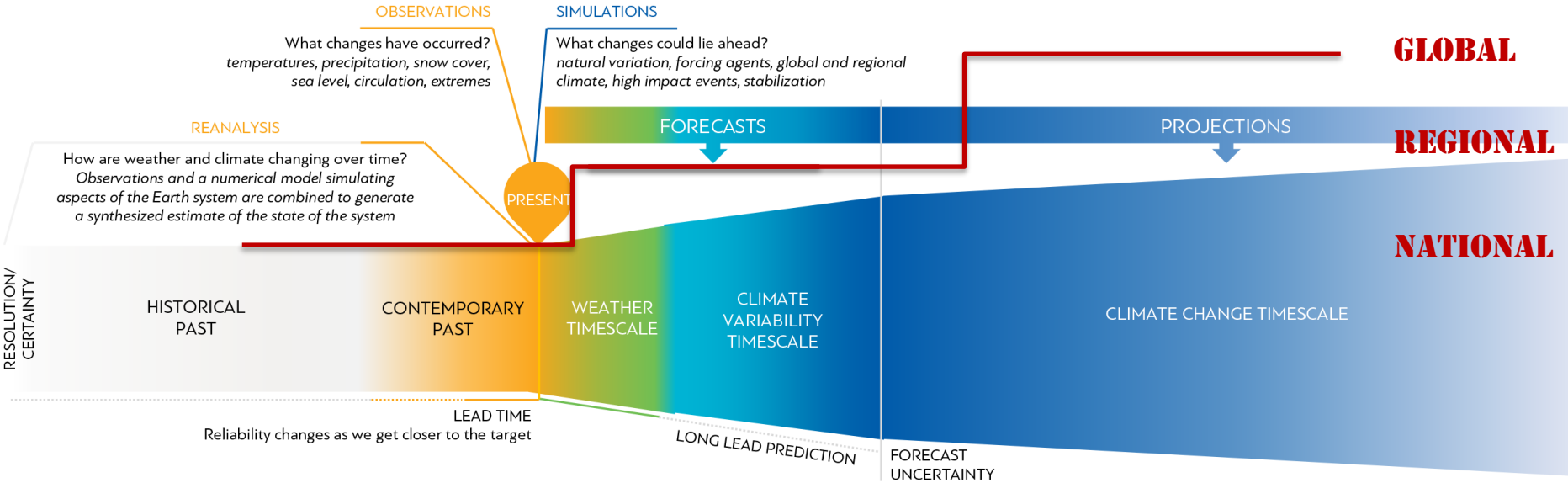
Data and Products for Climate Services

**OUTPUTS FLEXIBLY
GENERATED AT
MULTIPLE LEVELS:**

GLOBAL

REGIONAL

NATIONAL



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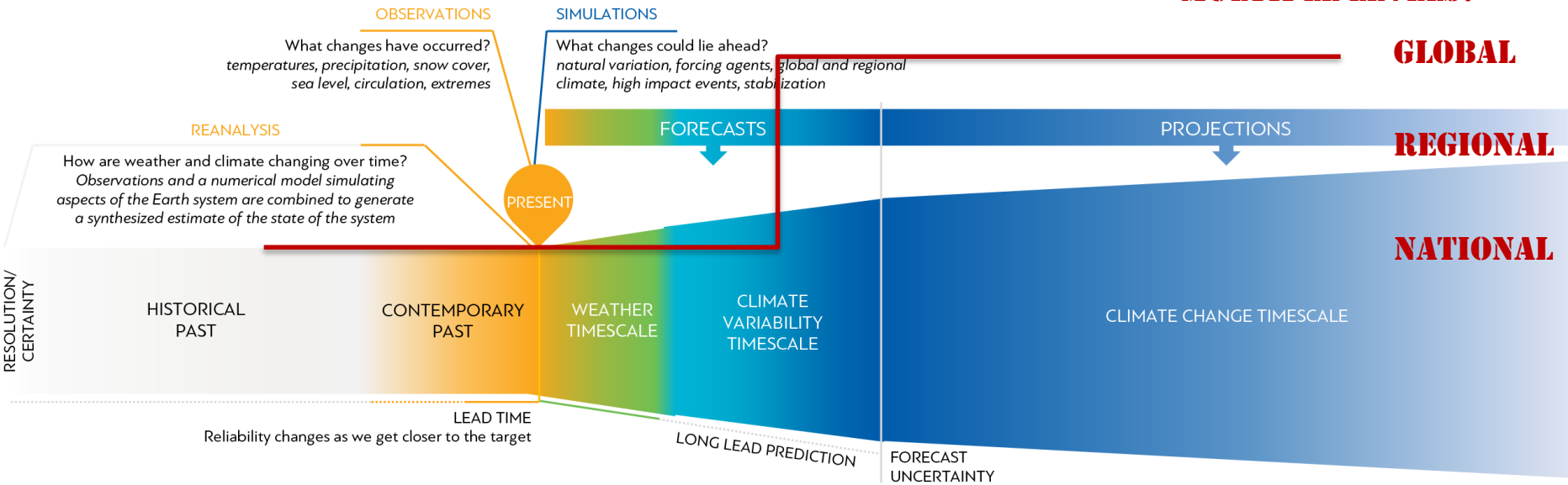
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CLIMATE SERVICES INFORMATION SYSTEM

Data and Products for Climate Services

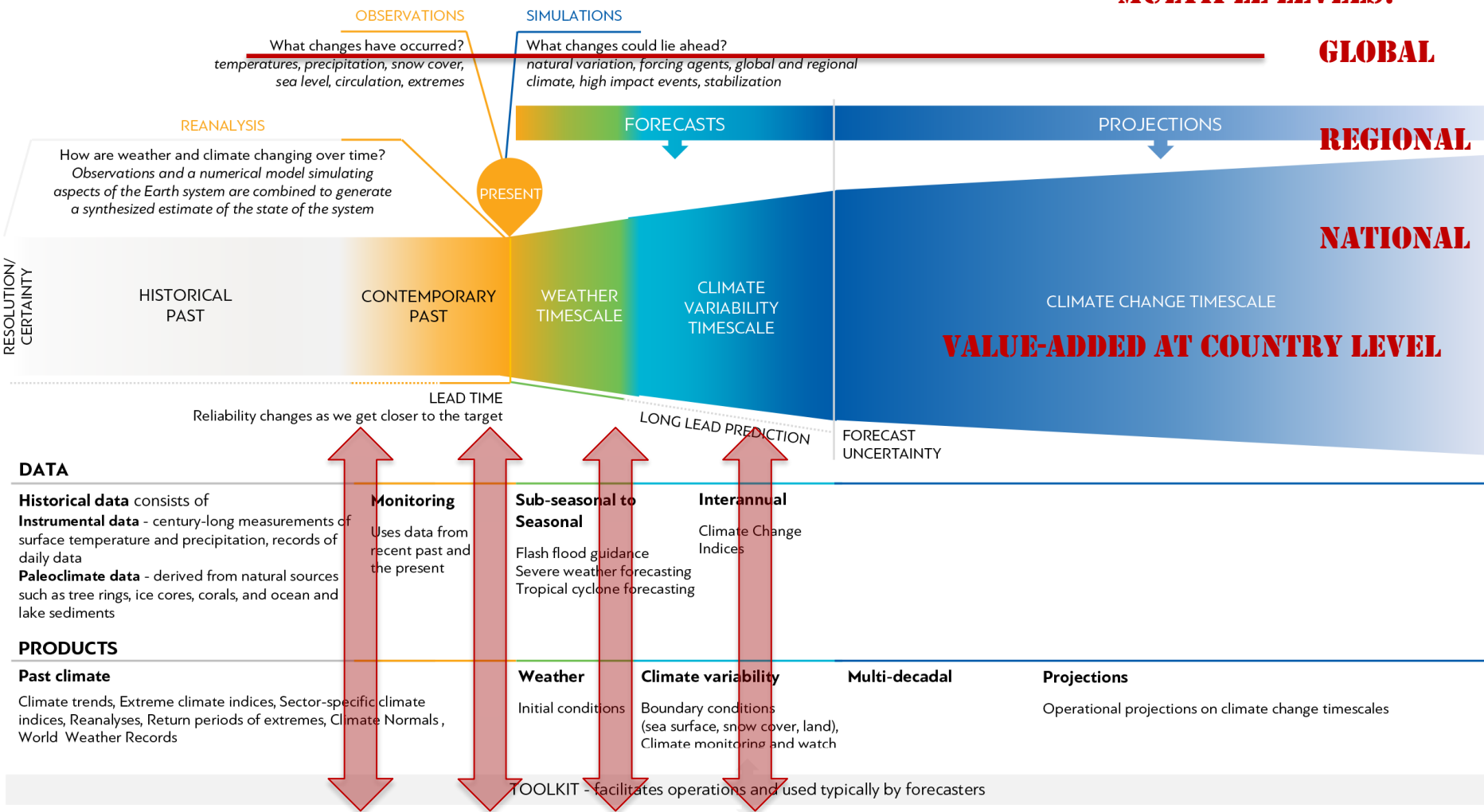
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MULTIPLE LEVELS:**

GLOBAL

REGIONAL

NATIONAL

VALUE-ADDED AT COUNTRY LEVEL



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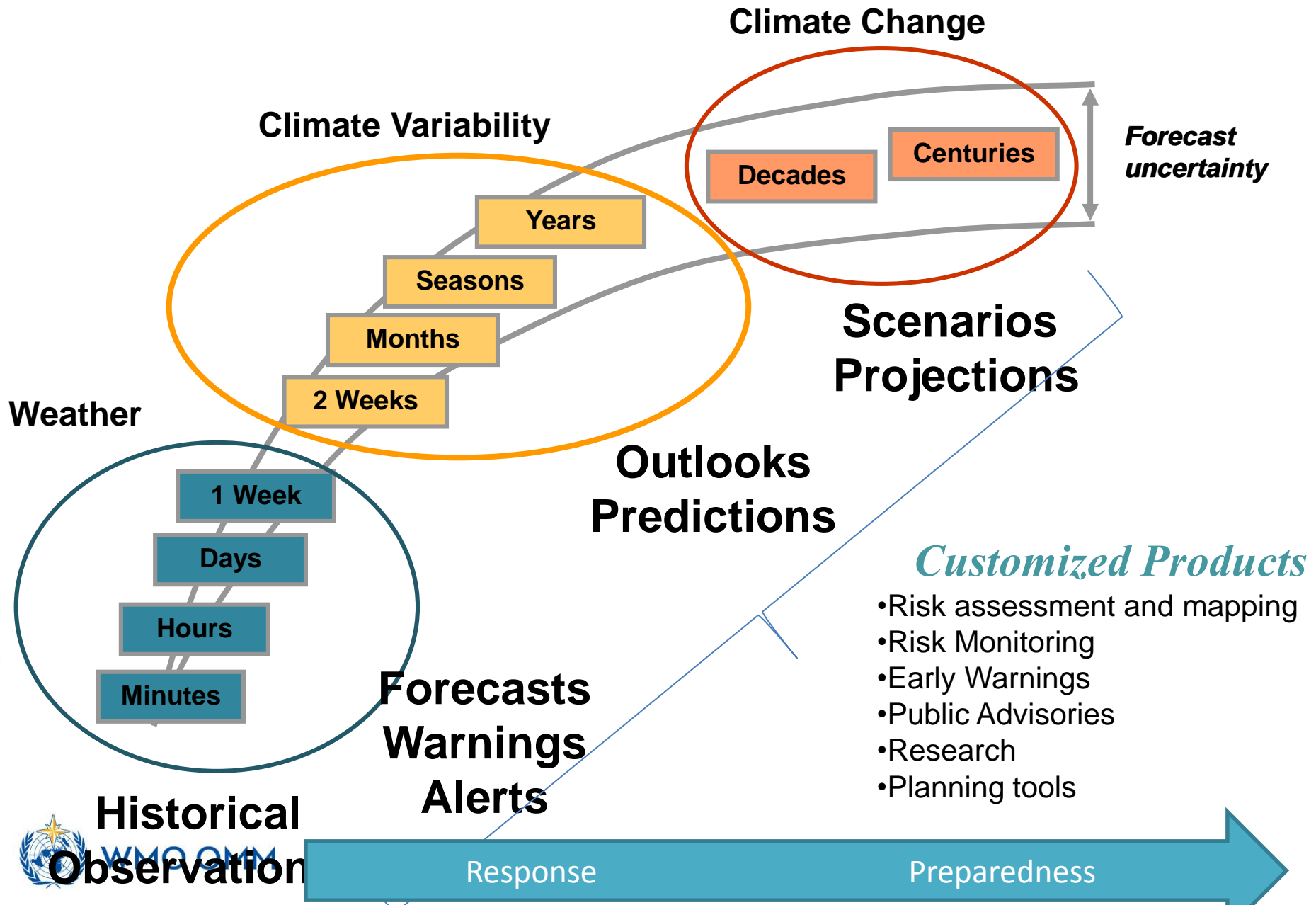
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Disaster Risk Reduction

Contingency plans, humanitarian response, government and private infrastructure investment

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SERVICE DELIVERY AT COUNTRY LEVEL

Seamless hydrometeorological and climate services



Status

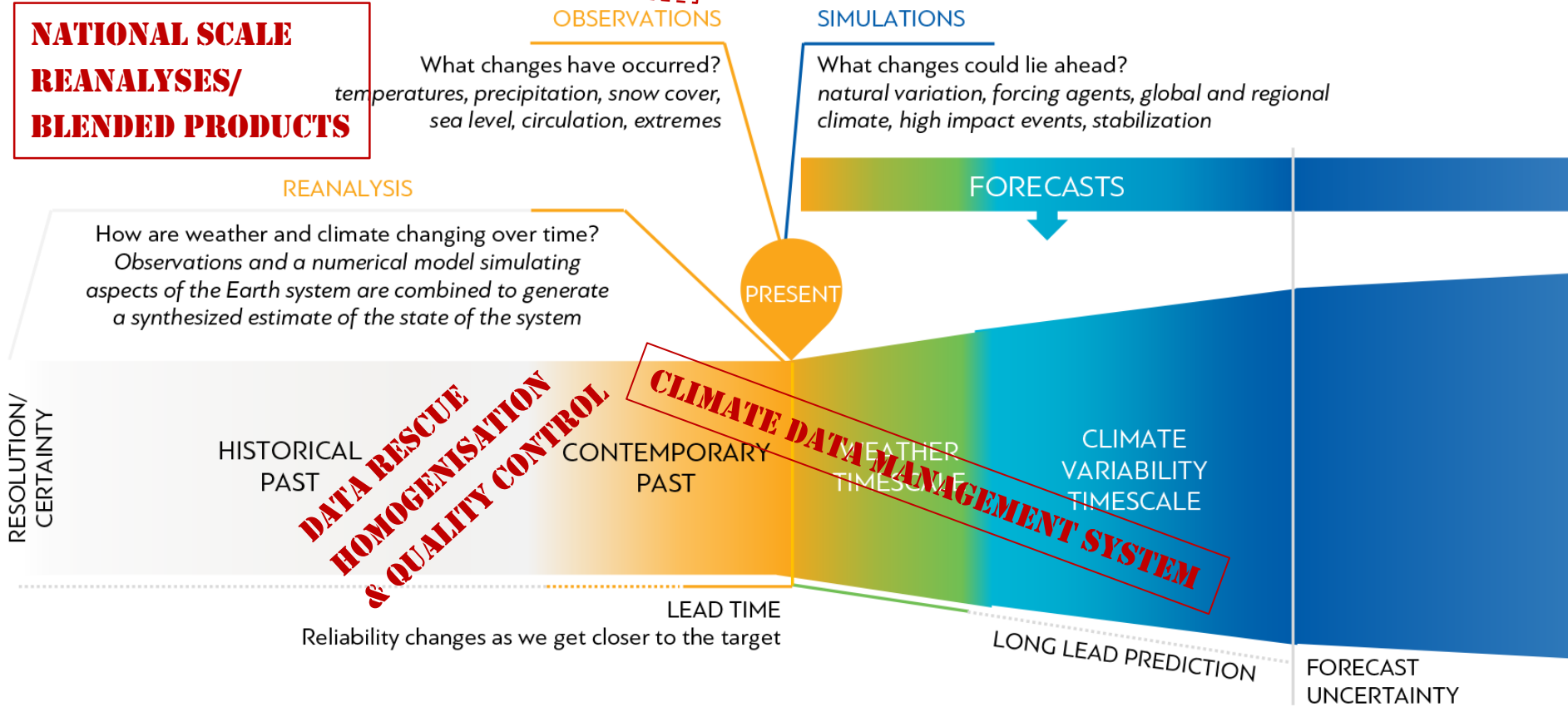
What support mechanisms are in place and what still needs to be done?

STATION INVENTORY AND METADATA
REVIEW OF REQUIREMENTS
IMPLEMENTATION AND MAINTENANCE PLAN

NATIONAL SCALE
**REANALYSES/
 BLENDED PRODUCTS**

CLIMATE SERVICES INFORMATION SYSTEM

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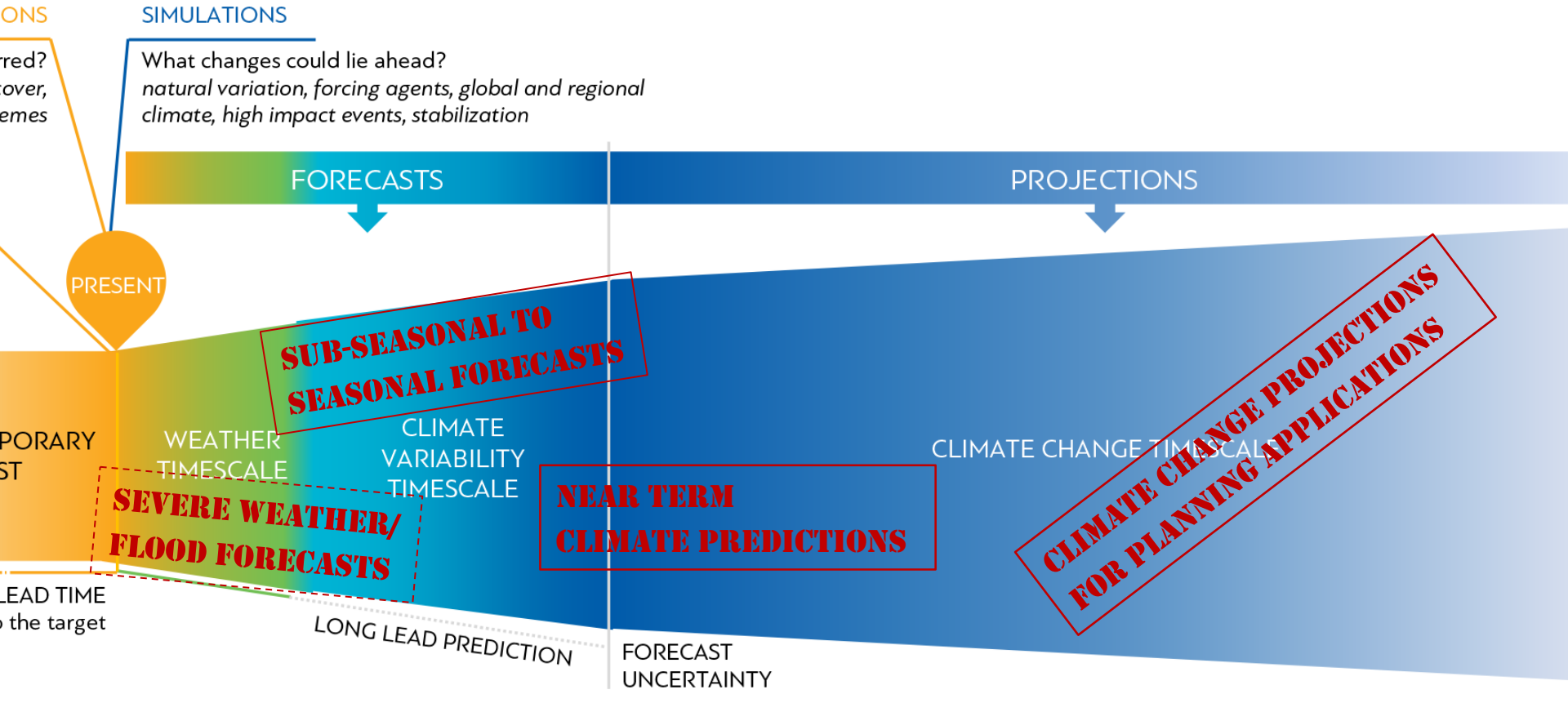
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SIMULATIONS

What changes could lie ahead?
natural variation, forcing agents, global and regional climate, high impact events, stabilization

What changes could lie ahead?
natural variation, forcing agents, global and regional climate, high impact events, stabilization

TEMPORARY
 STATE

LEAD TIME
 to the target

ing

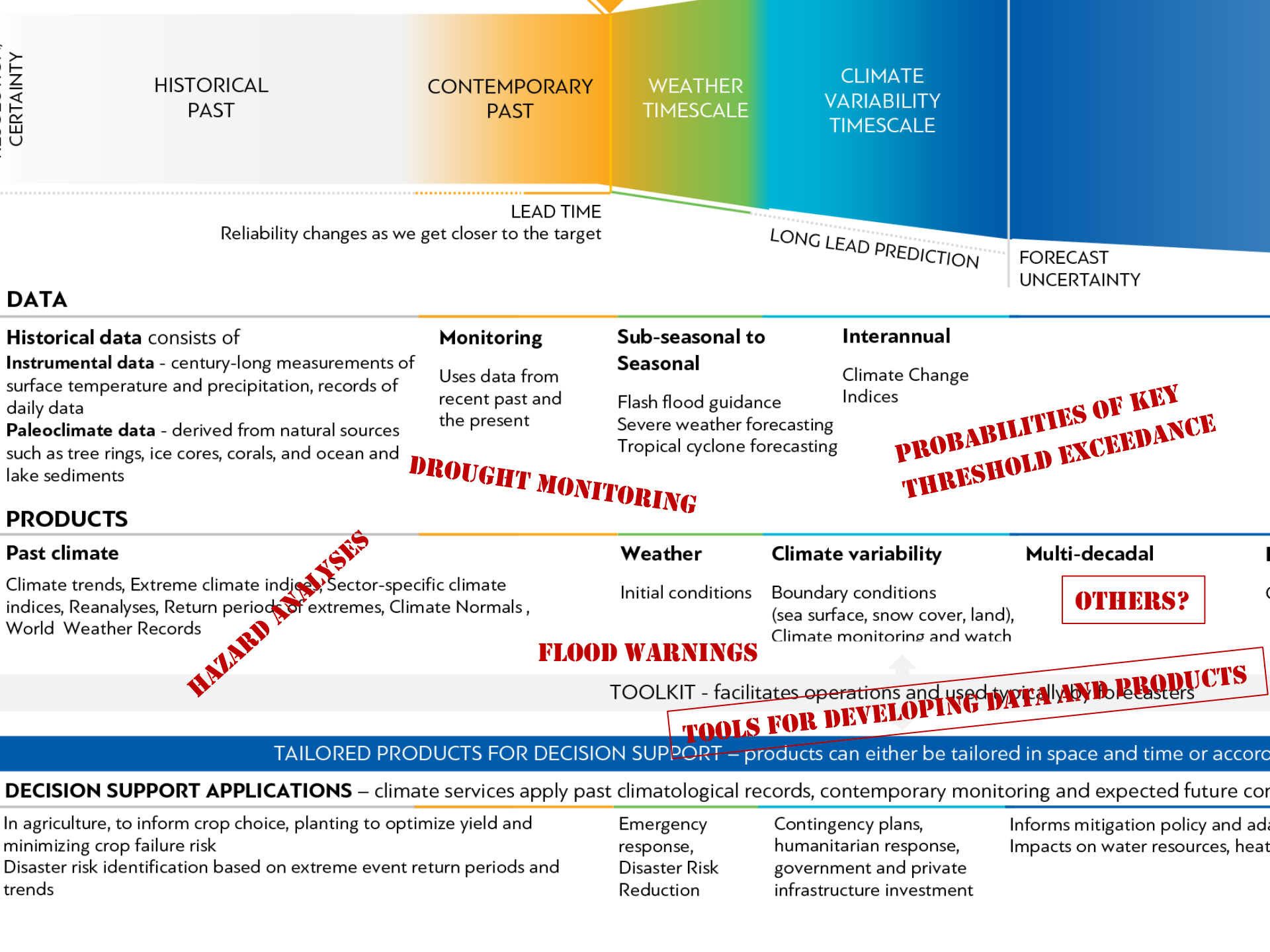
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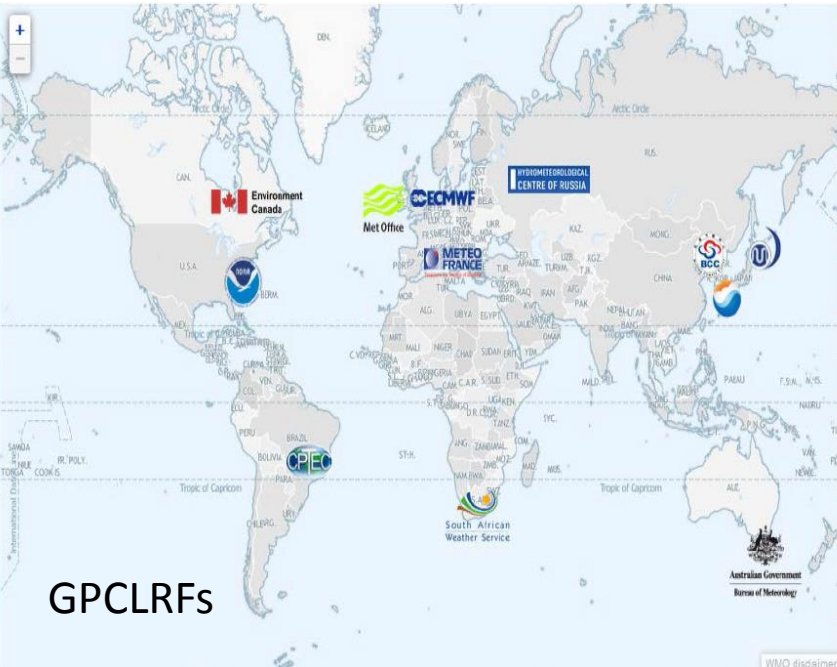
Climate Change Indices



CSIS implementation status

Policy and country levels
and global infrastructure

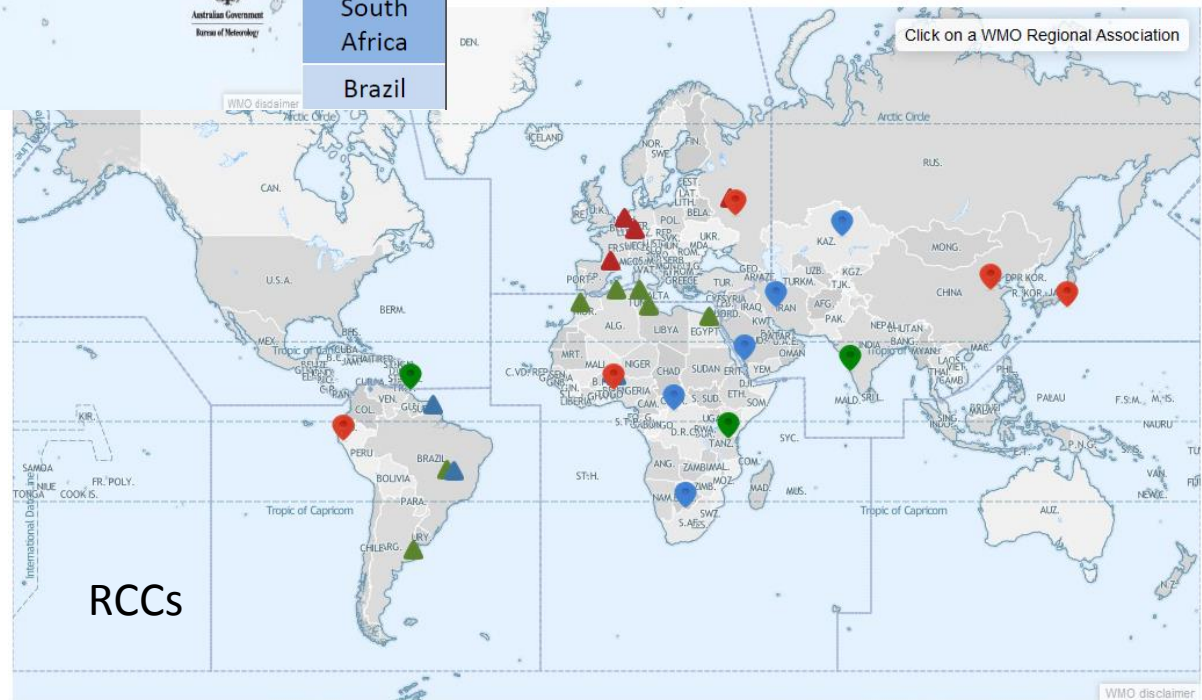
GPCs
Montreal
Washington
Moscow
Exeter
Seoul
Tokyo
Melbourne
Toulouse
ECMWF
Beijing
Pretoria
CPTEC



Countries
Canada
USA
Russia
UK
Korea
Japan
Australia
France
Europe
China
South Africa
Brazil

Global infrastructure

- GPCLRF & RCC inventory of GFCS-relevant climate data and products (ECVs) 95+ pp.
- Not discoverable or organized in systematic form

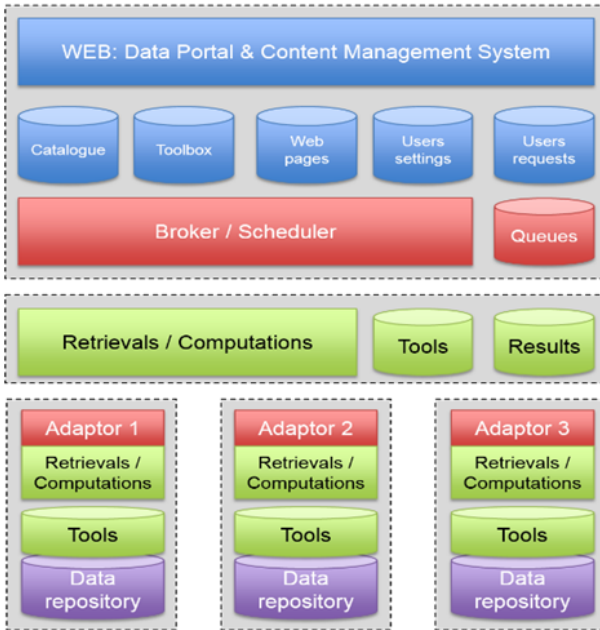


Legend

- designated RCC
- RCC in demonstration phase
- RCC proposed
- ▲ designated RCC-Network
- ▲ RCC-Network in demonstration phase
- ▲ RCC-Network proposed



Monitoring / Statistics



12

- C3S portal into past, present and future ECVs globally
- WIS to catalogue all
- GDPFS for cascading system



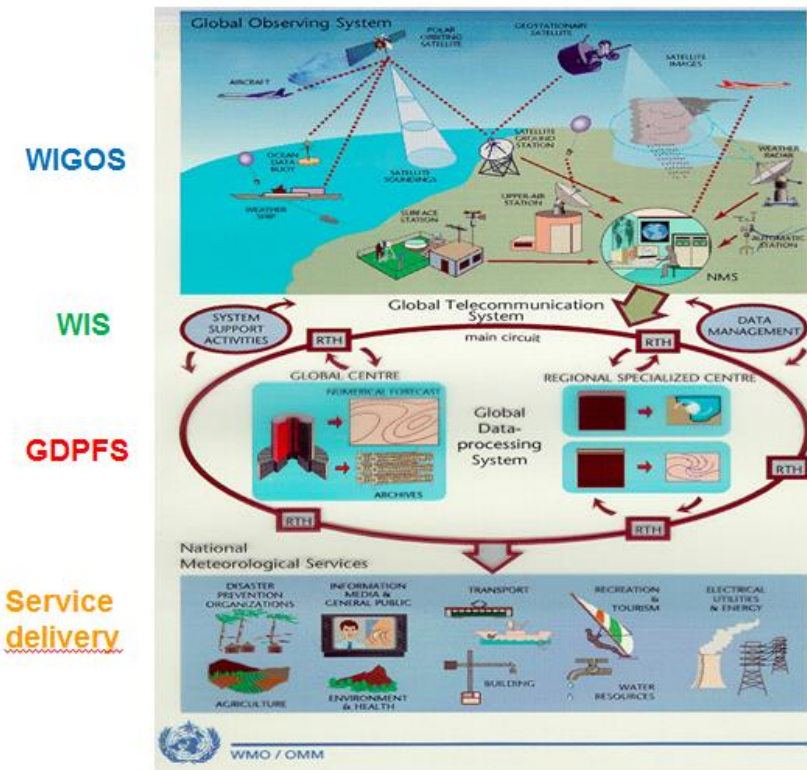
WMO OMM

Development of CDS software infrastructure

- 2016 Q1: Start of contract
- 2016 Q3: Initial release of working prototype for limited testing
- 2017 Q1: First functional release exposed to a large user group, then quarterly releases with added functionality

Global infrastructure

WMO operational networks



191 NMHSs: satellites, land, ships, buoys, and aircraft contribute to Global Observing every day

Global Telecom with Regional Hubs – becoming the WMO Information System

The **GDPFS**: Global, Regional Specialized Met. Centres (RSMC, RCC), and National Centres

NMHSs deliver analyses, forecast and early warning services

Status 2016: Data rescue



Search this site

Search

Data & Projects (by Country)

- Choose -

Go

Recently added Data to be Rescued

- Data Rescue in Senegal (Senegal)
- Data Rescue in Tanzania (Tanzania)
- Data Rescue in Botswana (Botswana)
- Mission Report 16 – 20 November Conakry, Guinea (Guinea)



WMO OMM

Status 2016: Observing systems

WMO ID

Generate station lists by:

Country

Type

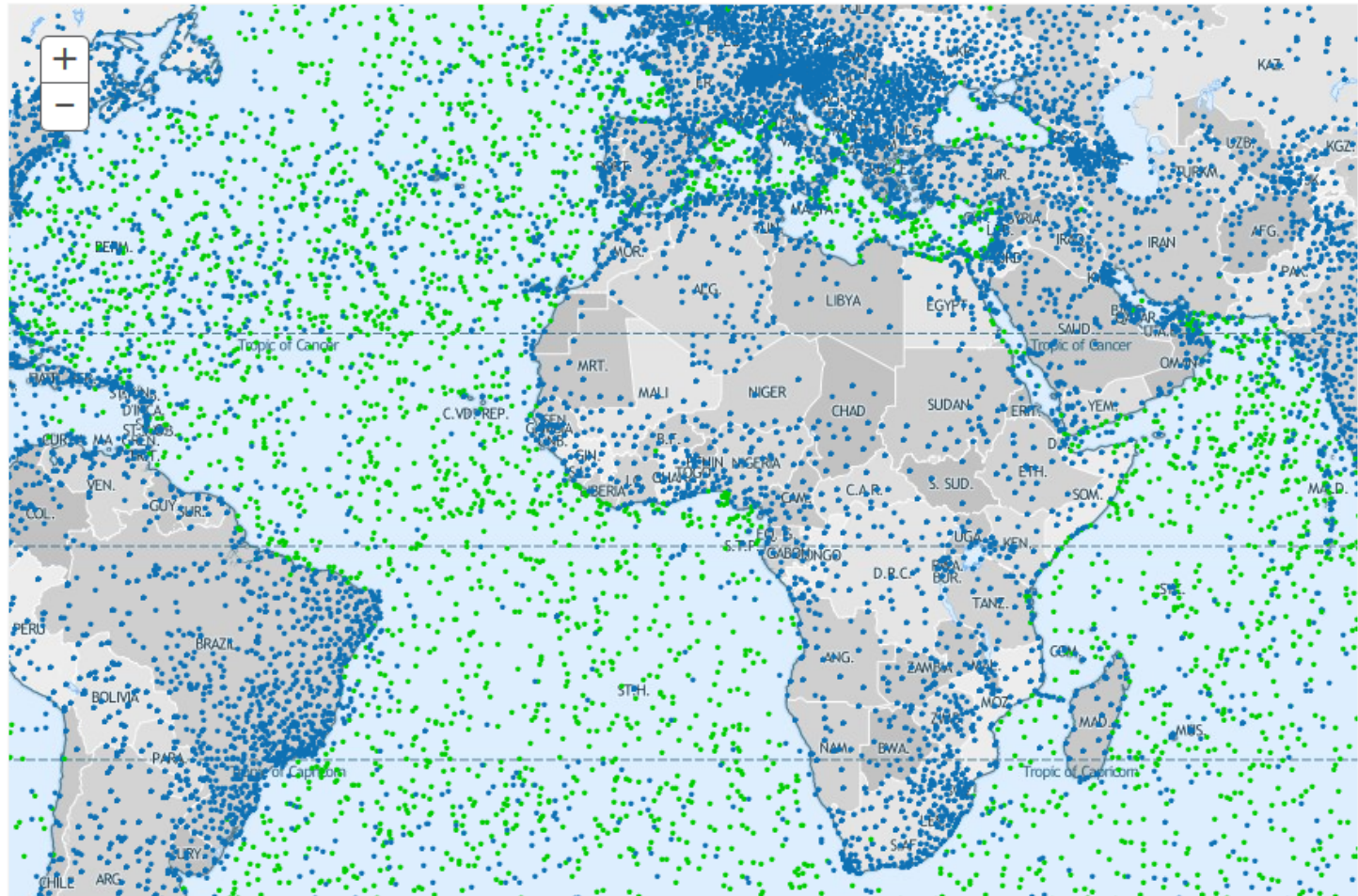
Find people by:

Contact name

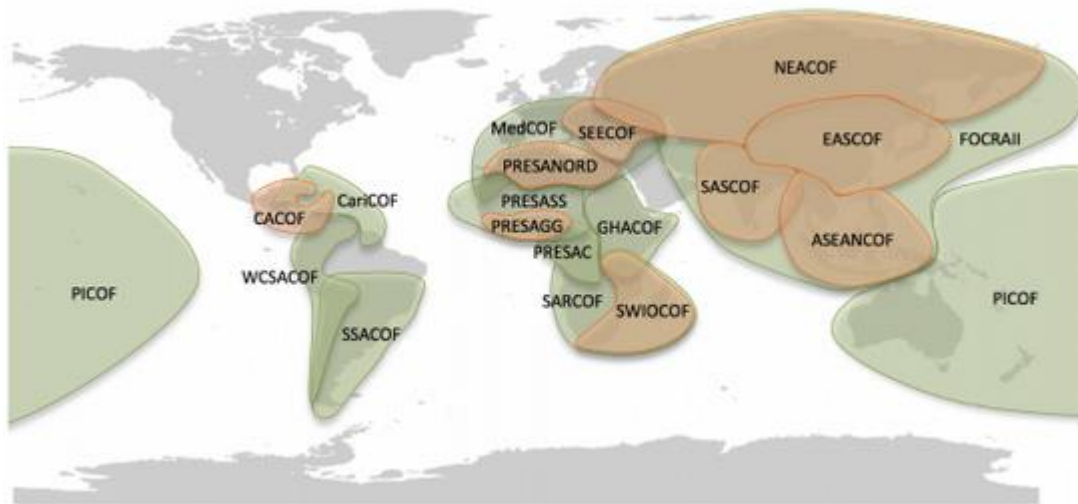
Filter map

By program / network:

- WIGOS components
 - GOS
 - GAW
 - WHOS
 - GCW
- Co-sponsored components
 - GCOS
 - GOOS
 - GTOS
- Other components



Status 2016: Seasonal forecasts



Regional Climate Outlook Forums (RCOFs) produce consensus-based, user-relevant climate outlook products in real time in order to reduce climate-related risks and support sustainable development for the coming season in sectors of critical socioeconomic significance for the region in question. (Map of Forums around the world.)



Maproom
Climate
 ENSO State
 La Niña

Climate Forecast
 Probability of Monthly Averages (in a Season) Rainfall Tercile Conditioned on ENSO

Region
 Tanzania

Spatially Average Over
 gridpoint

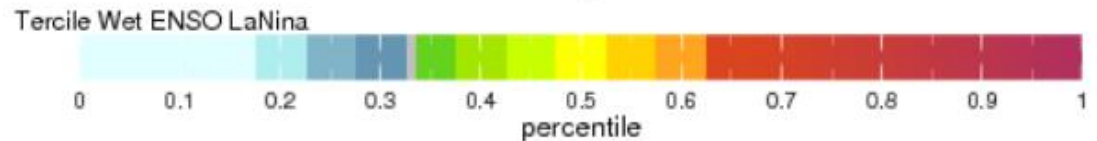
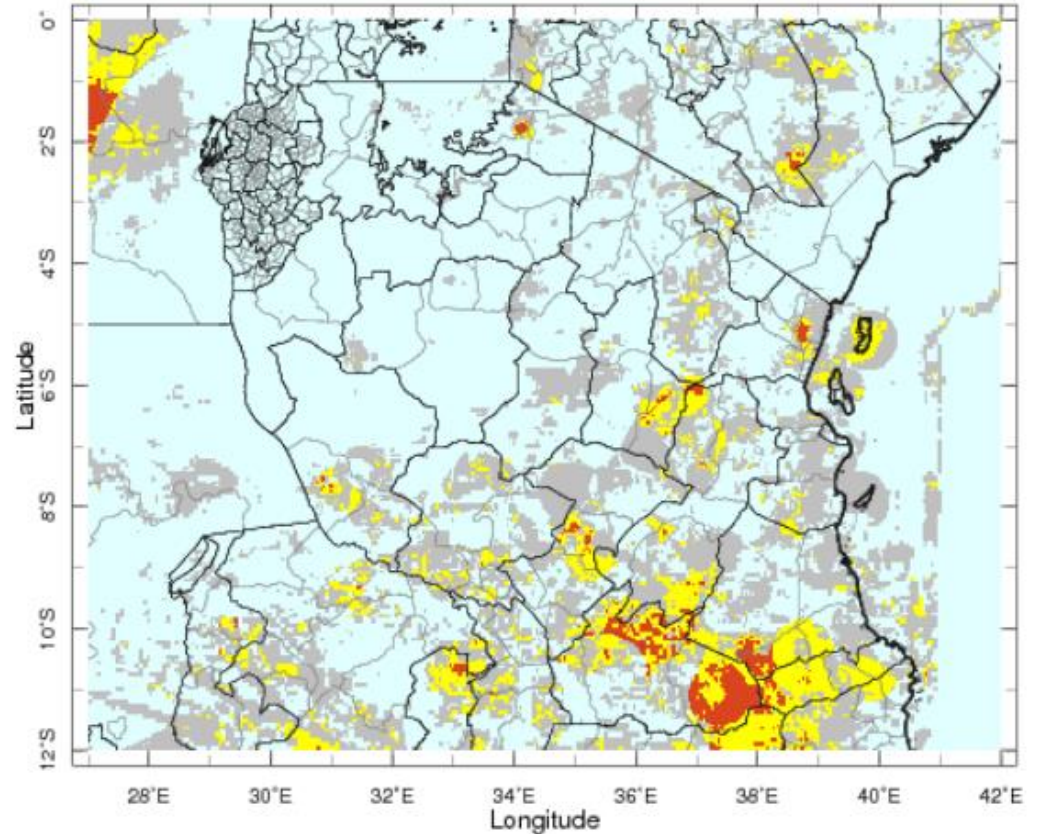
Season
 May-Jul

Tercile
 Wet

[Description](#) [Dataset Documentation](#) [Instructions](#) [Contact Us](#)

Probability of Monthly Averages (in a Season) Rainfall Tercile Conditioned on ENSO

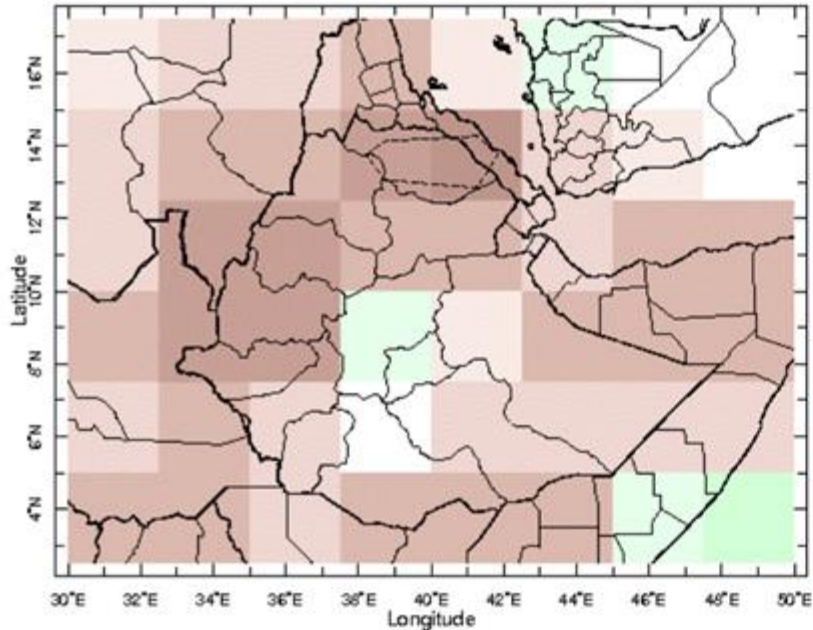
Status 2016: NMHS services



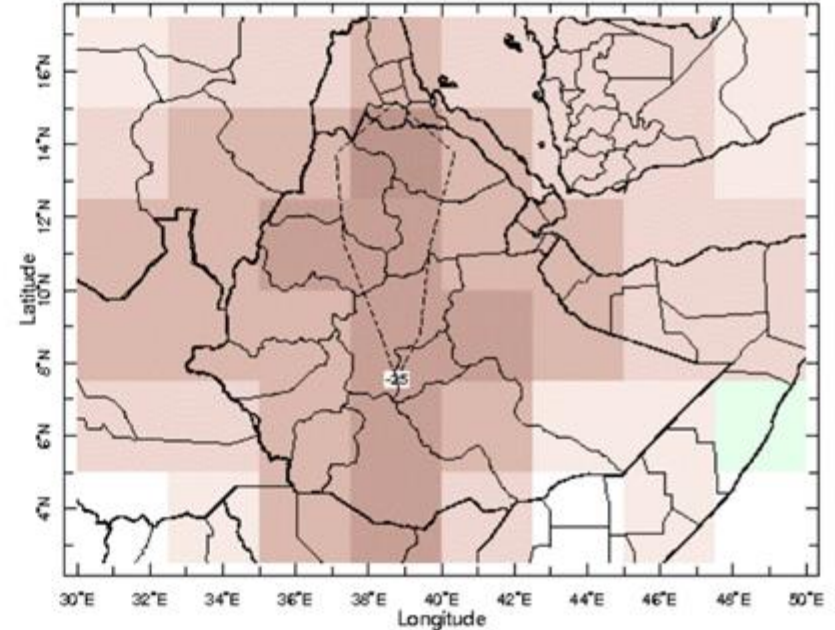
WMO OMM

Ethiopia: Same extreme event, different outcomes

1983-1984 Drought



2009-2012 Drought



300,000 deaths

Host for Somali refugees

WEATHER CLIMATE WATER
TEMPS CLIMAT EAU



WMO OMM

World Meteorological Organization
Organisation météorologique mondiale