# Tools for Bridging the Gap Between Producers and Users of CIS

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WEATHER CLIMATE WATER
TEMPS CLIMAT EAU

**WMO OMM**

World Meteorological Organization
Organisation météorologique mondiale

Users, Government, private sector, research, agriculture, water, health, construction, disaster reduction, environment,tourism, transport, etc
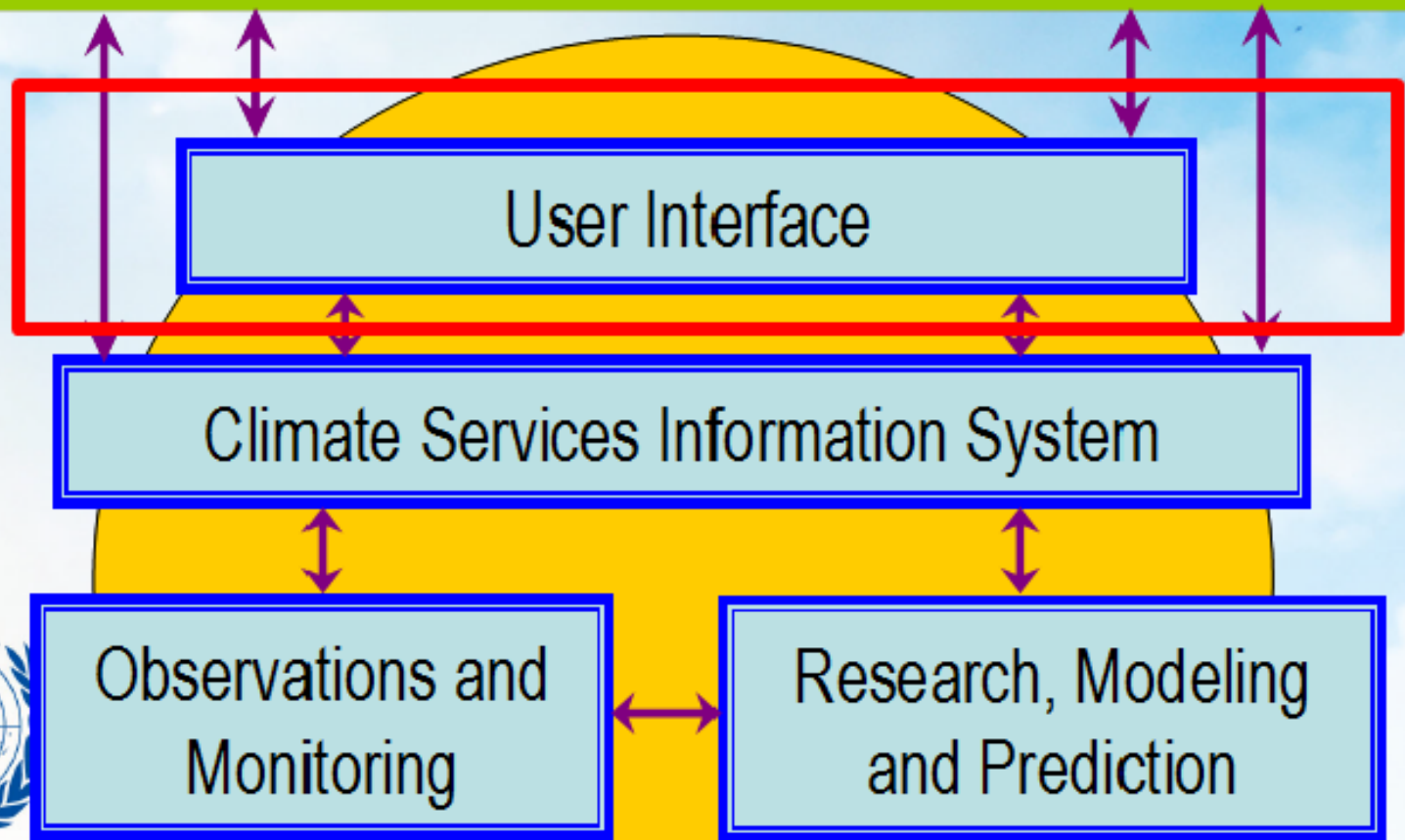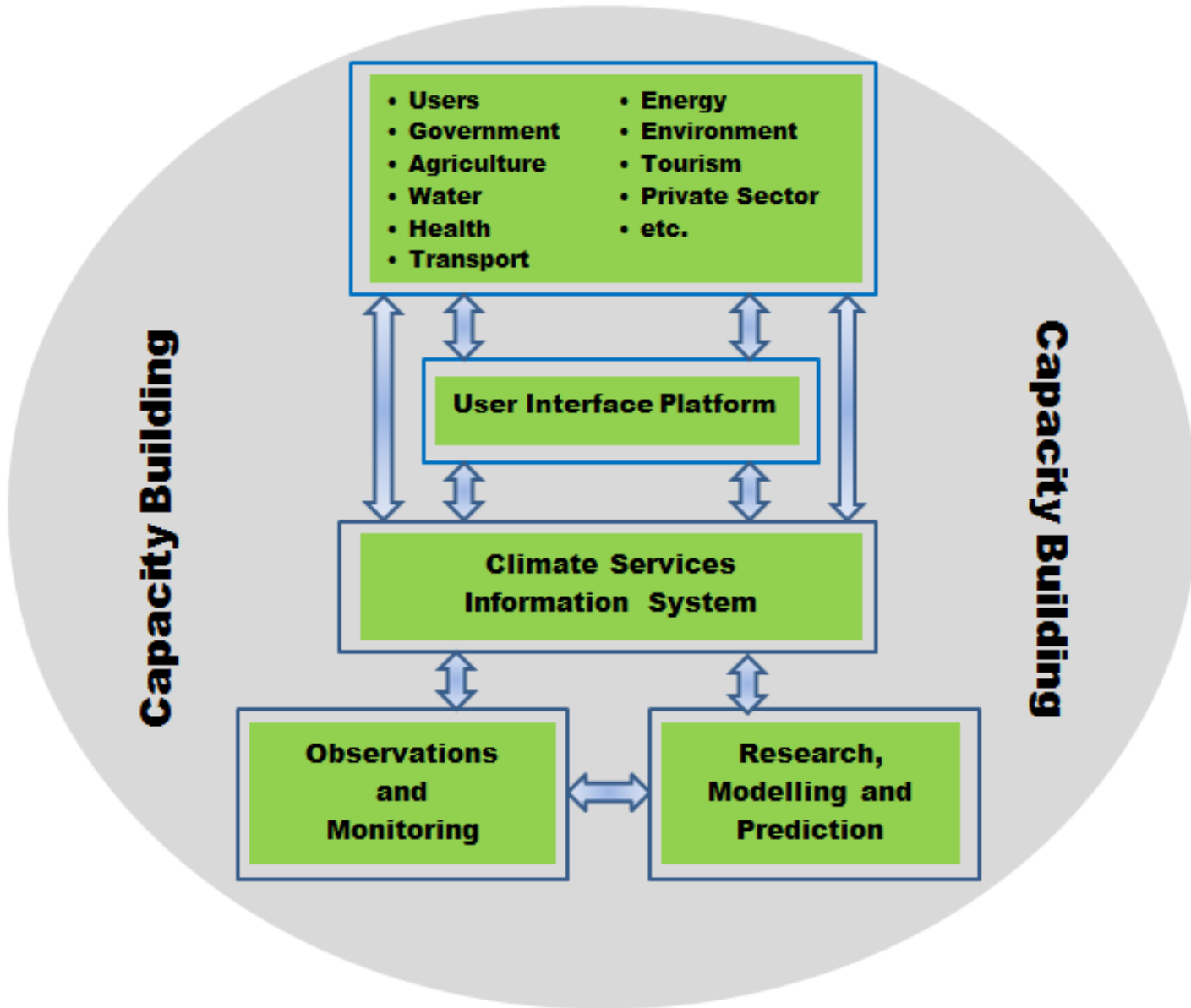
User Interface

Climate Services Information System

Observations and Monitoring

Research, Modeling and Prediction

CAPACITY BUILDING

WEATHER CLIMATE WATER

WORLD METEOROLOGICAL ORGANIZATION

GFCS
GLOBAL FRAMEWORK FOR CLIMATE SERVICES

# STRUCTURE OF THE FRAMEWORK

Reducing the vulnerability of society to climate-related hazards through better provision of climate information.

**1: Priority Applications**
Improving decision making in climate-sensitive areas:

- Health
- Food security and agriculture
- Disaster risk reduction
- Water resources
- Energy

**3: Foundational Pillars**
Enhancing technical and scientific capabilities to support user-driven climate services:

- Observations and monitoring
- Research, modeling, and prediction
- Climate services information systems
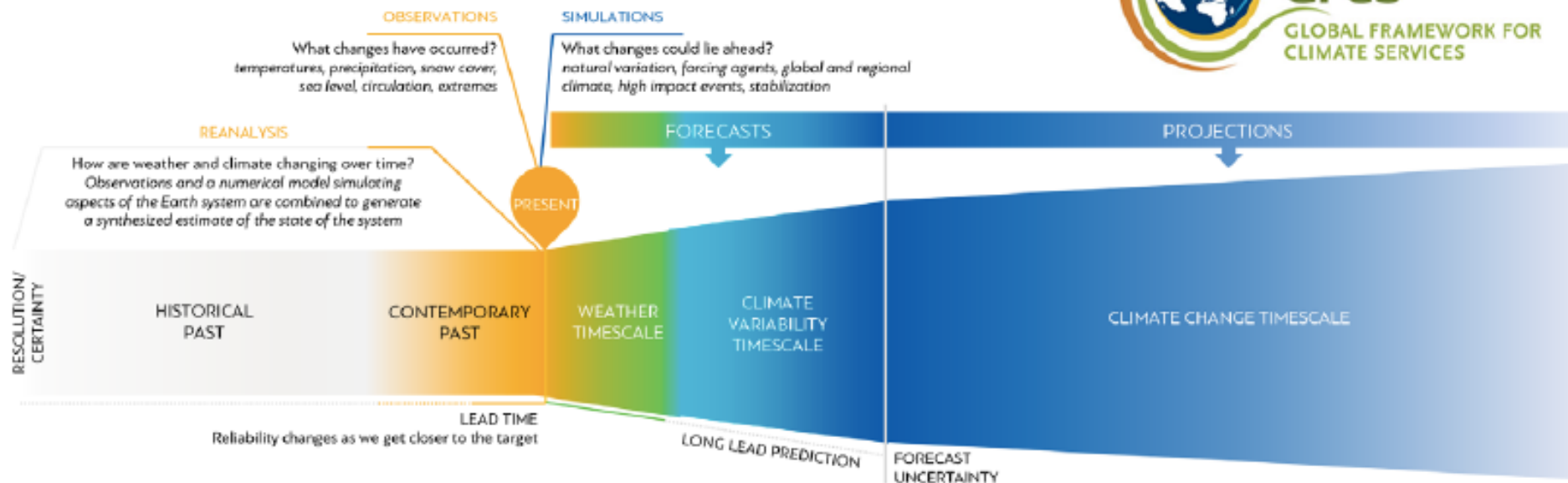- Capacity building

**2: Bridge**
Connecting user needs with climate services through sustained engagement mechanisms:

- National activities
- Regional activities
- Global activities

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**GFCS**
**GLOBAL FRAMEWORK FOR CLIMATE SERVICES**

# CLIMATE SERVICES INFORMATION SYSTEM
## Data and Products for Climate Services

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**GLOBAL FRAMEWORK FOR CLIMATE SERVICES**

**OBSERVATIONS**

What changes have occurred?
*temperatures, precipitation, snow cover, sea level, circulation, extremes*

**SIMULATIONS**

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

**REANALYSIS**

How are weather and climate changing over time?
*Observations and a numerical model simulating aspects of the Earth system are combined to generate a synthesized estimate of the state of the system*

**FORECASTS**

**PROJECTIONS**

**PRESENT**

RESOLUTION/CERTAINTY

| HISTORICAL PAST | CONTEMPORARY PAST | WEATHER TIMESCALE | CLIMATE VARIABILITY TIMESCALE | CLIMATE CHANGE TIMESCALE |

**LEAD TIME**
Reliability changes as we get closer to the target

LONG LEAD PREDICTION

FORECAST UNCERTAINTY

## DATA

| **Historical data** consists of | **Monitoring** | **Sub-seasonal to Seasonal** | **Interannual** |
|---|---|---|---|
| **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 | Uses data from recent past and the present | Flash flood guidance Severe weather forecasting Tropical cyclone forecasting | Climate Change Indices |

## PRODUCTS

| **Past climate** | **Weather** | **Climate variability** | **Multi-decadal** | **Projections** |
|---|---|---|---|---|
| Climate trends, Extreme climate indices, Sector-specific climate indices, Reanalyses, Return periods of extremes, Climate Normals, World Weather Records | Initial conditions | Boundary conditions (sea surface, snow cover, land), Climate monitoring and watch | | 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 |

# UIP Mechanisms

| 2. Bridge: Connecting user needs with climate services through sustained engagement mechanisms. | National. Establishing and support National Dialogues on Climate Services and Frameworks for Climate Services | UN Country Teams, NMFS, relevant ministries, user groups, donor community | Sustained mechanisms are established or enhanced to support effective user-driven climate services at regional and national levels |
| --- | --- | --- | --- |
| | Regional. Strengthening regional systems for climate service provision | RCCs, regional structures of partner agencies | |
| | Global. Coordinate GFCS implementation; communications and knowledge management; monitoring and evaluation | GFCS Office | |

**GFCS**
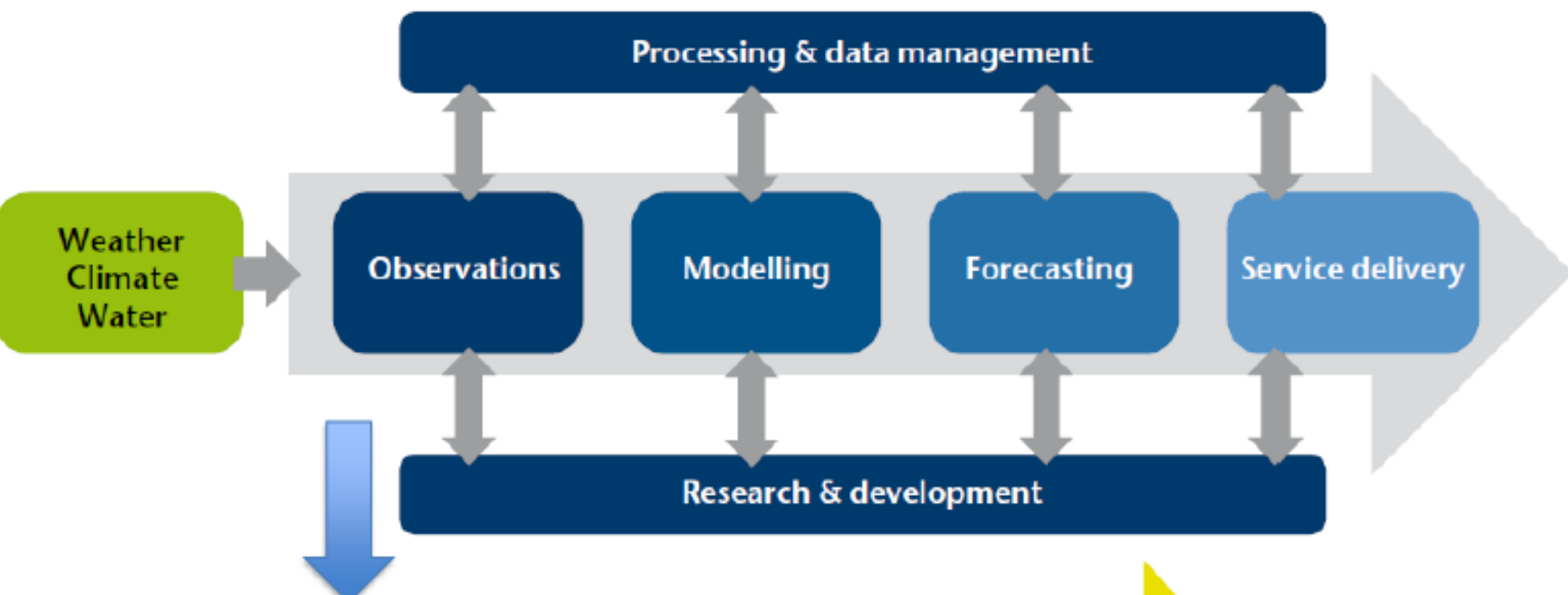GLOBAL FRAMEWORK FOR CLIMATE SERVICES

WEATHER CLIMATE WATER

WORLD METEOROLOGICAL ORGANIZATION

Decision-making and investments in climate-sensitive sectors are improved through the co-development and use of climate services with user interface platforms (UIPs).
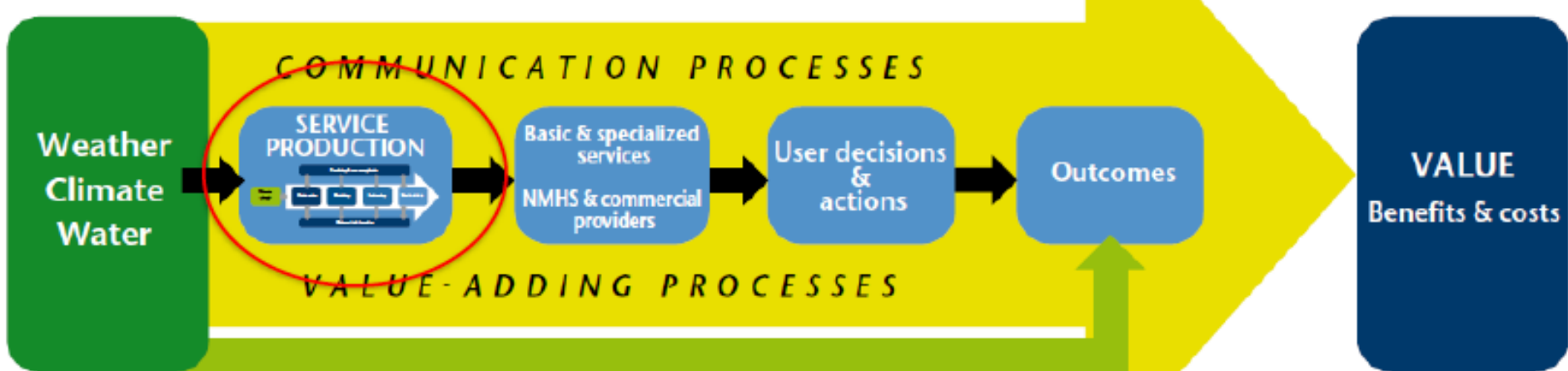
# Interactions at all Scales
# (Global, Regional and National levels)
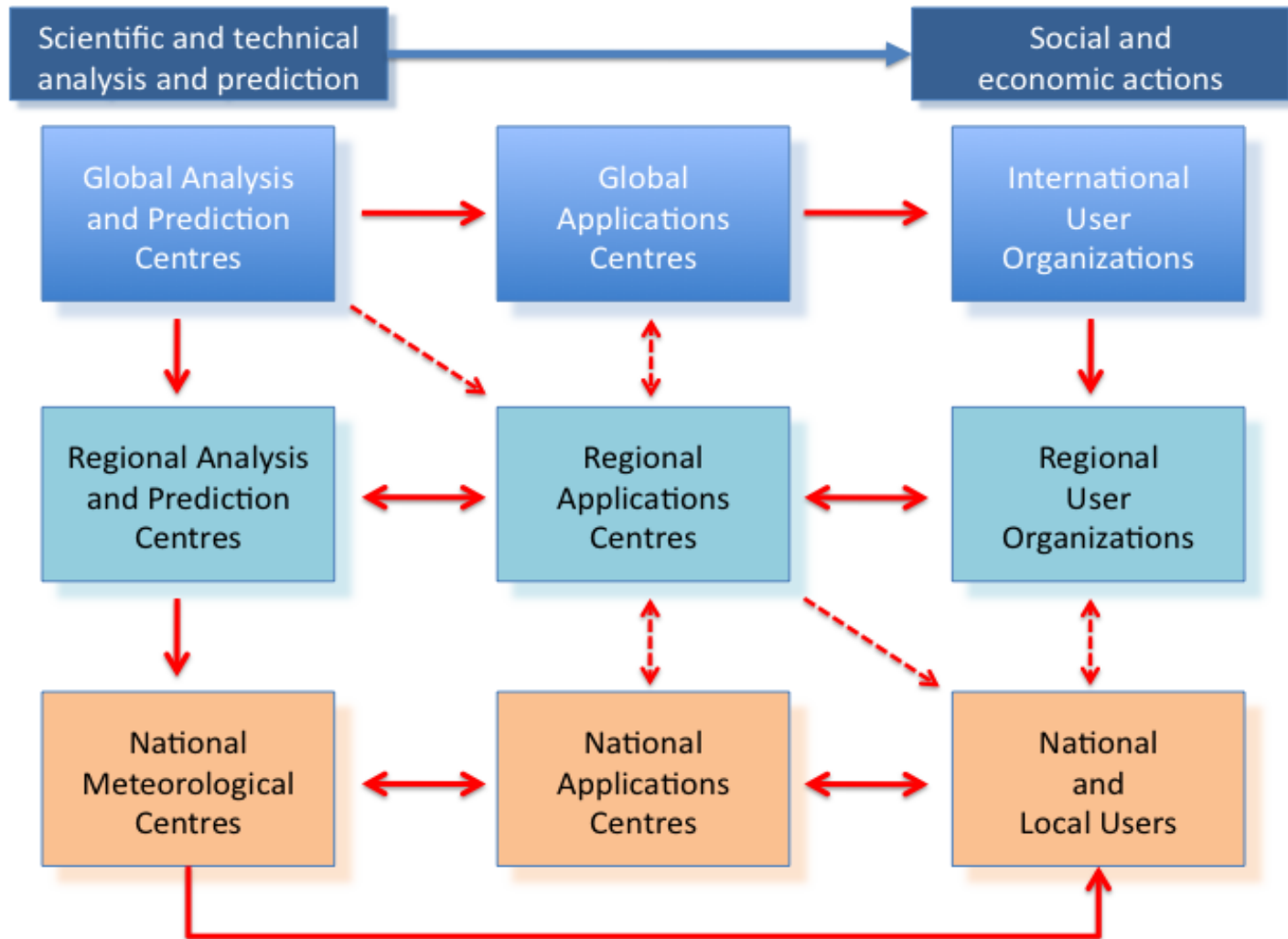
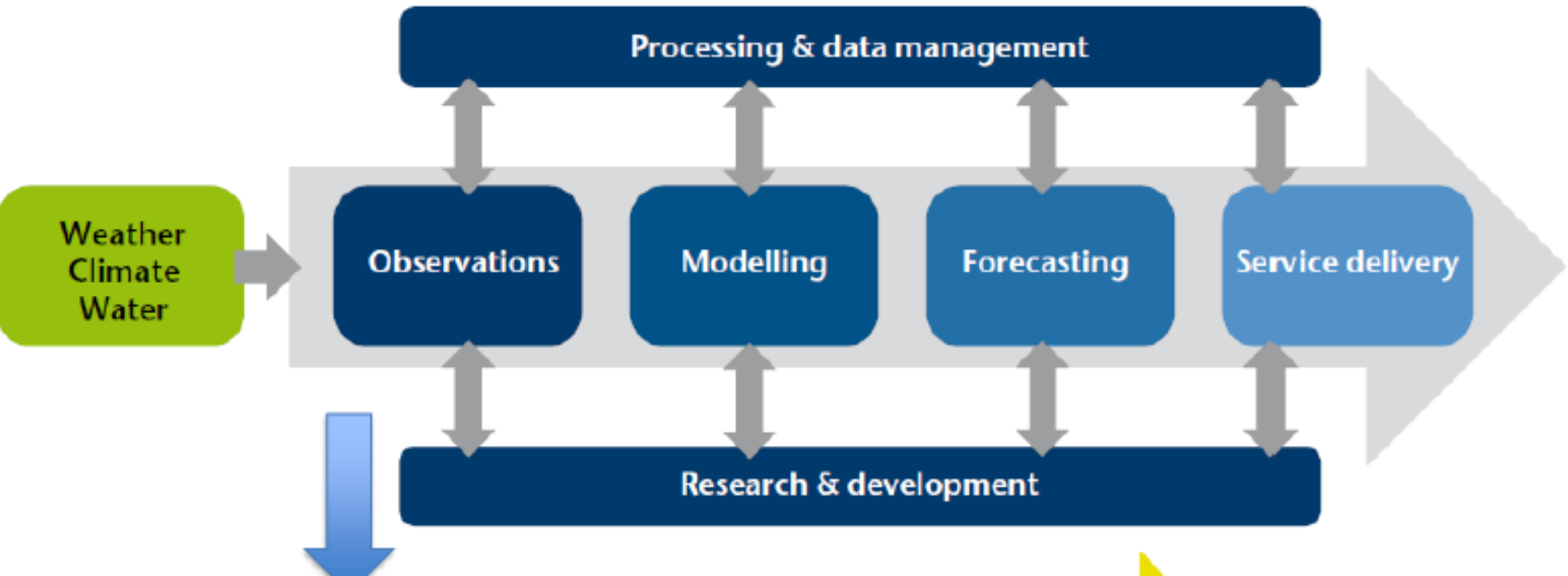# Operational service delivery system
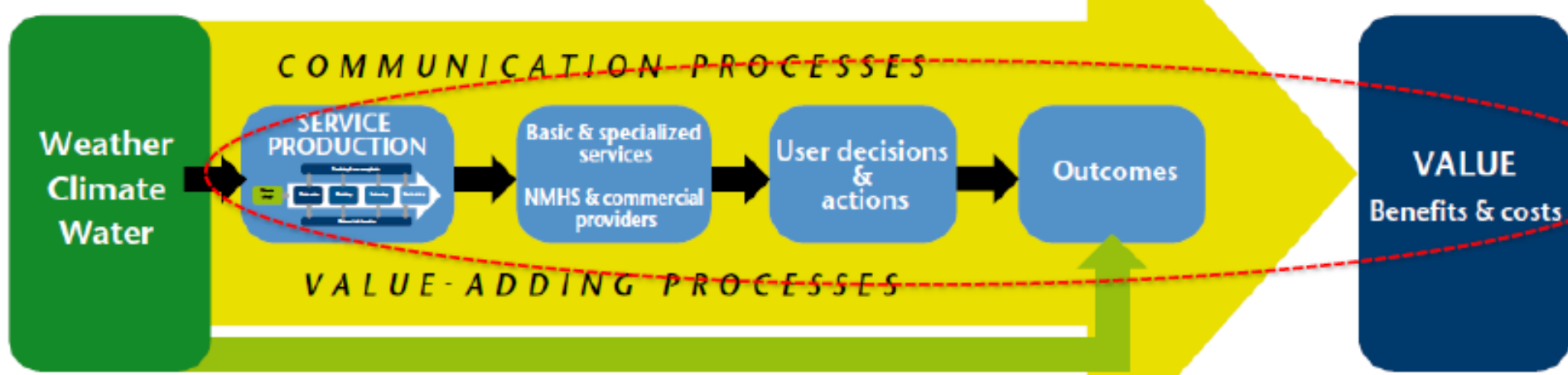


## Service delivery value chain

# Operational service delivery system

**Processing & data management**

**Weather Climate Water** → **Observations** | **Modelling** | **Forecasting** | **Service delivery**

**Research & development**

# Service delivery value chain

**COMMUNICATION PROCESSES**

**Weather Climate Water** → **SERVICE PRODUCTION** → **Basic & specialized services** / **NMHS & commercial providers** → **User decisions & actions** → **Outcomes** → **VALUE Benefits & costs**

**VALUE-ADDING PROCESSES**

**Multiple Interfaces for User Engagement and Informing Decisions**

**ACTIVE ENGAGEMENT**

- Bespoke services
- More intense interaction
- Highly iterative
- Directly usable data
- One-to-one contact
- In-depth understanding

Focused Relationships — Tailored & Targeted

- Multi-way communications
- Build trust
- Co-learning
- Co-producing
- Capacity-building
- Regular interaction

Interactive Group Activities — Dialogue Based

- One-stop shop window
- Up-to-date
- Wide range of products
- Easy to use
- User guided design
- Intuitive

Websites & Web Tools — Information Provision

**PASSIVE ENGAGEMENT**

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# CSIS Implementation Strategy

## Developing and implementing CSIS architecture
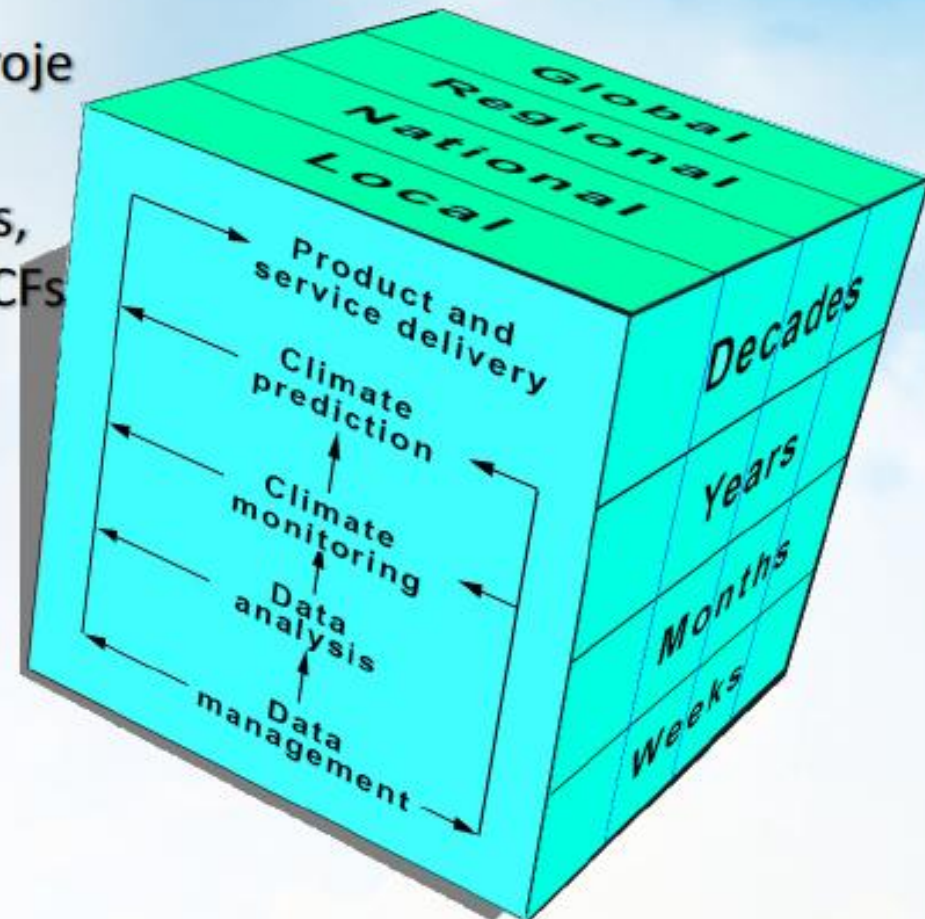
Functional descriptions and product development (Data/Monitoring/Prediction/Projection)

Operational infrastructure: GPCs, RCCs, RCOFs, NMHSs, NCOFs/NCFs

Climate Services Toolkit

Capacity Development

WORLD
METEOROLOGICAL
ORGANIZATION

# Climate Services Toolkit CST

WMO OMM

World Meteorological Organization
Organisation météorologique mondiale

# CST Purpose

- Improve efficiency and raise capacity of service providers by facilitating the production, communication and application of climate information products.

- Ensure that the information and products developed for and provided to end-users is reliable, consistent (through time and across regions) and of high quality.

- Share new tools, information and methods, and thereby enable all CSIS providers to take advantage of research advances.

- Facilitate climate services standards and consistency in support of National Meteorological and Hydrological Services

- Enable more countries to develop their national products, and so encourage improved data sharing, and foster the interaction and shared learning between information providers through the development of a common set of skills.

- Reduce the need for expensive capacity building through availability of training resources. The Climate Services Toolkit will also make training workshops more focused, tangible and efficient in imparting the operational skills.

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# What is CST?

- **The Climate Services Toolkit comprises:**
  - Data portal in public domain for access to and analysis of observations;
  - Data management system for quality control and simple management of data;
  - Climate monitoring tools for calculation of anomalies, percentiles, return periods;
  - Software tools for conducting climate analyses, making predictions, and assessing projections.

**CST** is a suite of guidance, data, software tools, training resources, and examples for enabling climate services at global, regional, and national levels

- These products are accompanied by training materials specifically designated to support the generation and use of climate information and prediction products dedicated to user-target.

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# CST Target Audience

# CST
## Climate Services Toolkit

**GFCS**
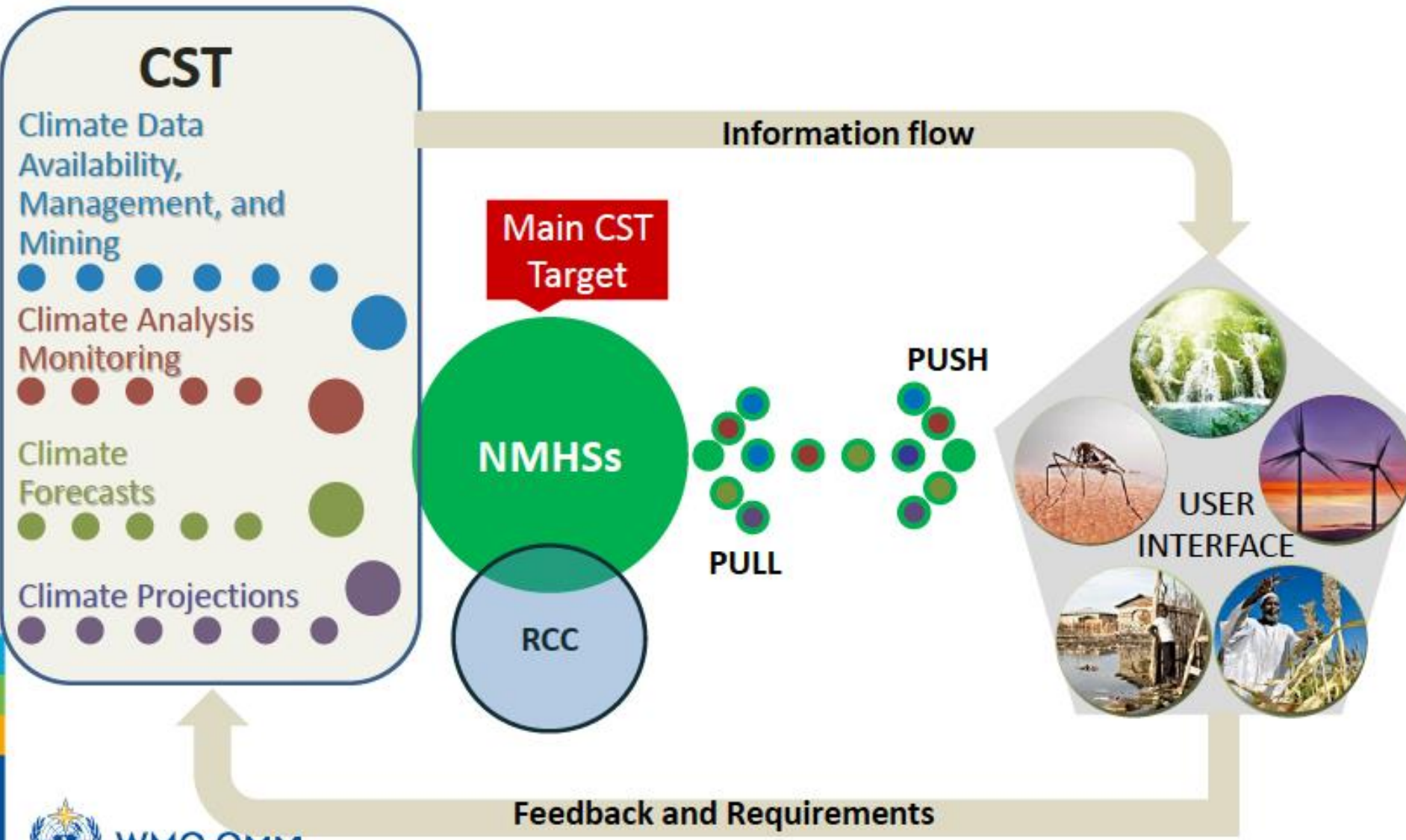
**Welcome to Climate Services Toolkit mockup!**

Climate Services Toolkit (CST) provides access to guidance, data, software tools, training for developing climate services at the National Meteorological and Hydrological Office of WMO members. CST also foresters collaboration and provide venue for developing ideas for application of climate information in decision support.

**At this stage of CST development, only limited resources are available to illustrate concept rather than provide fully operational capabilities.**

To use CST please navigate right -hand menu to examine available features. CRT suggested use:
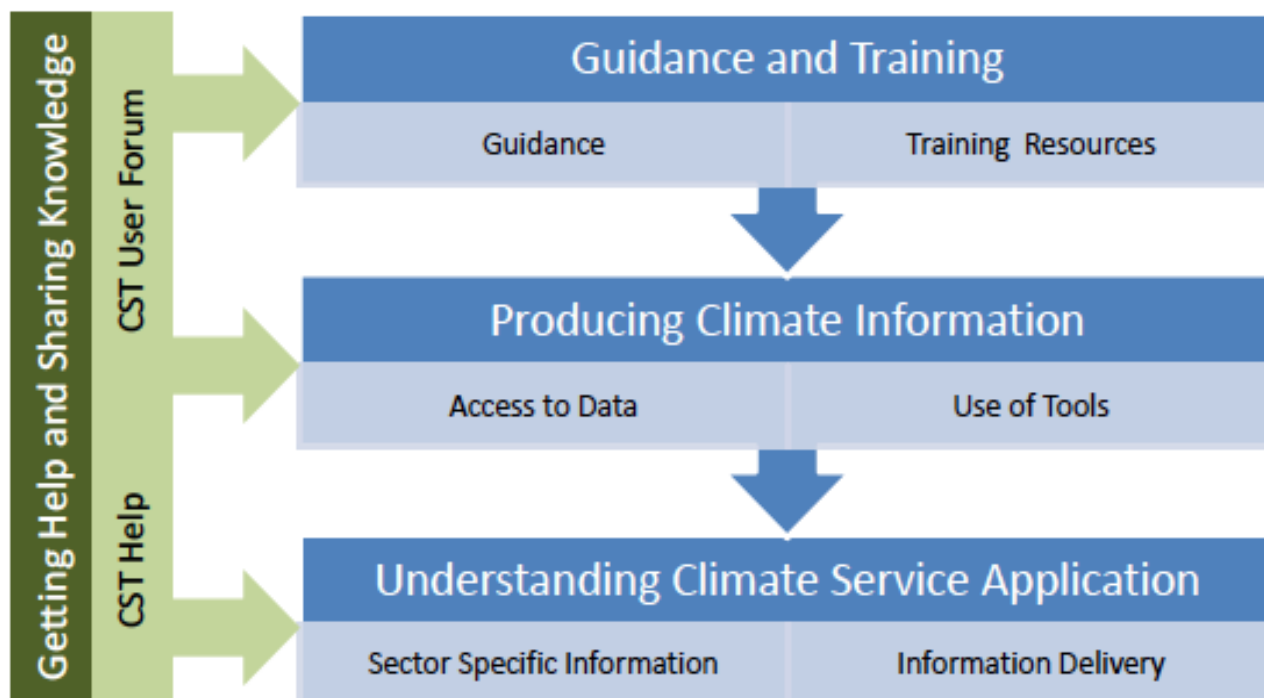
**Getting Help and Sharing Knowledge**

**CST User Forum**

**CST Help**

| Guidance and Training | |
|---|---|
| Guidance | Training Resources |

↓

| Producing Climate Information | |
|---|---|
| Access to Data | Use of Tools |

↓

| Understanding Climate Service Application | |
|---|---|
| Sector Specific Information | Information Delivery |

## About CST

### Guidance and Training
- Guidance
- Training Resources

### Producing Climate Service
- Access Data
- Software Tools

### Understanding User Needs
- Sectorial Information
- Service Delivery

### CST Support
- CST Help
- CST User Forum

# CST
## Climate Services Toolkit

**GFCS**

| | | |
|---|---|---|
| Guide to Climatological Practices WMO No. 100 | | All the relevant information regarding the most important practices and procedures in climatology is established in the Guide to Climatological Practices. http://www.wmo.int/pages/prog/wcp/ccl/guide/guide_climat_practices.php |
| Guidelines of extremes in a changing climate in support of informed decisions for adaptation 2009 | | Document provides guidance on how to account for a changing climate when assessing and estimating extremes http://eca.knmi.nl/documents/WCDMP_72_TD_1500_en_1.pdf |
| PROVIA Guidance on Assessing Vulnerability, Impacts and Adaptation to Climate Change, 2013, UN Environnemental Programme | | Document provides conceptual basis, decision trees, methods, and tools http://www.unep.org/provia/Portals/24128/PROVIA_guidance_report_low_resolution.pdf |
| International Climate Assessment and Dataset | | |

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# CST
## Climate Services Toolkit

**GFCS**

**Education and Training Resources** provide learning progression for staff from RCCs and NMHSs as well as technical users of climate information.

**Learn Climate Basics**
- • Understanding Climate
  - • Climate 101
  - • Climate Variability: Mechanisms, Impacts, Predictability
  - • Climate Change: Mechanisms, Impacts, Predictability
- • Create and Manage Climate Data Sets

**Produce Actionable Climate Information**
- • Derive Products from Climate Data
  - • Climatology Products
  - • Climate Monitoring Products
- • Create and Interpret Climate forecasts and Model outputs
  - • Intra-seasonal and Seasonal Outlooks
  - • Assessing Future Climate
- • Ensure the Quality of Climate Information and Services
- • Addressing limited predictability situations

**Support Climate Decisions**
- • Tailored Climate Information
- • Communication and Dissemination Practices
- • Climate Adaptation Planning
- • Monitoring and Evaluation of Climate Service

## About CST

## Guidance and Training
- • Guidance
- • Training Resources

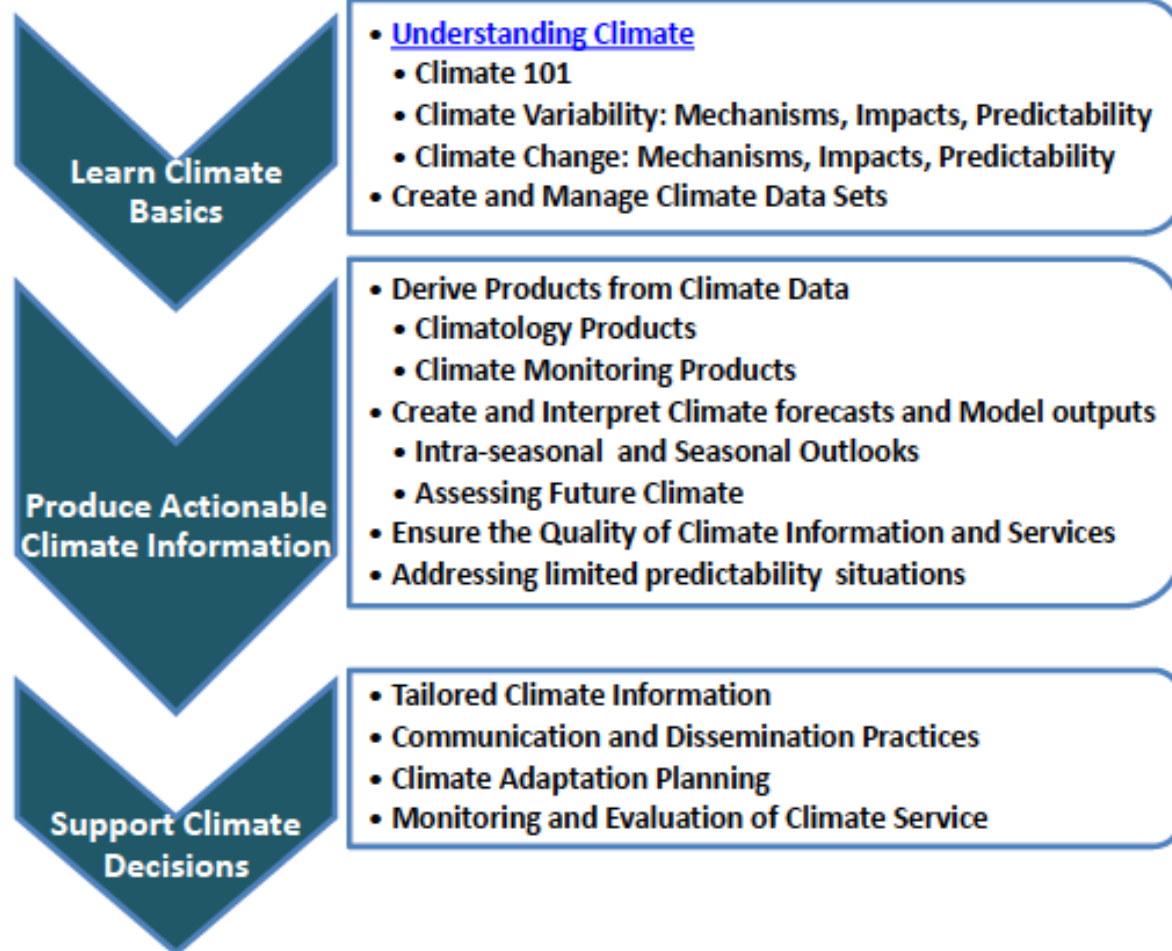## Producing Climate Service
- • Access Data
- • Software Tools

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- • Sectorial Information
- • Service Delivery

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# CST
## Climate Services Toolkit

**GFCS**

**Understanding Climate Training modules** provide training modules on background knowledge for understanding climate system, physical mechanisms, impacts, and predictability of climate variability and climate change.

### Weather vs. Climate

**Derek Arndt**
**National Climatic Data Center, NOAA**

**Description:** This lecture explores assumptions and current understanding of the differences between weather and climate. Differences are examined from the perspectives of physical experiences, approaches to data and analysis as well as conceptual and computational modeling.
(duration 1:02 hr)

### The El Niño/ Southern Oscillation (ENSO) Cycle

**Michelle L'Heureux**
**Climate Prediction Center, NOAA/National Weather Service**

**Description:** This lecture provides an overview of variables associated with the El Niño/ Southern Oscillation (ENSO) Cycle and the relationship between those variables. Teleconnections and global and US impacts are discussed along with an examination of the application of monitoring prediction at the NWS Climate Predictions Center.
(duration 1:03 hr)

### Madden-Julian Oscillation

**Jon Gottschalk**
**Climate Prediction Center, NOAA/National Weather Service**

**Description:** This lecture provides an introduction to the general characteristics, structure and propagation of the Madden-Julian Oscillation (MJO). Theories to explain the MJO are presented along with a discussion of tools, methods and data used to monitor this phenomenon. In addition, impacts, predictability and forecast tools are covered. Finally, assessment resources are offered.
(duration 1:02)

About CST
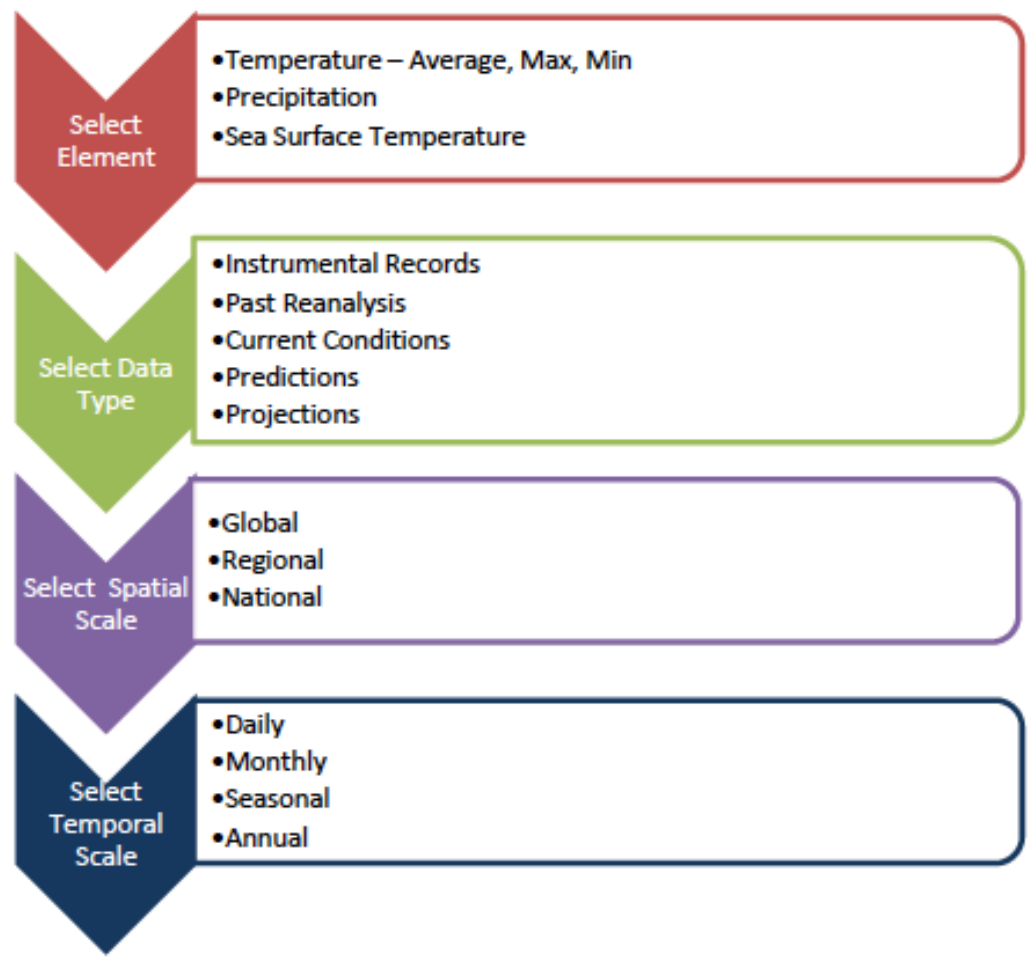
Guidance and Training
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# CST
## Climate Services Toolkit

**GFCS**

**Climate Data** provide access to recommended numerical data sets for downloading and using in provision of climate services.

**Select Element**
- Temperature – Average, Max, Min
- Precipitation
- Sea Surface Temperature

**Select Data Type**
- Instrumental Records
- Past Reanalysis
- Current Conditions
- Predictions
- Projections

**Select Spatial Scale**
- Global
- Regional
- National

**Select Temporal Scale**
- Daily
- Monthly
- Seasonal
- Annual

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# CST
**Climate Services Toolkit**

**GFCS**

**Climate Services Tools** provide access to recommended software for accessing, mining, and using information for improving climate services and supporting climate-sensitive societal challenges

Terms for Tool Compliance with WMO Quality Management Framework

Managing Data

Analyzing and Monitoring Climate

Predicting & Verifying Predictions

Projecting Future

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**Climate Service Application section** facilitate connection between climate information producers and users to enhance management of climate-related risks in the five priority areas:

**Health**
- GFDL Exemplar
- •Health and Climate Portal
- Climate Information Use

**Disaster Risk Reduction**
- GFDL Exemplar
- Climate Information Use

**Energy**
- GFDL Exemplar
- Climate Information Use

**Water Resources**
- GFDL Exemplar
- Climate Information Use

**Food Security**
- GFDL Exemplar
- Climate Information Use

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## Climate Services Toolkit

**GFCS**

**Placeholder for Service Delivery Guide** to be coordinated with the CCL ET on Tailoring Climate Information and UIP experts

```
Select Information  →  Taylor to Specific User Needs  →  Select proper delivery time  →  Apply effective communication method
```

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# CST

## Climate Services Toolkit

**GFCS**

**CST User Forum** fosters development of climate community including CST users, producers, and researchers. The forum fosters usability of climate data and tools, shares information, improves climate knowledge management, and creates ideas for climate services development.

| Topic | Replies | Views | Last Date |
|---|---|---|---|
| Ξ Temperature Data | | | |
| Ξ Use of Climate Analysis Tools | | | |
| Ξ Climate Information Application | | | |
| Ξ Prediction Tools | | | |
| Ξ Climate Adaptation Planning | | | |
| Ξ Training Sessions | | | |
| Ξ Add New Topic | | | |

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شكر
Thank you
Gracias
Merci
Спасибо
谢谢

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TEMPS CLIMAT EAU