

Capacity development aspects:
Addressing the needs to build competences

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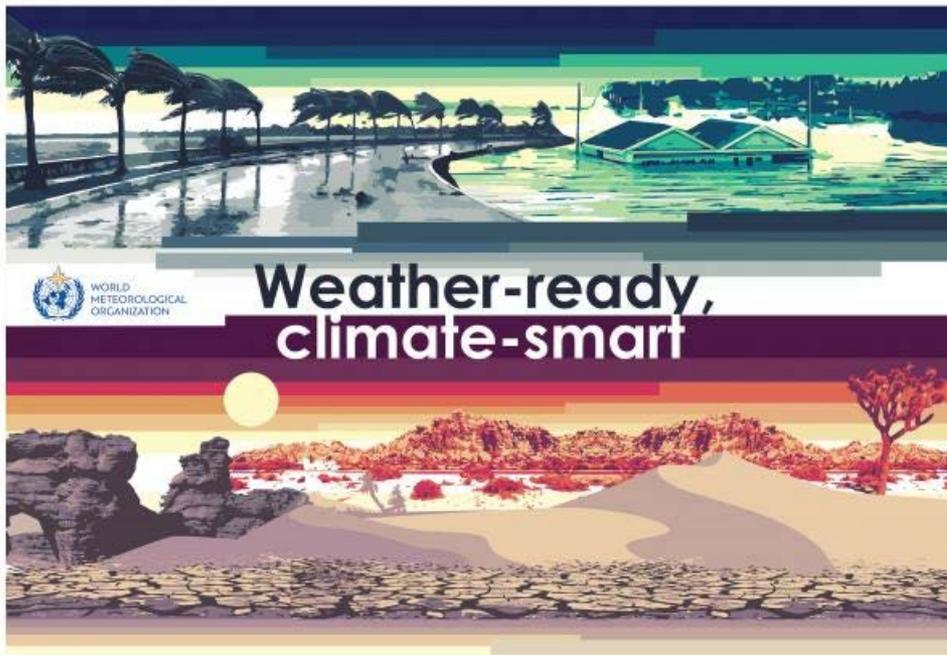
International Desks

Climate Prediction Center

National Oceanic and Atmospheric Administration

Weather-ready, climate-smart

World Meteorological Day, 23 March 2018



Source: WMO

- Meteorological Services are the backbone of Weather-ready, Climate-smart communities

Climate-smart communities: communities that can use forecast information at all time scales to reduce devastating impact of extreme events (tropical cyclones, flooding, drought, etc.)

Requirements:

- Build institutional and infrastructural capabilities to enable the transition of research into operations that will improve weather and climate services
- Engage government agencies, NGOs, private sector, and academia, that can all commit to making communities responsive and resilient

Observations

Strong Observational Network required to:

- Assimilate data into numerical models that produce forecasts
- Develop reliable historical data that can support high quality reanalysis datasets
- Conduct weather and climate diagnostics and attribution studies
- Develop tools to monitor and assess the current state of the climate system
- Climate Data Management Systems
 - Essential to improve data access and to use the information adequately



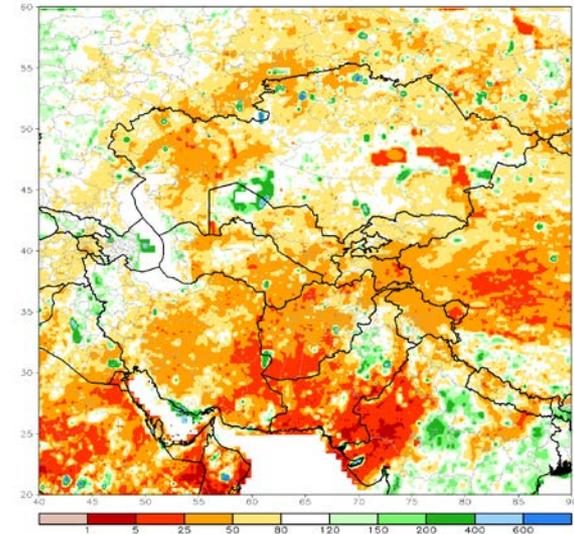
Observing system, Source WMO

Climate Monitoring

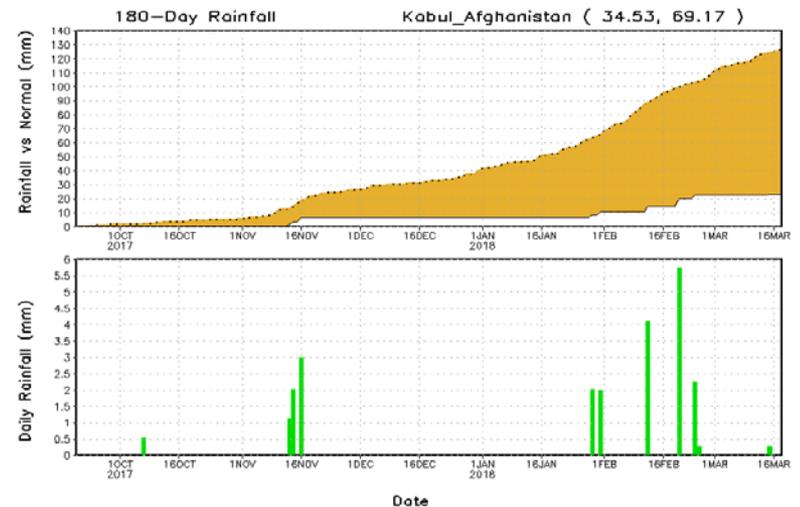
Essential for effective delivery of climate services

- Provide timely and relevant information on droughts and degree of drought severity, flooding, extreme weather conditions, etc.
- Make use of satellite rainfall estimates to complement in-situ observations
- Efficient climate monitoring system requires a minimum set of graphics that Meteorological Services can create and update on a daily basis

RFE2 180-Day Percent of Normal Rainfall (%)
Period: 20Sep2017 - 18Mar2018



RFE2 Point Time Series

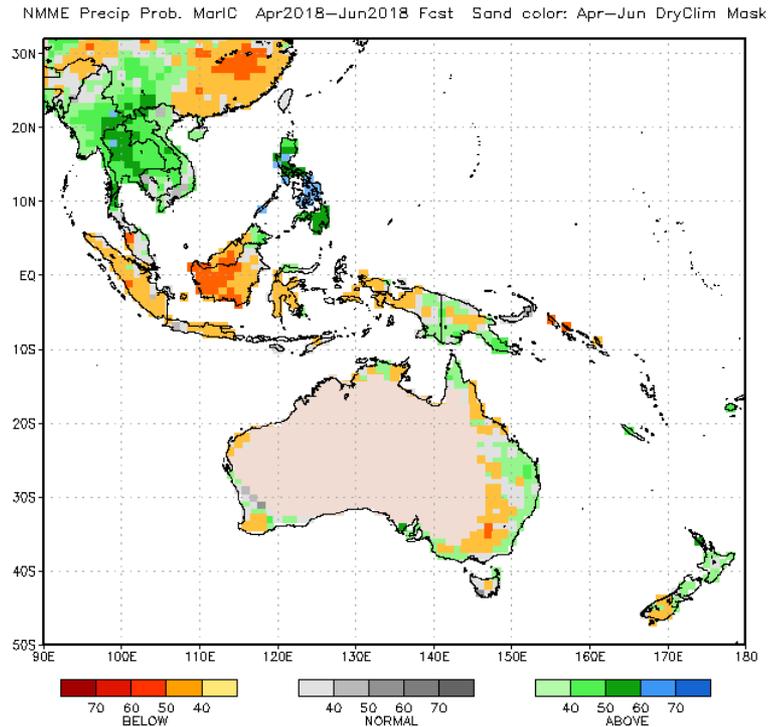


Source CPC/NOAA

Weather and Climate Forecasting

Seamless approach to forecasting (nowcasting, short and medium range weather forecasting, sub-seasonal and seasonal forecasting), is critical to meeting the requirement of the public.

- Sub-seasonal forecasting (week-2, week3-4, monthly)
 - Requires combination of numerical model outputs and knowledge of the dynamics associated with sub-seasonal variability
 - Knowledge of the state of the Madden Julian Oscillation (MJO)
- Seasonal forecasts: three month averages of precipitation and temperature at least one month up to one year lead time
 - Probabilistic in nature to convey uncertainty in the forecasts
 - Basic understanding of sources of predictability is required to make high quality forecasts (ENSO, trends, Indian Ocean Dipole Mode, Atlantic Mode, etc.)



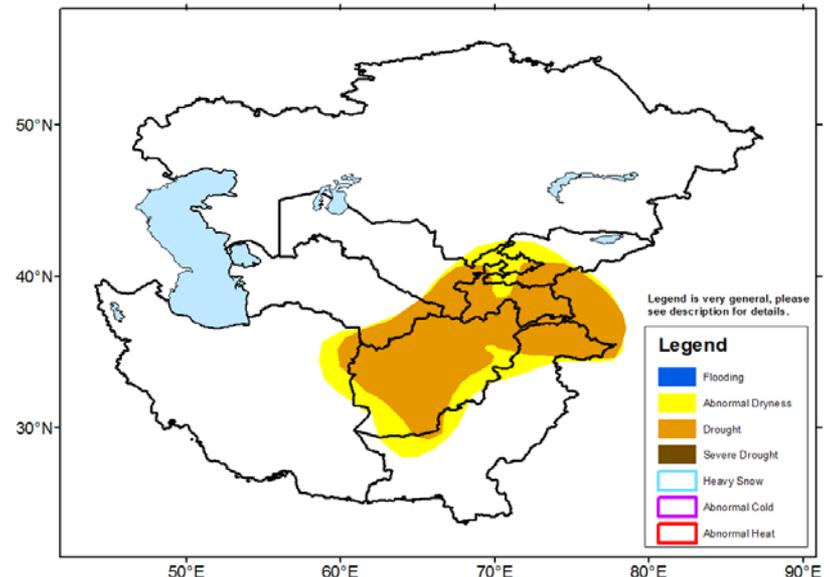
Source CPC/NOAA

Impact-Based Climate Forecasts

Multi-hazard climate forecast systems are critical to increase preparedness for drought, floods, and variability within a season

- Multi-disciplinary outlooks that could be used to predict the level of hazards given current conditions and the forecasts
- Hazards can be crop damage, water shortages, epidemic outbreaks, food insecurity
- Hazards outlooks are prepared in partnership with other government agencies and/or academia and private sector

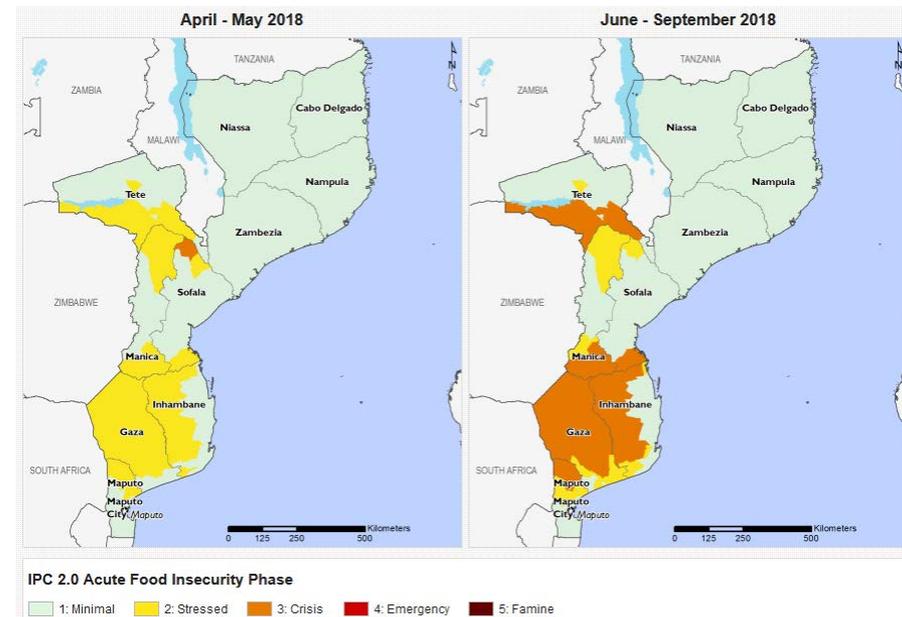
Hazards Outlooks for Food Security Central Asia



Source CPC/NOAA

National Early Warning System (NEWS)

- Meteorological Services to provide all stake holders within the country with real time operational weather and climate information and warnings that enable decision making
- National Multidisciplinary Working Group (NMWG) led by NMHSs with a clearly articulated mandate and terms of reference (ToR) is critical to the effectiveness of the NEWS



Source USAID

National Early Warning System (NEWS)

- The goal of the NMWG is:
 - To foster dialog between Met and the various institutions engaged in the NEWS
 - To provide relevant meteorological and climate information that meet the requirement of the NEWS
 - Identify priorities in the use of climate information in decision making
 - Train the members of the NMWG in the understanding of the climate information
 - Work towards an efficient dissemination system of relevant climate information for early warnings
 - Encourage data exchange and the creation of databases that will support collaborative multidisciplinary research and development
 - Promote the work of the NMWG to funding agencies to support joint projects on EWs



Education

Meteorologists or physical scientists must possess at least a 4-year university degree in meteorology or related sciences

- Assess the staffing needs and requirements to meet the challenges for climate services
- Invest in higher level education for meteorological assistants who have a high school diploma
- Hire new graduates from universities
- Allow the staff to attend post graduate studies (MS or Ph. D.) provided that this does not impede upon the delivery of climate services
- Provide newly hired and returning staff from academic training with a job description and work plan tied to the overarching operating plan of the Met
- Engage mid-level managers in the operations of the NMHSs

Professional Development Training

Modern Hydrometeorological Services must strive to strengthen human resource capacity

- NWP modeling and weather forecasting
- Climate monitoring and forecasting
- Research and development
- Climate data management
- Computing support and maintenance
- On-the-job or hands-on training to develop skills

Professional Development

Current Practices

- Training workshops
 - Two-to-five day training workshops generally on seasonal forecasting
 - Participants run seasonal forecast experiments
 - Prepare seasonal outlooks to feed into the regional consensus outlook
 - Various methods to make seasonal outlooks
 - Linear Regression
 - CCA forced with observed SST
 - CCA forced with dynamical model predicted SST
- Issues
 - No continuity in terms of attendance
 - Lack of required background
 - Lack of good quality data
 - Little emphasis on the interpretation of the forecasts

Competencies Required Operational Seasonal Forecasting

- Knowledge of statistics and climatology
- Knowledge of the physical parameters that impact outlooks: Trends; Physical modes and impacts (ENSO, IOD, AO, AAO, etc.)
- Ability to think through what goes into the forecast, NOT just transpose models (**How to combine dynamical model output with statistical models and trends**)
- Ability to use GIS to map outlooks
- Ability to communicate the outlook in writing and orally
 - Technical communication: Properly explain the science behind the outlook
 - Non- technical communication: Ability to distill down the outlook and explain probabilities
- Ability to verify forecasts and to communicate uncertainty

Competencies Required

Operational Sub-seasonal Forecasting

- Knowledge of the state of the MJO:
 - Understand MJO impacts on regional rainfall
- Fluent in the use and interpretation of NWP model outputs
- Assess forecast skill and factor into forecast decision
- Prepare sub-seasonal forecasts based on convergence of evidence between MJO signal and NWP outputs

Summary

- Weather Ready and Climate Smart Communities must be supported by strong institutional and infrastructural capabilities
- Meteorological Services need government mandate:
 - To provide basic meteorological and climatological services
 - To lead a National Multidisciplinary Working Group that enables effective early warning system
- Met Services need to invest in the training of a cadre of professionals who can deliver the services required
- Strong institutional commitment leads to developing the infrastructure required to improve operations via R&D
 - Enhancing the observational network and data management
 - Developing tools for climate monitoring and forecasting
 - Developing tools for hazards outlooks
 - Packaging and communicating information in a way that decision makers can understand it and use it
- Perennial professional development training for Met staff and stakeholders to sustain and improve climate services

Thank you