Application of Climate information in the management of water resources

Christopher Oludhe (Ph.D)

Department of Meteorology

University of Nairobi

And

IGAD Climate Prediction and Applications Centre (ICPAC)

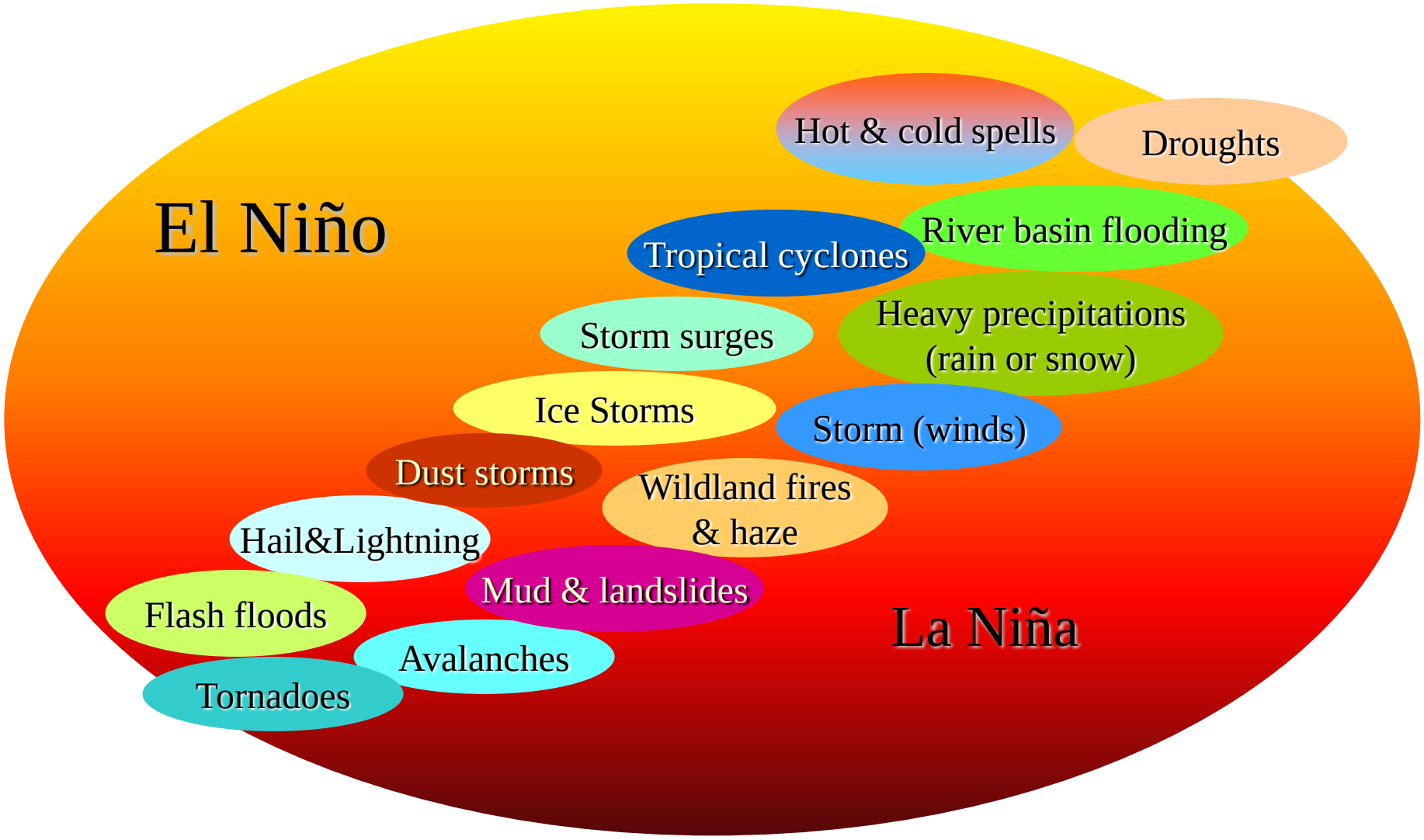
Workshop on Multi-Country Support Programme to Strengthen Climate information systems in Africa

13 – 14 April 2014, UN Conference Centre, Addis Ababa, Ethiopia.

Background

- **Extreme climate events are very common within the IGAD sub-region and whenever they occur, they are associated with loss of life and property, destruction of infrastructure resulting in large losses to the economy and sometimes retarding national economic grown backwards by several years.**
- **Climate monitoring, prediction and timely early warning of such extreme climate events is one of the best strategies for mitigating the negative impacts resulting from these events.**
- **Climate information can also be used to improve crucial decisions required in all the components of an integrated disaster management namely early warning, prevention, mitigation, preparedness, relief and rescue, rehabilitation and reconstruction.**

Climate Hazards









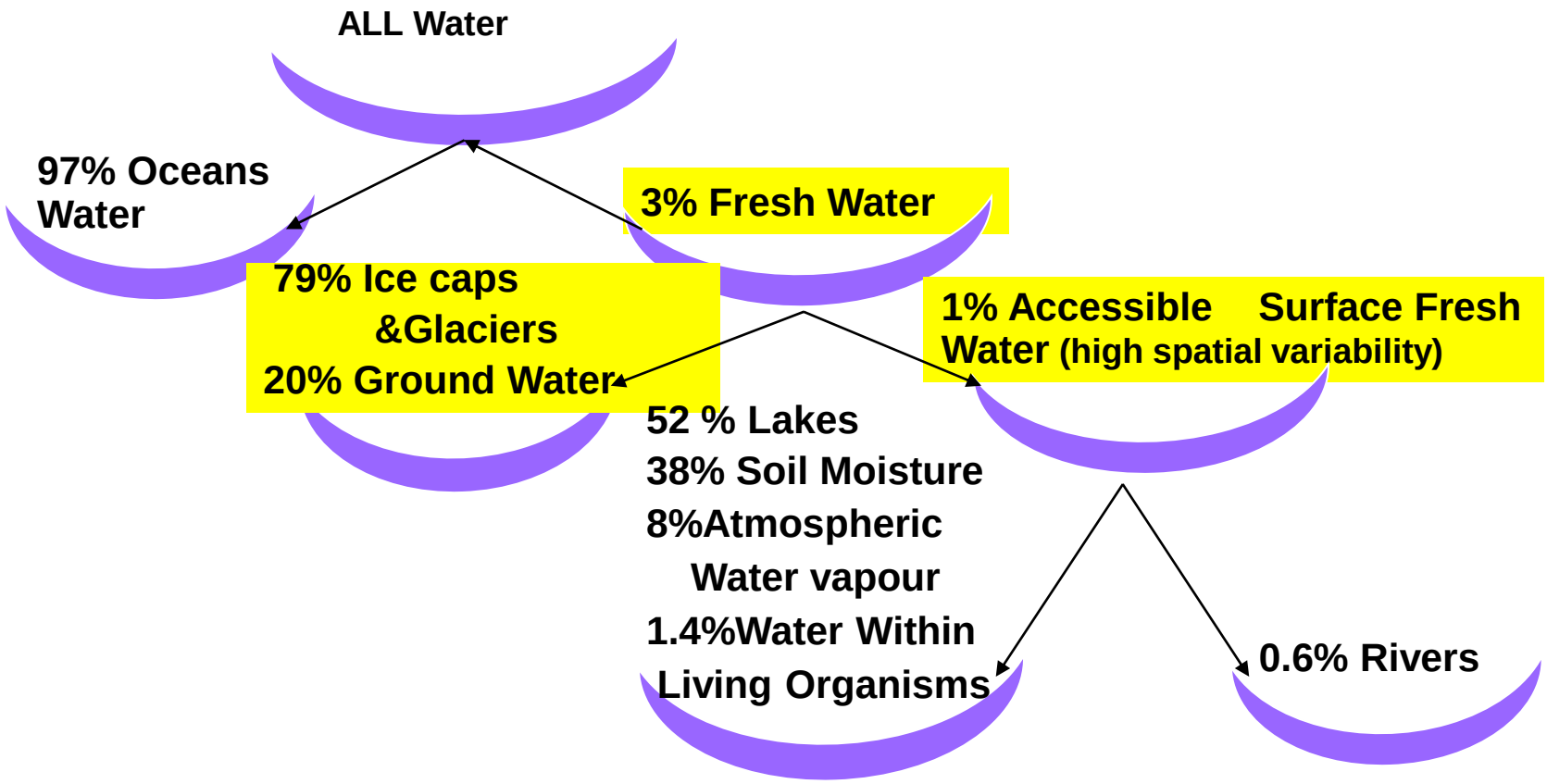


Climate Impacts

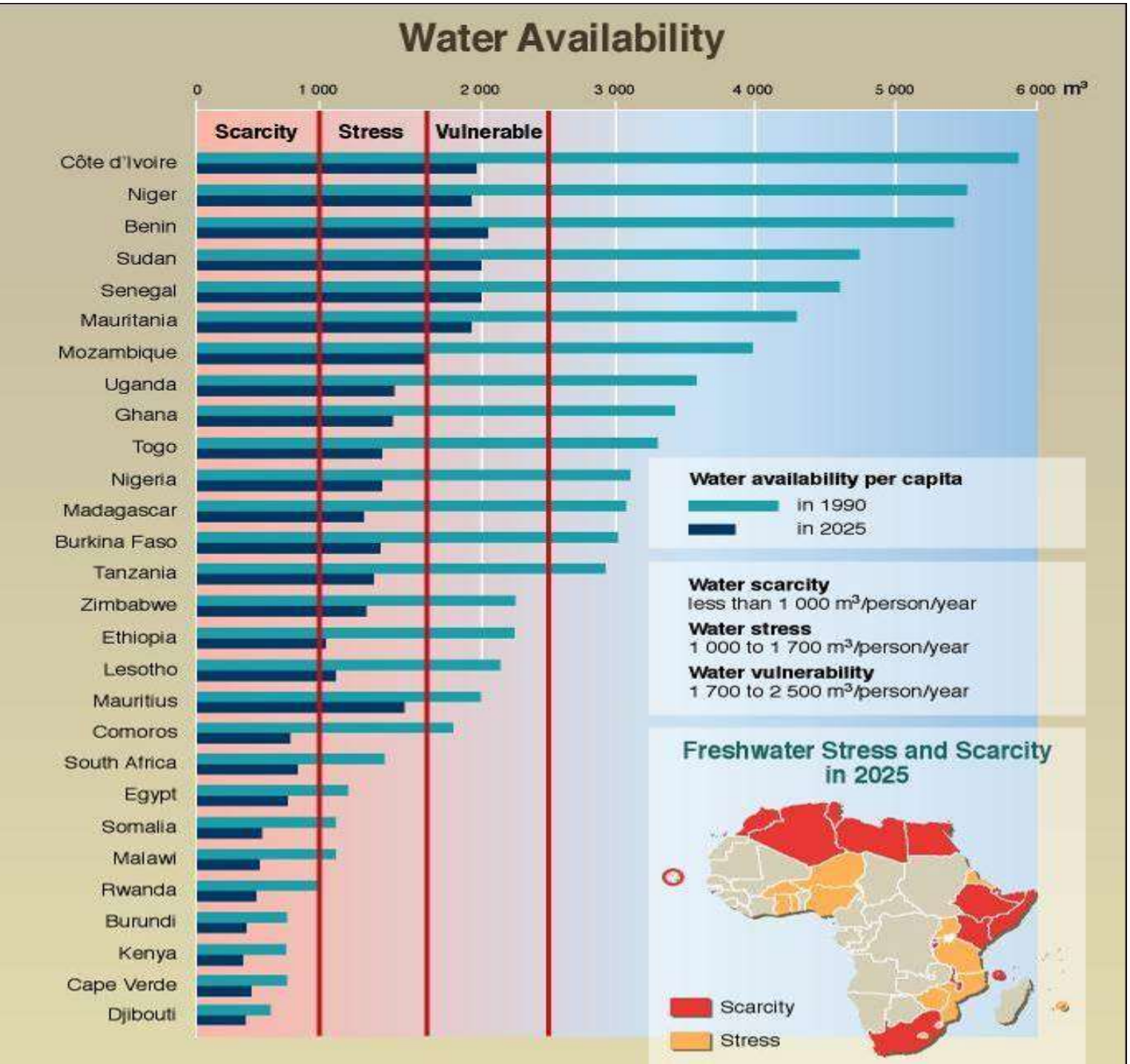

Water as a Resource

- Water as a resource plays a major role in driving the economy of a country and is practically used in all sectors and more so for domestic consumption in urban and rural areas, industries, energy generation, agriculture, livestock, fisheries among others.
- Rainfall is a major input into the hydrological cycle, hence surface water resources are greatly influenced by climatic factors.
- Climate variability and change strongly affects the spatial and temporal distribution of the water Resources
- Too much or too little water is a major concern to water managers and there is need to manage this resource for sustainable development of a country .
- Freshwater availability and access is a priority in many countries in Africa including the IGAD sub-region.

Global Water Resources



- Total Fresh Water = 35 000 000 Km^3
- Total Water Flowing in the Rivers = 21 200 Km^3



- The main factors contributing to water stress are population growth, irrigation, and livestock watering, droughts and deforestation, poor land management, and pollution from human activities and industry.

Climate information needs in the Water Sector

- Efficient management of water resources.
- Reservoir (Dam) planning and operations
- Hydropower generation
- Development of appropriate water harvesting techniques
- Development of flood early warning systems
- Flood Hazard (risk) mapping and management
- Water conservation, regulation and allocation
- Ensuring water security for various socio economic activities

Role of ICPAC in the GHA

- The IGAD Climate Prediction and Applications Centre (**ICPAC**), formerly known as the Drought Monitoring Centre, Nairobi (DMCN), is a specialized regional centre of the Inter-Governmental Authority on Development **(IGAD)** charged with the responsibility of climate monitoring, prediction, early warning and applications for the reduction of climate related risks including those associated with climate variability and change.
- ICPAC serves 11 member countries within the GHA which include Kenya, Uganda, Tanzania, Rwanda, Burundi, Somalia, Ethiopia, South Sudan, Sudan, Eritrea and Djibouti.

Operational Activities

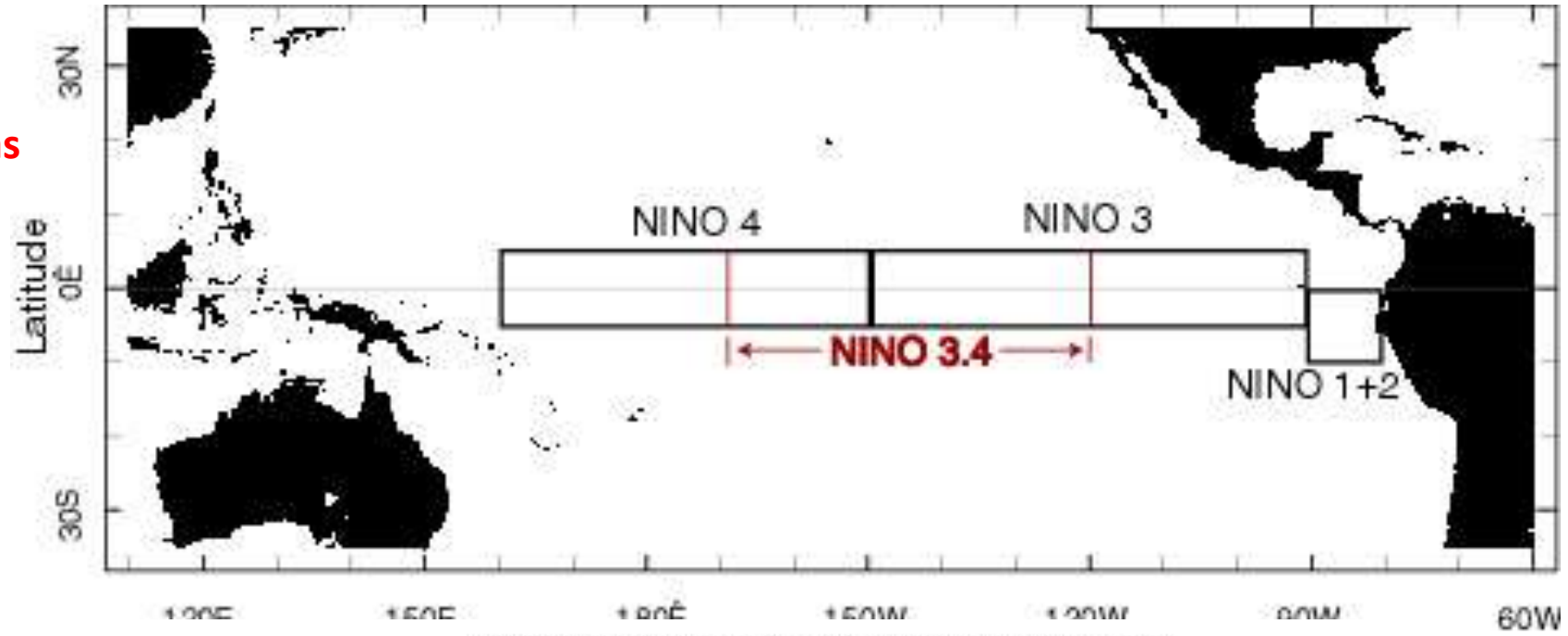
- Development and archiving of regional and national quality controlled climate databanks
- Data processing including development of basic climatological statistics
- Timely acquisition of near real-time climate and remotely sensed data
- Monitoring space-time evolutions of weather and climate extremes over the region
- Generation of climate prediction and early warning products
- Timely dissemination of early warning products
- Climate change monitoring, detection and attribution including climate change modeling.
- Delineation of risk zones of the extreme climate related events
- Downscaling of global climate forecasts to regional and national levels
- Conduct capacity building activities in the generation and application of regional tailored climate products relevant to user needs
- **Organization of Climate Outlook Forums (COFs) for the GHA countries**
- Enhancement of interactions with users through users workshops and pilot application projects
- Enhanced networking with the NMHSs, regional and international centers for data and information exchange
- Promoting technical capacity building at NMHS level (e.g. acquisition of hardware, software, etc.), as required for implementation of climate services.

Climate Monitoring Indicators at ICPAC

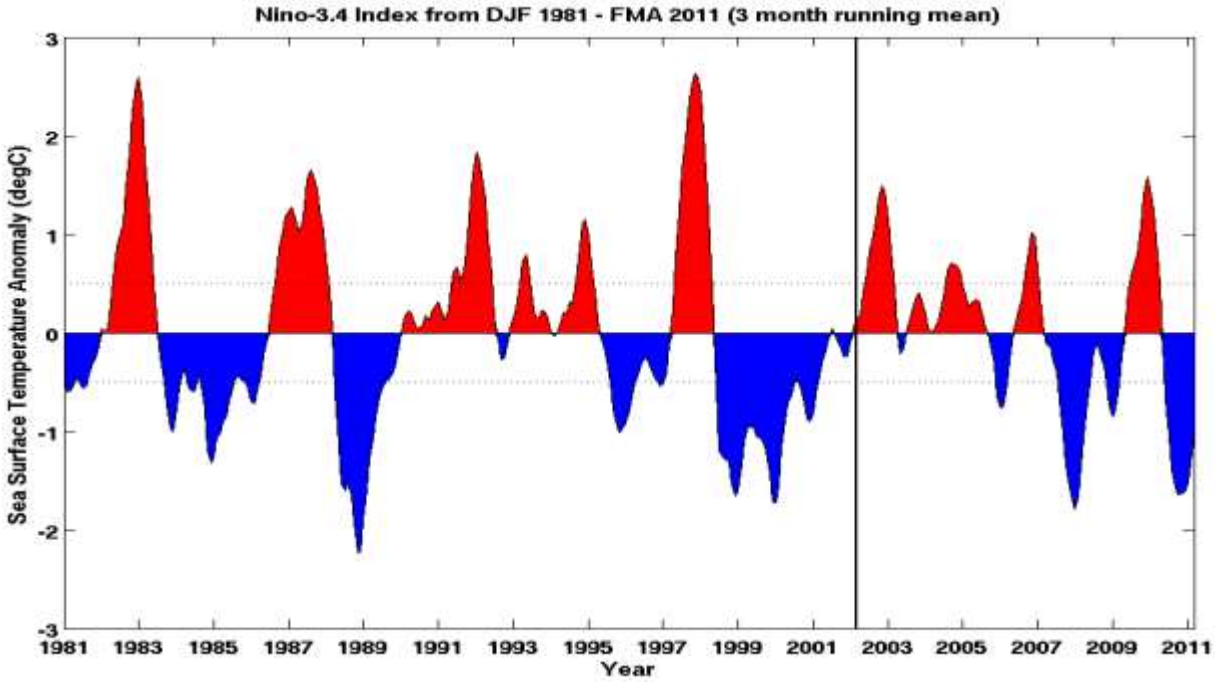
The frequently used indicators for monitoring, analyzing and predicting extreme climate events at ICPAC include:

- Sea Surface Temperatures (SSTs)
- El-Niño Southern Oscillation (ENSO) Indices
- Indian Ocean Dipole (IOD)
- Tropical Cyclones (TC)
- Inter-Tropical Convergence Zone (ITCZ)
- Surface and Upper Air winds,
- Air Temperature
- Humidity among others

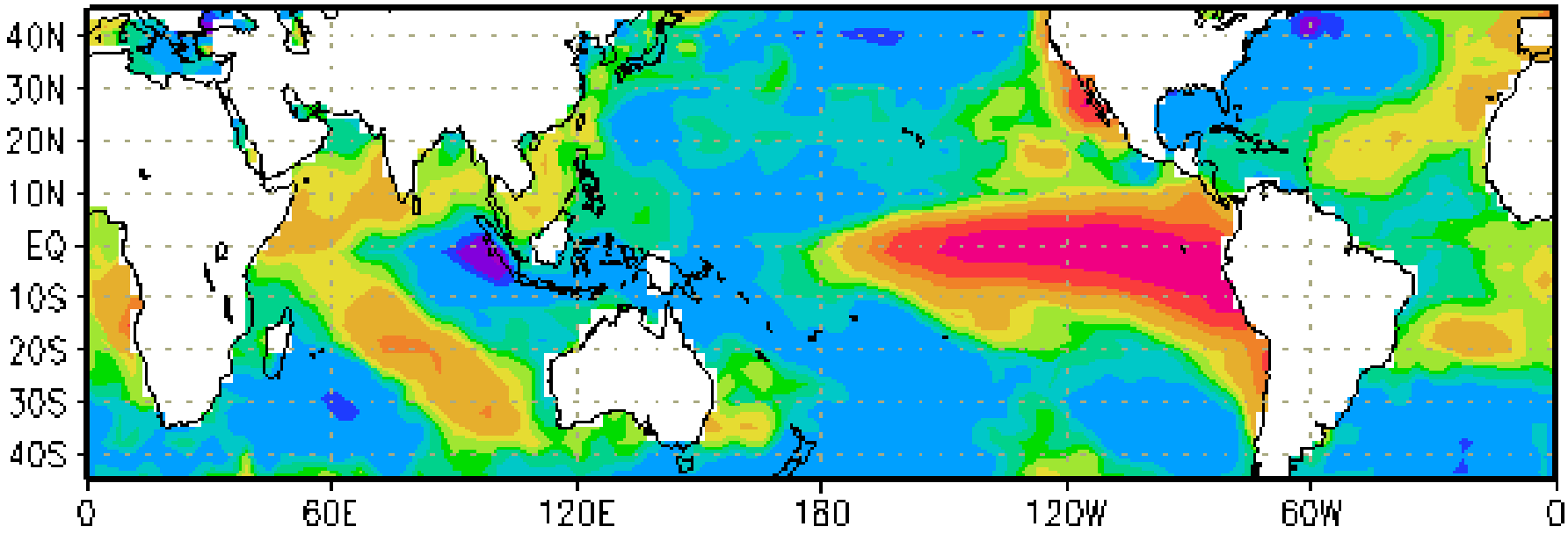
Niño Areas

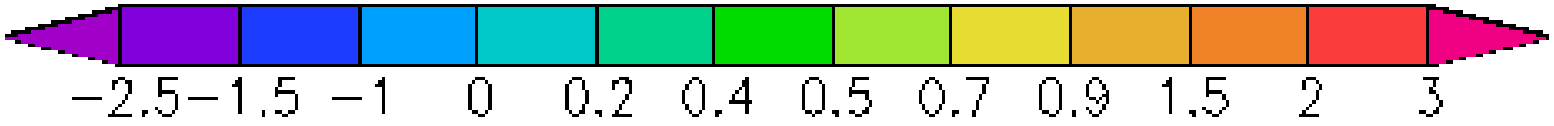


Nino 3.4 Index

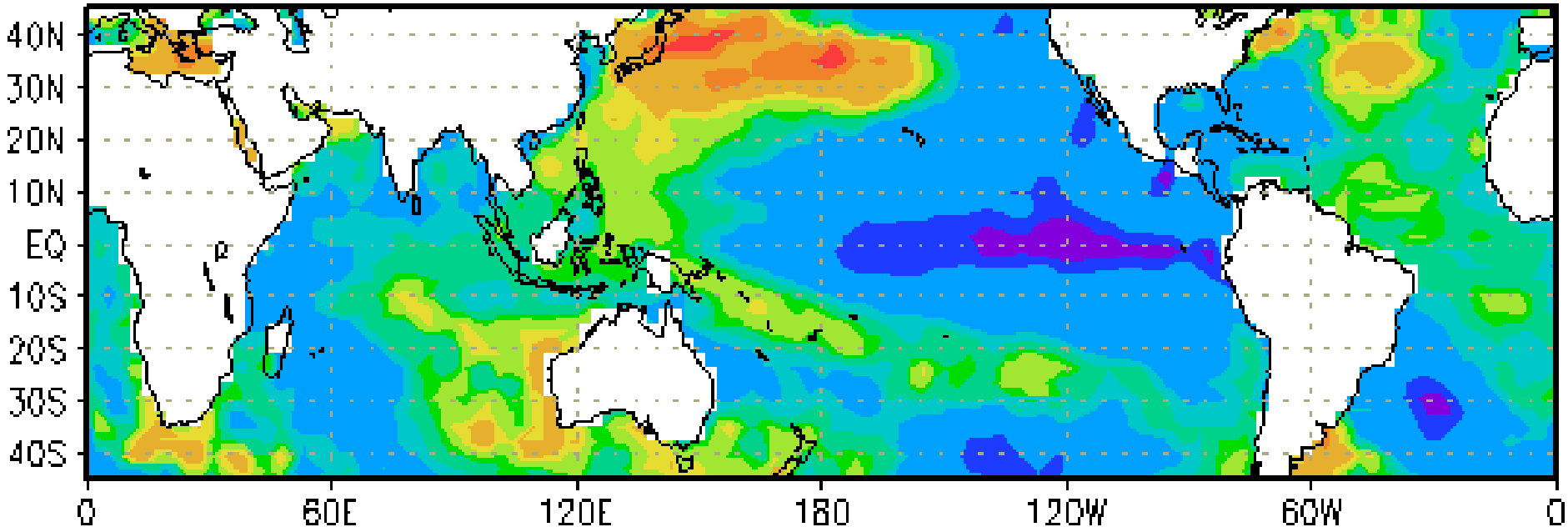


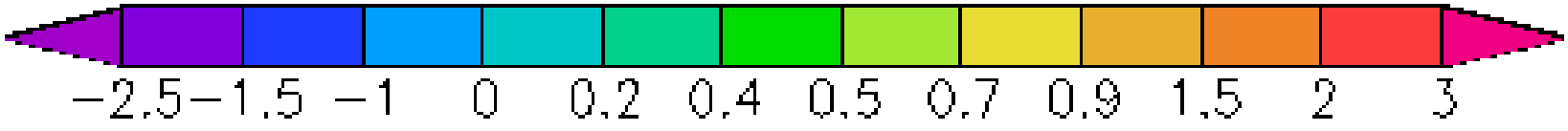
GLOBAL OCEAN SST INDEX PATTERNS FOR A MATURE PHASE OF EL-NINO





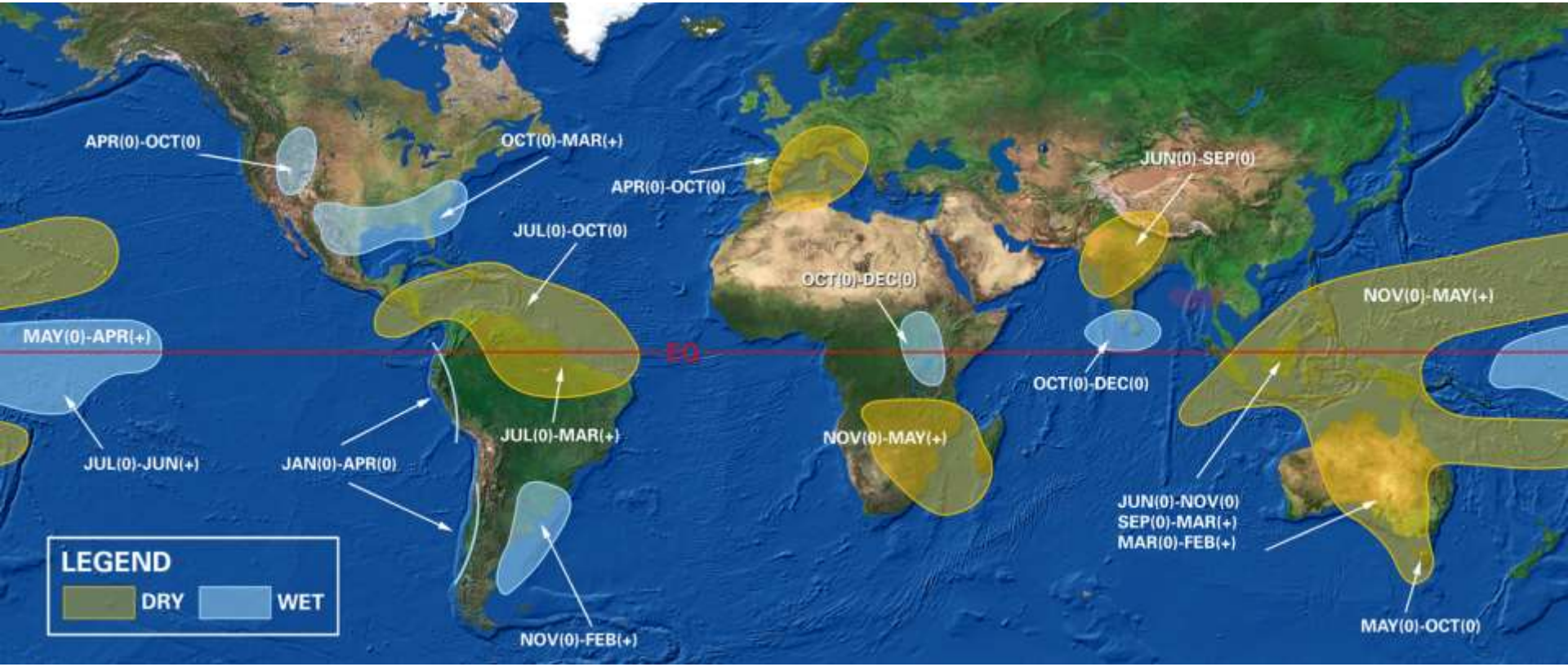
GLOBAL SST INDEX PATTERNS FOR A MATURE PHASE OF LA-NINA





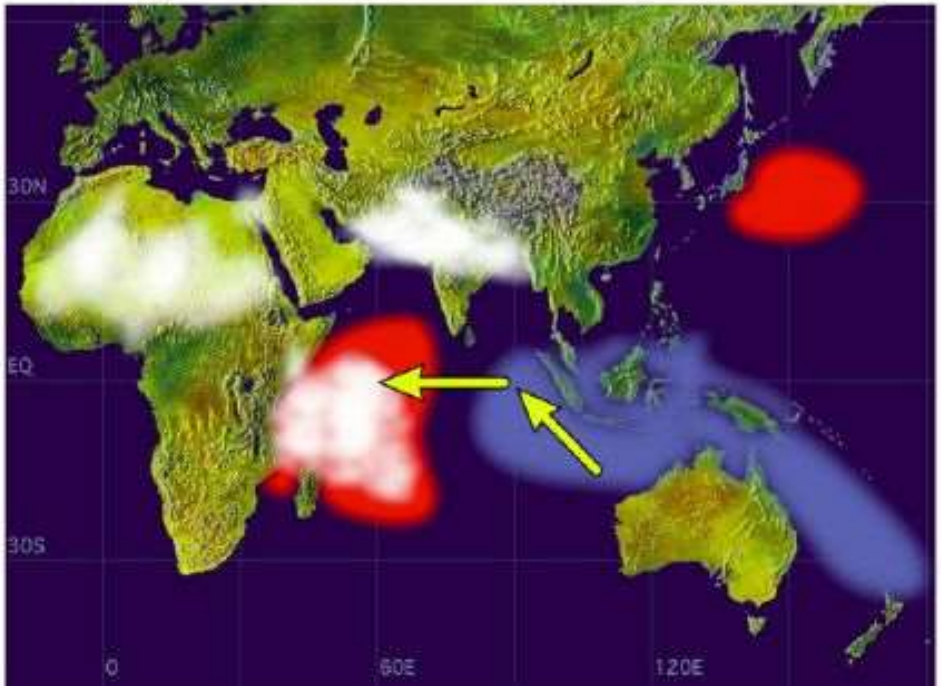
ENSO Impacts

ENSO - El Nino Southern Oscillation - Worldwide impacts

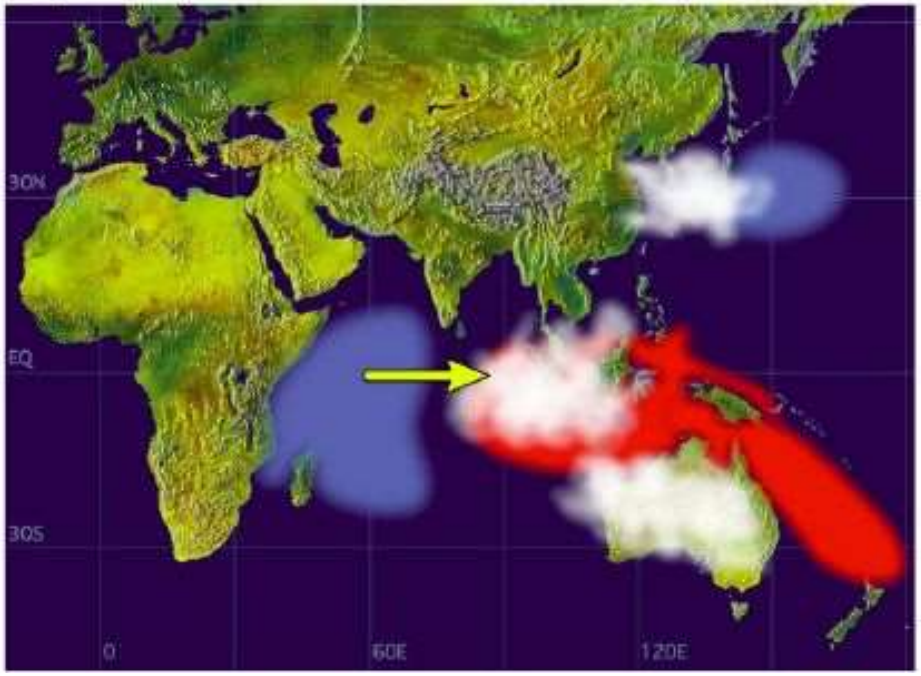


Indian Ocean Dipole (IOD)

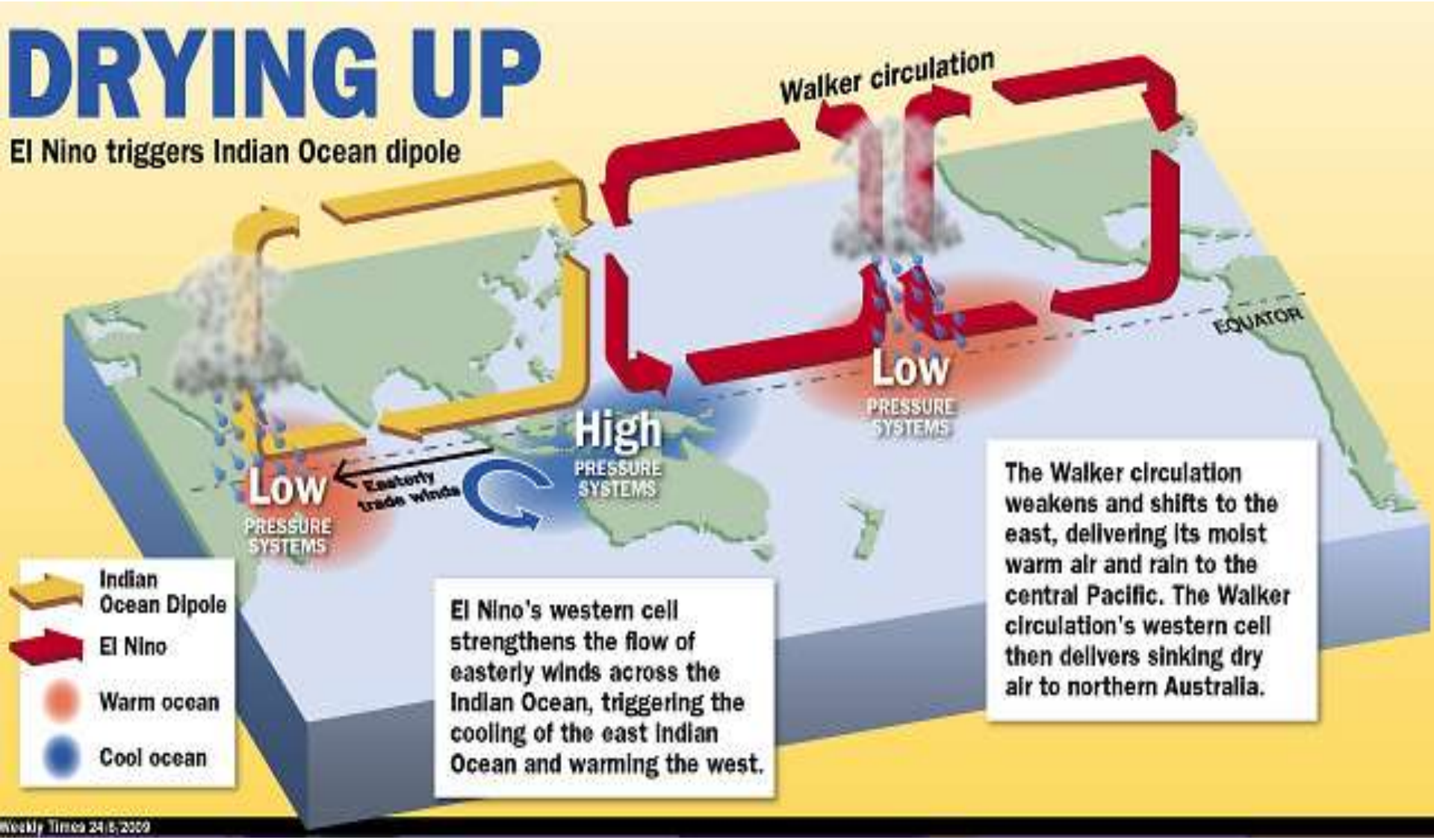
Positive Dipole Mode



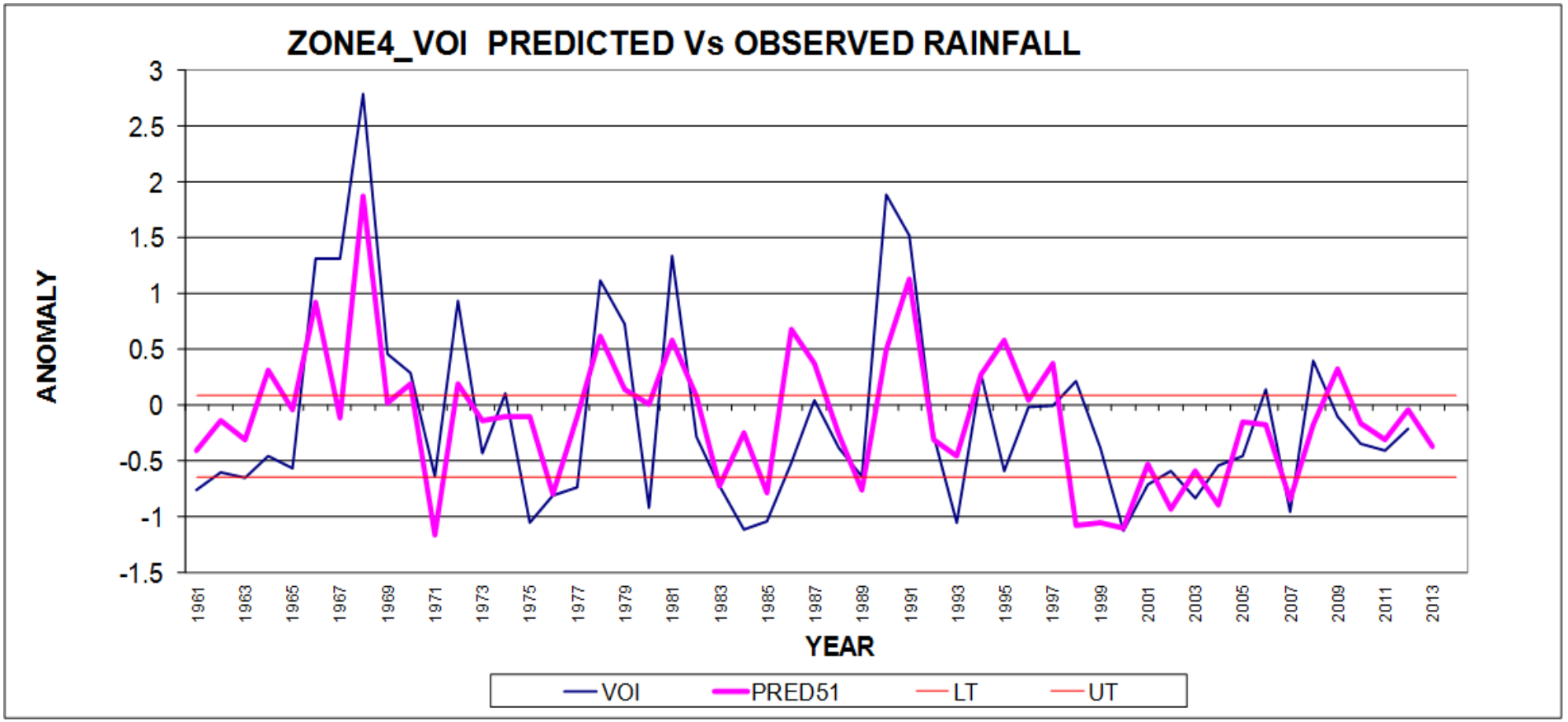
Negative Dipole Mode



IOD AND EL NINO LINKAGES



Example of a Statistical Climate Prediction

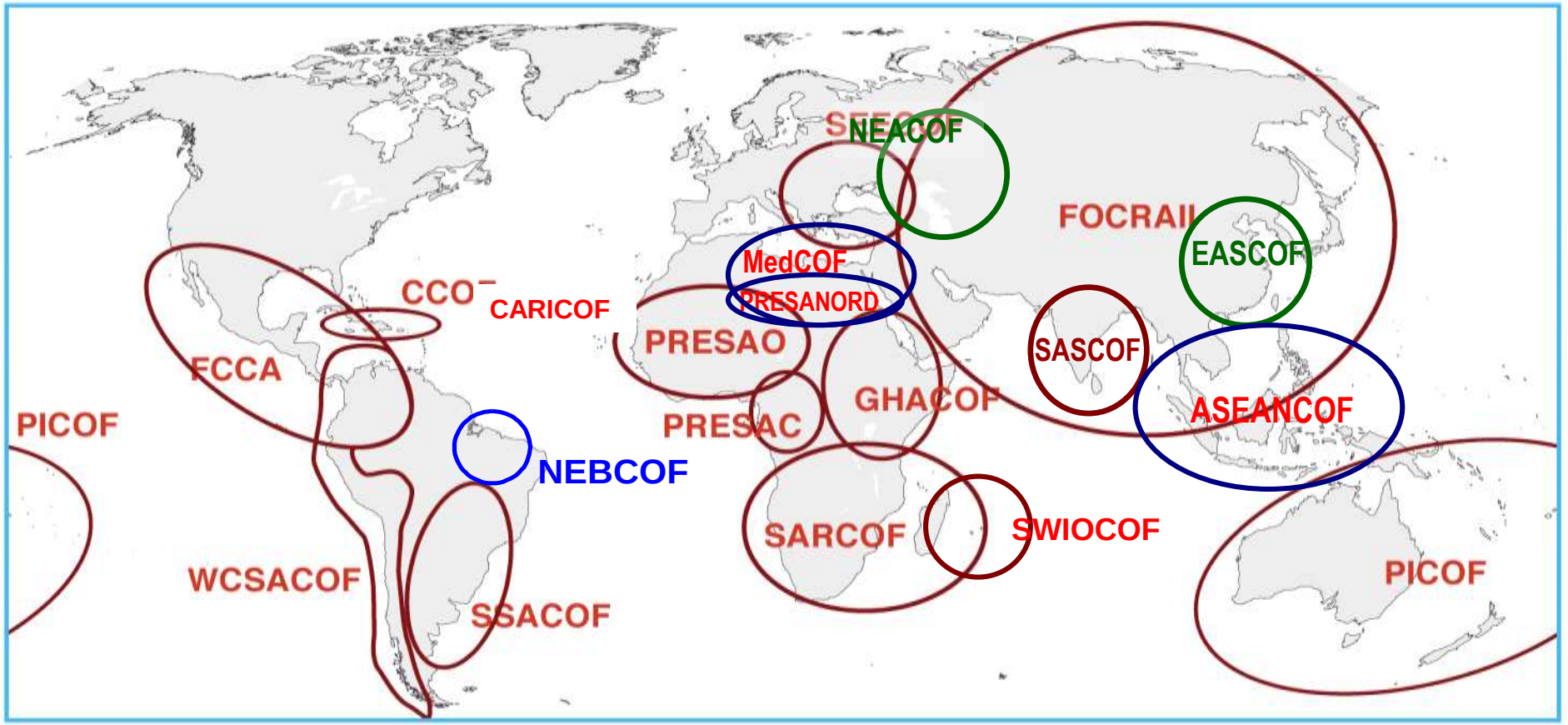


Voi, An ASAL area, SE Lowlands– Near normal tending to depressed rainfall expected.

Regional Climate Outlook Forums (RCOFs)

- RCOFs provide platforms for Climate experts and climate information users to:
  - Discuss current climate status
  - Exchange views on scientific developments in climate prediction
  - Develop consensus-based regional climate outlooks that can feed into national climate outlooks produced by NMHSs
  - Engage in user-provider dialogue
- An important aspect of RCOFs is the facility to bring together experts in various fields, operational climate providers and end users of forecasts in an environment that encourages interaction and learning.

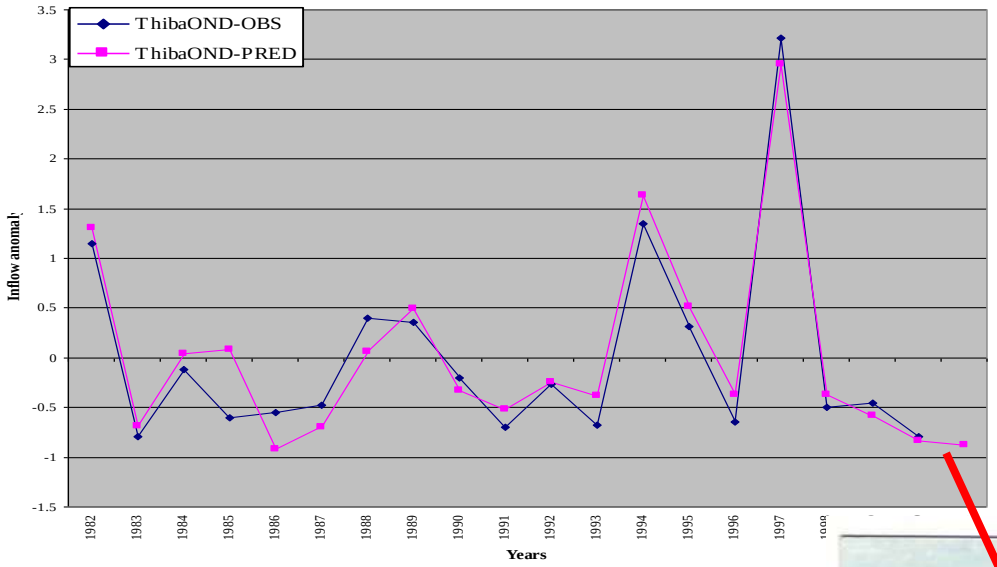
Regional Climate Outlook Forums Worldwide



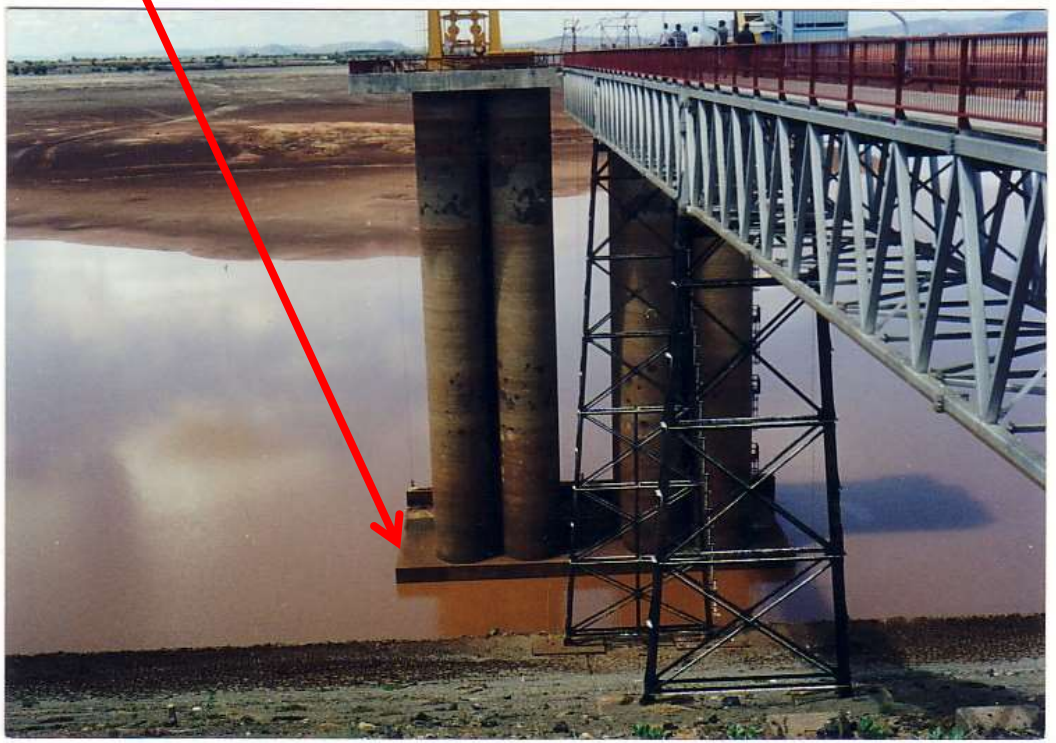

A SECTION OF GHACOF35 PARTICIPANTS - (August 2013, Eldoret, Kenya)

Examples of ICPAC Tailored Products, Partnership and Community Service Projects

Masinga Dam Tailored Forecasts during the 1999/2000 La-Nina Drought



KenGen



KRCS' Strategic Partnership in Climate Information (Forecast/ Prediction)

- ICPAC – Seasonal predictions and early warnings
- KMD – 4 day, weekly, bi-weekly, monthly forecasts.
- Indigenous Knowledge and partnership with community

MOU between KRCS and ICPAC

Example of Turning El Nino into an Opportunity

- **Kenya Red Cross used the downscaled COF 2009 SOND Forecasts (El-nino Year) to distributes seeds worth Ksh. 30 Million (US$ 350,000) in a drought prone Ukambani area and reaped a bumper harvest estimated at a Ksh. 2.5 billion (US$ 30M).**

DAILY NATION › News

NEWS

Ukambani enjoys season of plenty

SHARE BOOKMARK PRINT EMAIL RATING

The distribution of seeds in the wake of good rains in Ukambani region have been rewarded with a bumper harvest. Mwingi south MP David Musila (far fight), Kenya Red Cross Secretary-General Abbas Gullet and government officials during a tour of farms in Migwani district recently. Photo/KITAVI MUTUA

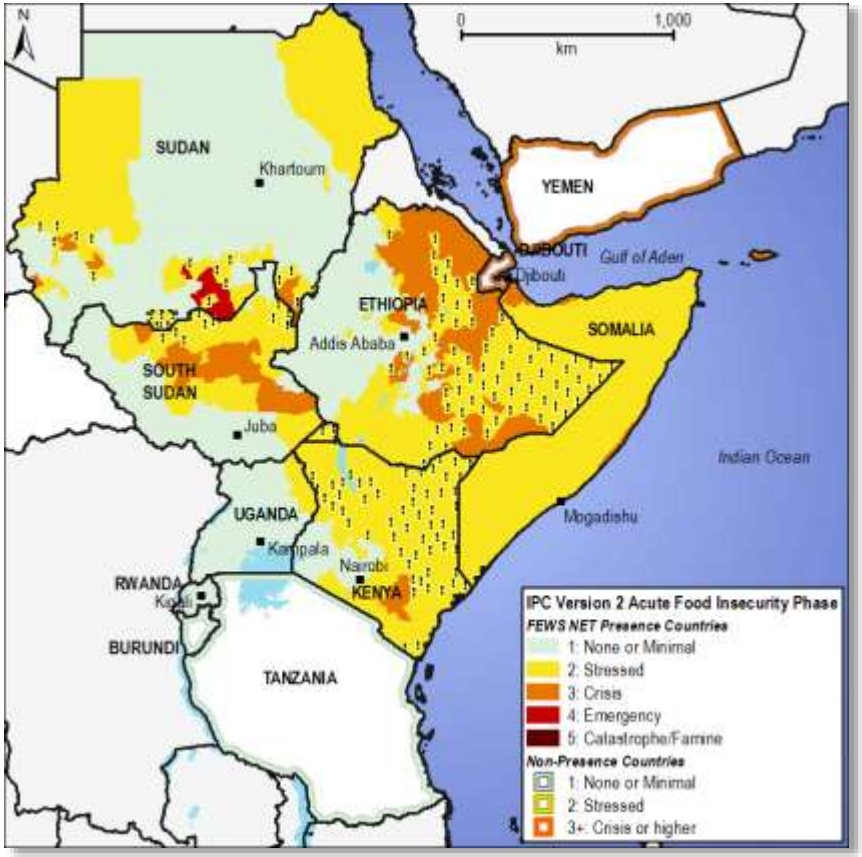
Situation in Turkana one Year before Red Cross moved in

Drought

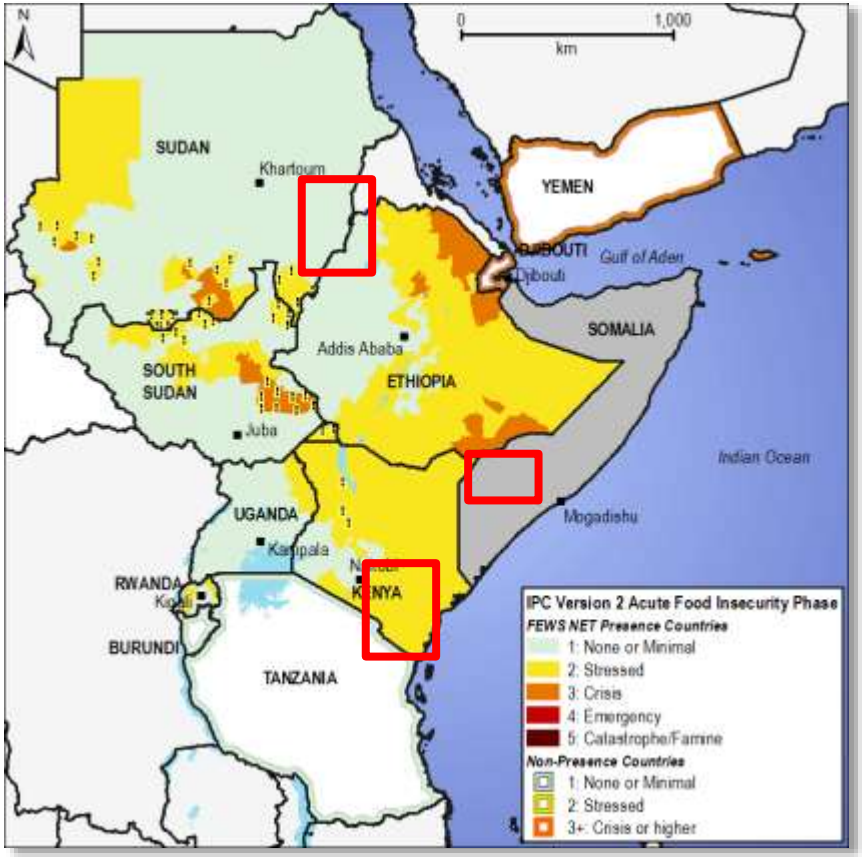
Greenhouses and Water harvesting changing lives in Turkana

Food Security Outlook Scenario (FEWSNET)

July to September 2013



October to December 2013

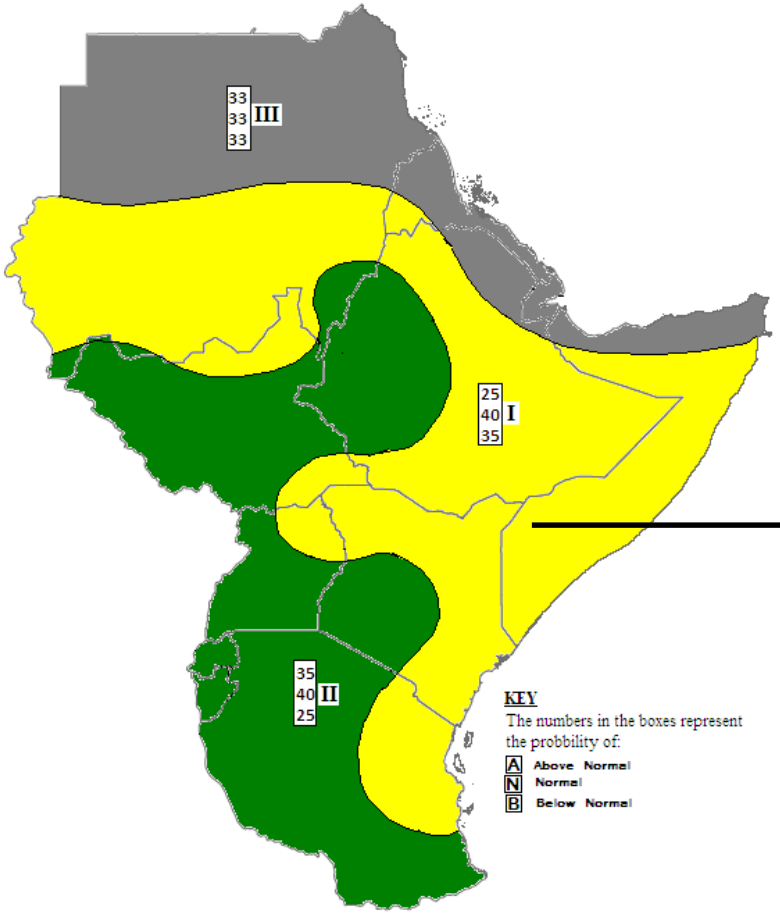


Source: *FEWS NET*

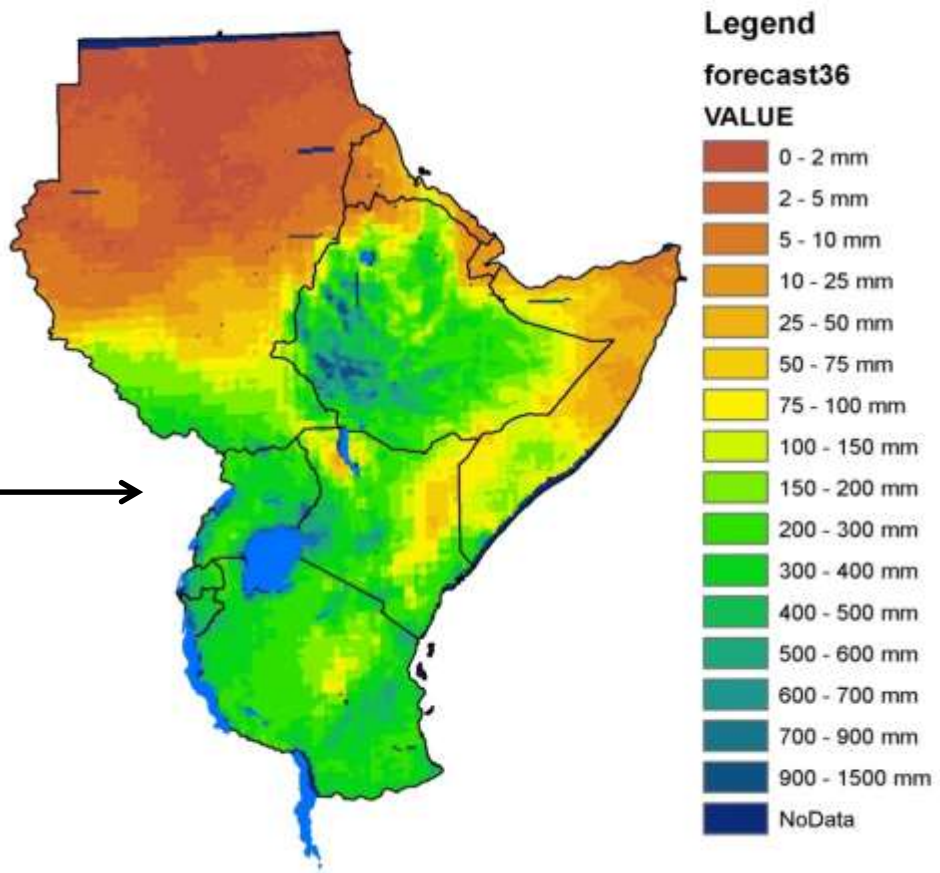
Areas to watch for possible changes in food security outcomes

Forecast Translation (FEWSNET)

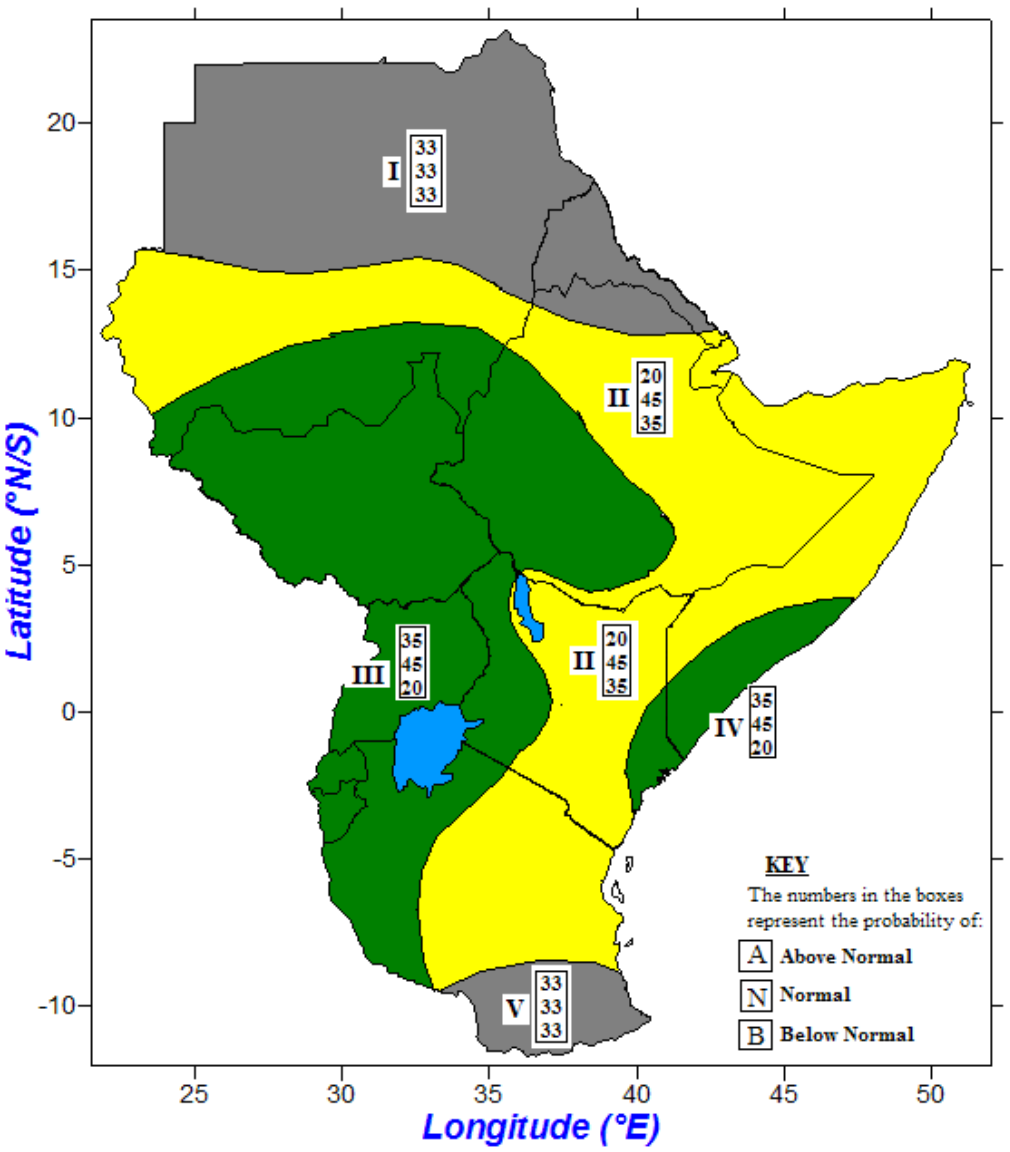
MAM 2014 Outlook



MAM 2014 Rainfall Amounts



Health Outlook: SOND-2013



Disease outlook

Zone I & V:

- No variation in expected incidences of malaria
- No significant changes in other water and climate related diseases
- However, diseases related specifically to water deficiency e.g. trachoma, diarrhea scabies may occur where its endemic

Zone II:

- No significant change expected in malaria transmission
- No variation expected in other climate induced disease
- Due to likelihood of water scarcity in arid and semi-arid areas in the zone– there are chances of increased diarrheal diseases including cholera, trachoma, scabies etc

(Zone III):

- General increased risk of Malaria in the zone and likelihood of epidemics in prone fringe and highland areas
- Due to likelihood of localized flooding and destruction of sanitation utilities – there are chances of increased diarrheal diseases including cholera, dysentry

(Zone IV):

- Likelihood of increased malaria cases but no epidemics is expected
- Likelihood of VHF(dengue), filariasis may occur

OLOITOKITOK

User Registration
followed by SMS
Broadcasts

RERU

The Server is used to simultaneously and rapidly broadcast information through an SMS to selected registered users. It will be customized to allow receiving feedback from the users.

Modern Science

Data Collection

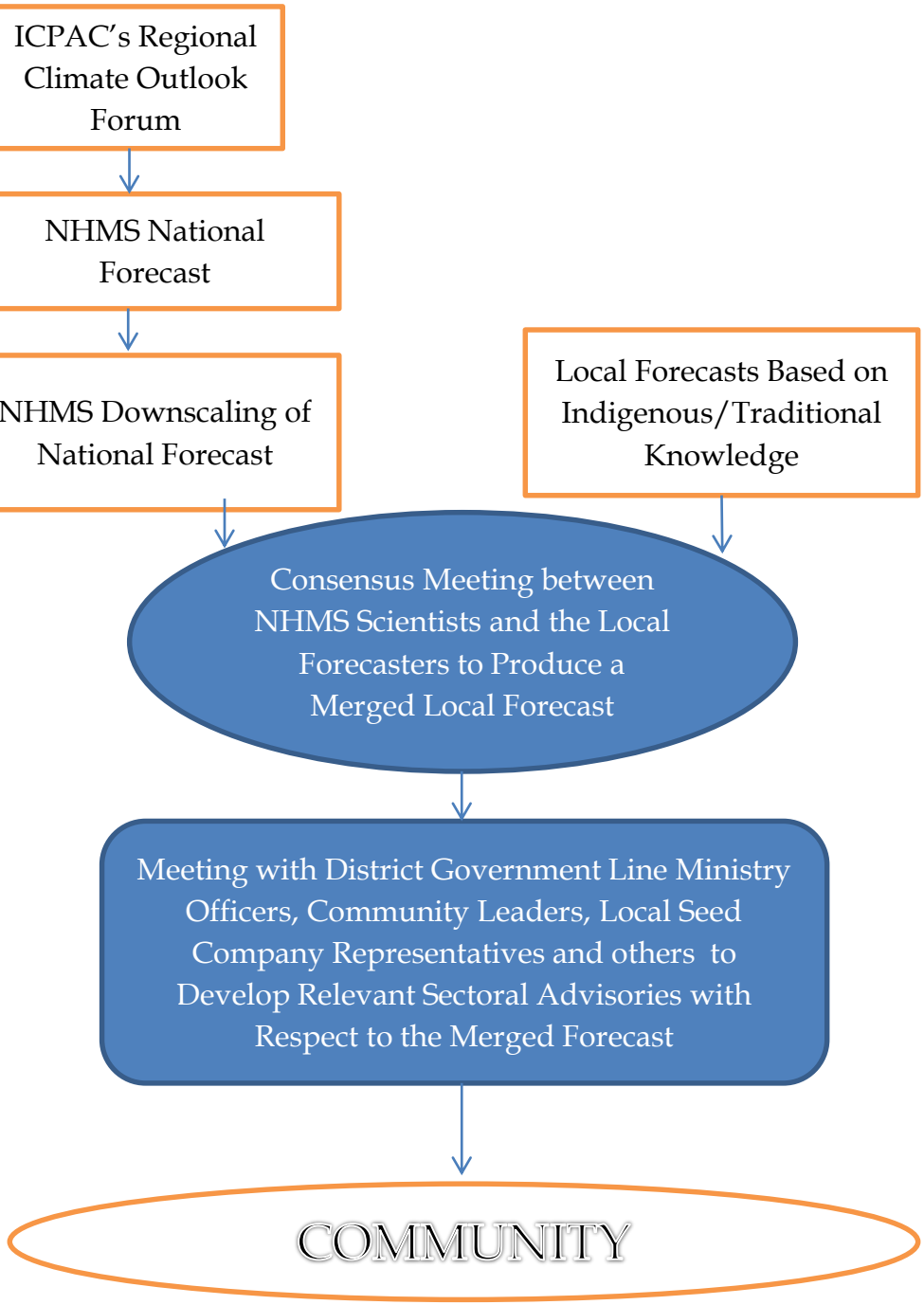
Observations

Analysis and Interpretation

Laboratories

FORECAST

Nganyi Community


ICPAC's Regional Climate Outlook Forum
NHMS National Forecast
NHMS Downscaling of National Forecast
Local Forecasts Based on Indigenous/Traditional Knowledge
Consensus Meeting between NHMS Scientists and the Local Forecasters to Produce a Merged Local Forecast
Meeting with District Government Line Ministry Officers, Community Leaders, Local Seed Company Representatives and others to Develop Relevant Sectoral Advisories with Respect to the Merged Forecast
COMMUNITY

REGULAR CAPACITY BUILDING

FARMERS MAKE INFORMED DECISIONS ABOUT THE TECHNOLOGIES TO EMPLOY

CONCLUSIONS

- **Weather/Climate monitoring and prediction is one of the best strategies for mitigating the negative impacts of weather/climate related disasters.**
- **ICPAC plays an important role in providing the IGAD subregion with weather and climate advisories and more importantly, timely early warnings on extreme climate events**
- **The use of these predictions products can help countries put measures in place to mitigate against some of the adverse impacts of extreme climate events.**

THANK YOU