

# Requirements on tailored seasonal forecasts under WMO-led projects

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WMO OMM

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Organisation météorologique mondiale

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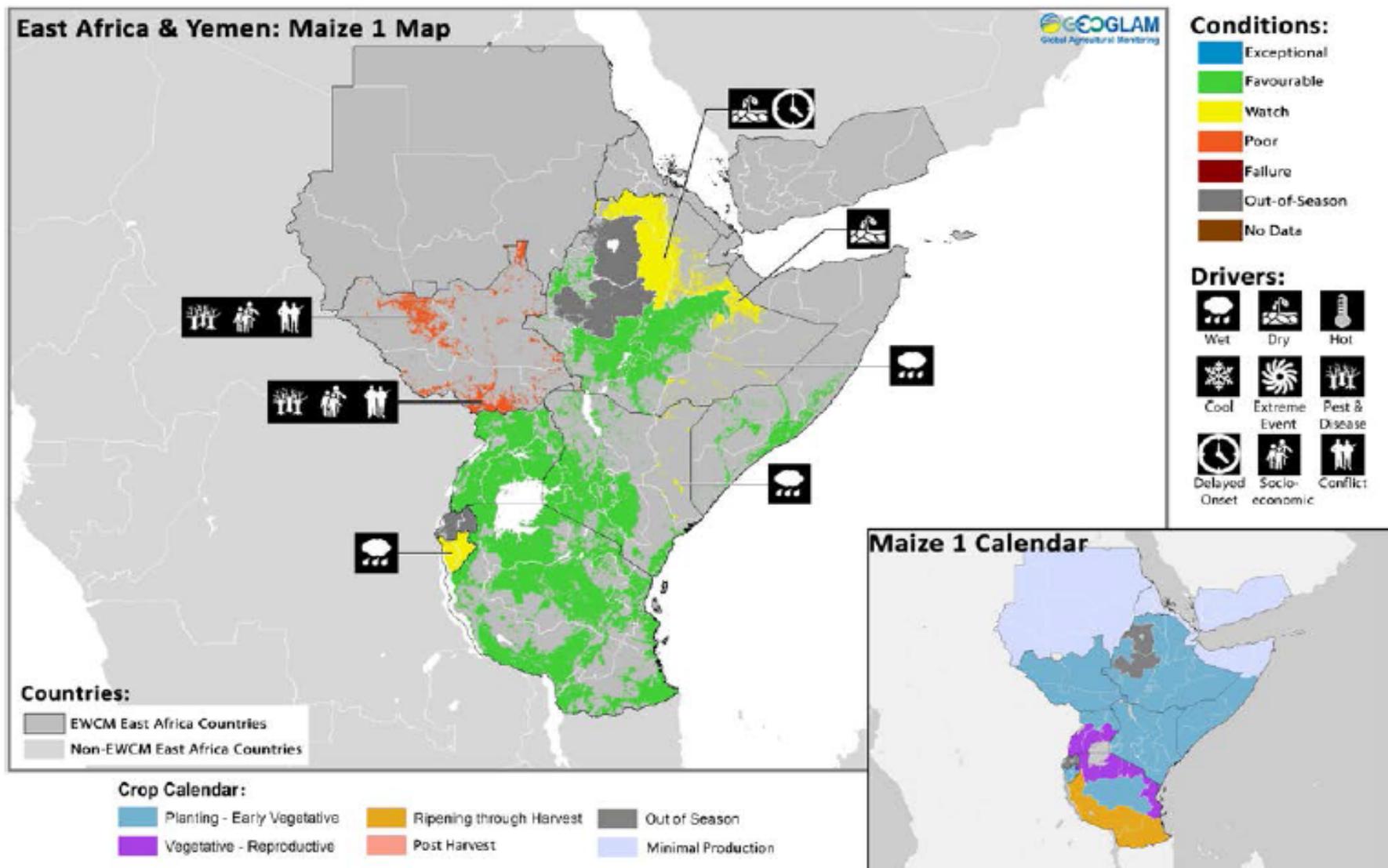
# Food Security World & Regional Surveys

- GeoGLAM <https://cropmonitor.org/>
- OCHA <https://www.unocha.org/themes/el-ni%C3%B1o>
- World Food Programme  
<http://www1.wfp.org/climate-action>
- FAO  
<http://www.fao.org/emergencies/fao-in-action/ewea/en/>
- FEWSNET (East Africa) <http://fews.net/east-africa>



# GEOGLAM- Bulletin end of April 2018

## East Africa & Yemen



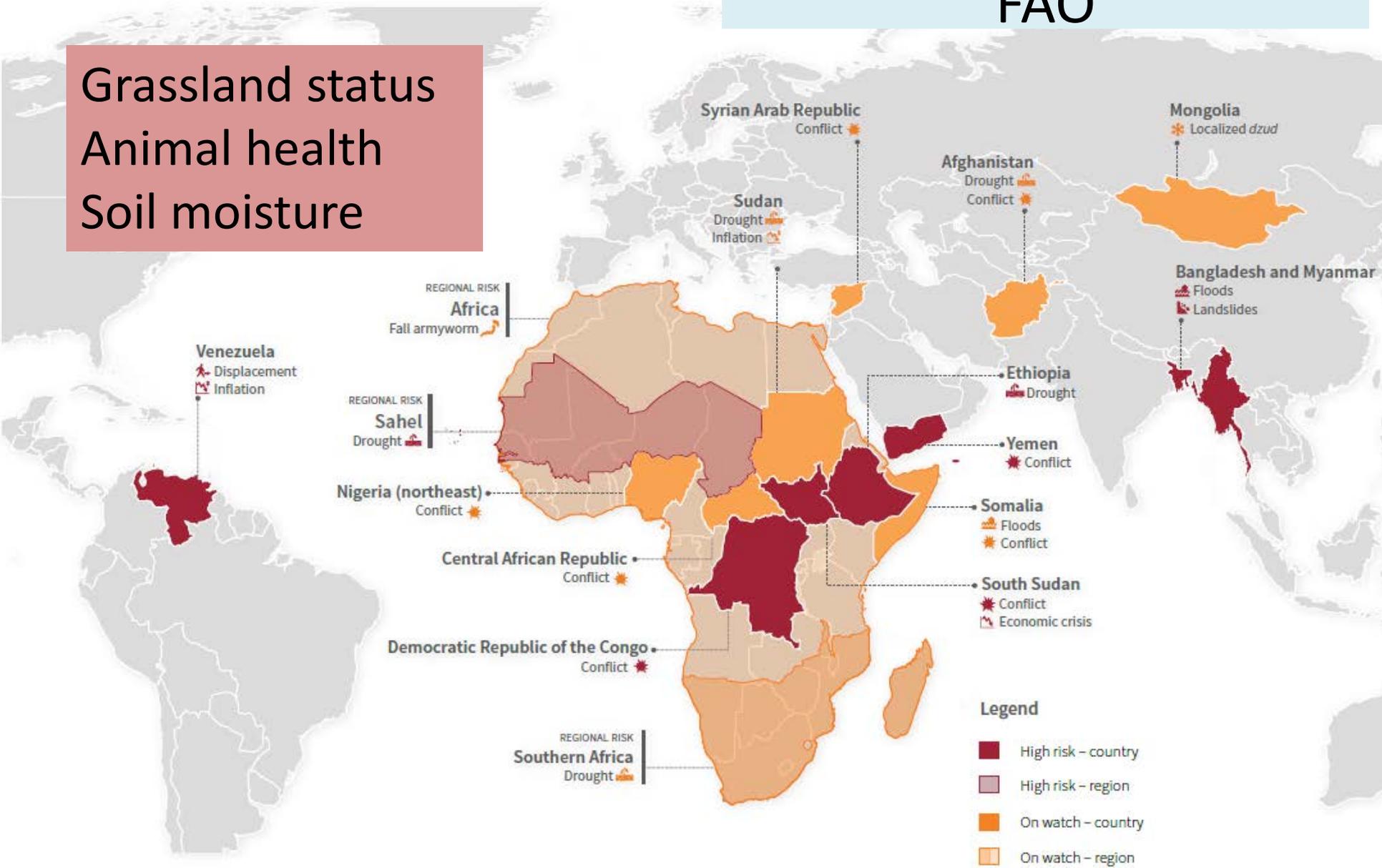
*Crop condition map synthesizing conditions as of April 28<sup>th</sup>. Crop conditions over the main growing areas are based on a combination of inputs including remotely sensed data, ground observations, field reports, national, and regional experts. Conditions that are other than favourable are labeled on the map with their driver.*



# Global risk map: April–June 2018

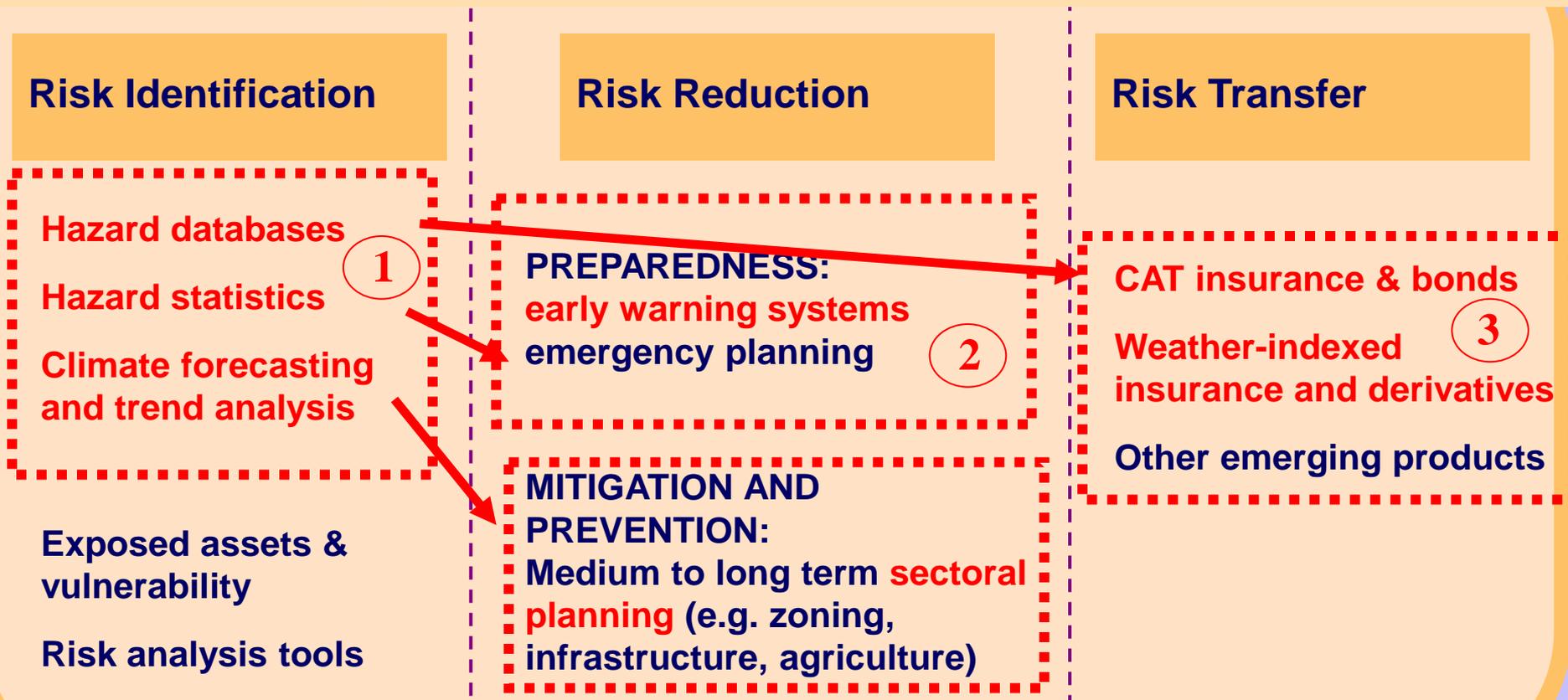
FAO

Grassland status  
Animal health  
Soil moisture



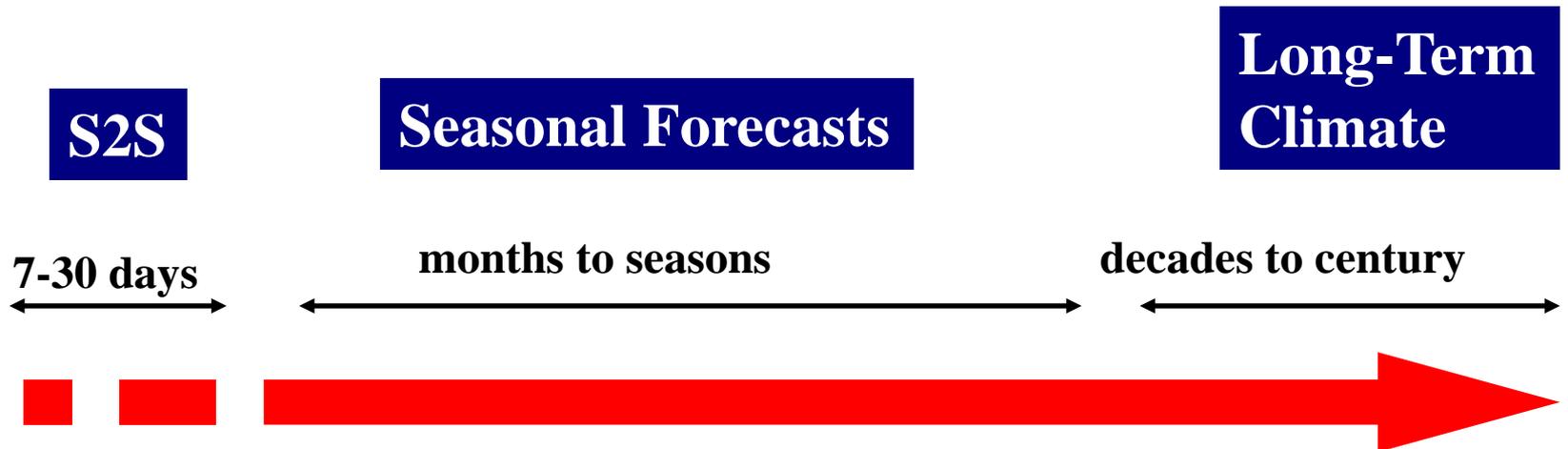
# Potential role of Role of National Meteorological and Hydrological Services within more comprehensive National Disaster Risk Management Programmes

Alignment of national to local policies, legislation, planning, resources  
multi-sectoral organizational coordination and collaboration



Information and Knowledge Sharing  
Education and training

## Emerging Technologies (Weather and Climate Time Scales)



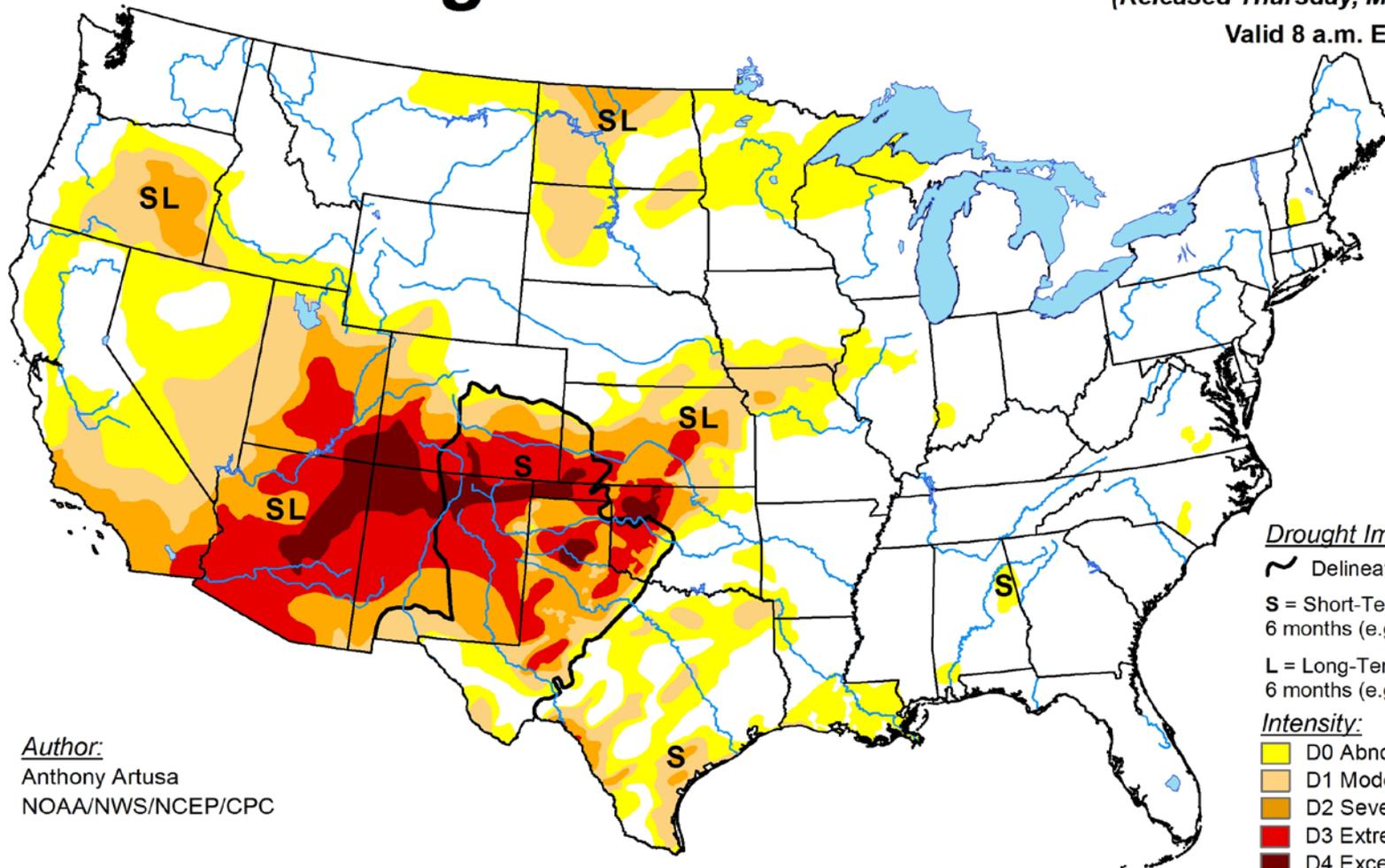
- **Forward looking risk analysis for improved planning and risk management**
- **Utilization in the financial risk transfer markets**
- **Still not fully developed. Room for co-design**

# U.S. Drought Monitor

May 29, 2018

(Released Thursday, May. 31, 2018)

Valid 8 a.m. EDT



Author:  
Anthony Artusa  
NOAA/NWS/NCEP/CPC

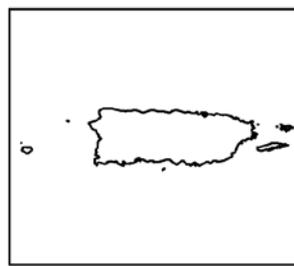
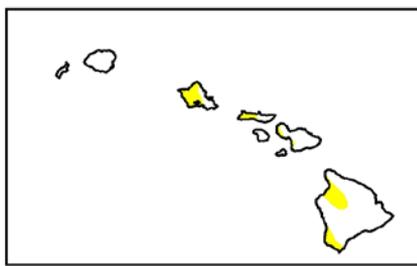
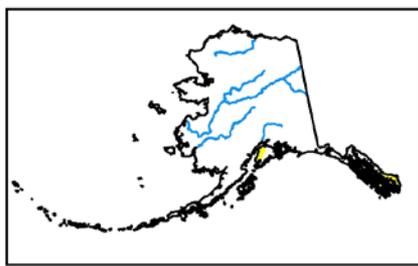
### Drought Impact Types:

- ~ Delineates dominant impacts
- S = Short-Term, typically less than 6 months (e.g. agriculture, grasslands)
- L = Long-Term, typically greater than 6 months (e.g. hydrology, ecology)

### Intensity:

- Yellow: D0 Abnormally Dry
- Light Orange: D1 Moderate Drought
- Orange: D2 Severe Drought
- Red: D3 Extreme Drought
- Dark Red: D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.



<http://droughtmonitor.unl.edu/>

# Advanced Seasonal Forecasts Workshop

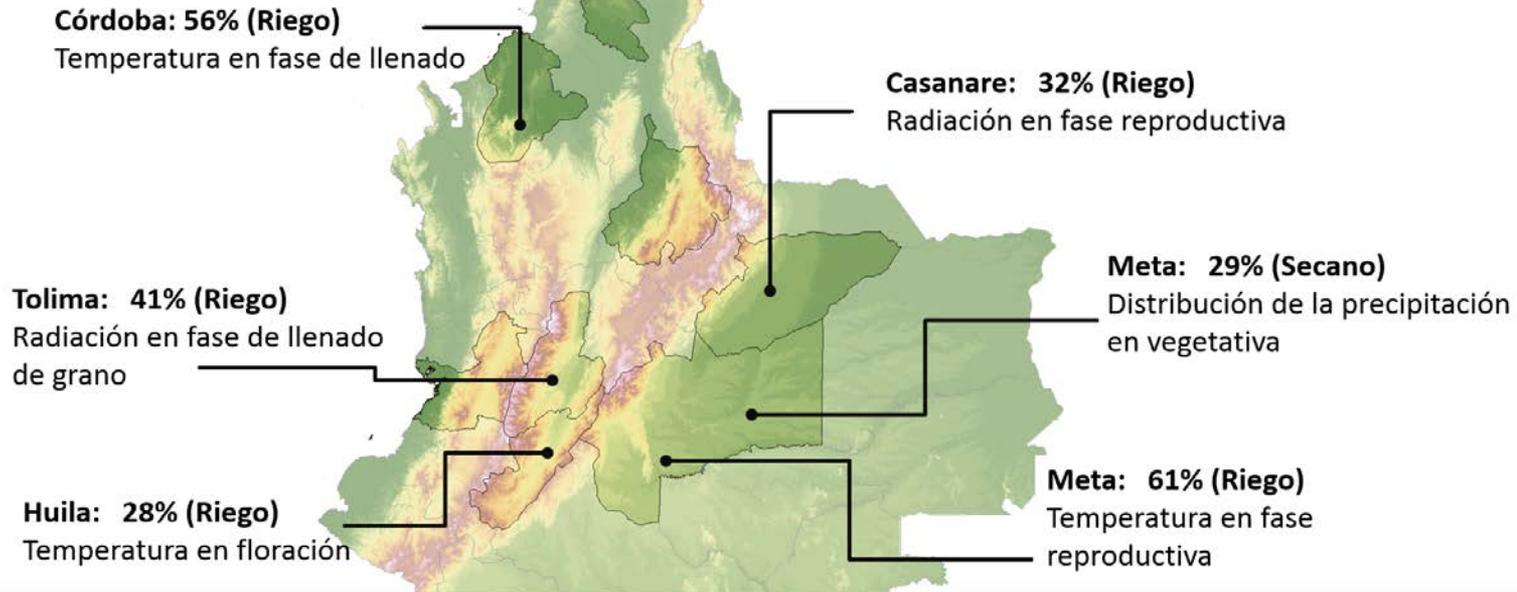
## Bogota 29-31 October 2017 – Request from Agriculture

Drought associated losses 564 M USD ( El Niño 1997-98), 1000 M USD (2010/11)

Climate info needs according rainfed, restricted irrigation, full irrigation, crop phases and total life plant time

Rice phases and climate variability relation with productivity

¿Cuanto afecta el clima sobre productividad?



# Basic rainfed agriculture – Roving Seminars

## Request from Agriculture

Crop variety choices

Preferred fields (near rivers, higher terrain)

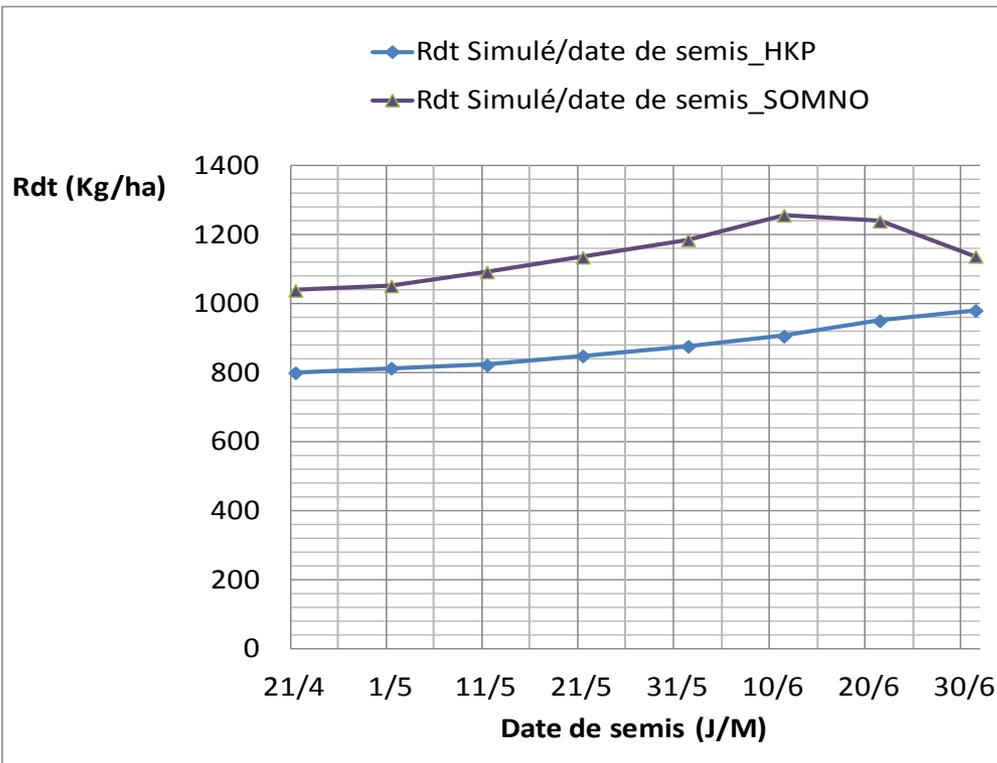
Seeding date according local rain gauge measurements

Needs:

Rain season onset and cessation

Rain season character (drier, normal, wetter)

Dry spells events



Yield simulated by SARRA-H (périod 1971-2010) for 2 millet varieties (90 and 120 days), according seed date for Ségou, Mali .

Training on the use of farmers rain gauges



# A case study – Corn in Illinois

## Request from Agriculture

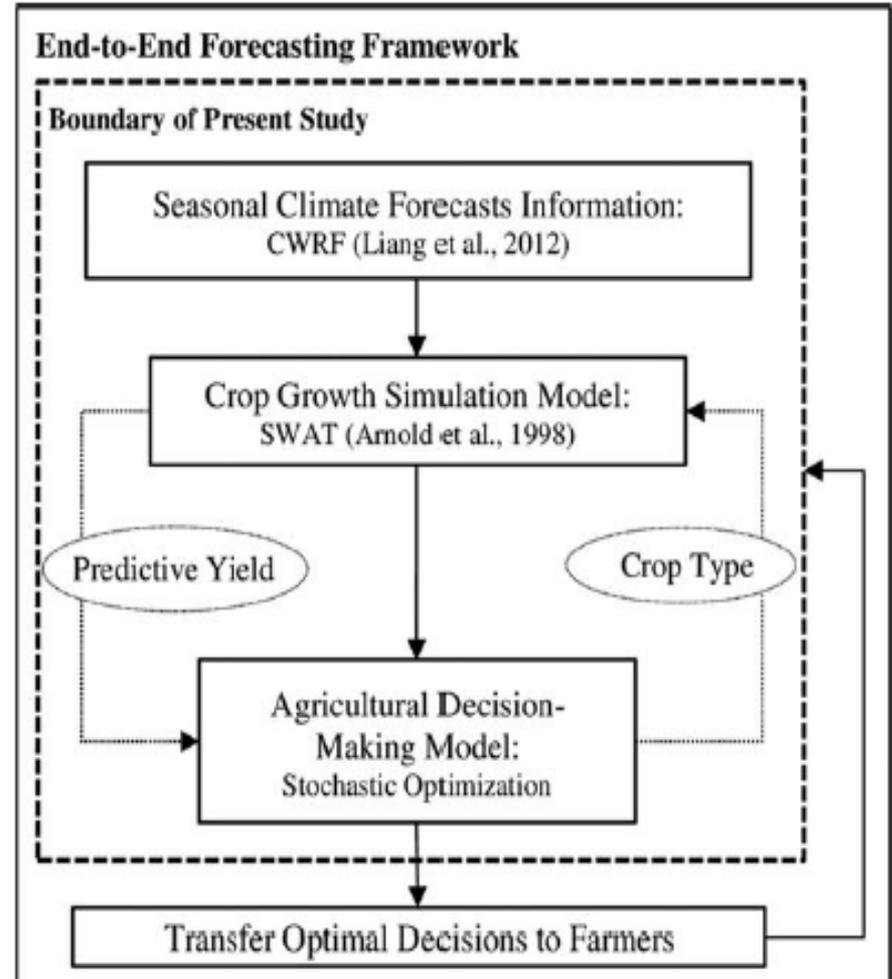
Crop type and Crop variety choice  
(Ag DM Model)

Investments in chemicals and  
others

Date of planting

Insurance choice

Contracts. Ethanol industry.



# A case study – Corn in Illinois

## Request from Agriculture

Corn yield is highly dependant on weather conditions in June and July

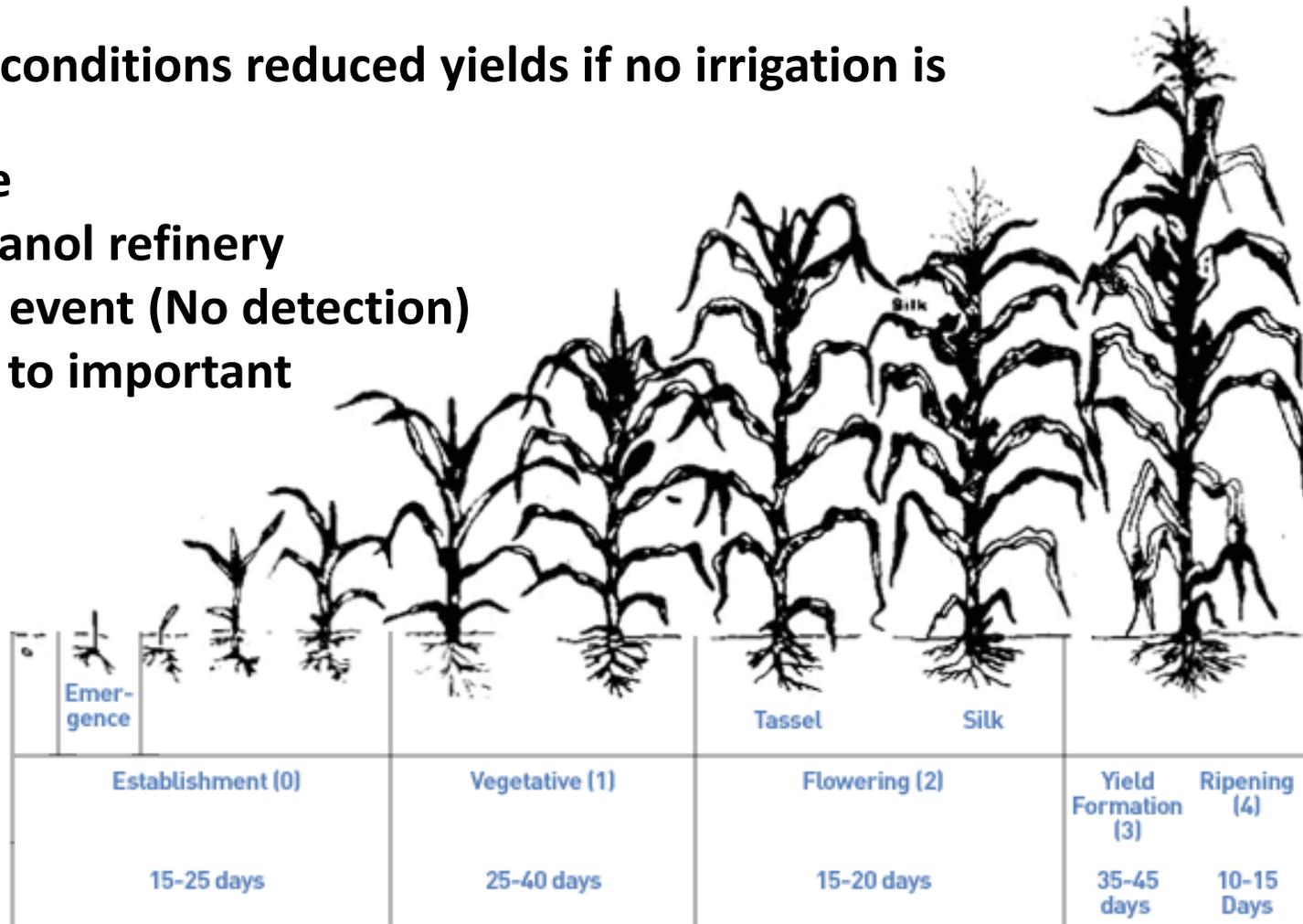
Very hot and dry conditions reduced yields if no irrigation is provided

Market crop price

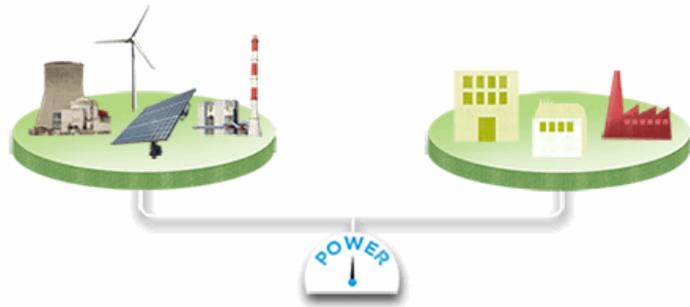
Prize offer by ethanol refinery

Drought extreme event (No detection)

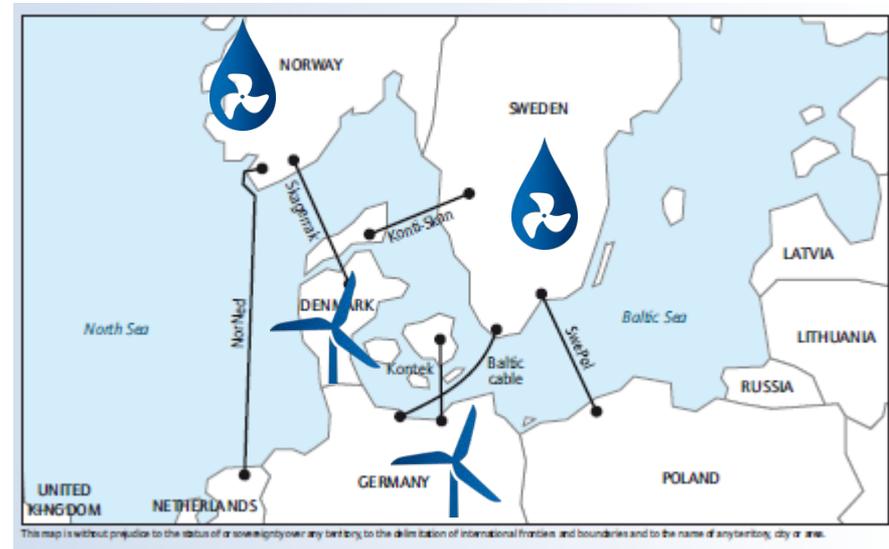
Bad forecasts led to important losses



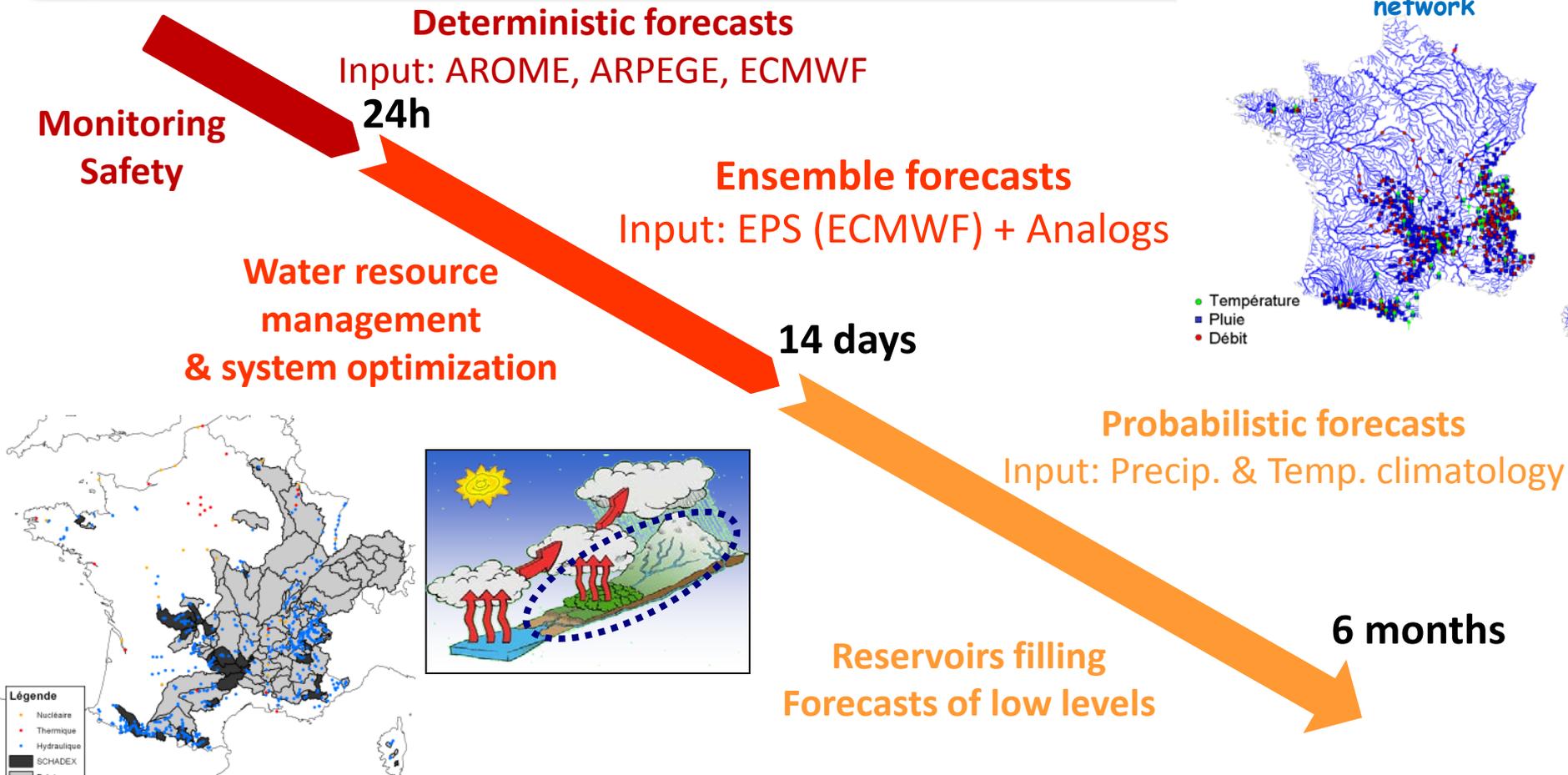
# Renewable energies, generation and distribution. High spatial and temporal variability. Hydro-power resources as buffer



Hydropower is very important for the optimization of the balance between power production & demand, both at national and regional scale (e.g. Denmark/Sweden/Norway/Germany grid connections)

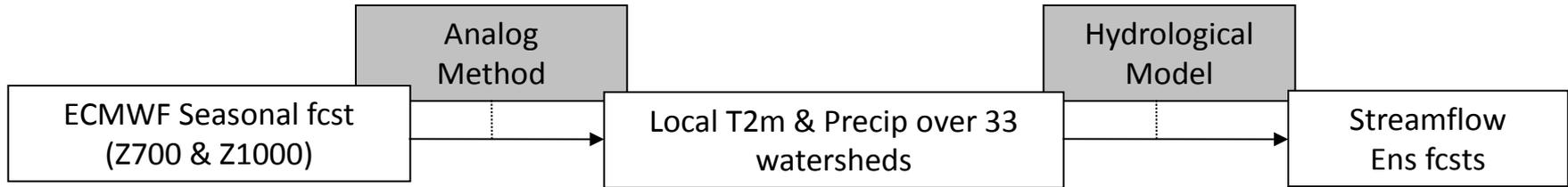


# Operational suite: Build on different models and time scales. Hydro-meteorological forecasts @ EDF / DTG: a long experience

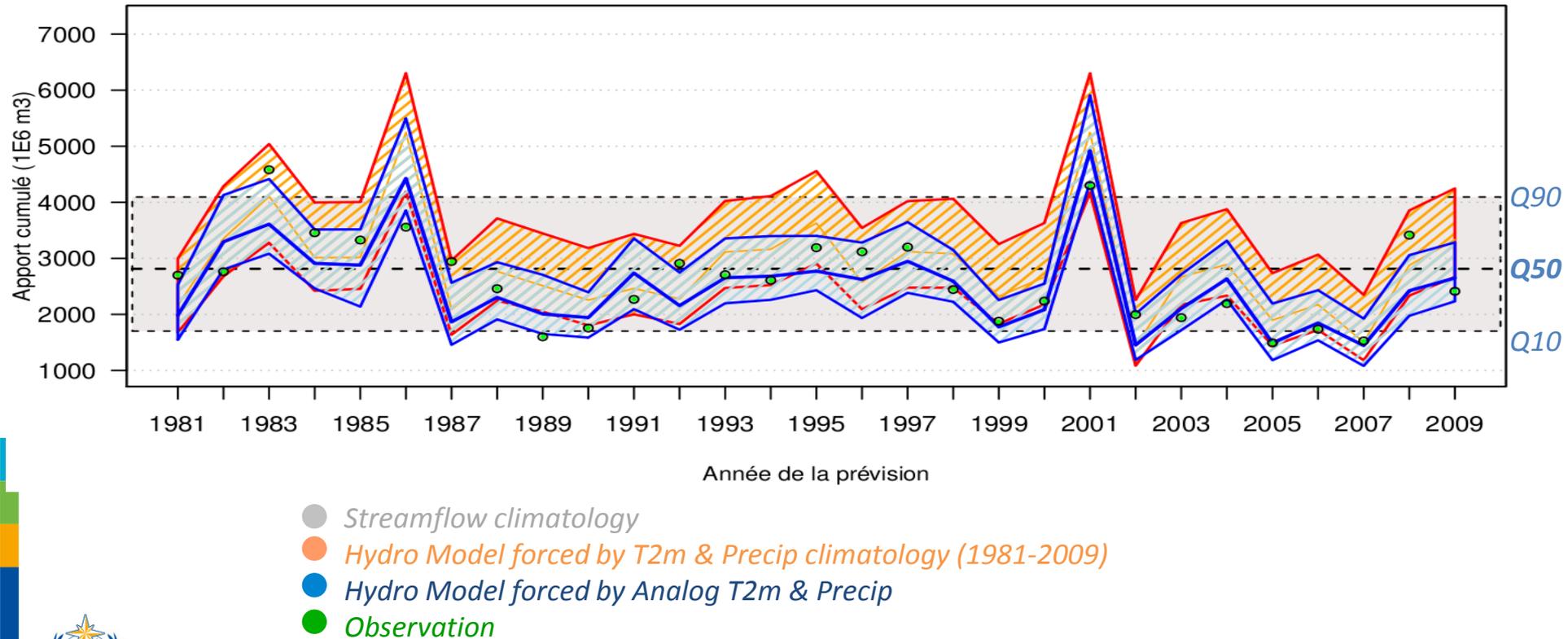


Drainage basins with operational hydrological model

There is some natural hydrological predictability !



**Durance@Serre-Ponçon, Initialization : May, Lead time : JJA**



## A million dollars question from French Guyana reservoir managers

2009-10: dam managers ask about possible forecasts of the onset of rainy season. Some dams are critical for power and water supply, no alternative cheap solutions are available. Sometimes the only important source of energy.

Because:

- Low level of water in the reservoir. Previous rainy season weaker in totals than normal.
- If no rain in next 2-4 weeks → need to rent fossil fuel generating units (expensive)

Ideally, need to know:

- Onset date of the rainy season
- Total amount of water (reservoir filling)



- ✓ There is some predictability in the area
- ✓ Climate Seasonal Forecasts are only the beginning of the chain: Post-processing needed to get the useful product
- ✓ Importance of good quality user's data (river flow)
- ✓ Interaction and co-design with all actors are essential: iterative process with many discussions to converge towards a useful and viable solution
- ✓ Process was long, but positive outcomes
- ✓ New developments:
  - Hydrological modelling of the watershed
  - Better use of local weather observation



# New Zealand Water level at reservoirs

## Seasonal Inflow Forecast Models

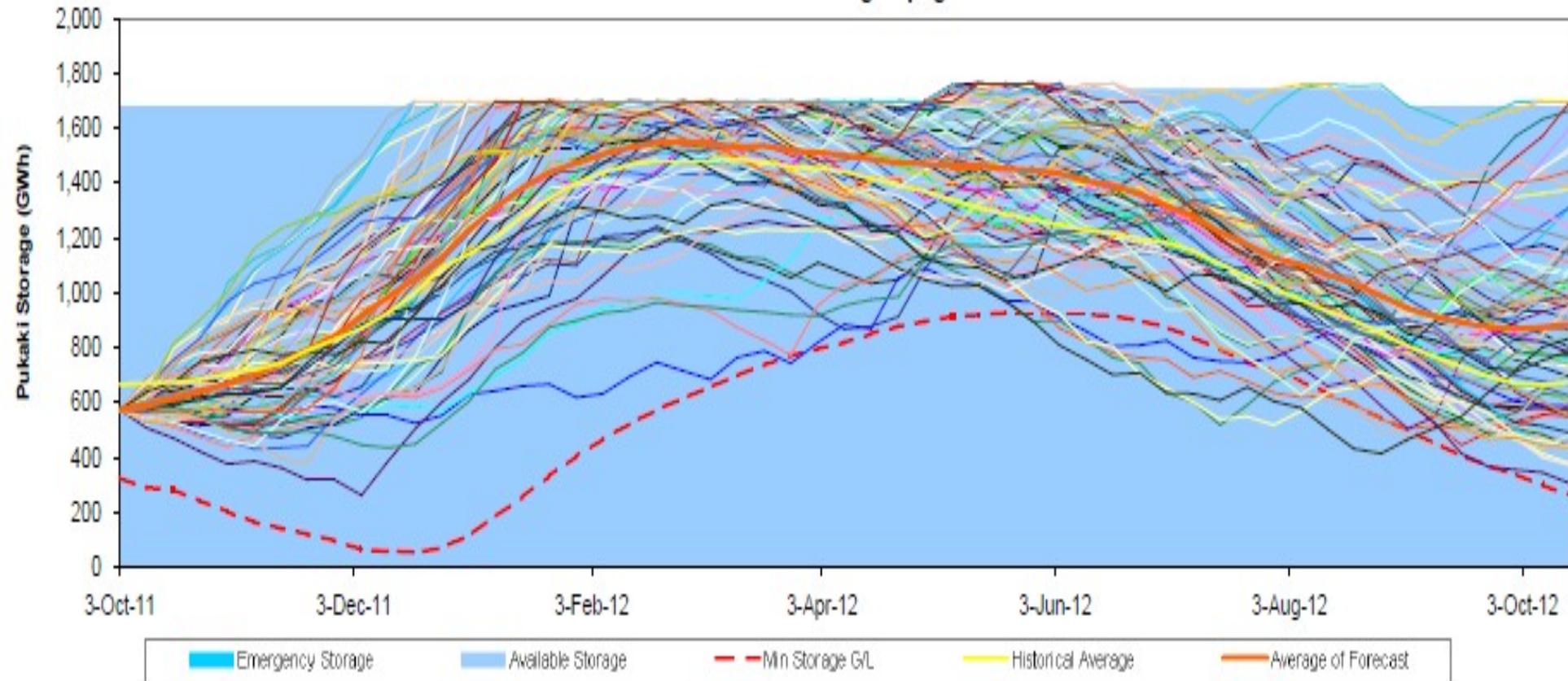
- created from research conducted in early 2000's (Purdie & Bardsley 2010, IJC)
- Run every 3 months to predict catchment total inflow for next 3 months
- use statistical approaches to quantify relationships between multiple large scale ocean-atmosphere state variables and at site hydrology
- principal components and multiple linear regression
- use these relationships to create seasonal forecasts of rainfall and inflows in the catchment
- forecasts tested against validation data using cross-validation techniques and randomisation testing
- Predictor variables:

SSTs and SLPs, 700hPa geopotential height, local inflow, rainfall, temperature data, ENSO (SOI), QBO, SLP indices (Trenberth indices)



# New Zealand Water level at reservoirs

Forecast Pukaki Storage Spaghetti



Explained Variance: 10 - 24%, significantly better than random chance, significantly better than climatology. Spaghetti looks sparse



# Advanced Seasonal Forecasts Workshop

## Bogota 29-31 October 2017 – Request from Energy

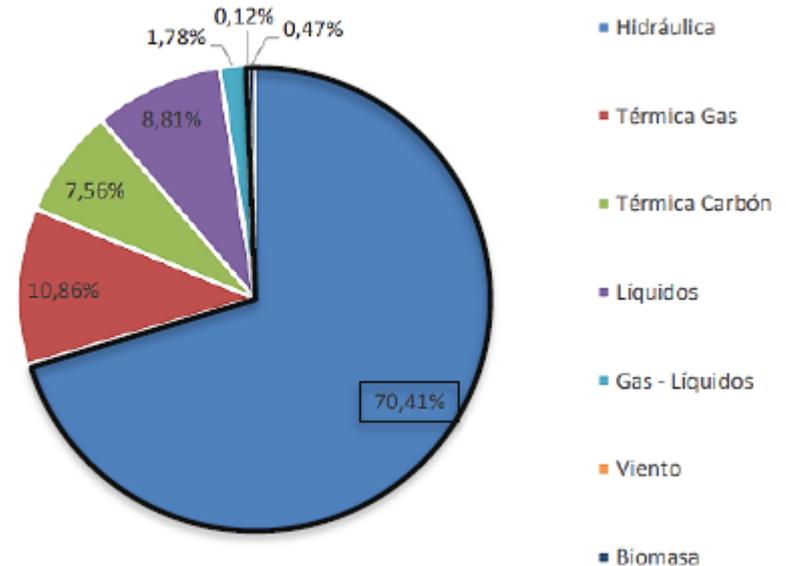
### Requirements :

River flows/week from present time to 2 years. Monthly update.

River flows/month from present time to 5 years. Monthly update.

Accurate forecast extreme ENSO events

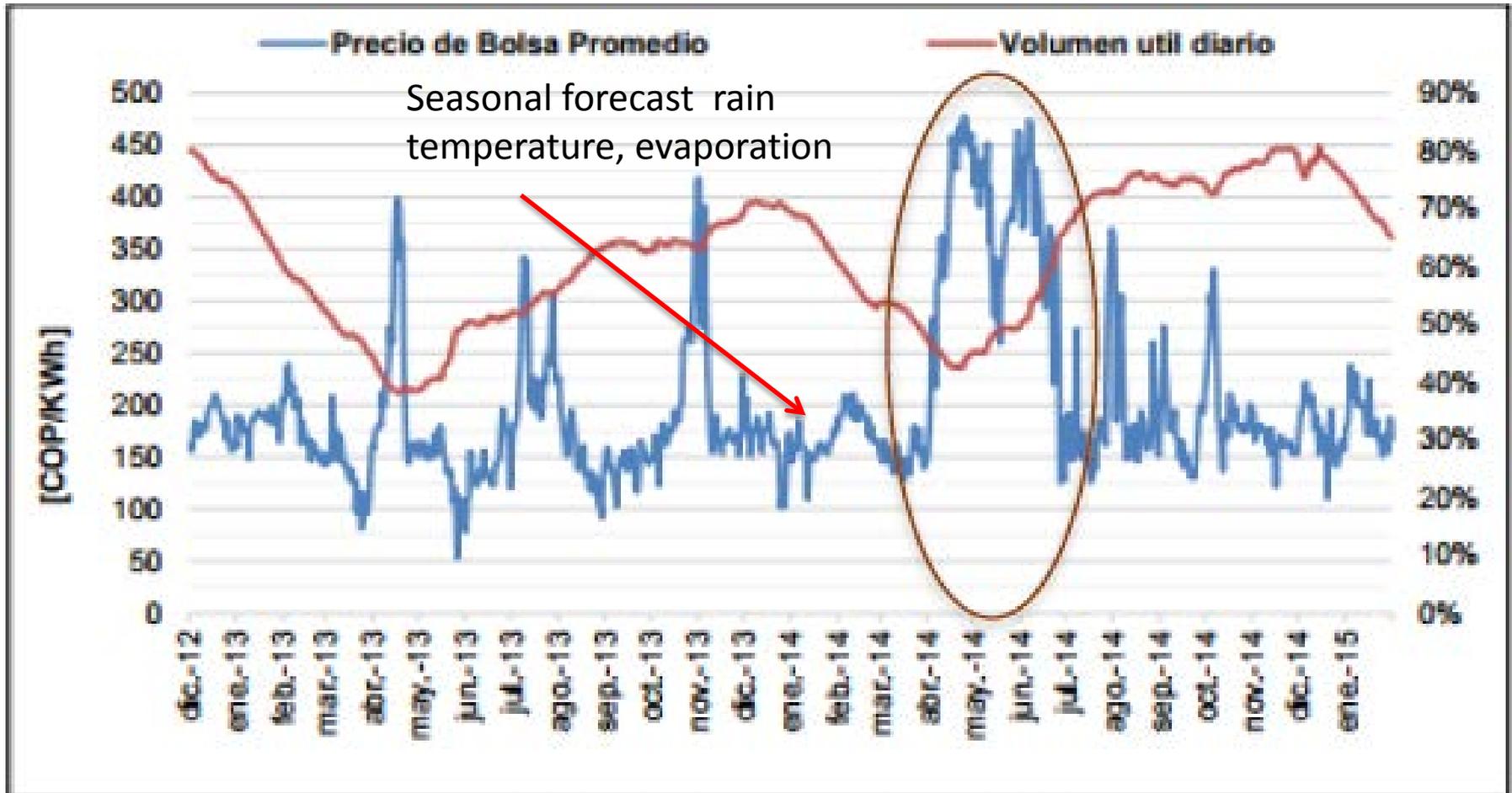
Capacidad por tecnología



Colombia, 70% hydropower at energy mix but wind farms are projected in dry areas. Combined management of a highly variable resource with water reservoirs

# Advanced Seasonal Forecasts Workshop

## Bogota 29-31 October 2017 – What is at stake



Fuente de datos: Sistema de Información de XM

Fuente de gráfica: UPME



# Seasonal Forecasts and Health – The IRI Malaria Map Room

## Malaria Early Warning System

The Malaria Early Warning System (MEWS) aids in the prediction of malaria outbreaks. The system consists of four elements; Vulnerability, Seasonal Climate Forecasts, Monitoring the Environment and Observed Malaria Morbidity. In certain regions, these products may be used to determine the timing and severity of an outbreak.

**Pollen Allergies** – Pollen production depends on R and T (S2S ??)

**Heat waves** – Frequency and intensity

## France, Medical alerts, human and animals

11 May 2018 E. coli EHEC - France: O26, unpasteurized cheese, alert, recall

09 May 2018 Equine rhinopneumonitis - France: (eastern) EHV-1, EHV-4

30 Apr 2018 Invasive mosquito – France

## Summer conditions

Invasive species, new breeding environment (Tiger mosquito – *Aedes albopictus*), related with Yellow fever, Dengue, Chikungunya and Zika.



# Agricultural Climate Resilience Enhancement Initiative (ACREI) and ICPAC

**Output 3.1** Downscaled, location-specific seasonal climate forecasts and future projections generated regularly by ICPAC and participating NMHSs.

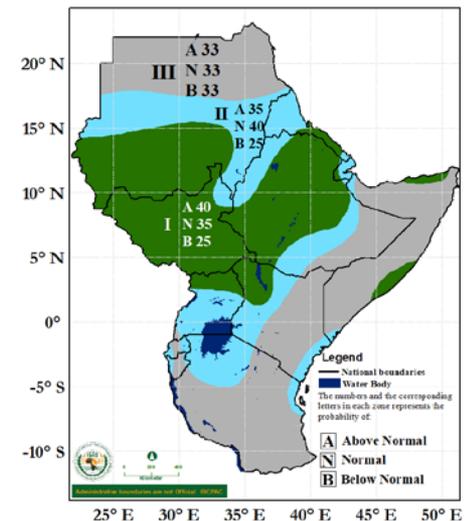
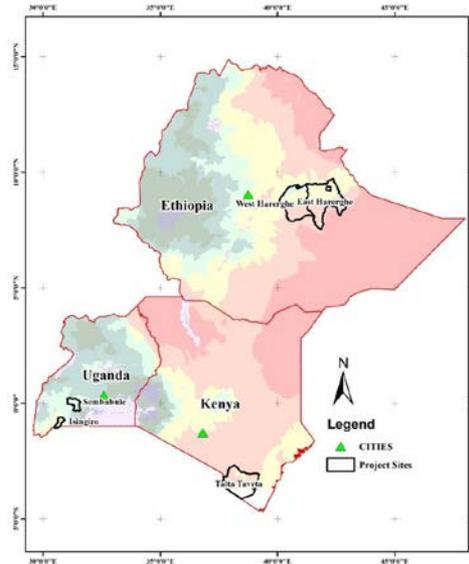
Improved tailored seasonal climate forecasts and climate change projections

Provision of climate change projections at regional, national and community level

Training and capacity building in downscaling techniques and communication of uncertainties

High resolution forecast downscaling to farming community level

Establishment of historical baseline statistics, trends and historical and future climate change hotspots for selected agricultural communities



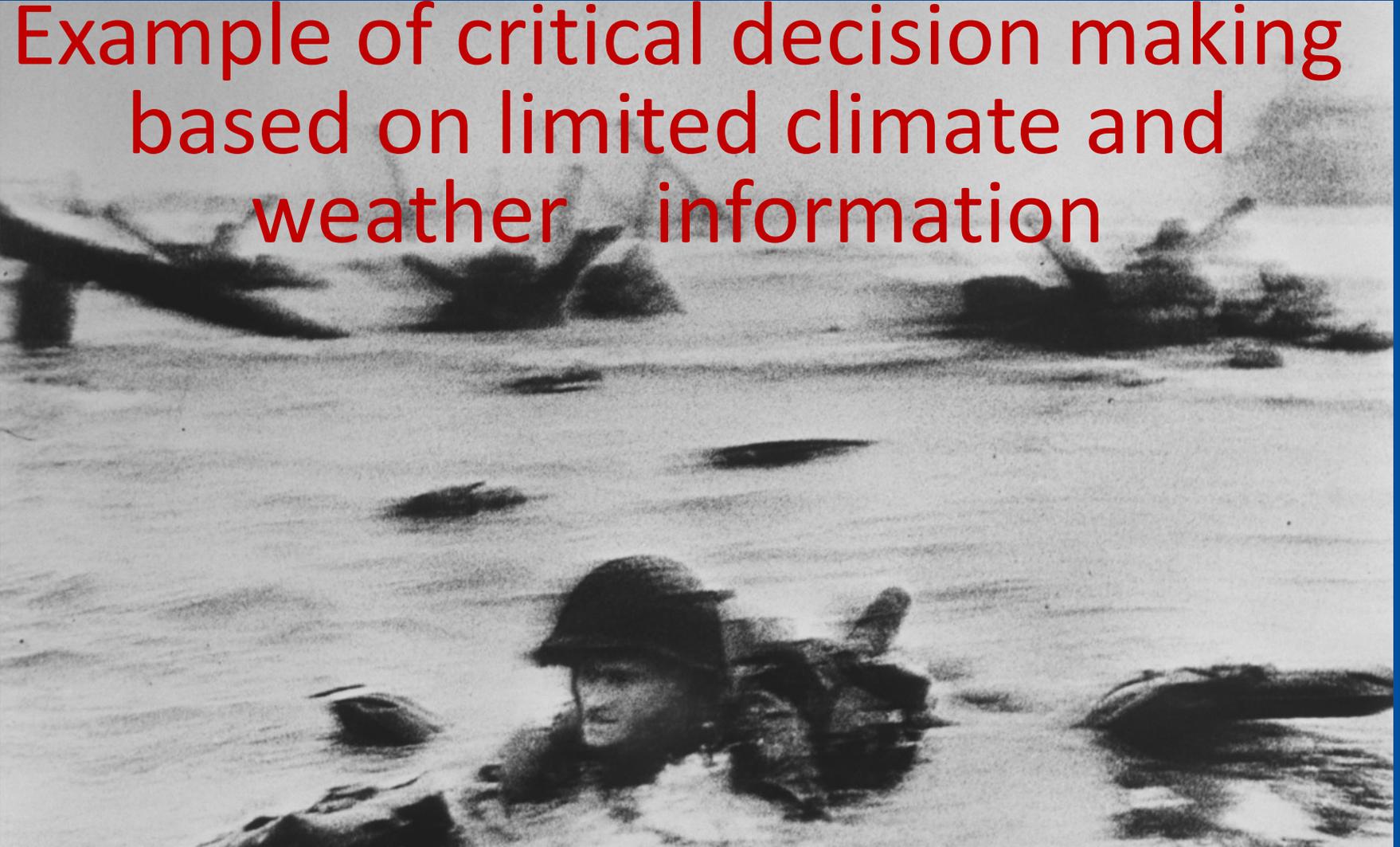
# CREWS Burkina Faso – Seasonal Forecasts

## Météo France

### Component 1d- Sub seasonal to Seasonal Forecasts – Météo France – Météo Burkina Faso

Outcome	Activities	Institutions also involved	Main deliverables
(i) Acces to the largest hindcast information available. Meteo-France, WMO experts. (Forecast method development / Enhancement)	Definition of a production suite Development of a production suite	WMO/ANAM	Work plan. WMO technical report
(ii) Calibration by best observation sets (applied to seasonal and sub-seasonal)	Score computation and evaluation in hindcast mode	WMO/ANAM	Evaluation report score computation in a hindcast mode
(iii) Forecast co-production (regional, national) Tailored derived products for sectors developed.	Implementation and dissemination of all products. Training and experimentation. Final reporting and recommendations	WMO/ANAM	Products and feedback from users. Final report. Set of recommendations to WMO

# Example of critical decision making based on limited climate and weather information



Thank you very much  
Merci beaucoup  
Muchas gracias  
Moltes gràcies



WMO OMM

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Organisation météorologique mondiale