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**Pillar 1: Drought
Monitoring and
Early Warning
Systems**

Why Monitor Drought?

- Drought is a **Normal** Part of the Climatic Cycle
- Drought **Impacts** are Significant & Widespread
- **Many** Economic Sectors Affected
- Drought is **Expensive**
 - Droughts cause more deaths and displace more people than any other kind of natural disaster.
 - Since 1980, major droughts and heat waves within the U.S. alone have resulted in costs exceeding 100 billion dollars

Source: Svoboda, 2009

Importance of a Drought Monitoring System

- allows for *early* drought detection
- improves response (*proactive*)
- *“triggers”* actions within a drought plan
- a critical *mitigation* action
- *foundation* of a drought plan

Source: Svoboda, 2009

Components of a Drought Early Warning and Information System

- Monitoring **AND** Forecasting
- **Tools** for decision makers
- Drought risk assessment and planning
- **Education** and awareness

Source: Wilhite, 2013

Indices and Data Issues

Approaches to Drought Monitoring

- **Single index or parameter**
- **Multiple indices or parameters**
- ***Composite* index**

Source: Svoboda, 2009

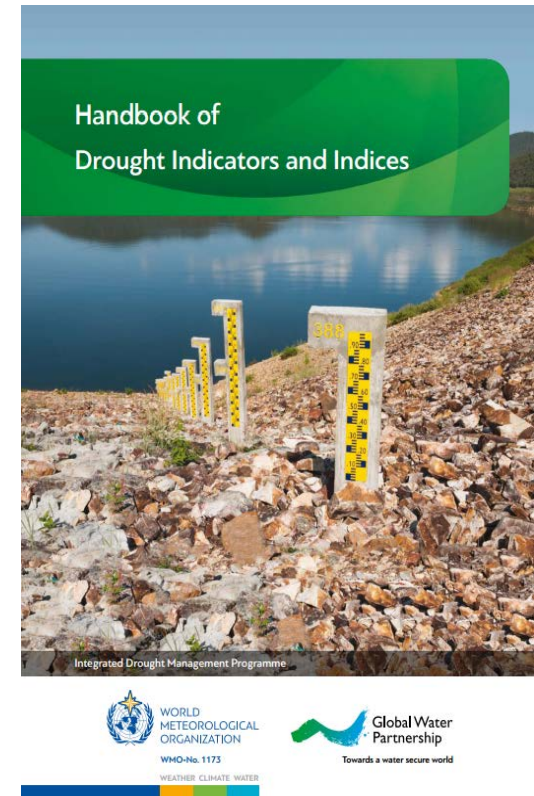
Importance of Drought Indices

- ***Simplify*** complex relationships and provide a good communication tool for diverse audiences
- ***Quantitative*** assessment of anomalous climatic conditions
 - Intensity
 - Duration
 - Spatial extent
- ***Historical*** reference (probability of recurrence)
 - Planning and design applications

Source: Svoboda, 2009

Handbook of Drought Indicators and Indices

- Handbook is a resource to cover most commonly used drought indicators/indices
- A starting point to describe and characterize the most common indicators and indices and their applications
- Does not recommend a "best" set of indicators and indices, given research requirements for appropriate application in location in question.



Selecting drought indicators and indices

- Timely detection of drought to trigger appropriate communication and coordination to mitigate or respond
- Sensitivity to climate, space and time to determine drought onset and termination
- Responsive to reflect drought impacts occurring on the ground
- Which indicators/indices and triggers to use for going into and coming out of drought
- Data for indices/indicator available and record consistent
- Ease of implementation? (Human, institutional and financial capacity available)

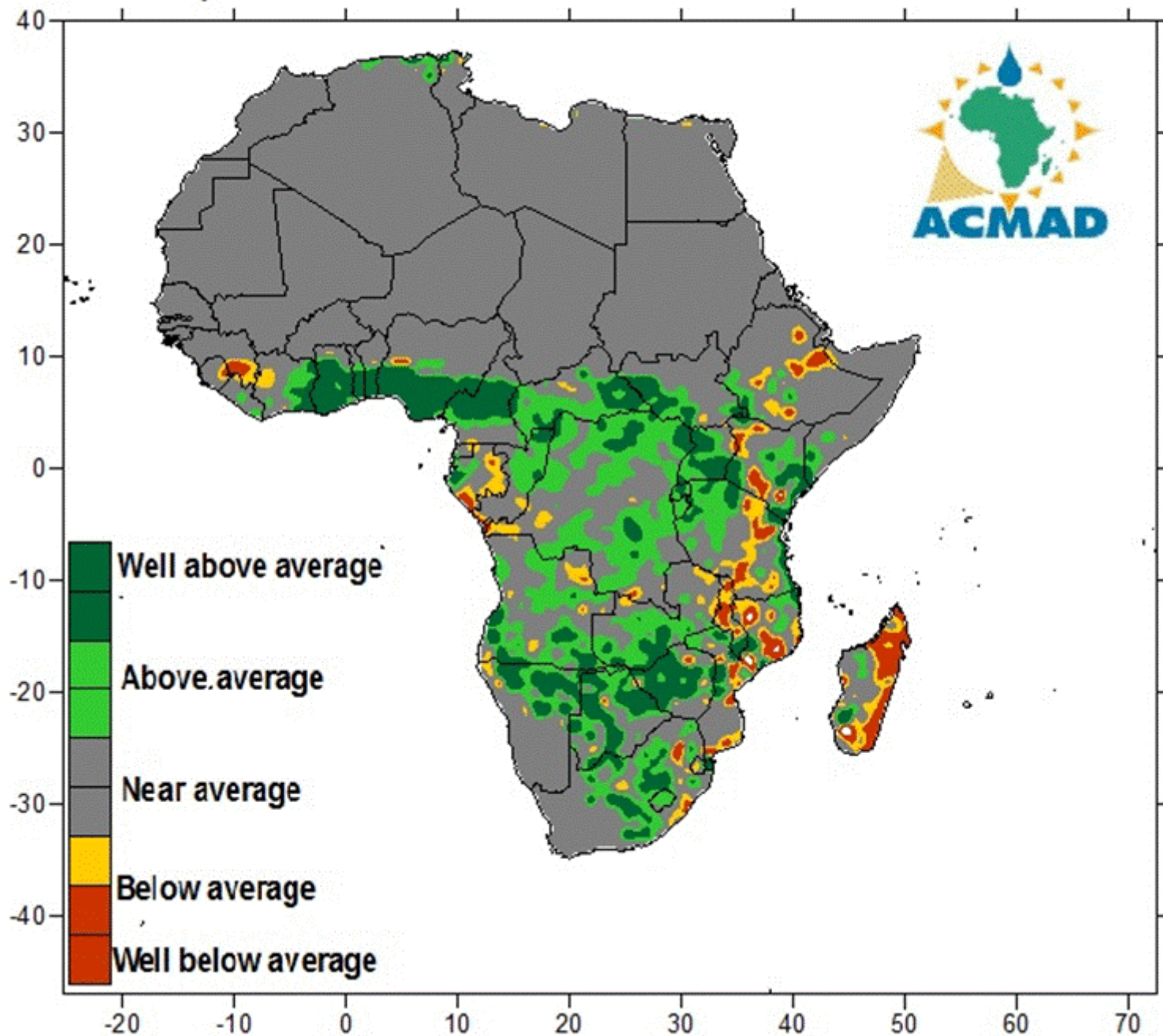
Data Issues I

- **Accurate and long-term weather data is needed**
- **Need at least years 30 years of rainfall data for SPI**
- **For Agricultural and Hydrological drought need other data**
 - **Potential evapotranspiration (ETP)**
 - **Departure of ETP from normal?**
 - **Affected crops – conditions, growth stages**
 - **Soil moisture (measurement/simulation/departure from normals)**

Data Issues II

- **Gridded datasets can be used (i.e. GPCC-Global Precipitation Climatology Centre)**
- **Reanalysis of weather model data**
- **Satellite products / Remotely sensed data are useful and but need to be calibrated and validated**
- **Vulnerability and impact data are limited in area and length of record**

Précipitations decadaires du 21 au 31 Mars 2015



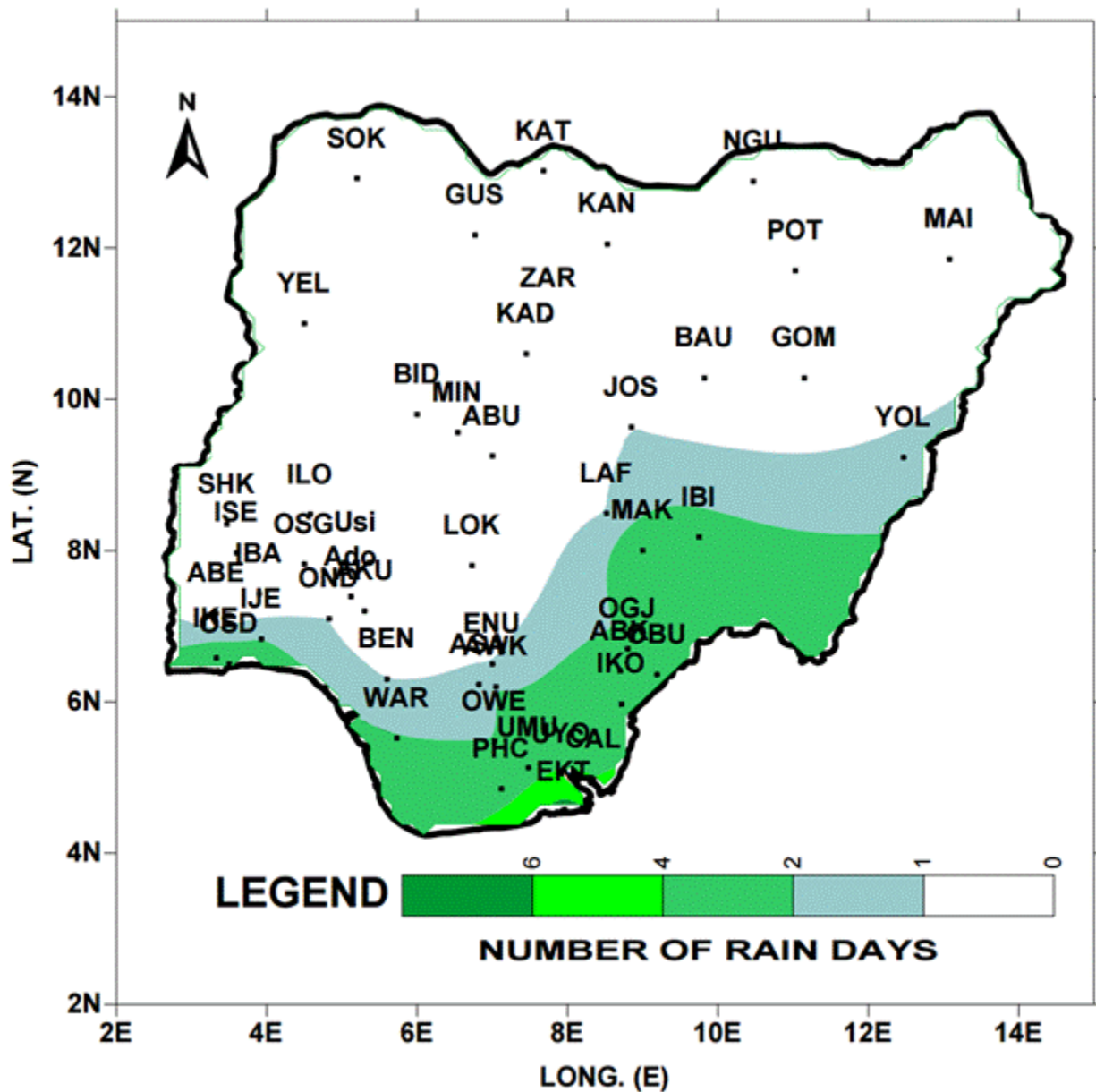


Fig.4: NUMBER OF RAIN DAYS

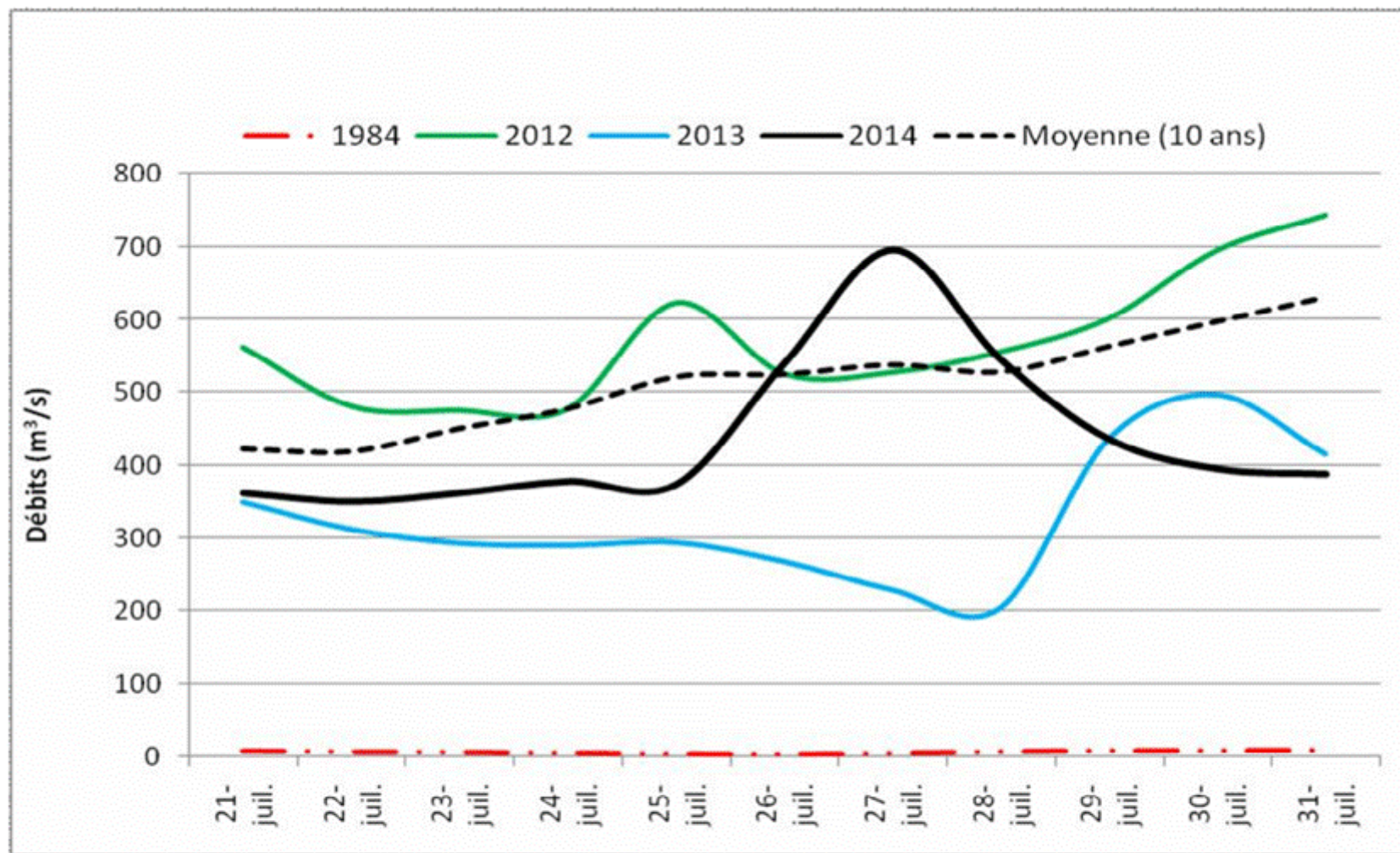


Figure 8: Hydrogramme du Fleuve Niger à Niamey de la Troisième décade de juillet 2014



Fig 5 : ISBE des cultures annuelles en début de croissance végétative ou en maturité

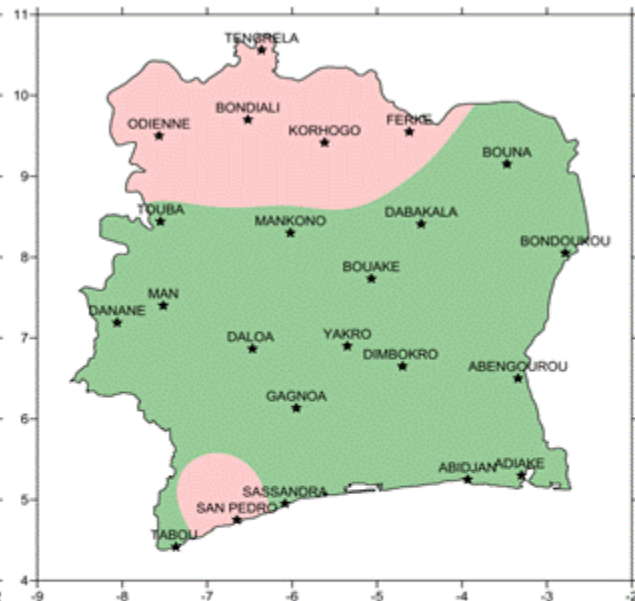


Fig 6: ISBE des cultures annuelles en pleine croissance végétative

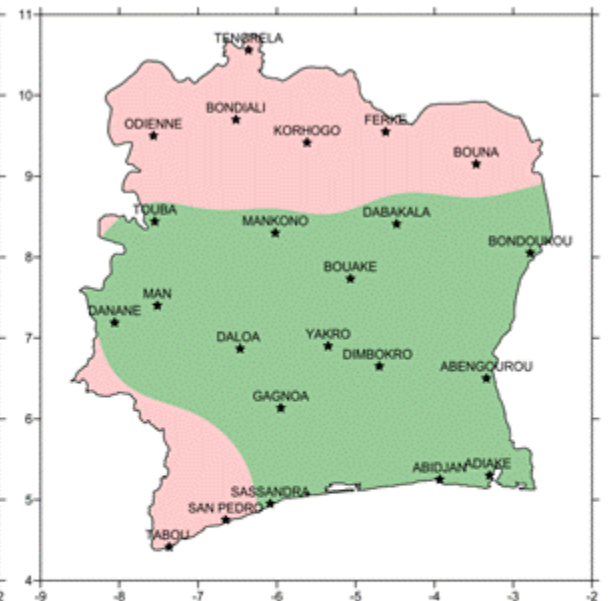


Fig 7: ISBE des cultures annuelles en phase reproductrice ou cultures pérennes



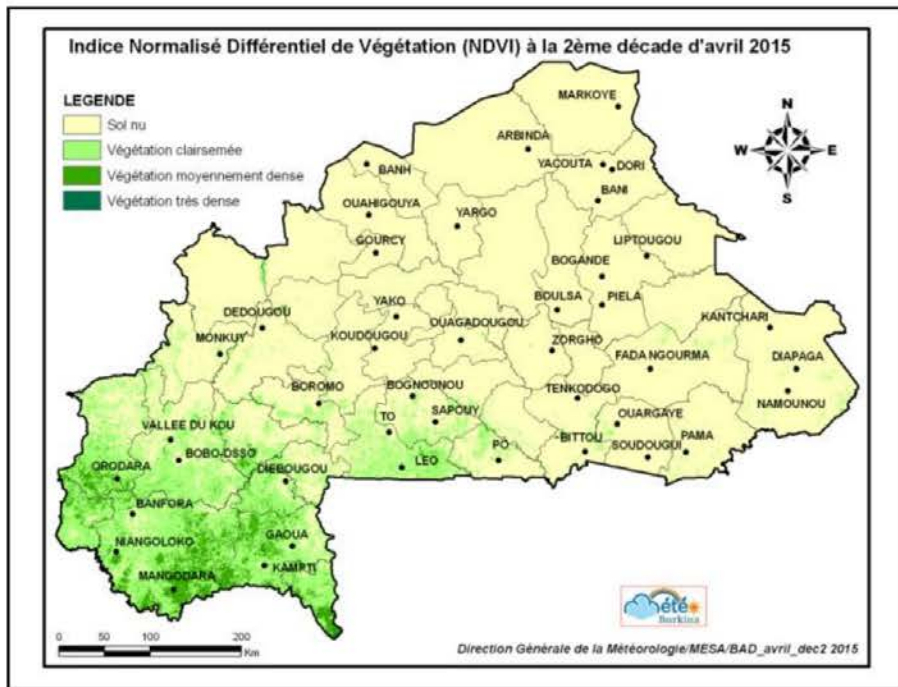


Fig.9 : NDVI à la 2^{ème} décennie d'avril 2015

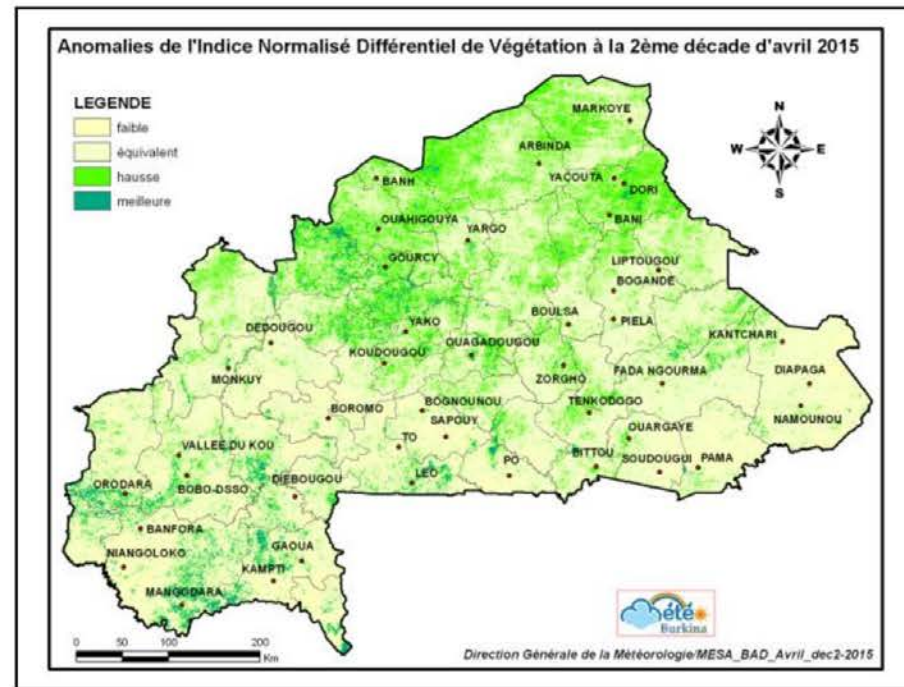
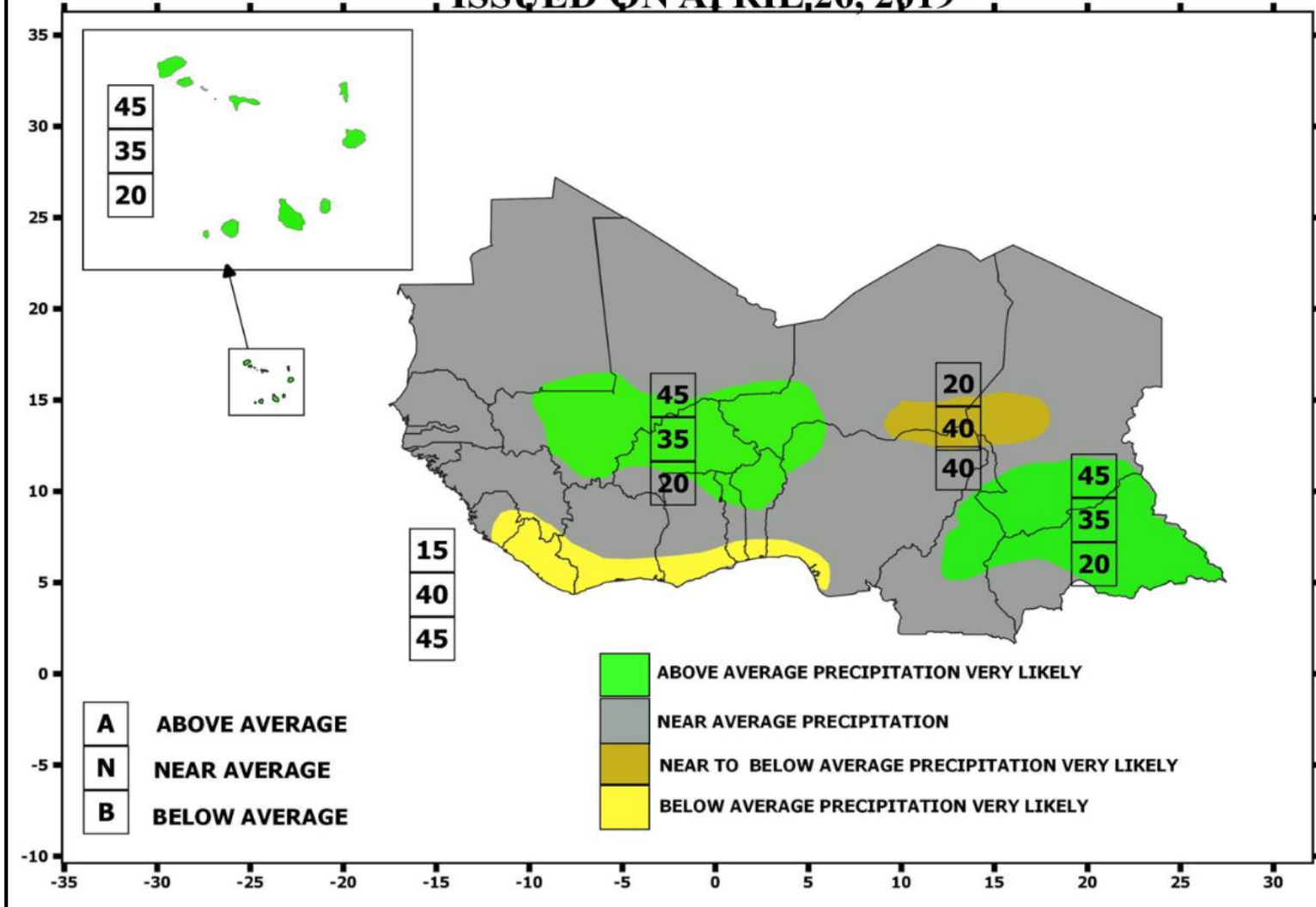


Fig.10 : Anomalies des différences d'images d'indices de végétation entre la 2^{ème} décennie d'avril 2015 et la moyenne 2001-2010

SEASONAL PRECIPITATION FORECAST FOR SUDANO-SAHELIAN REGION OF AFRICA VALID FOR JULY-AUGUST-SEPTEMBER 2019

ISSUED ON APRIL, 26, 2019



Pillar 1: Monitoring and Early Warning Systems



- **Monitoring/early warning, prediction and information delivery systems**
 - **Integrated** monitoring of key indicators
 - Precipitation, temperature, soil moisture, streamflow, snowpack, groundwater, **impacts**, etc.
 - Use of appropriate indices
 - **Used to trigger actions in drought plans**
 - Reliable seasonal forecasts
 - Development/delivery of information and sector-specific decision-support tools

Monitoring, Early Warning & Information Delivery Systems

Indicators/Indices	Agencies/Ministries/Organizations
<ul style="list-style-type: none">• Precipitation• Temperature• Surface water supplies<ul style="list-style-type: none">– Stream flow– Soil Moisture– Reservoir levels– Snow pack– Water use• Ground water• Remotely-sensed data (e.g., plant water stress)• Impacts<ul style="list-style-type: none">– By sector, area	<ul style="list-style-type: none">• Water• Meteorological & Hydrological Services• Agriculture, Forestry & Fisheries• Environment• Health• Energy• Transportation• Commerce• Social Services• NGOs• Others

Questions?

Get in touch: **Integrated Drought Management Helpdesk**

The image shows three interactive cards arranged horizontally. Each card has a title in an orange box, a central icon, a description in a white box, and a small orange plus sign in the bottom right corner. The first card, 'Ask', features a question mark and an information 'i' icon. The second card, 'Find', features a magnifying glass icon. The third card, 'Connect', features an icon of people holding hands in a circle.

- Ask**: Ask for assistance on integrated drought management
- Find**: Find knowledge resources on integrated drought management
- Connect**: Learn about the activities of IDMP and connect to them

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