Drought Preparedness, Mitigation and Response

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In collaboration with

WMO, UNCCD, FAO, CBD, UN-Water
Western and Central Africa Workshop on National Drought Management Policies

Accra, Ghana, 4-7 May 2015
3 Pillars of Drought Policy & Preparedness with linkages

Monitoring and Early Warning & Info. Delivery
- Drought status (meteo., hydro, agric., socio-econ.)

Vulnerability and Impact Assessment
- Who/What is at Risk & Why.
- Prioritization/Ranking

Mitigation and Response
- actions and measures to mitigate drought impacts and respond to drought emergencies (short-, medium- & long-term)

Feedback
- Drought characterization studies

Data, info for decision-making
- Monitoring, Feedback

Who/What requires action
- Feedback
Background

Drought planning

is defined as actions taken by individual citizens, industry, government, and others before drought occurs to mitigate impacts and conflicts arising from drought.
The Cycle of Disaster Management

- Risk management:
  - Preparedness
  - Mitigation

- Crisis management:
  - Prediction and Early Warning
  - Impact Assessment
  - Reconstruction
  - Recovery
  - Response

- Disaster
  - Protection
  - Recovery
Typology of drought risk management measures

Drought Preparedness
Drought Mitigation
Drought Response
Drought Recovery

(UN/ISDR Terminology of Disaster Risk Reduction - http://www.unisdr.org/)
established policies and specified plans and activities taken before drought to prepare people and enhance institutional and coping capacities, to forecast or warn of approaching dangers, and to ensure coordinated and effective response in a drought situation (contingency planning)
Typology of drought risk management measures

(UN/ISDR Terminology of Disaster Risk Reduction - http://www.unisdr.org/)

Drought Mitigation

any structural/physical measures (e.g., appropriate crops, dams, engineering projects) or non-structural measures (e.g., policies, awareness, knowledge development, public commitment, and operating practices) undertaken to limit the adverse impacts of drought
Typology of drought risk management measures

(UN/ISDR Terminology of Disaster Risk Reduction - http://www.unisdr.org/)

efforts such as the provision of assistance or intervention during or immediately after a drought disaster to meet the life preservation and basic subsistence needs of those people affected. It can be of an immediate, short-term, or protracted duration
Drought Recovery

decisions and actions taken after a drought with a view to restoring or improving the pre-drought living conditions of the stricken community, while encouraging and facilitating necessary adjustments to reduce drought risk
Typology of drought risk management measures

(UN/ISDR Terminology of Disaster Risk Reduction - http://www.unisdr.org/)

- Drought Preparedness
- Drought Mitigation
- Drought Response
- Drought Recovery
Drought Mitigation and Response (and Recovery)
Components of Drought Plans

- Monitoring, early warning and information delivery systems
  - Integrated monitoring of key indicators
  - Use of appropriate indices
  - Development/delivery of information and decision-support tools

- Risk and impact assessment
  - Conduct of risk/vulnerability assessments
  - Monitoring/archiving of impacts

- Mitigation and response
  - Proactive measures to increase coping capacity
    - Response to drought (when it hits)
Vulnerability Analysis

• Impact Assessment
  - Social
  - Environmental
  - Economic

• Causal Assessment

• Temporal Trends
Vulnerability to drought

Main vulnerable sectors to drought

(After Lulian Florin Vladu, UNFCCC, 2006)
## Checklist of Historical, Current, and Potential Drought Impacts

<table>
<thead>
<tr>
<th>H=Historical</th>
<th>C=Current</th>
<th>P=Potential</th>
</tr>
</thead>
</table>

### Economic

*Costs and losses to agricultural producers*

- Annual and perennial crop losses
- Damage to crop quality
- Income loss for farmers due to reduced crop yields
- Reduced productivity of cropland
- Insect infestation
- Plant disease
- Wildlife damage to crops
- Increased irrigation costs
- Cost of new or supplemental water resources
Impact Assessment by Subcommittees of the Risk Management Committee

e.g. 1
  _ Agriculture, Natural Resources, and Wildlife
  _ Municipal Water Supply, Health, and Energy

e.g. 2
  _ Agriculture
  _ Drinking Water, Health, and Energy
  _ Wildlife and Wildfire
  _ Tourism and Economic Impact
Steps:

1. Identify impacts of recent/historical droughts
2. Identify drought impact trends
3. Prioritize impacts to address
4. Identify mitigation actions that could reduce impacts (short vs. long term)
5. Identify triggers to phase in and phase out actions during drought onset or termination
6. Identify agencies and organizations to develop and implement actions
List of who/what is vulnerable to drought (based on drought impacts), prioritized on the basis of agreed criteria (for Drought Task Force)

Prepared by a “Risk Management Committee”
List of measures and actions to take proactively to increase coping capacity and eliminate or reduce those impacts

Prioritized on the basis of agreed criteria (for Drought Task Force)

Prepared by a “Risk Management Committee”

Risk Management options can be split into three categories, as follows:

<table>
<thead>
<tr>
<th>Category</th>
<th>Mitigation (long-term)</th>
<th>Mitigation (short-term)</th>
<th>Response (and Recovery)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective</td>
<td>resilience building</td>
<td>drought mitigation</td>
<td>Impact Reduction</td>
</tr>
<tr>
<td>Implementation framework</td>
<td>regular develop. programs</td>
<td>drought plan</td>
<td>Response within drought plan</td>
</tr>
<tr>
<td>Implement. time</td>
<td>continuous</td>
<td>before, during, after drought</td>
<td>during, after drought</td>
</tr>
</tbody>
</table>
Drought Plan

Foundation for building resilience to drought, BUT not complete shield

Long-Term Mitigation

Short-term Mitigation

Response

risk management measures

Normal

Drought

Normal
Long-Term
Short-term
Response
Drought Plan

Scale: $f(\text{national, regional, district, local, ...})$

Plan likely to change from one drought to another
I. Long-term

Re-visiting national policies/strategies to cater for drought preparedness

1. Water Resources
   - *Enhancing supply*
     
     - storage capacity increase
     - water transfers
     - locating new potential resources
     - aqueducts and canals
     - groundwater recharge
     - small scale water collection/harvesting
     - adjusting legal and institutional framework
     - artificial precipitation
     - desalination of brackish & saline water
     - treatment & reuse of wastewater/recycling
     - etc.
I. Long-term

Re-visiting national policies/strategies to cater for drought preparedness

1. Water Resources

   Improving demand management (in all sectors/uses)

   Reducing use
   Reducing losses
   Reviewing water allocation
   Monitoring, metering, forecasting
   Conjunctive use (surface-groundwater)
   Reviewing education curricula
   Adopting/reviewing water tariffs
   Adjusting legal & institutional framework
   Voluntary insurance, pricing and economic incentives
   Etc.
Options for drought preparedness plan/Strategy

I. Long-term

Re-visiting national policies/strategies to cater for drought preparedness

2. Agriculture

- Agric. water management (complying with water resources strategy/plan)
  - Irrigation expansion if/where possible
  - Improving demand management (more efficient systems)
    - Water loss reduction
    - Irrig. scheme modernization/ conversion to more efficient systems
  - Shift to less water-demanding crops and cropping systems
  - Research of drought tolerant crops/species/genotypes
  - Adjusting cropping calendars to avoid heat stress
  - Use of non-conventional water resources
  - Deficit irrigation, supplementary irrigation
  - Conjunctive use of surface and groundwater
  - Soil water conservation practices
  - Adopting/reviewing water tariffs
  - Etc.
Options for drought preparedness plan/Strategy

I. Long-term

Re-visiting national policies/strategies to cater for drought preparedness

2. Agriculture

- Crop production
  - Breeding for drought tolerance species & adaptation to short season
  - Cultural practices and techniques for conservation agriculture:
    - Proper fertilization
    - No-till/reduced tillage systems
    - Crop rotation/cropping systems
    - Seeding rate/density
    - Weeding/adapted pest management
    - Mulching/adapted soil preparation
    - Strip farming
    - Crop insurance, Etc.
Options for drought preparedness plan/Strategy

I. Long-term
Re-visiting national policies/strategies to cater for drought preparedness

2. Agriculture

- Livestock
  
  Drinking supplies
  Balancing livestock in irrigated areas
  Managing pasture and range supportive capacity
  Use of indigenous breeds of feed and fodder
  Genotypes of mammals / low water use
  Early information for pastoralists
  Forage reserves
  Non conventional fodder sources
  etc.
Options for drought preparedness plan/Strategy

I. Long-term
Re-visiting national policies/strategies to cater for drought preparedness

3. Other sectors
   - Municipal water
   - Health
   - Food security
   - Energy
   - Transportation
   - Tourism/Recreation
   - Industry
   - Forest/rangeland fires
   - Environment
   - Ecosystem services/ biodiversity
   - etc
II. Short-term measures

1. Water

- Supply augmentation (all/specified sectors)

  Mixing fresh & low quality waters
  Exploiting high-cost waters
  Adjusting legal and institutional framework
  Locating new standby resources (for emergency)
  Providing permits to exploit additional resources
  Providing drilling equipment
  etc.
Options for drought preparedness plan/Strategy

II. Short-term measures

1. Water

- *Demand management (all/specified sectors)*
  
  Restricting agric. uses (rationing, subjecting certain crops to stress, …)
  Restricting municipal uses (lawn irrigation, …)
  Reviewing operations of reservoirs
  Diverting water from given uses
  Over-drafting aquifers (temporarily)
  Reviewing water tariffs
  Rationing water supply
  Sensitising and awareness campaign
  Adjusting legal and institutional framework
  Negotiating transfer between sectors
  Dual distribution networks for drinking water supply
  Adopting carry-over storage
  Conjunctive use
  etc.
II. Short-term measures

1. Water

- Measures other than supply and demand

  Temporary reallocation of water (on basis of assigned use priority)
  Decreasing transport and distribution costs
  Banning/restricting uses
  Providing emergency supplies
  Elaborating set-aside regulations
  Inventory private wells, negotiate purchase of water rights for public use
  Elaborate regulations on water markets
  Assess vulnerability & advise water users
  Elaborate alert procedures
  etc.
Drought levels and water mitigation/responses

- **Incipient**: Monitoring and public education
- **Moderate**: Voluntary reduction in water use
- **Severe**: Voluntary/mandatory water use restrictions
- **Extreme**: Mandatory water use restrictions
II. Short-term measures

2. Agriculture

– Crop Production

Supplementary irrigation where water can be mobilized and made available on short-term basis
Soil water conservation practices
Early warning, information and advice to farmers
Review of fertilization program
Soil mulching and crop shading
Reducing crop density
Weeding
etc.
Options for drought preparedness plan/Strategy

II. Short-term measures

2. Agriculture

– *Livestock, range and pasture lands*

  Early warning / advice to herders
  Destocking / incentives for owners to reduce
  Review available feed and reduce animal numbers
  Livestock transfer where/when possible
  Watering points/ water hauling sources
  Locating potential sites of water for emergency
  Constituting feed stocks
  Adjusting water salinity to tolerable levels
  Rapid inventory of grazing potential
  Protective (natural) shelters
  Alternative feed (by-products, less and un-palatable shrubs, …)
  Supplementary, substitute feeds
  Etc.
III. Response and Recovery

Response options often depend on level of country development

- Drinking water supply (humans, livestock, wildlife)
- Insurance compensation
- Public aid to compensate loss of revenue
- Tax relief (reduction or delay of payment deadline)
- Rehabilitation/recovery programs
- Food programs
- Feed programs
- Fire control programs
- Resolving conflicts
- Postponing payment of credits
- Implement set-aside regulations
- Etc.
Response integral part of drought risk management plan

- Public aid to compensate loss of revenue
- Food programs
- Feed programs
- Rehabilitation/Recovery programs (not always foreseeable and planned)
- Etc.

In-kind contribution of beneficiaries, often in the form of work, are used to implement development programs that have been planned during the preparedness phase.

Ready to implement programs included in drought plan

e.g. food for work to be used for building a community water reservoir. Pre-feasibility and feasibility studies done, execution plan ready, work can start at any time.
Planned drought mitigation and response options

Risk Assessment Committee prioritizes all options based on agreed criteria (vulnerability, cost, etc.)

Scale (national, regional, local, specific groups, etc.)

Drought Task Force selects options to be included in drought plan

Time-bound implementation plan, based on indices/triggers from Monitoring and Early Warning
Planned drought mitigation and response options

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Time during normal conditions</th>
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<tbody>
<tr>
<td>I-1</td>
<td>Consider I-1 is SPI</td>
</tr>
<tr>
<td>I-2</td>
<td></td>
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<tr>
<td>I-3</td>
<td></td>
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<td>I-4</td>
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<table>
<thead>
<tr>
<th>Triggers</th>
<th>Actions</th>
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<tr>
<td>I-1</td>
<td>Level 2; SPI = -1.25  (Moderate drought)</td>
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| Level 1 (SPI 0.0 to -0.99) | Consider Action 1: Ban watering lawns |
| Level 2 (SPI -1.0 to -1.49) | Consider Action 2: Dig extra wells for livestock and wildlife in area |
| Level 3 (SPI -1.5 to -1.99) | Consider Action 3: Reduce irrigation of annual crops by 50% |
| Level 4 (SPI ≤ -2.0)       | |
## Planned drought mitigation and response options

### Example

#### Indicators
- I-1
- I-2
- I-3
- I-4

#### Triggers
- I-3
  - Level 1 (water level in wells $\leq 100$ m)
  - Level 2 (water level in wells from 100 to 200 m)
  - Level 3 (water level in wells from 200 to 300 m)
  - Level 4 (water level in wells $\geq 300$ m)

#### Actions
- Level 2
  - Action 1: Consider I-3 is groundwater level
  - Action 2: Ban watering lawn
  - Action 3: Reuse of treated wastewater for orchards
  - Action 4: Inform livestock owners to destock by 50%

### Time during normal conditions

- Consider Level 2; groundwater level of well x in zone y drops below 100 m (Moderate drought)
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<td>Who is responsible?</td>
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Drought Preparedness
Institutional Coordination and Methodologies and Tools

Operational Arrangements, Management and Public review & Evaluation

Policies, momentum

Organizational Frameworks

Communication

Drought Preparedness

Pre-, During and Post Drought Planning

Drought Characterization

Monitoring and Early Warning

Vulnerability and Impact Assessment

Mitigation and Response Options

Drought Plan
Drought Task Force

Monitoring Committee
- Policy Direction
- Situation Reports

Risk Assessment And Management Committee
- Assessment Reports
- Situation Reports

Drought Plan Organizational Structure

Working Groups
Using the result of the impact and vulnerability assessment carried out under the previous session,

Propose drought risk management measures adapted for Western and Central Africa regions, including both medium- and long-term dimensions, and specify for each measure the responsible agency(ies)

(Note: in a real exercise one needs to specify also the space scale and the beneficiaries for each measure)

Group A: Water Sector
Group B: Agriculture Sector (including forestry, livestock, fisheries)
Group C: Other sectors
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