Drought Preparedness, Mitigation and Response

Mohamed Bazza, PhD
Senior Officer
Food and Agriculture Organization of the UN - FAO

In collaboration with
The Robert B. Daugherty Water for Food Institute

WMO, UNCCD, FAO, UN-Water – Latin America Regional Workshop on National Drought Management

www.fao.org/nr/water
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
  - Preparation
  - Mitigation

- Crisis Management
  - Recovery
  - Response
  - Impact Assessment
  - Prediction and Early Warning

- Protection
  - Disaster
Typology of drought risk management measures

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

Drought Preparedness

Drought Mitigation

Drought Response

Drought Recovery

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
www.fao.org(nr)/water
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

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
Drought Response 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.

Typology of drought risk management measures (UN/ISDR Terminology of Disaster Risk Reduction - http://www.unisdr.org/)
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
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></th>
<th>H=Historical</th>
<th>C=Current</th>
<th>P=Potential</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Economic</strong></td>
<td></td>
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</tbody>
</table>

- 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>
Normal  Drought  Normal

**risk management measures**

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**Foundation for building resilience to drought, BUT not complete shield**

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**Drought Plan**

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**Long-Term Mitigation**

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**Short-term Mitigation**

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**Response**
Scale: f(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

1. 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

1. 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.
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
- 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.
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

**Indicators**
- I-1
- I-2
- I-3
- I-4

**Triggers**
- Level 1 (SPI 0.0 to -0.99)
- Level 2 (SPI -1.0 to -1.49)
- Level 3 (SPI -1.5 to -1.99)
- Level 4 (SPI ≤ -2.0)

**Actions**
- Consider Level 2; SPI = -1.25 (Moderate drought)
  - Action 1: Ban watering lawns
  - Action 2: Dig extra wells for livestock and wildlife in area
  - Action 3: Reduce irrigation of annual crops by 50%

Another example
### 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></td>
</tr>
<tr>
<td>I-2</td>
<td></td>
</tr>
<tr>
<td>I-3</td>
<td></td>
</tr>
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<tr>
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<tbody>
<tr>
<td>Level 1</td>
<td>(water level in wells ≤ 100 m)</td>
</tr>
<tr>
<td>Level 2</td>
<td>(water level in wells from 100 to 200 m)</td>
</tr>
<tr>
<td>Level 3</td>
<td>(water level in wells from 200 to 300 m)</td>
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<td>Level 4</td>
<td>(water level in wells ≥ 300 m)</td>
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<tr>
<td>Action 1</td>
<td>Consider Level 2; groundwater level of well x in zone y drops below 100 m (Moderate drought)</td>
</tr>
<tr>
<td>Action 2</td>
<td>Consider Action 1: Ban watering lawn</td>
</tr>
<tr>
<td>Action 3</td>
<td>Consider Action 2: Reuse of treated wastewater for orchards</td>
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<td>Action 4</td>
<td>Consider Action 3: inform livestock owners to destock by 50%</td>
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**Example**

Consider I-3 is groundwater level

Consider Level 2; groundwater level of well x in zone y drops below 100 m (Moderate drought)

Consider Action 1: Ban watering lawn

Consider Action 2: Reuse of treated wastewater for orchards

Consider Action 3: inform livestock owners to destock by 50%
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<td>Who is responsible?</td>
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Drought Preparedness
Institutional Coordination Methodologies and Tools

Operational Arrangements, Management

Public review & Evaluation

Pre-, During and Post Drought Planning

Policies, momentum

Communication

Organizational Frameworks

Drought Characterization

Monitoring and Early Warning

Vulnerability and Impact Assessment

Mitigation and Response Options

Drought Plan
Questions for Breakout Groups

Using the result of the impact and vulnerability assessment done yesterday,

i. Develop risk managements measures

ii. Include both medium- and long-term measures

iii. Specify for each measure the responsible agency(ies)

(iv. Specify for each measure the space scale and the beneficiaries)
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