

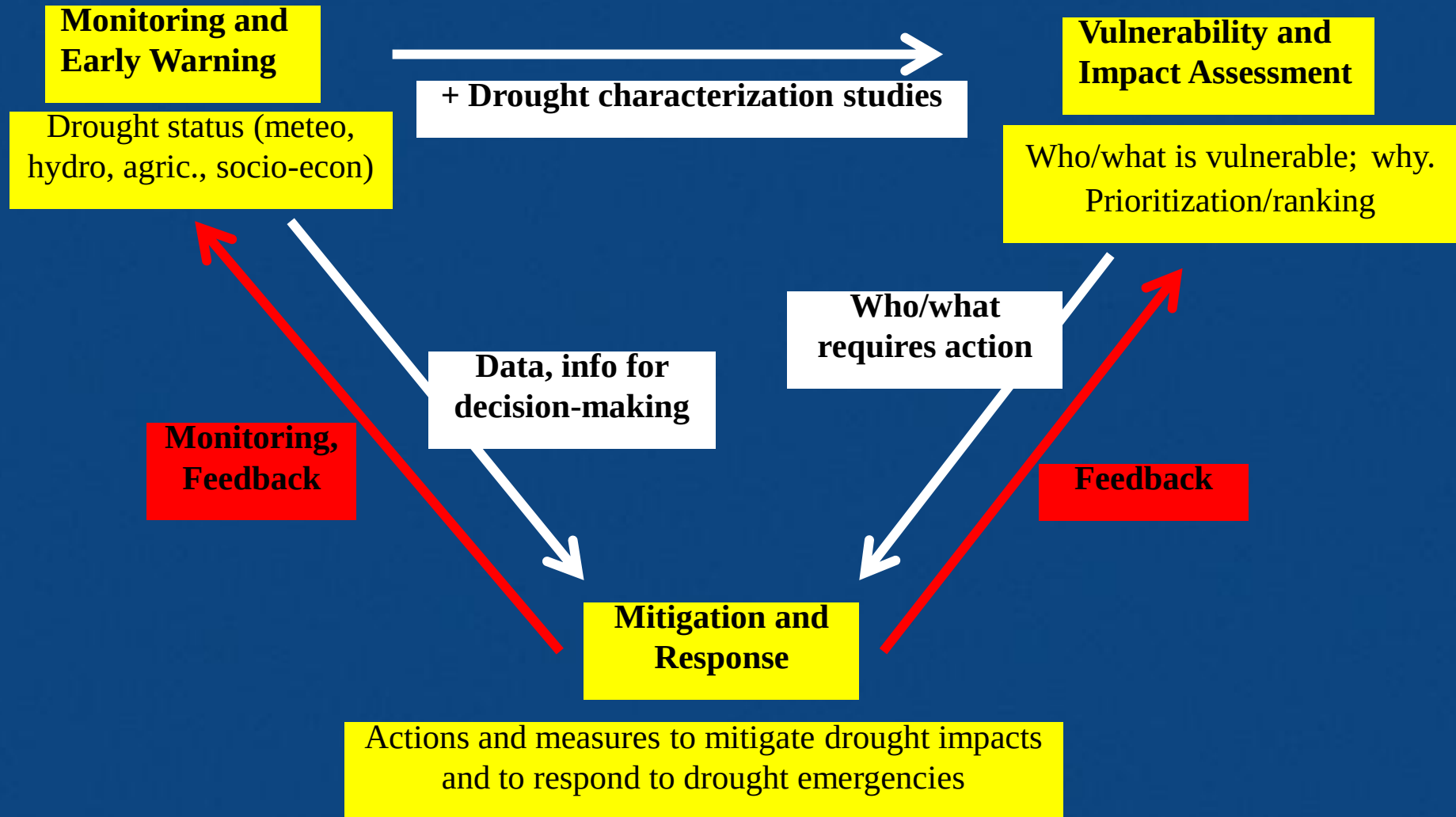
**WMO, UNCCD, FAO, CBD, UN-Water Asia-Pacific  
Workshop on National Drought Management Policies  
In partnership with VAWR and IWDR, Vietnam**

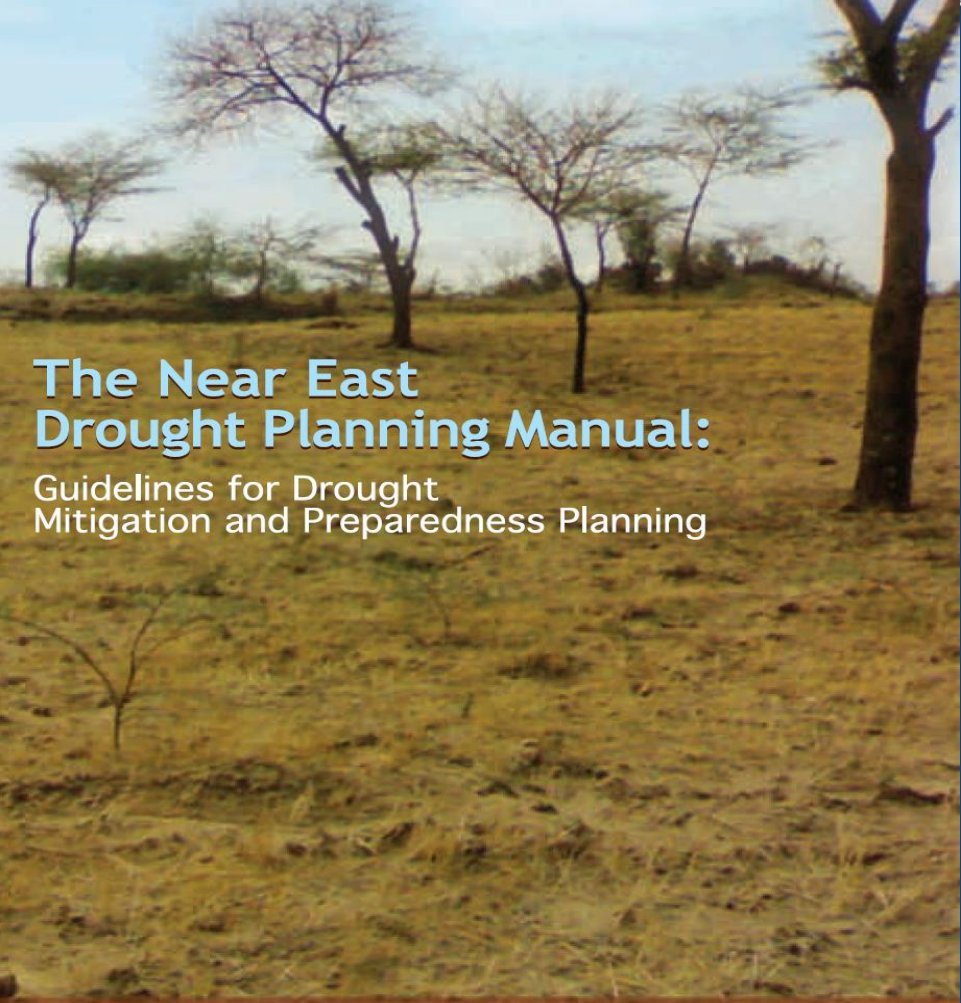
# **Drought Preparedness, Mitigation and Response**

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

Hanoi, Vietnam, 6-9 May 2014,

# The 3 Pillars of Drought Policy and their linkages





## The Near East Drought Planning Manual:

Guidelines for Drought  
Mitigation and Preparedness Planning



Food and Agriculture Organization  
of the United Nations  
Regional Office for the Near East,  
Cairo, Egypt



National Drought Mitigation Center  
University of Nebraska, Lincoln,  
Nebraska - USA

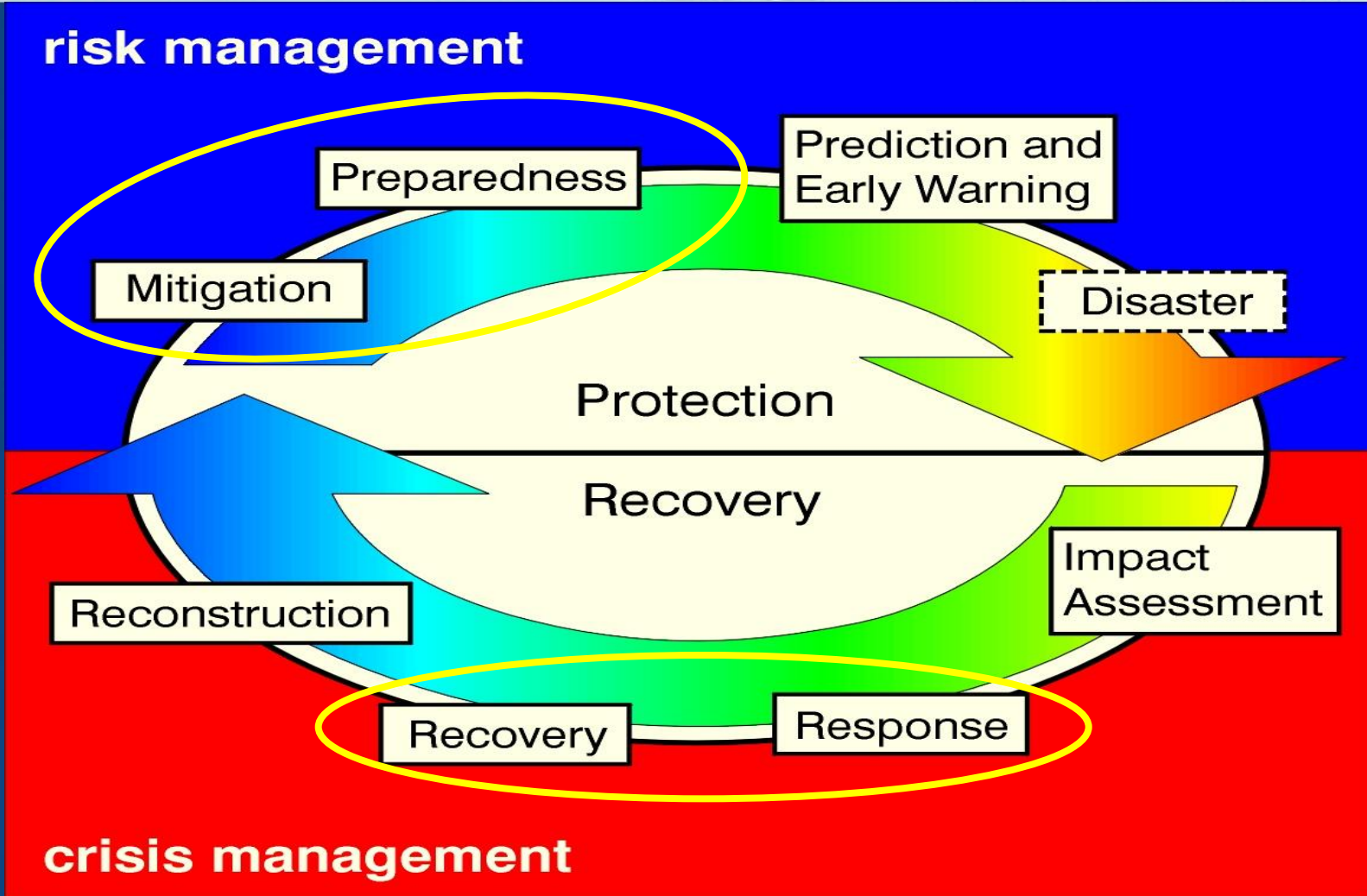


## Background

### **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





**Drought  
Preparedness**

**Drought  
Mitigation**

**Drought  
Response**

**Drought  
Recovery**



## Drought Preparedness

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)

## 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

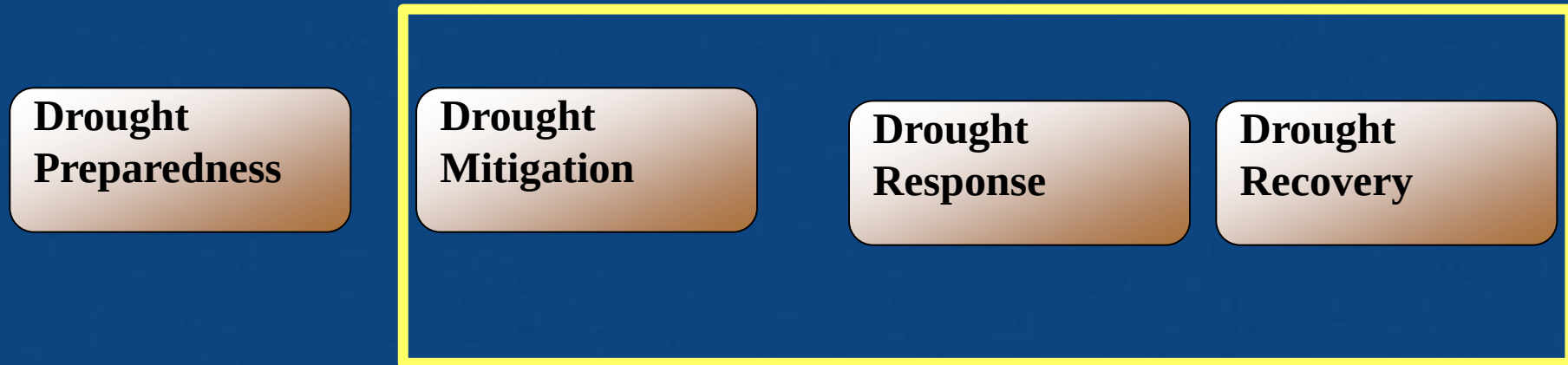


## Drought Response

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

## 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





# 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)





- Impact Assessment
  - \_ Social
  - \_ Environmental
  - \_ Economic
- Causal Assessment
- Temporal Trends

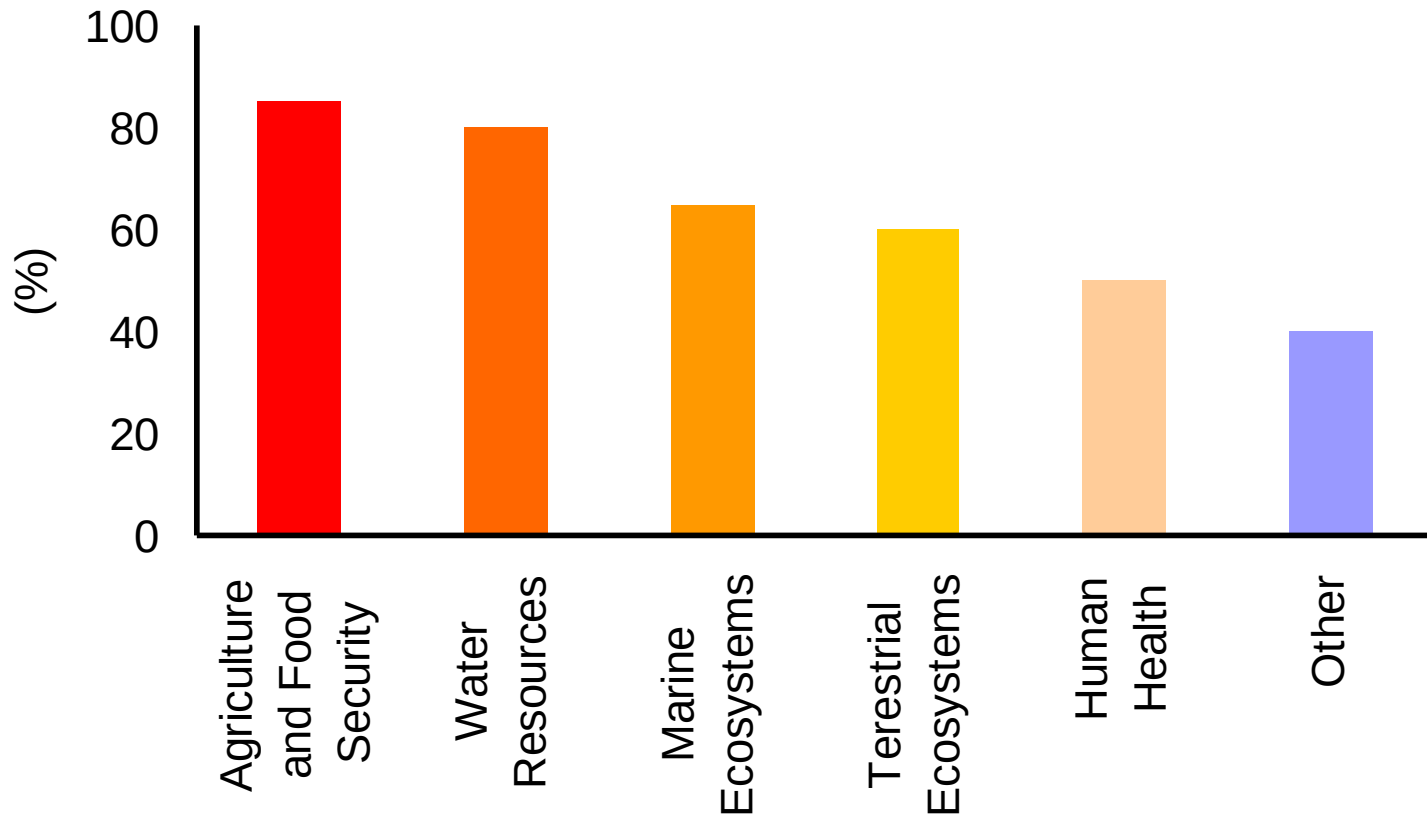




# Vulnerability to drought



Main vulnerable sectors to drought



(After Lulian Florin Vladu, UNFCCC, 2006)

# Checklist of Historical, Current, and Potential Drought Impacts



H=Historical

C=Current

P=Potential

## Economic

| H                        | C                        | P                        | <i>Costs and losses to agricultural producers</i>  |
|--------------------------|--------------------------|--------------------------|----------------------------------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Annual and perennial crop losses                   |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Damage to crop quality                             |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Income loss for farmers due to reduced crop yields |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Reduced productivity of cropland                   |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Insect infestation                                 |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Plant disease                                      |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Wildlife damage to crops                           |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Increased irrigation costs                         |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 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

## Risk Assessment Outputs



**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”

# Risk Management Options



List of measures and actions to take proactively to increase coping capacity and eliminate or reduce those impacts

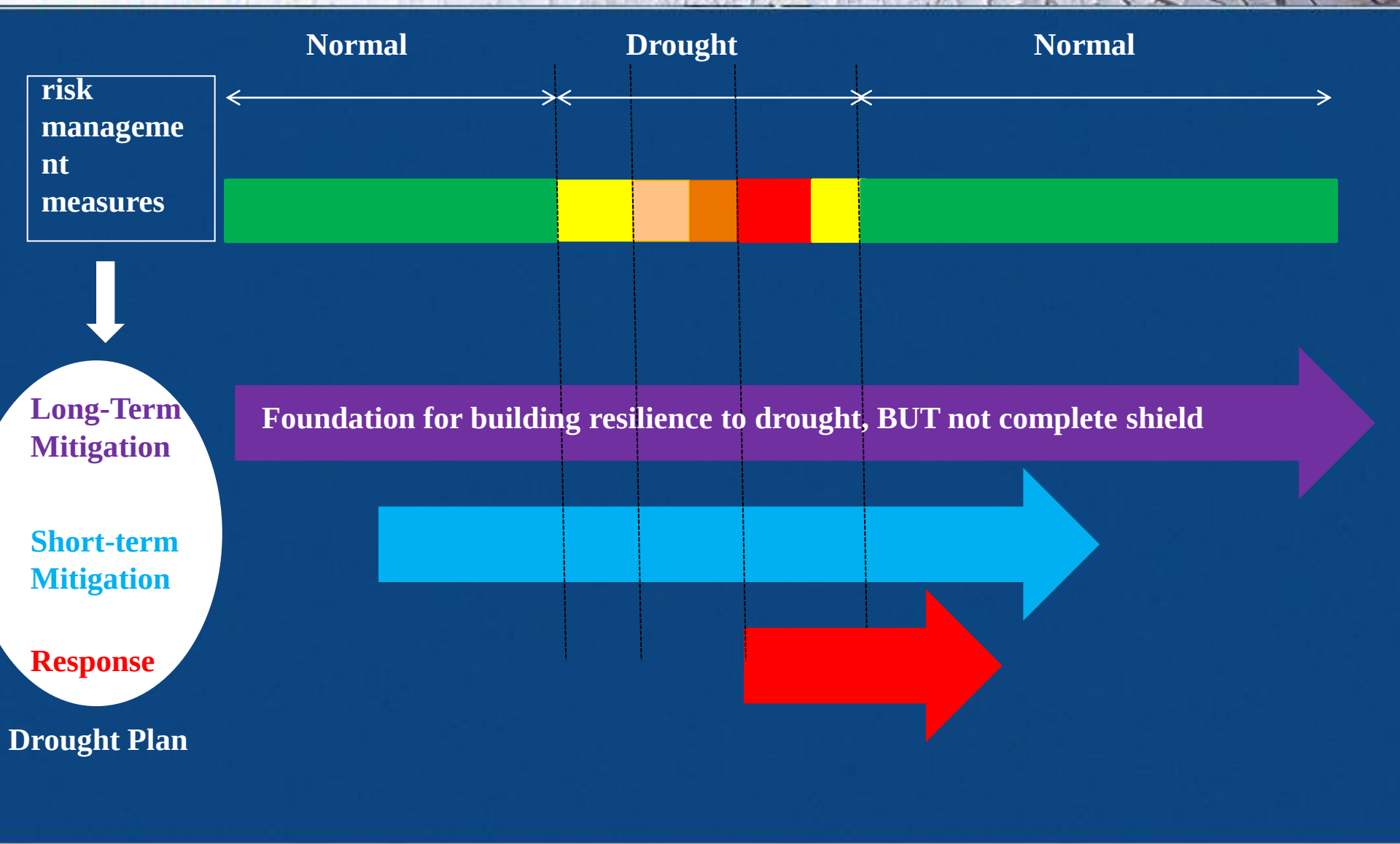
Prioritized on the basis of agreed criteria (for Drought Task Force)

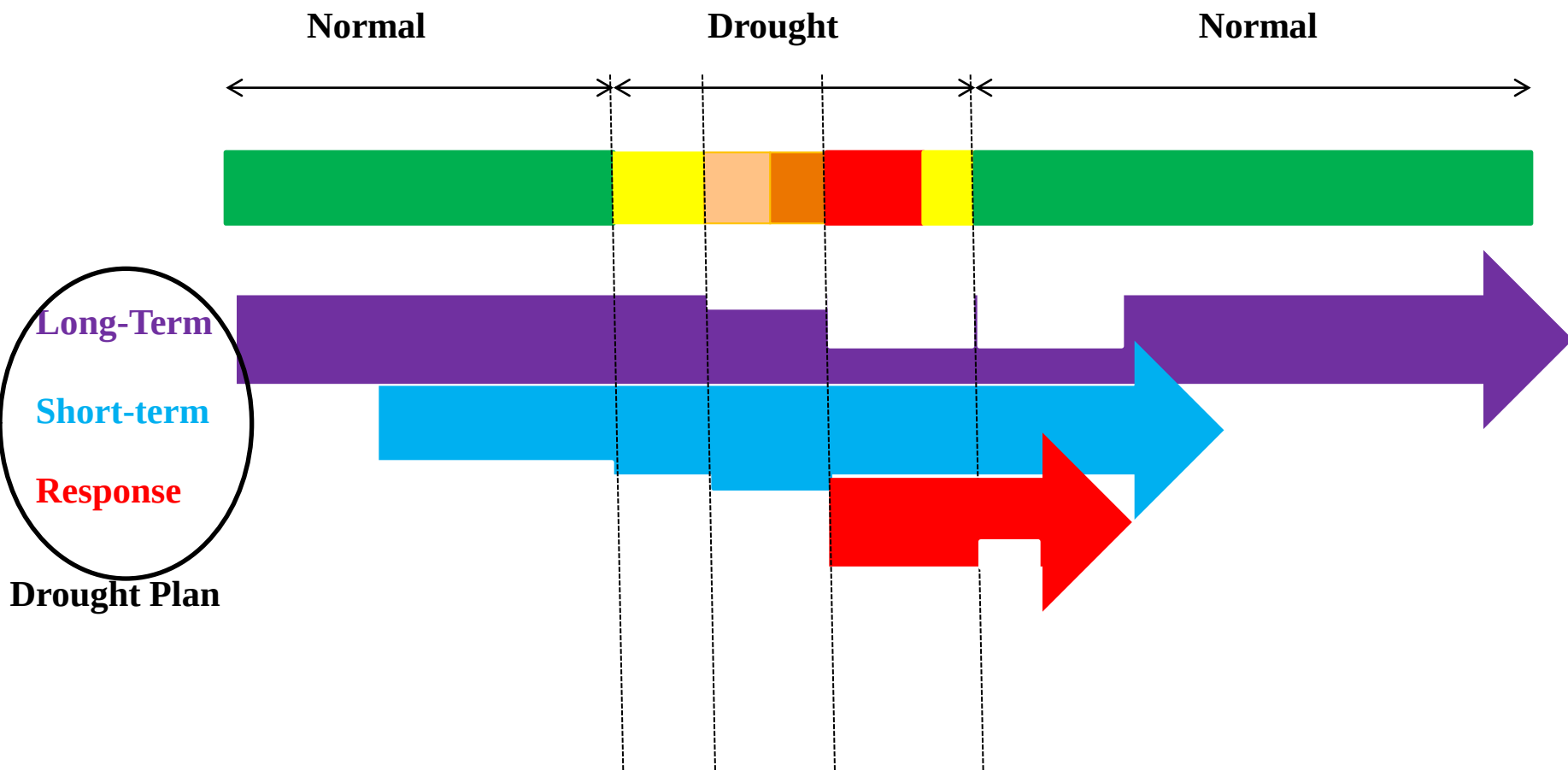
Prepared by a “Risk Management Committee”

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

| Category                 | Mitigation (long-term)    | Mitigation (short-term)       | Response (and Recovery)      |
|--------------------------|---------------------------|-------------------------------|------------------------------|
| Objective                | resilience building       | drought mitigation            | Impact Reduction             |
| Implementation framework | regular develop. programs | drought plan                  | Response within drought plan |
| Implement. time          | continuous                | before, during, after drought | during, after drought        |







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.



## 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.



## 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.



## 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/ 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.



## 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.





- **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.



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



Another example

Time during normal conditions

Indicators

I-1  
I-2  
I-3  
I-4

Consider I-1 is SPI

Triggers

I-1  
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  $\leq$  -2.0)

Consider Level 2 ; SPI = -1.25  
(Moderate drought)

Actions

Level 2  
Action 1  
Action 2  
Action 3

Consider Action 1: Ban watering lawns  
Consider Action 2: Dig extra wells for livestock and wildlife in area  
Consider Action 3: Reduce irrigation of annual crops by 50%

# Planned drought mitigation and response options



**Example**

**Time during normal conditions**

**Indicators**

I-1  
I-2  
I-3  
I-4

Consider I-3 is groundwater level

**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)

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

**Actions**

Level 2  
Action 1  
Action 2  
Action 3  
Action 4

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%



[illegible]

# Drought Preparedness



**Policies, momentum**

**Communication**

**Organizational  
Frameworks**

**Institutional  
Coordination**

**Methodologies  
and Tools**

**Drought  
Preparedness**

**Operational  
Arrangements,  
Management**

**Public review  
& Evaluation**

**Pre-, During and Post  
Drought Planning**

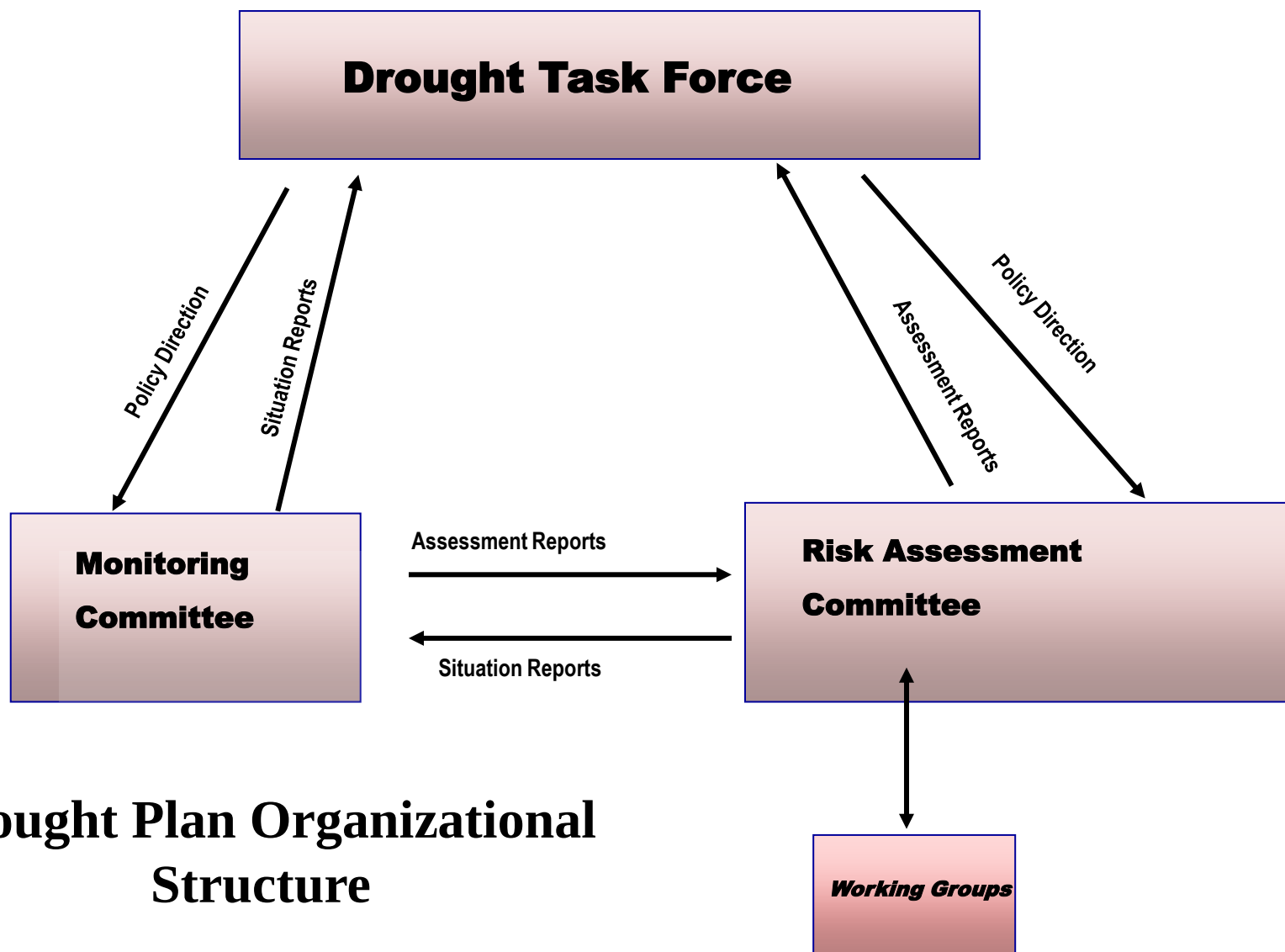
**Drought  
Characterization**

**Monitoring and  
Early Warning**

**Vulnerability and  
Impact Assessment**

**Mitigation and  
Response Options**

**Drought Plan**



## Drought Plan Organizational Structure





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)*

**Group A: Water**

**Group B: Agriculture**

**Group C: Other**

[illegible]