



# **Risk-based National Drought Policy: *Background, Challenges and Opportunities***

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***Capacity Development to Support National Drought Management Policies  
Bucharest, Romania July 9-11, 2013***

# Thanks for your Leadership!



World Meteorological Organization  
Weather • Climate • Water

**WMO**



Food and Agriculture  
Organization of the  
United Nations

*for a world without hunger*

**FAO**



UNCCD

United Nations Convention  
to Combat Desertification

**UNCCD**

# Presentation Outline

- The **DROUGHT AS HAZARD**— a growing sense of urgency
  - Drought characteristics, definition
- Building **SOCIETAL RESILIENCE**
  - Hydro-illogical Cycle/Crisis Management/Changing the Paradigm
- **CHALLENGES** of integrated drought management
  - Changing Climate
  - Changing Vulnerability/Risk/Impacts
- **OPPORTUNITIES** for integrated drought management
  - Drought policy
  - Drought preparedness planning
    - Monitoring/Early Warning
    - Risk and Impact assessment
    - Mitigation and Response
- **TAKEAWAY MESSAGES**

# Drought Characteristics in the Context of Natural Hazards

- **slow onset, “creeping phenomenon”**
  - drought’s onset and end difficult to determine
  - **commonality with climate change**

**It's behind me...**

**Isn't it..?**

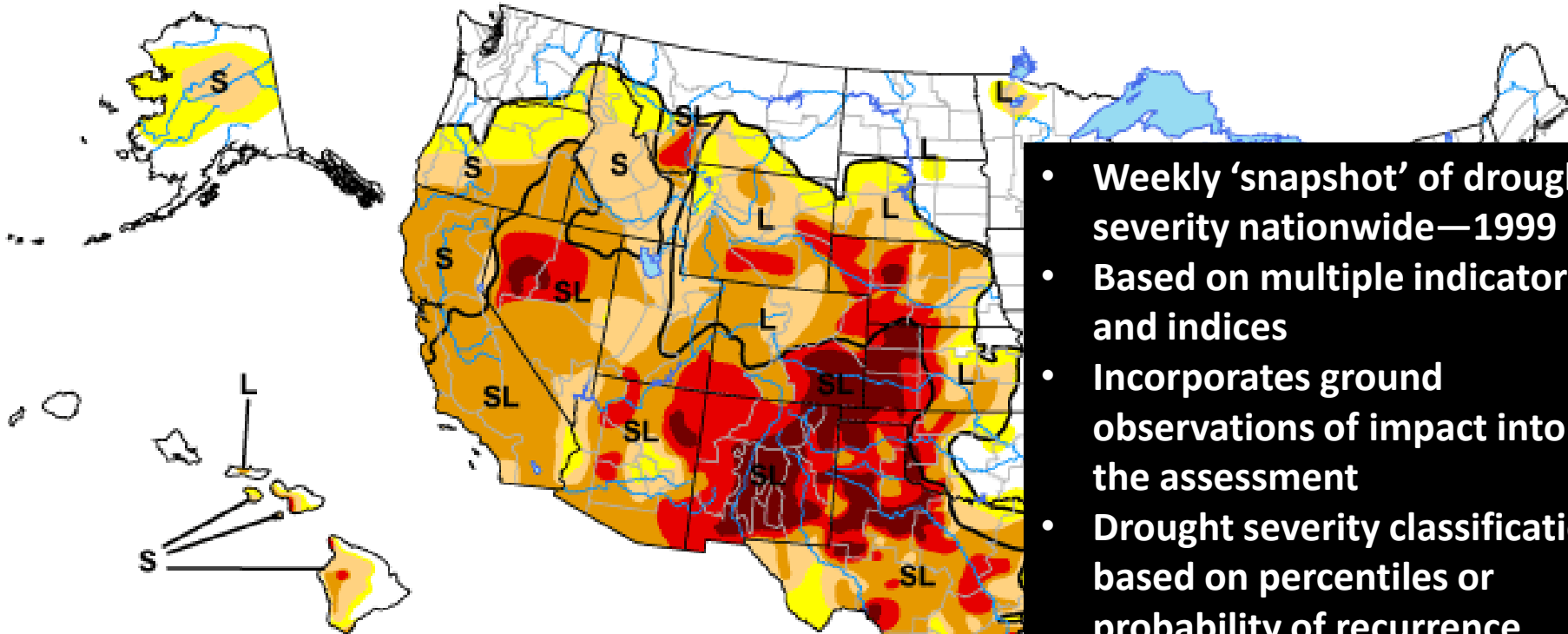
**Drought— it sneaks up on you!**

# Drought Characteristics in the Context of Natural Hazards

- **slow onset, “creeping phenomenon”**
  - drought onset and end difficult to determine
  - commonality with climate change
- **absence of a universal definition**
- **impacts are nonstructural and spread over large areas**
- **severity and impacts best defined by multiple indices and indicators**
- **impacts are complex, affect many people, and vary on spatial and temporal timescales, multiple and migrating epicenters**

# U.S. Drought Monitor

July 2, 2013  
Valid 7 a.m. EDT



- Weekly 'snapshot' of drought severity nationwide—1999
- Based on multiple indicators and indices
- Incorporates ground observations of impact into the assessment
- Drought severity classification based on percentiles or probability of recurrence
- Jointly prepared by the NDMC, NOAA and USDA

Intensity:

- D0 Abnormally Dry
- D1 Drought - Moderate
- D2 Drought - Severe
- D3 Drought - Extreme
- D4 Drought - Exceptional

Drought Impact Types:

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

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



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

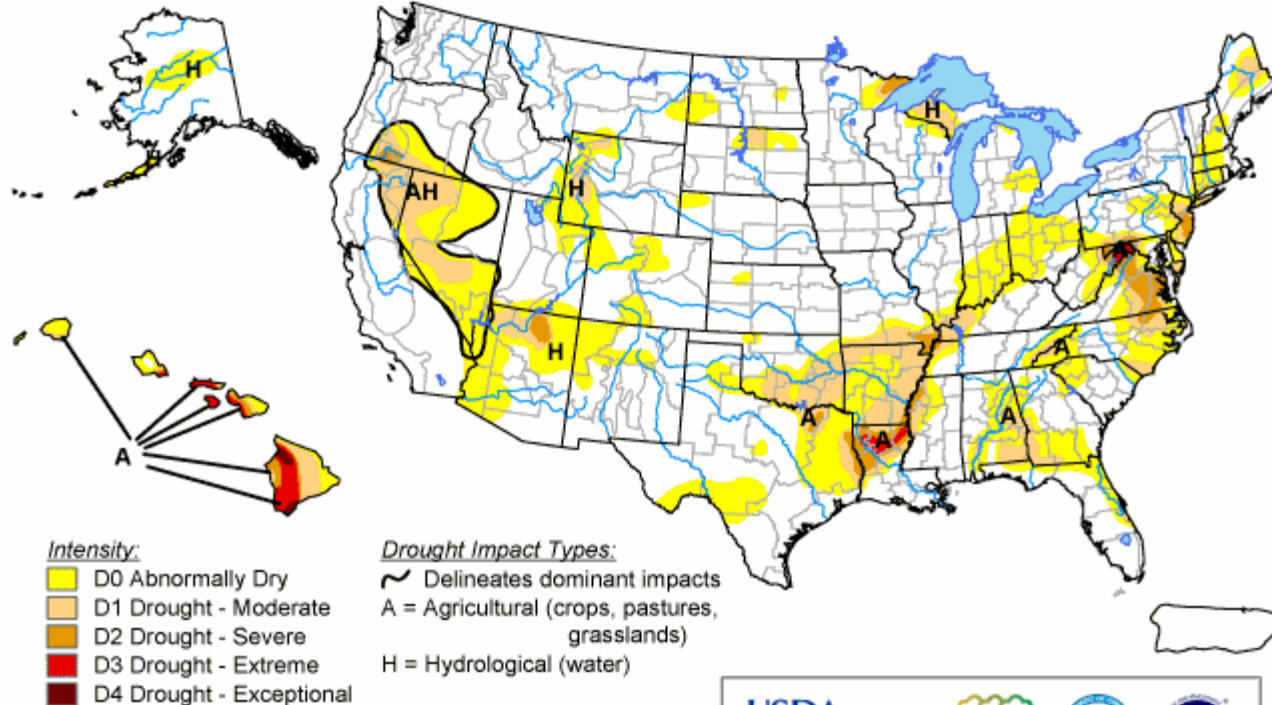
Released Wednesday, July 3, 2013

Author: Matthew Rosencrans, NOAA/NWS/NCEP/CPC

# 35 month animation—USDM, 2010-2013

## U.S. Drought Monitor

September 7, 2010  
Valid 8 a.m. EDT



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

<http://drought.unl.edu/dm>



Released Thursday, September 9, 2010  
Author: Matthew Rosencrans, NOAA/NWS/NCEP/CPC



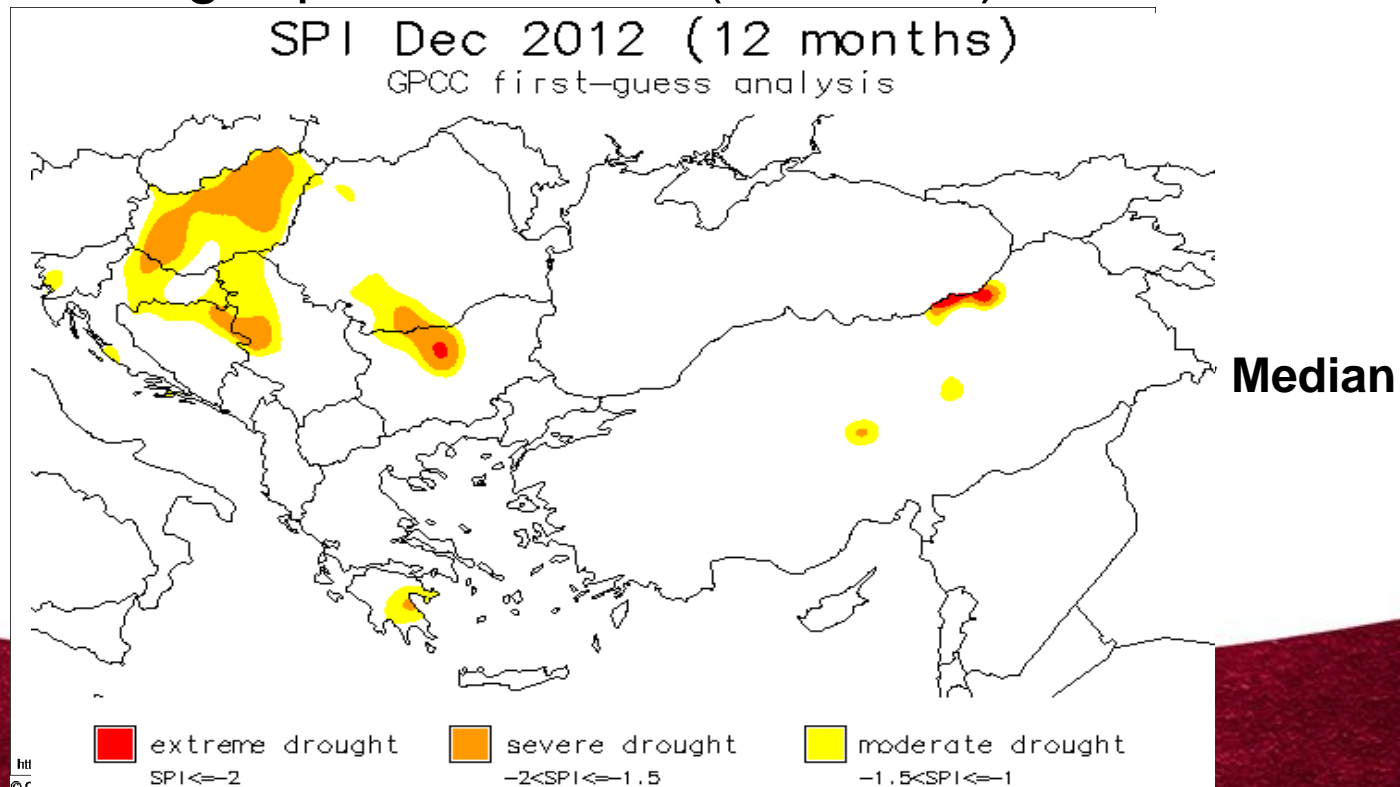
# Drought—as hazard

- a normal part of climate.
- occurs in virtually all climatic regimes.
- characteristics vary between regions.
- definitions must be region and application specific.
- **impacts** are a good measure of severity and an indicator of societal vulnerability or resilience.

# Defining Drought

-Hundreds of definitions—application and region specific

Drought is a deficiency of precipitation (**intensity**) from expected or “normal” that extends over a season or longer period of time (**duration**) . . . . .



# Defining Drought

-Hundreds of definitions—application and region specific

Drought is a deficiency of precipitation (**intensity**) from expected or “normal” that extends over a season or longer period of time (**duration**) . . . . .

## Meteorological Drought

and is insufficient to meet the demands of human activities and the environment (**impacts**).

Agricultural Drought  
Hydrological Drought  
Socio-economic Drought



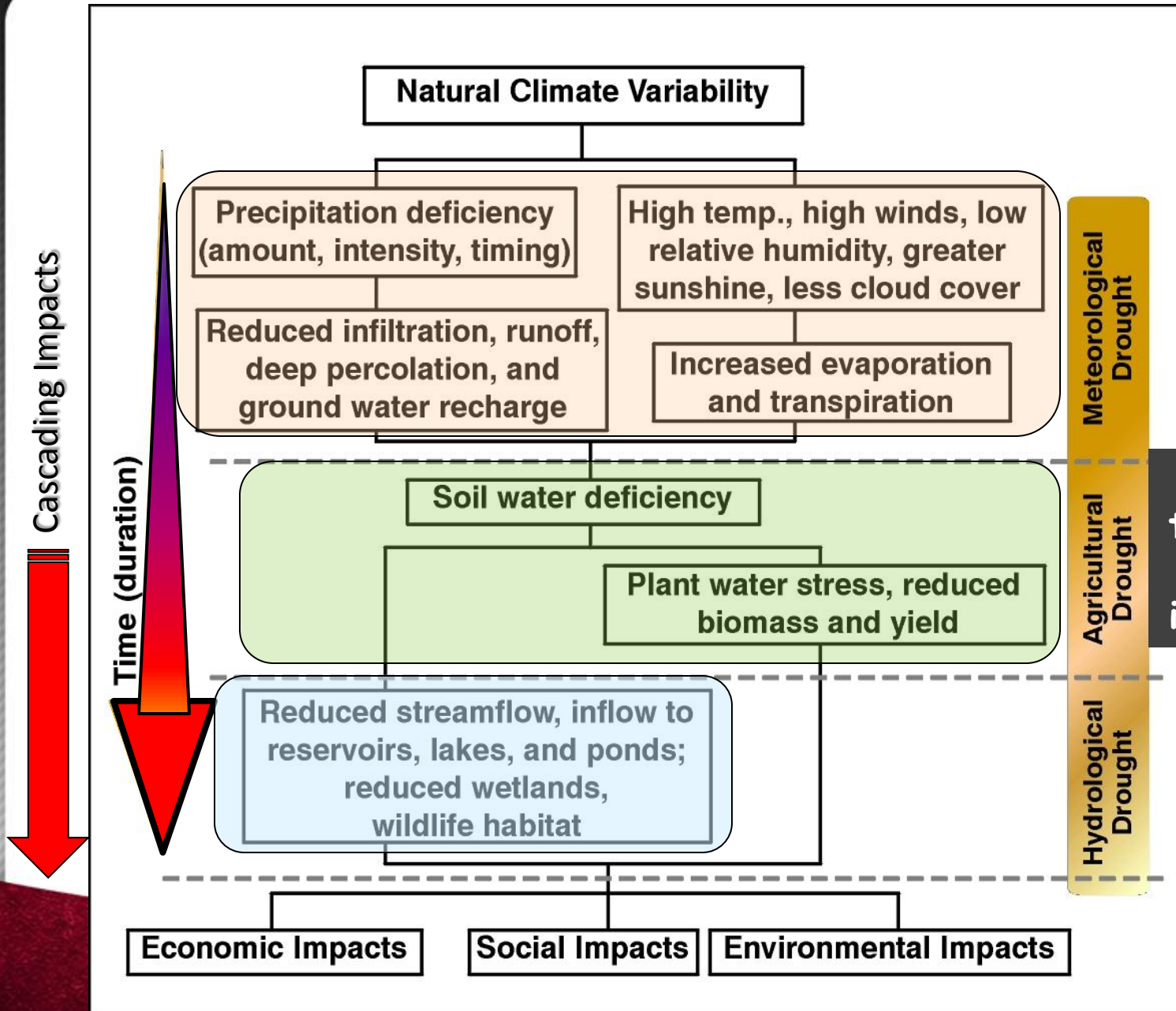
HOW DRY IS IT?

It's so dry . . .



VICARVILLE  
BUSINESS MEDIA GROUP 7/25/06

# Evolution of Drought Types



What are the indices and indicators?

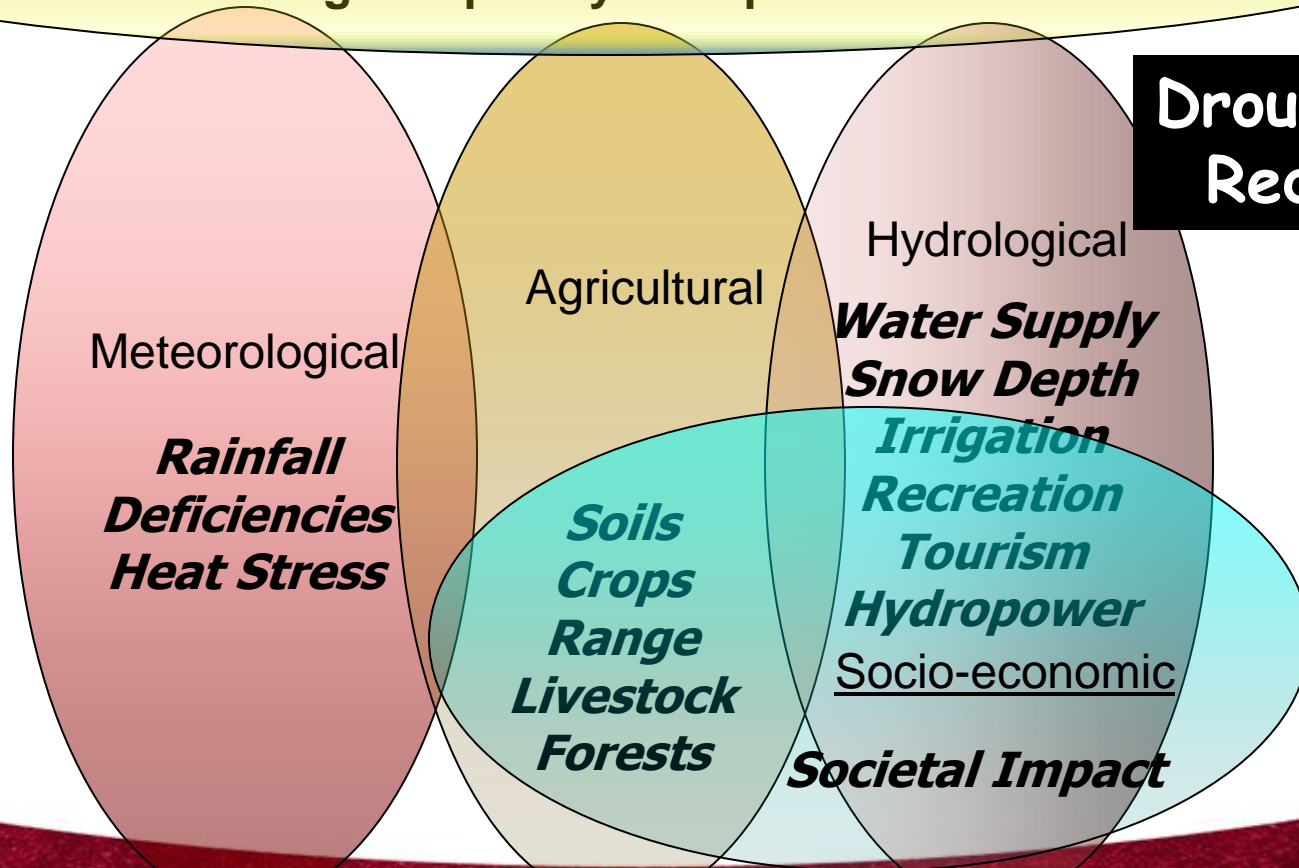
# Natural and Social Dimensions of Drought

Decreasing emphasis on the natural event (precipitation deficiencies)

Increasing emphasis on water/natural resource management & policy

Increasing complexity of impacts and conflicts

**Drought Risk  
Reduction**



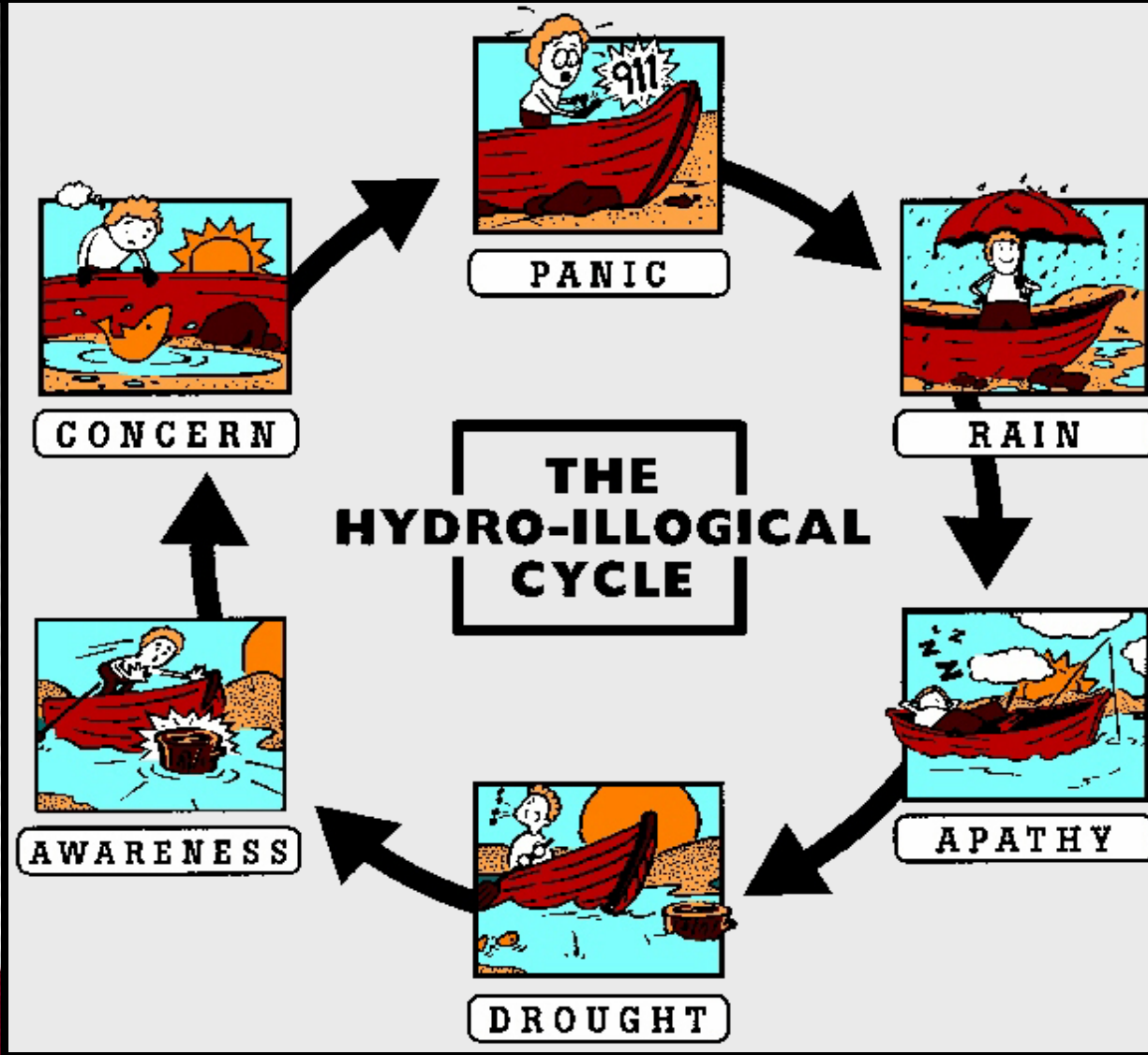
Time/Duration of the event

**Building Societal  
Resilience  
through National  
Drought Policies  
and Preparedness  
Plans: The Way  
Forward**



# Breaking the Hydro-illogical Cycle:

An Institutional Challenge for Drought Management



Crisis Management

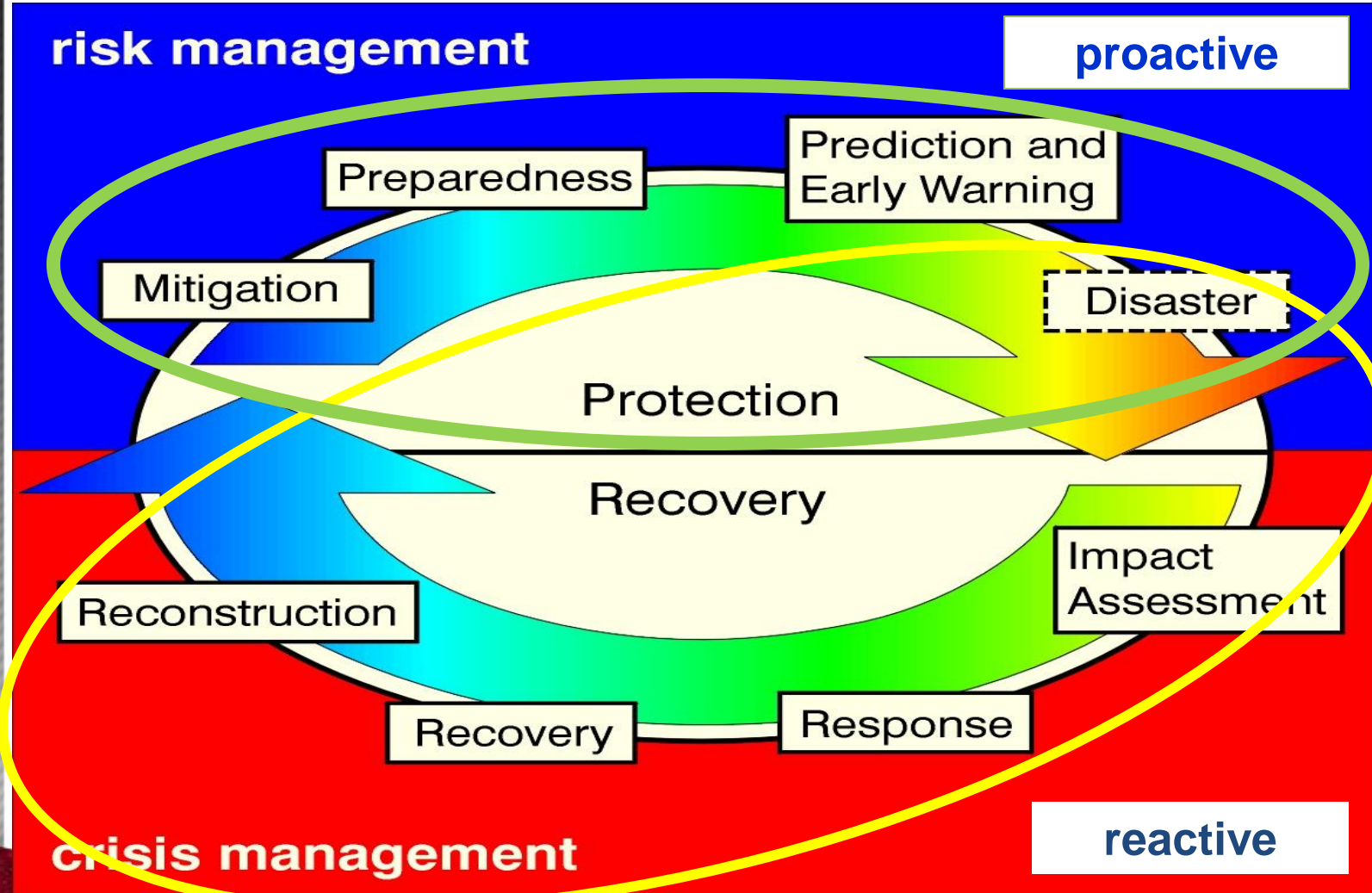
If you do what you've always done, you'll get what you've always got.

**We MUST** adopt a new paradigm for drought management!



# The Cycle of Disaster Management

Risk management increases coping capacity, builds resilience.



Crisis management treats the symptoms, not the causes.

# Hazard x Vulnerability = Risk

## EXPOSURE

- **Severity/Magnitude**
  - Intensity/Duration
- **Frequency**
- **Spatial extent**
- **Trends**
  - Historical
  - Future
- **Impacts**
- **Early warning**

## SOCIAL FACTORS

- **Population growth**
- **Population shifts**
- **Urbanization**
- **Technology**
- **Land use changes**
- **Environmental degradation**
- **Water use trends**
- **Government policies**
- **Environmental awareness**

**RISK**

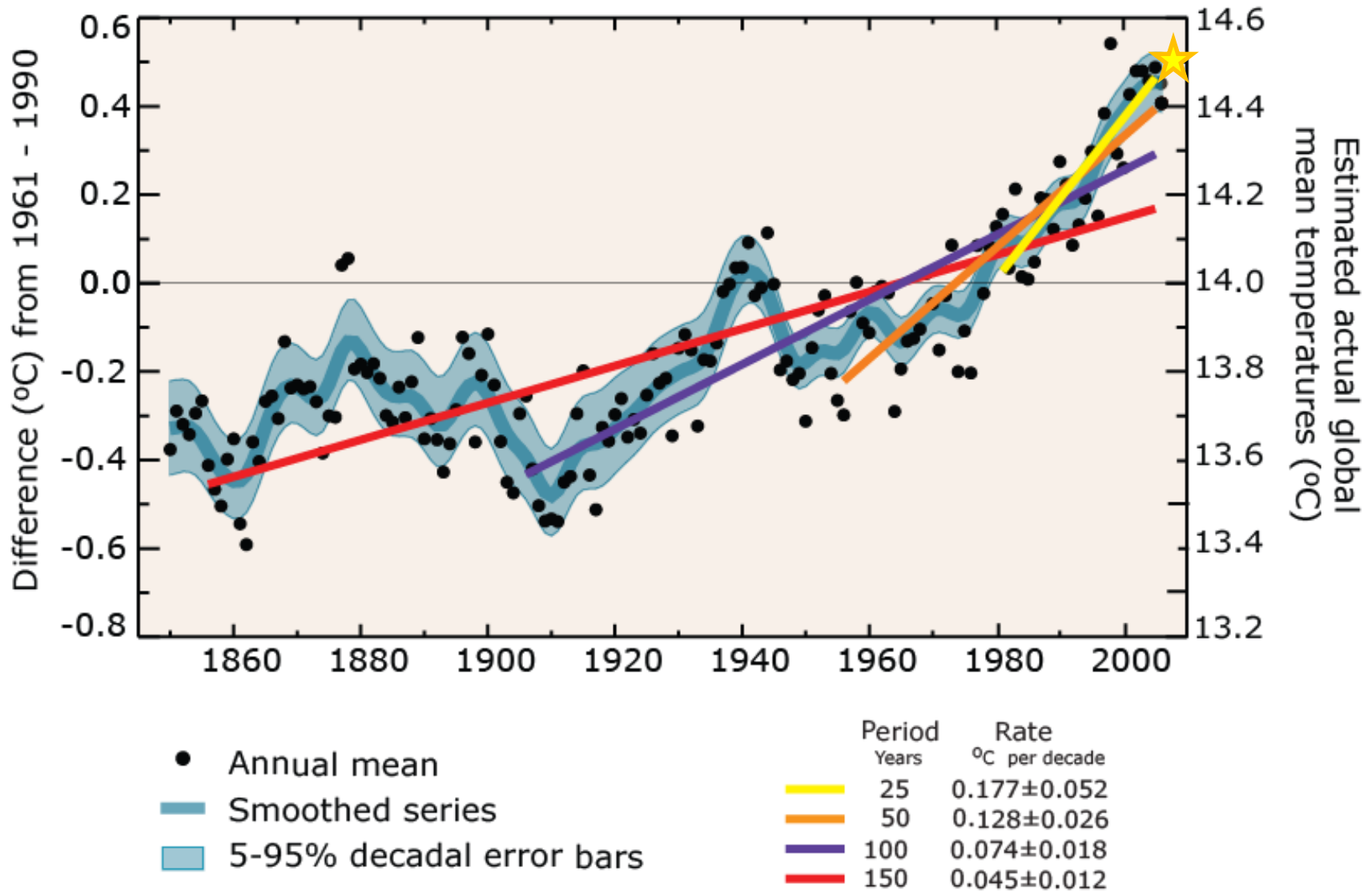
# Challenges to Integrated Drought Management



甘蔗受旱，叶子卷起，植株枯萎。  
10.25摄于陆屋



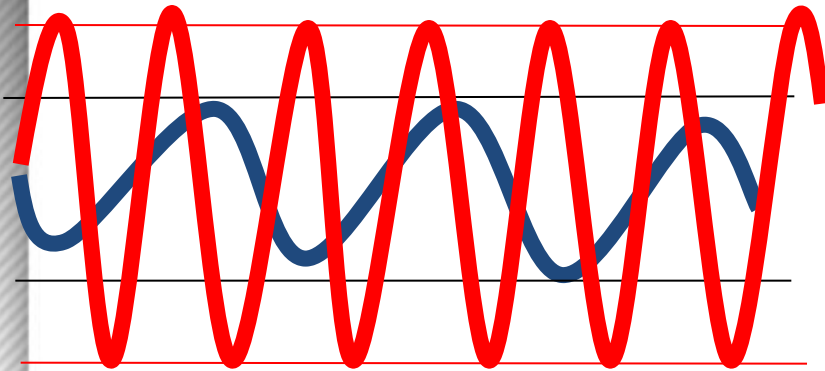
# Challenges of a Changing Climate



# Managing for Climate Variability

Impacts of Global Climate Change:

Increased frequency of extreme weather events



along with heat waves, snow storms, etc.

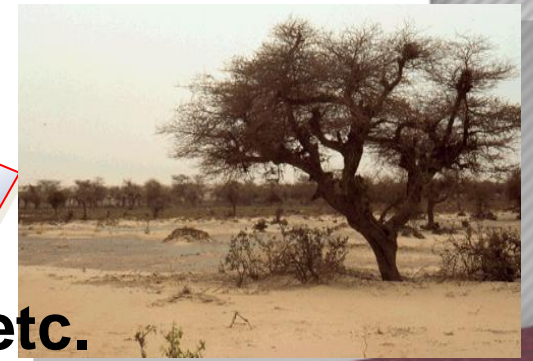
Storms



Floods



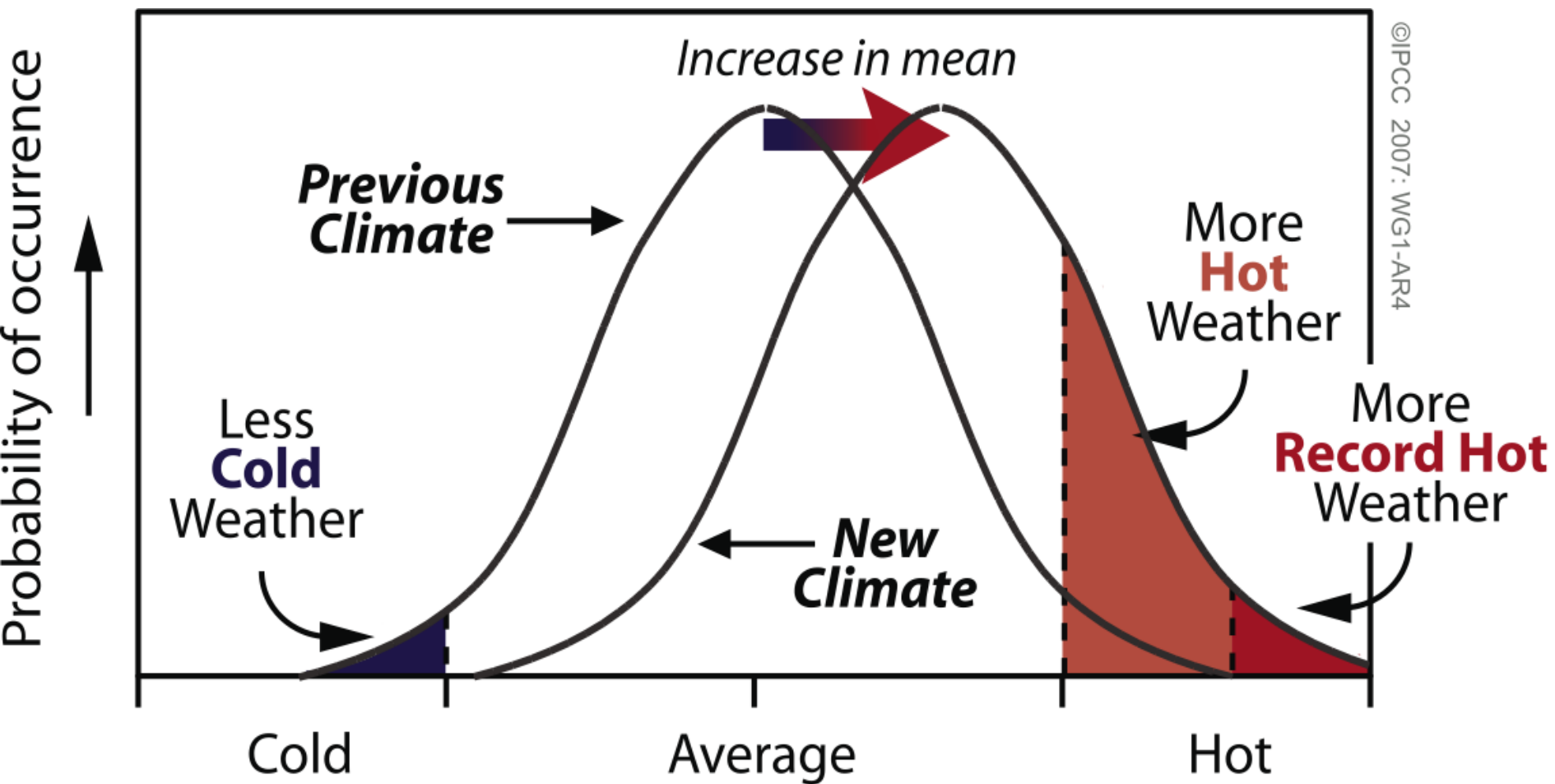
Droughts



# The Climate Challenge for Drought Management

- Increase in mean temperature
- High temp. stress and heat waves/longer growing seasons
- Increased evapotranspiration
- Changes in precipitation amount, intensity and distribution
- Reduced soil moisture
- Changes in groundwater recharge
- Reduced runoff/stream flow resulting from reduced snowpack/sublimation

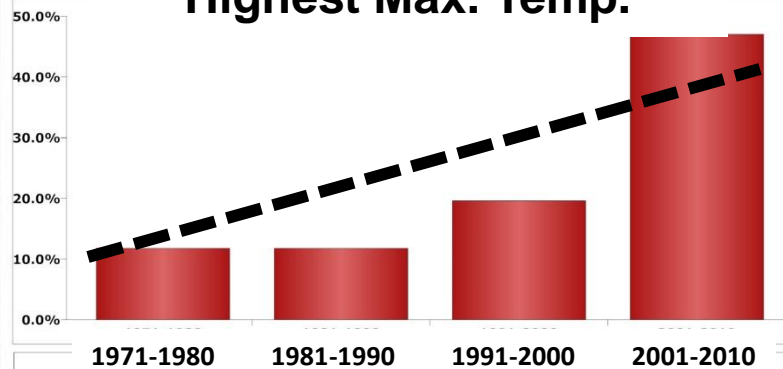
# Mean Temperature Increase & Impact on Extreme Temperatures



# Adapting to Changing Extremes

WMO

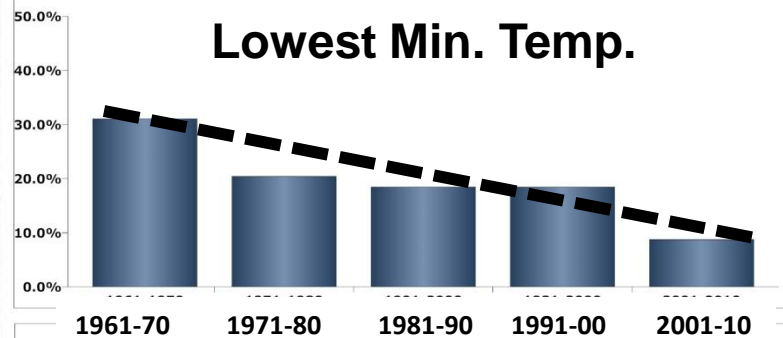
### Highest Max. Temp.



Highest number of broken National maximum  $T^{\circ}$  records in 2001-2010 compared to the previous three decades

Fits with IPCC → more hot days and more heat waves

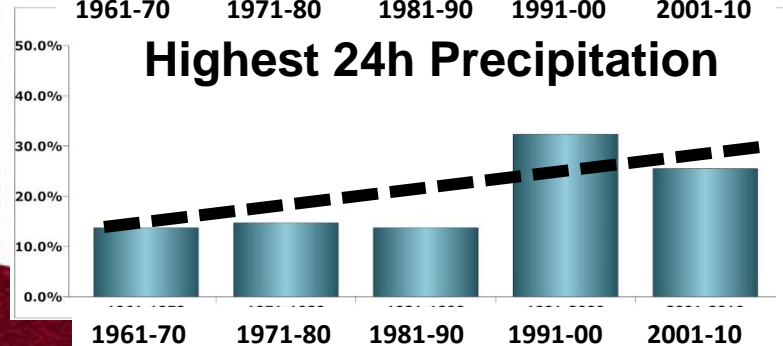
### Lowest Min. Temp.



Lowest number of broken National minimum  $T^{\circ}$  records in 2001-2010 compared to the previous four decades

→ Fewer cool nights

### Highest 24h Precipitation

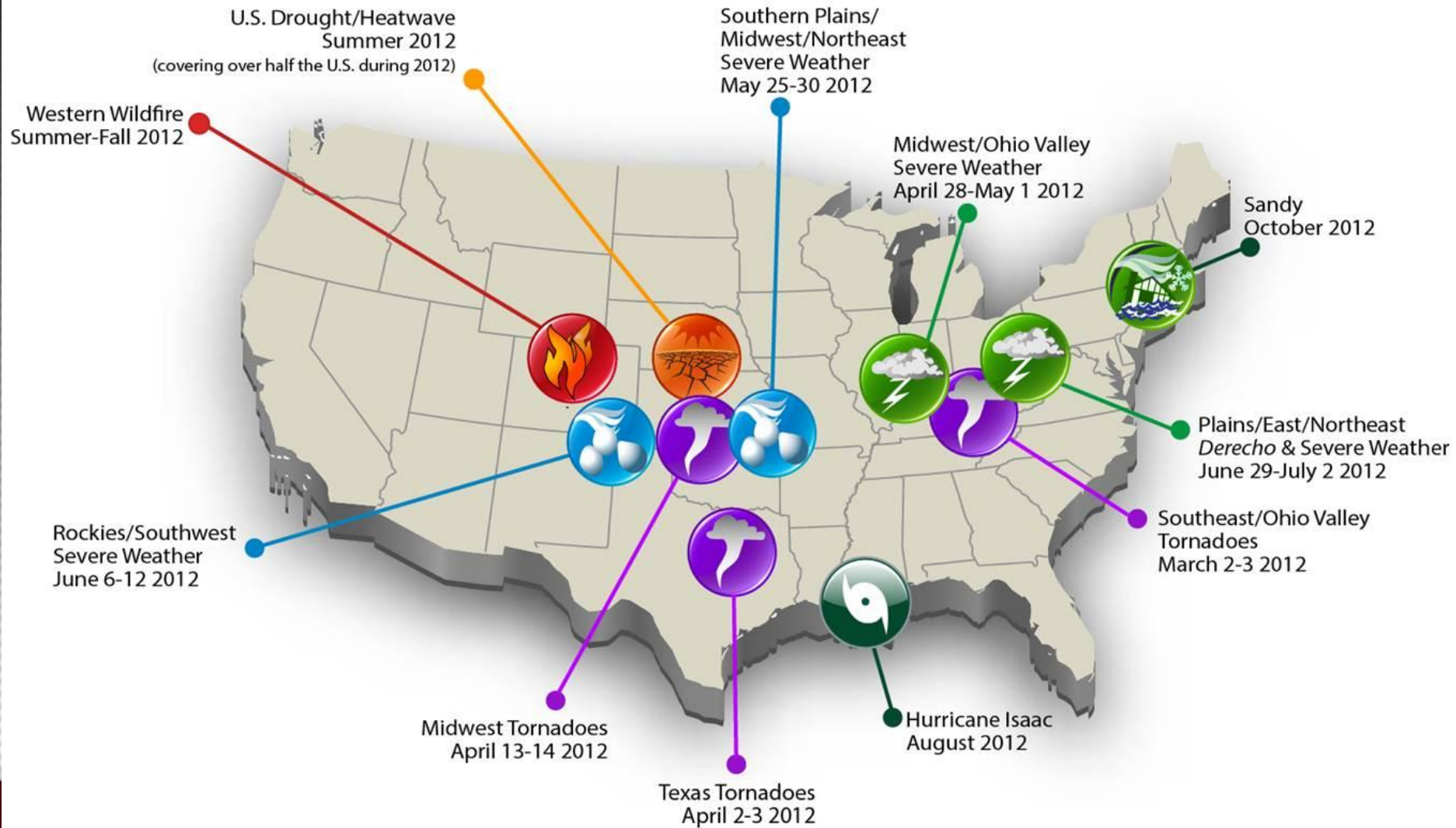


The previous two decades recorded highest number of national 24 hour precipitation records

→ Intensification of heavy rainfall



# U.S. 2012 Billion-dollar Weather and Climate Disasters



# Changes in Societal Vulnerability

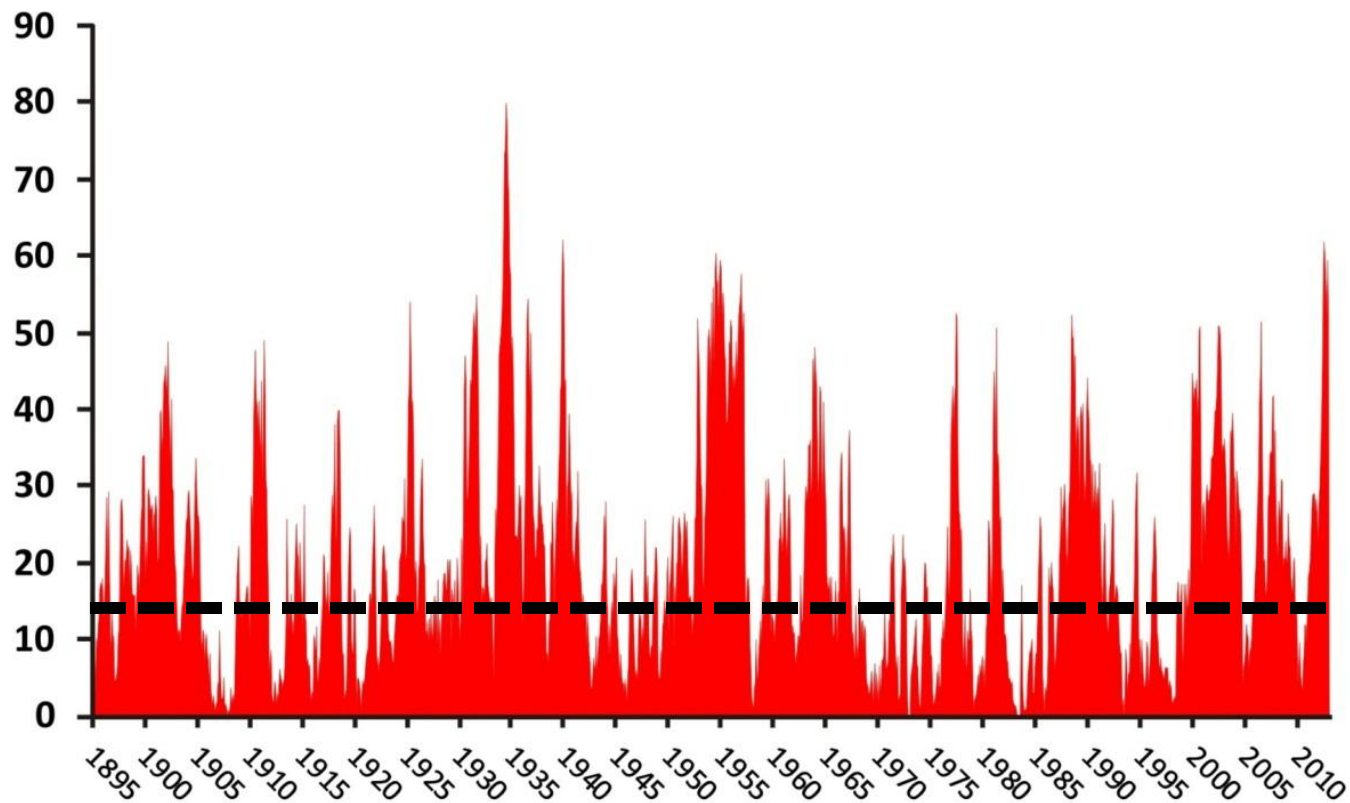
Drought impacts are more complex today as more economic sectors are affected, creating more conflicts between water users, i.e., *societal vulnerability is dramatically different and changing.*

- Agricultural production
- Food security
- Energy
- Transportation
- Tourism/Recreation
- Forest/rangeland fires
- Municipal water
- Water quality/quantity
- Environment
- Ecosystem services
- Health



# Percent Area of the United States in Moderate to Extreme Drought

January 1895–December 2012



Based on data from the National Climatic Data Center/NOAA

Droughts differ in terms of:

- ***INTENSITY***
- **Duration**
- **Spatial Extent**

# Natural Catastrophes Worldwide 1980-2012

Number

500

400

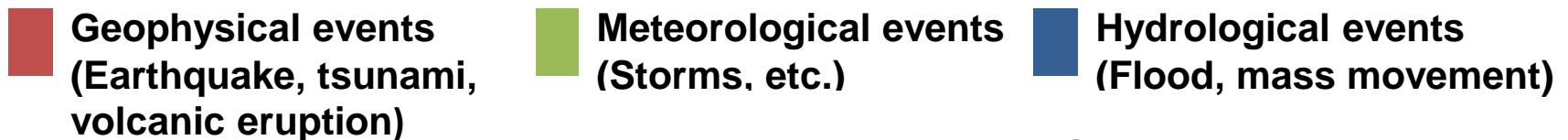
300

200

100

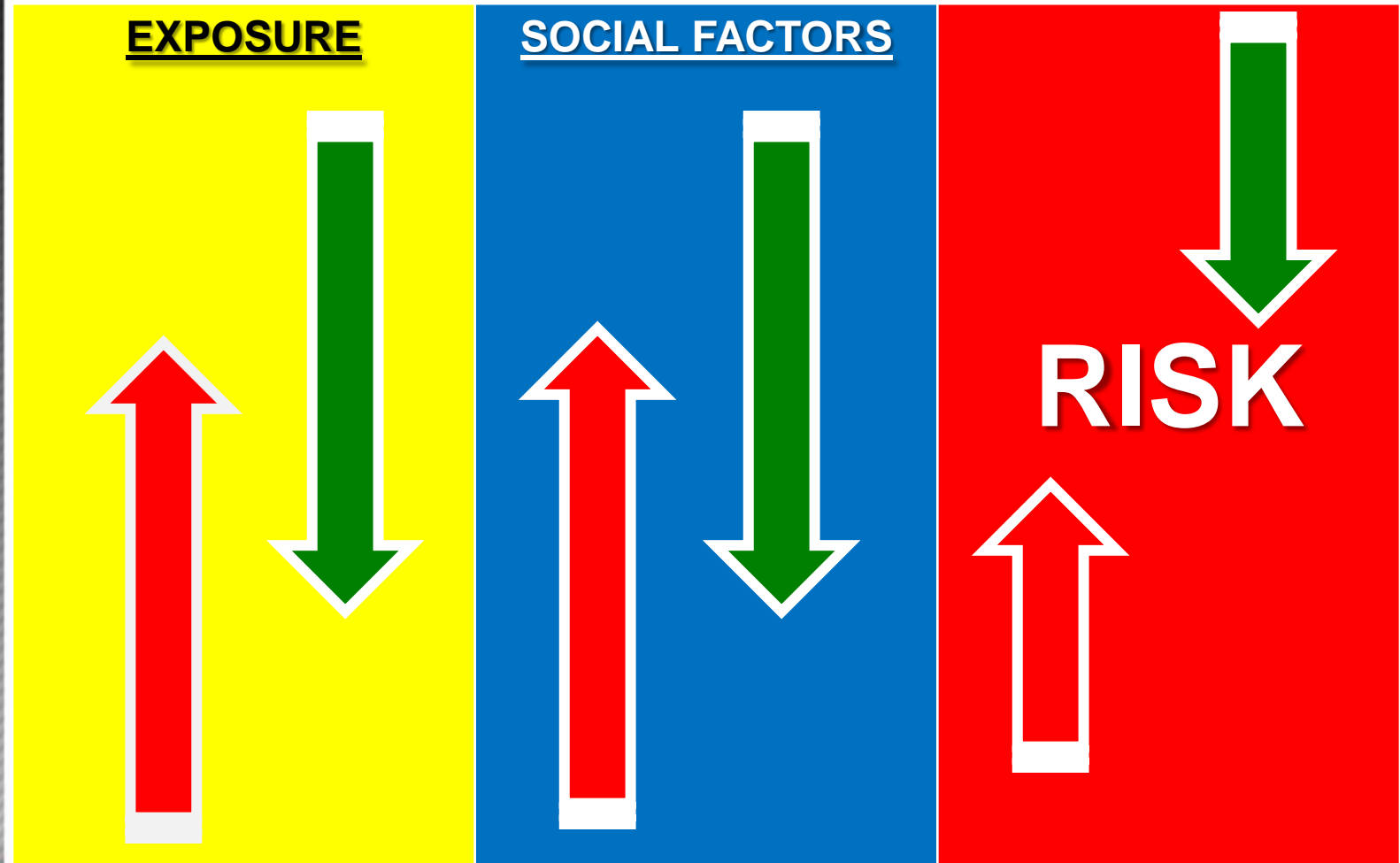
**Risk = Hazard x Vulnerability**

1980 1982 1984 1986 1988 1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012



Source: Munich Re

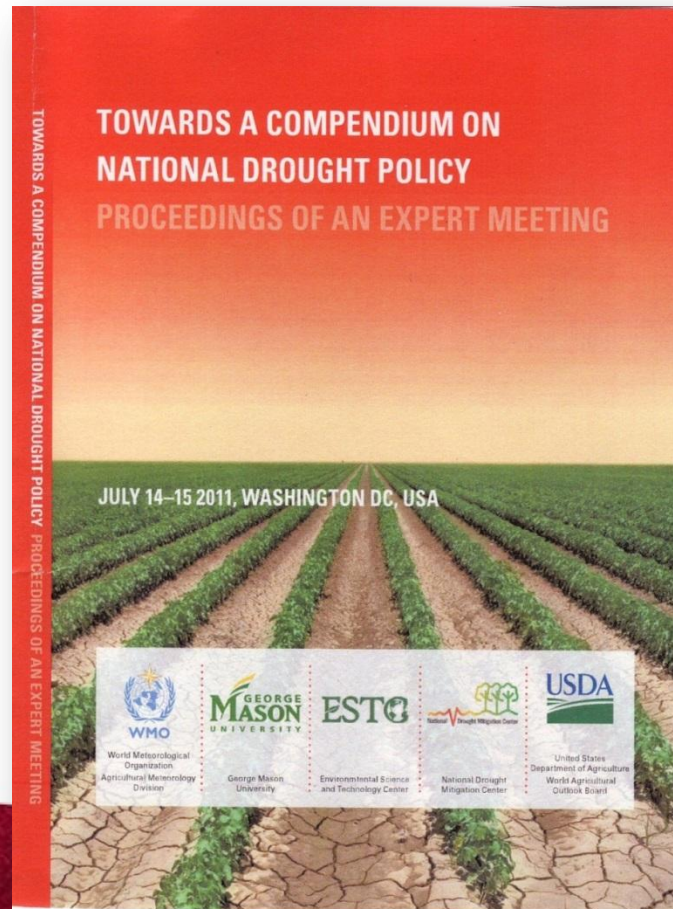
# Hazard **x** Vulnerability = Risk



# Reducing Societal Vulnerability

- Improve **drought awareness**
- Develop/improve monitoring, early warning and **information delivery** systems
- Improve **decision support** tools
- Complete **risk assessments** of vulnerable sectors, population groups, regions
- Improve understanding and quantification of **drought impacts vs. mitigation costs**
- Develop and implement **drought preparedness plans**
- Create **national drought policies** based on the principles of risk reduction

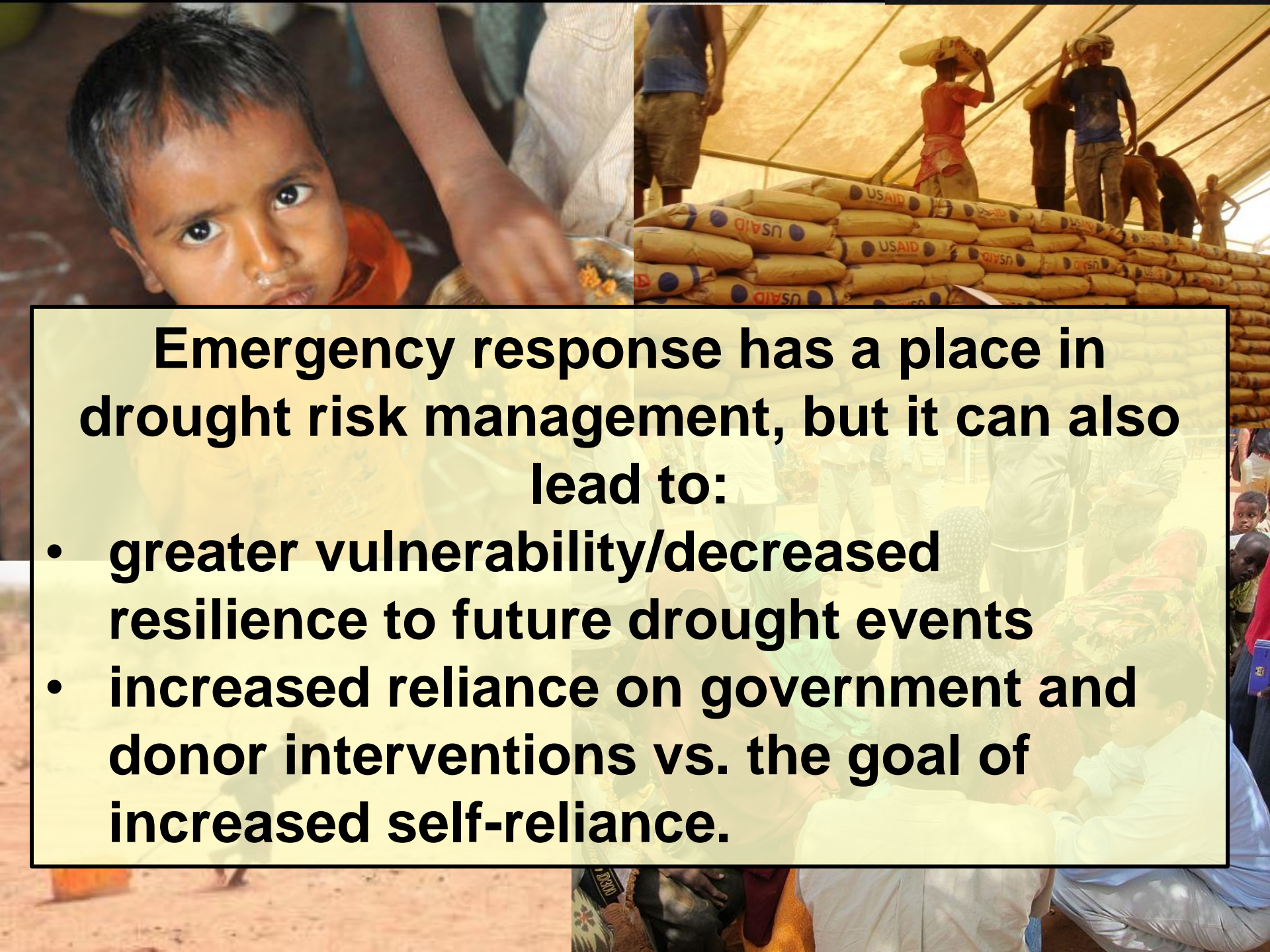
# What is "DROUGHT POLICY"?





# Types of Policy Responses

- Post-impact government interventions—relief measures (i.e., **crisis management**)
- Pre-impact government programs—mitigation measures to reduce vulnerability and impacts, including insurance programs
  - Are insurance programs financially viable and do they promote risk-based management?
- Preparedness plans and policies, organizational frameworks and operational arrangements



**Emergency response has a place in drought risk management, but it can also lead to:**

- greater vulnerability/decreased resilience to future drought events**
- increased reliance on government and donor interventions vs. the goal of increased self-reliance.**

# A drought policy should be broadly stated and . . .

- Establish a clear set of principles or operating guidelines to govern drought management.
- Be consistent and equitable for all regions, population groups, and economic/social sectors.
- Be consistent with the goals of sustainable development.
- Reflect regional differences in drought characteristics, vulnerability and impacts.

# A drought policy should

...(continued)

- Promote the principles of risk management by encouraging development of
  - Reliable seasonal forecasts;
  - Early warning and delivery systems;
  - Preparedness plans at all levels of government, within river basins, and the private sector;
  - Mitigation policies and plans that reduce drought impacts and the need for government intervention;
  - Coordinated emergency response that ensures targeted and timely relief during drought emergencies.

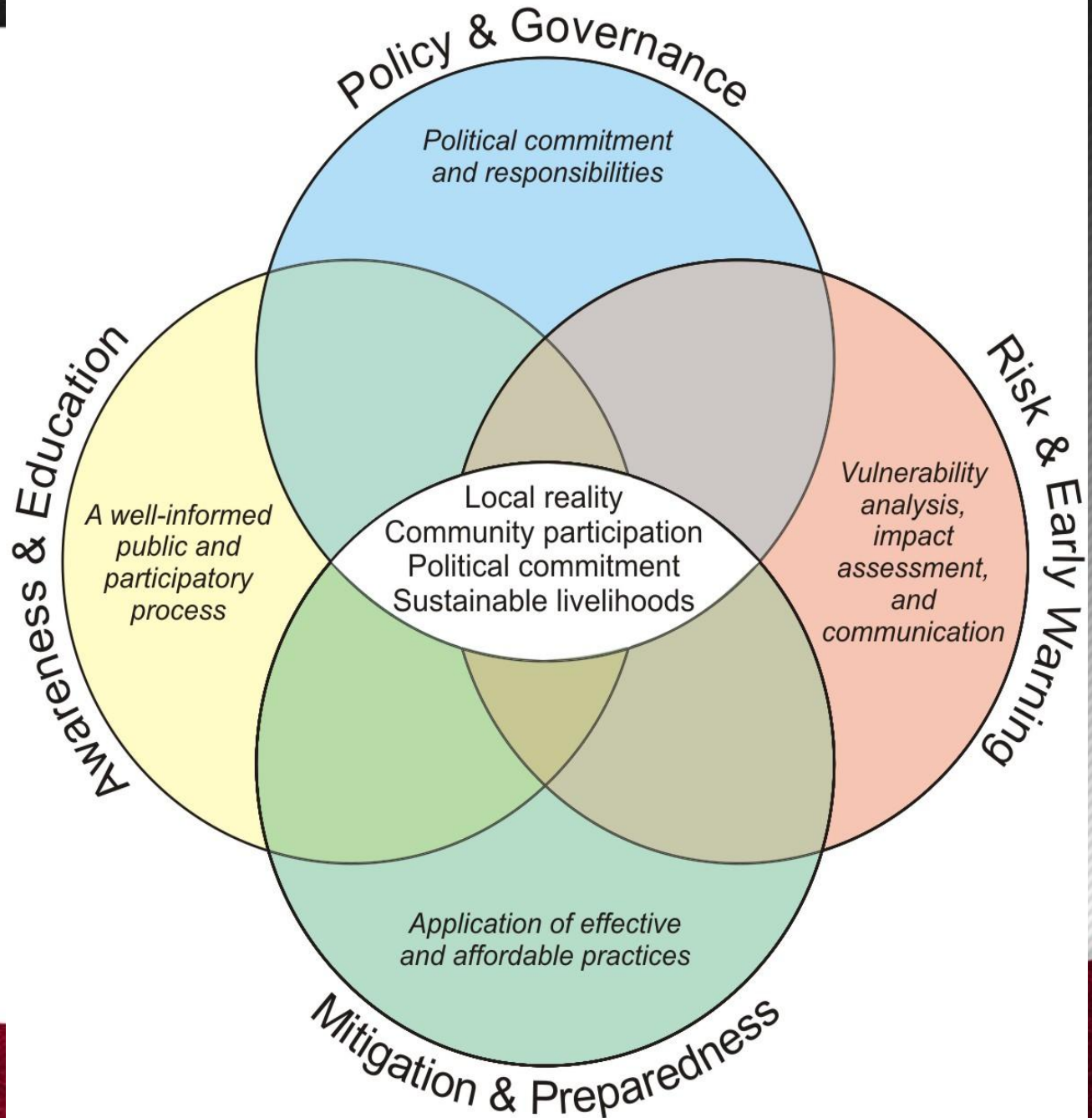
# National Drought Policy Goals

- Proactive mitigation and planning measures, risk management, public outreach and resource stewardship.
- Greater collaboration to enhance the national / regional / global observation networks and information delivery systems to improve public understanding of, and preparedness for, drought.
- Incorporation of comprehensive governmental and private insurance and financial strategies into drought preparedness plans.

# National Drought Policy Goals

- Recognition of a safety net of emergency relief based on sound stewardship of natural resources and self-help at diverse governance levels.
- Coordination of drought programmes and response in an effective, efficient and customer-oriented manner.

**Principle  
Elements  
of Drought  
Risk  
Reduction  
Framework**



# What is 'Drought Planning'?

- actions taken by individual citizens, industry, government, and others before drought occurs to reduce or mitigate impacts and conflicts arising from drought. **It can take two forms:**
- **Response** planning (reactive)
- **Mitigation** planning (pro-active)



# Key Elements of a Drought Mitigation Plan

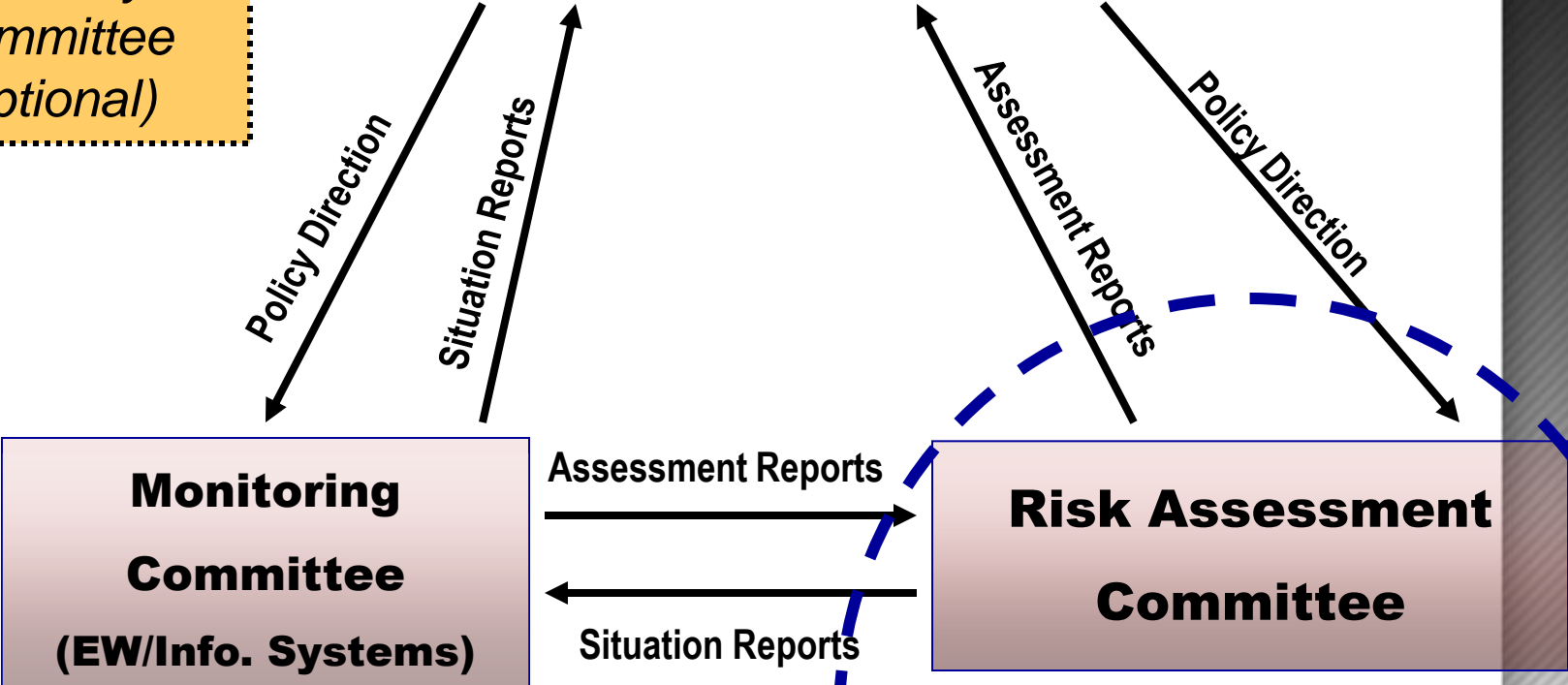
- **Monitoring, early warning and information delivery systems**
  - Integrated monitoring of key indicators
    - Precipitation, temperature, soil moisture, streamflow, snowpack, groundwater, etc.
  - Use of appropriate indices
  - Development/delivery of information and decision-support tools

# Key Elements of a Drought Mitigation Plan

- **Risk and impact assessment**
  - Conduct of risk/vulnerability assessments
  - Monitoring/archiving of impacts
- **Mitigation and response**
  - Proactive measures to increase coping capacity
    - Strategic—longer term
    - Tactical—short term
    - Emergency--immediate

*Citizens  
Advisory  
Committee  
(optional)*

# Drought Commission



## Drought Plan Organizational Structure

# 10-Step Planning Process

Step 1

**Appoint** a drought task force or commission

Step 2

**State** purpose and objectives of the drought plan

Step 3

**Seek** stakeholder participation and **resolve** conflict

Step 4

**Inventory** resources and **identify** groups at risk

Step 5

**Develop** organizational framework and **prepare** the drought plan

# 10-Step Planning Process

**Step 6**

**Identify** research needs and **fill** institutional gaps

**Step 7**

**Integrate** science and policy

**Step 8**

**Publicize** the drought plan, **build** public awareness

**Step 9**

**Develop** education programs

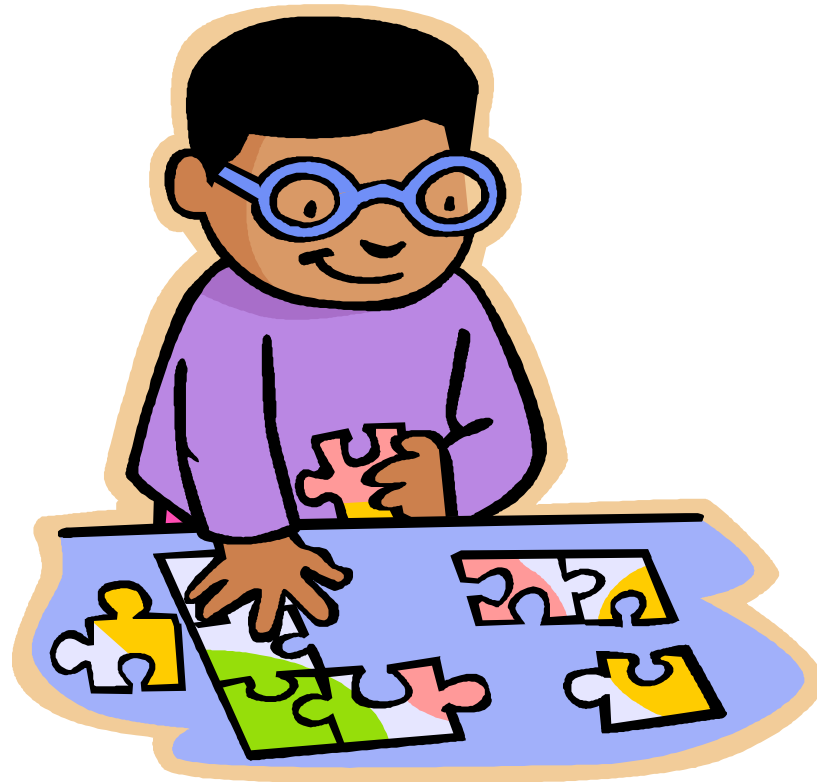
**Step 10**

**Evaluate, test** and **revise** drought plan

# Components of a Drought Early Warning and Information System (DEWIS)

- Monitoring **AND** Forecasting
- Access to **timely** data (including **impacts**) and “value added” **information**
- **Synthesis/analysis** of data used to “trigger” set actions within a drought plan
- **Tools** for decision makers
- Efficient **dissemination/communication** (WWW, media, extension, etc.)
- Drought risk assessment and **planning**
- **Education** and Awareness

Building an effective **drought early warning system** is like assembling the pieces of a puzzle.



Each **indicator** represents a valuable piece of information to assess the severity of drought and its potential impact on people and the environment. We do not see the full picture until all pieces are in place.

# Drought Impacts

- Droughts have different physical characteristics.
- Society is dynamic so each drought event is superimposed onto society—impacts reflect changing vulnerabilities.

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- Does your country have a monitoring system for recording drought impacts?
- How do you incorporate impacts into a drought early warning system?



# *Risk Assessment: Purpose*

- 
- To identify those sectors, population groups, or regions most at risk from drought, most probable impacts, and mitigation actions that will reduce impacts to future events.



**Who and what is at risk and why.**

**Vulnerability Profile**

# Risk Assessment Methodology

## 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

# Checklist of Historical, Current, and Potential Drought Impacts

H=Historical

C=Current

P=Potential

## Economic

H	C	P	
			Costs and losses to agricultural producers
<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

# Takeaway Messages

- Climate is changing—climate state and climate variability.
- Extreme climate events are increasing in frequency globally, *managing impacts—increasing resilience critically important.*
- Time is **NOW** to change the **paradigm** from crisis to **drought risk management**.
- Time is **NOW** for all drought-prone nations to adopt **appropriate** *drought policies* and *preparedness plans* that will reduce the impacts of future drought episodes through risk-based management.

A vibrant sunset scene with a bright sun low on the horizon, casting long, golden rays across a field of corn. The corn stalks are silhouetted against the warm, orange and yellow sky, creating a dramatic and peaceful atmosphere.

# Thanks for your attention!

## **Contact Information:**

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