

Cover Story

Drought: Concerns And Management



BACKGROUND

Drought is a natural hazard that differs from other hazards since it has a slow onset, evolves over months or even years, affects a large spatial extent, and cause little structural damage. Its onset and end and severity are often difficult to determine. Like other hazards, the impacts of drought span economic, environmental and social sectors and can be reduced through mitigation and preparedness.

Because droughts are a normal part of climate variability for virtually all regions, it is important to develop plans to deal with these extended periods of water shortage in a timely, systematic manner as they evolve. Experience has shown that the democratic form of governance has handled droughts more efficiently than others, as demonstrated by the situation in India before and after independence.

Drought in India occurs in areas with high as well as regions with meagre rainfall. Water scarcity conditions in the Himalayan region are also not uncommon. Drought is no longer mere scarcity or the absence of rainfall, but related to inefficient water resource management. Requirement of over 80-90 % of the drinking water and over 50 % for irrigation is met from groundwater. The control of this resource is with the owner of land. Water is being overexploited and not harvested.

FEW INCIDENTS OF DROUGHT IN INDIA

- Analysis of incidence of droughts over the last two centuries in India does not show any increase in the incidence of droughts in recent years. However, their severity appears to have increased.

- India in 2002 experienced its worst drought in 20 years.
- However, the probability of drought in India varies from once in 2 years in Western Rajasthan to once in 15 years in Assam.
- After two consecutive years of weak monsoons, a quarter of India's population, spread across 10 states, had been reeling from severe water shortage in 2016.
- Drought conditions in Maharashtra were so severe that the government decided to run water trains to provide water to drought-hit regions, especially Marathwada.
- **Jaldoot**, commissioned by the railway ministry in collaboration with the Maharashtra government, transported half a million litres of water on each of its trips from Miraj in Sangli district.
- Maharashtra along with Uttar Pradesh, Bihar, Chhattisgarh, Madhya Pradesh, Karnataka, Telangana, Odisha and West Bengal all declared a drought in 2015.

CLASSIFICATION OF DROUGHT

Table 1. Drought classification systems

Drought class	Conditions of drought and effects
Classification by British Rainfall Organization (BRO, 1936)	
Absolute drought	When there are at least 15 consecutive days with less than 0.01 inch of rainfall per day.
Partial drought	When there are at least 29 days having mean rainfall of 0.01 inch or less.
Dry spell	When 15 consecutive days receive less than 0.04 inch of rain per day.
Thornthwaite (1947) classification^{1,14}	
Permanent	Characteristics of the desert climate, possibility of vegetation and agriculture only by irrigation.
Seasonal	Planting dates and crop duration should be synchronized with rainy season and residual moisture storage.
Contingent	Irregular occurrence and there is no regular season of occurrence.
Invisible	Occurs even when there is frequent rainfall and occurs in humid region.
Classification based on physical aspects^{10,38-40}	
Agricultural	When soil moisture is inadequate to support healthy growth of crops, resulting in very low yield.
Hydrological	Associated with shortfalls in surface or subsurface water supply (stream flow, reservoir and lake levels, and groundwater) on a watershed or river basin-scale.
Meteorological	Related to the deficiency of rainfall compared to the average mean annual rainfall of an area.
Indian National Commission on Agriculture (1978)	
Meteorological	Normal precipitation below 25%.
Hydrological	Prolonged meteorological drought and drying of reservoirs, lakes, streams and rivers, cessation of spring flows and fall in groundwater levels.
Agricultural	Depletion of soil moisture during the growing season. A dry situation with 20% probability and rainfall deficiency of more than 25% in drought-prone states of India.

- The National Commission on Agriculture in India classified three types of drought: *meteorological, agricultural and hydrological*.
- **Meteorological drought** is defined as a situation when there is significant decrease from normal precipitation over an area (i.e. more than 10 %). Meteorological drought is classified into three groups:
 - Normal – If rainfall deficiency with respect to long term average is 25% or less
 - Moderate - If rainfall deficiency with respect to long term average is 26 to 30%
 - Severe - If rainfall deficiency with respect to long term average is more than 50%
- **Hydrological drought** results from prolonged meteorological drought resulting in depletion of surface and sub-surface water resources.
- **Agricultural drought** is a situation when soil moisture and rainfall are inadequate to support healthy crop growth.
- Drought is also classified on the basis of time of onset as early season, mid-season and late season.
- The Indian Meteorological Department (IMD) recognizes
 - **A drought week**- when rainfall in a week is less than half of its normal amount,
 - **An agricultural drought**- when four drought weeks occur consecutively during mid-June to September
 - **A seasonal drought**- when seasonal rainfall is deficient by more than the standard deviations from the normal
 - **A drought year**- when annual rainfall is deficient by 20 % of normal or more
 - **Severe drought year**- when annual rainfall is deficient by 25-40% of normal or more.

WHEN IS DROUGHT DECLARED?

The four indicators viz., **rainfall deficiency, the extent of area sown, normalized difference vegetation index and moisture adequacy index** are usually applied in combination for drought declaration. The information on these indicators is available at the level of Taluka / Tehsil / Block. Drought may be declared by the State Government at these levels.

Figure 1: Causes of Drought

Effects of drought

Like floods, drought is a grave natural calamity that affects Indian life, its agriculture, industry, and economy. Drought has varying degrees of economic, environmental and social impact. These are:

- Agricultural losses affect farmer's income, which increases the rate of suicide among farmers.
- Wells, tanks and canals get dried and even the cattle die without water.
- Shortage of drinking water supplies
- food insecurity, fodder deficit
- distress sale of animals
- Lowering of soil moisture and ground water table
- Poverty and squalor become their inseparable companions.
- Industry suffers a setback due to the scarcity of raw materials produced by agriculture. This combined with the demand of increased wages by the workers, puts the industrialists on the horns of a dilemma and some industries face closure.

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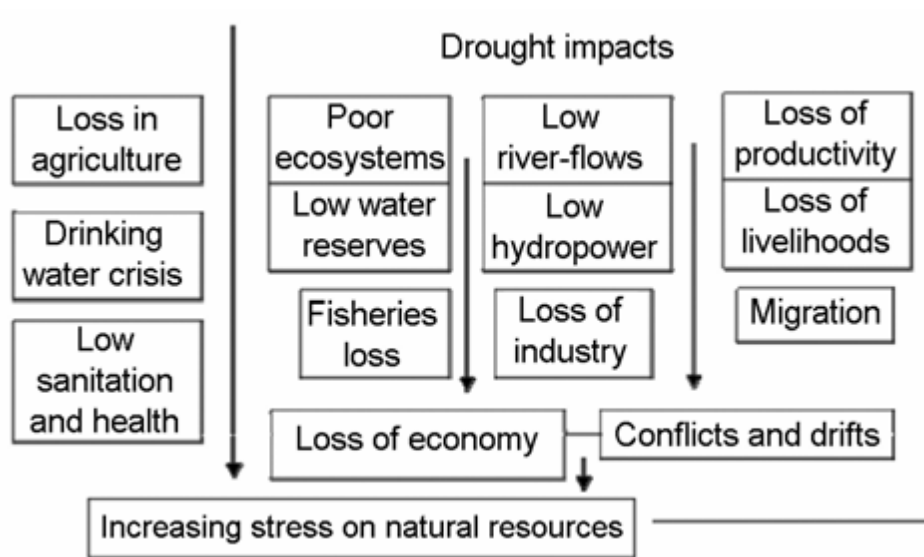
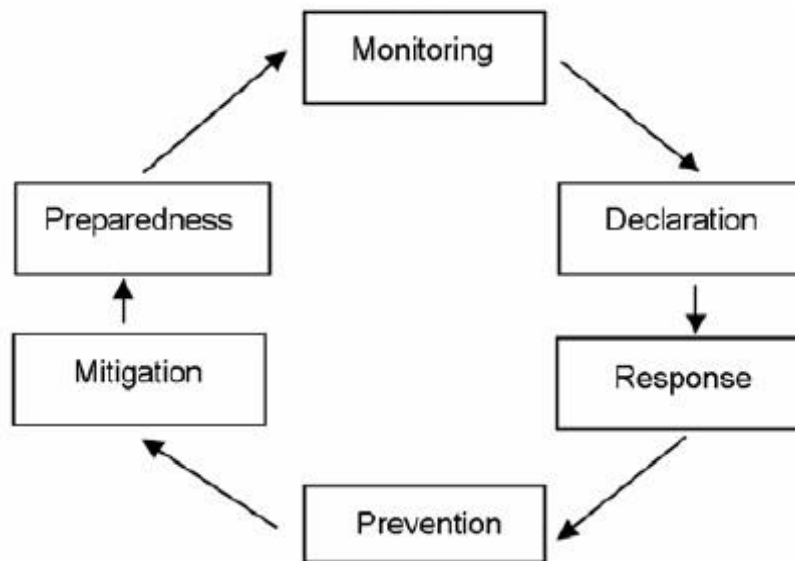


Figure 2: Effects of drought

DROUGHT MANAGEMENT IN INDIA

- Disaster management emphasizes preparedness, mitigation and improved Early Warning System over emergency response and relief assistance. A drought management strategy consists of the components as shown in following figure:



- The Union Ministry of Agriculture is the nodal ministry in respect of monitoring and managing drought conditions.
- In the last few years, India has shifted its focus from relief centric to the present drought management strategy which involves institutional mechanisms, extending relief through employment generation and social welfare practices, community participation and operation of Early Warning System (EWS).
- **Institutional mechanism:**
 - There is a Crop Weather Watch Group (CWWG) representing concerned Central Ministries/Departments under Department of Agriculture & Cooperation (DAC) which meets on regular basis to take stock of rainfall, weather forecast, progress of sowing, crop health, level of water in the major water reservoirs in the country, etc.
 - The findings of CWWG and India Meteorological Department reports are also discussed by Secretary (A&C) with the Senior Officers and the requirements for agricultural and allied sector are assessed and appropriate actions taken by the Central Government.
 - The State Governments are also advised suitably and their efforts are supplemented from the Central resources, whenever the situation warrants for immediate intervention for mitigating the hardships of agricultural sector
 - The Crisis Management Group on drought headed by the Central Drought Relief Commissioner reviews situation with the representatives of all the Line Departments, as and when warranted. .
 - A Crisis Management Plan is released annually to guide and formulate the Contingency Plan for all the sectors linked with the impact of drought to mitigate the impact of drought situation. State Governments are also advised to prepare district-wise contingency plans accordingly.
 - In case of severe drought situation in the country, the National Crisis Management Committee (NCMC) under the Chairmanship of Cabinet Secretary also reviews the situation and takes necessary decisions to mitigate the drought situation.
 - National Disaster Response Force (NDRF) and State Disaster Response Force are constituted to provide immediate drought relief to the affected people.

- The Drought Management Group was constituted to deal with the situation. The National Disaster Management Cell monitors the drought situation in different states and National Calamity Contingency Fund from the government deals with calamities of severe nature.
- Research Institutes like ICRISAT, Central Arid Zone Research Institute, Indian council of Forestry Research and Training are involved in draught management.
- **Different programmes to combat drought like situation:** To increase the preparedness as well as to mitigate the impact, Government has launched various schemes. These are:
 - National Agricultural Insurance Scheme in 1999 and Weather Based Crop Insurance scheme in 2007 was launched to protect the income of farmers in drought like situation.
 - Drought Prone Area Development Programme and Desert Development programme
 - Watershed development programme
 - National Food Security Mission
 - National Horticulture mission
 - Rashtriya Krishi Vikas Yojana
 - National mission on micro-irrigation
 - National Mission for Green India to improve quality of forests
 - National Water Policy addresses the issues like the water scarcity, inequities in its distribution and lack of planning, management and use of water resources.
- **Extending Relief:** Drought Management Manual sets out four important measures that a State government should take at the time of a drought, with the Union government's help.
 1. It should use the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) to provide immediate employment to drought-affected people.
 2. The public distribution mechanism should be strengthened to provide food and fodder as a measure to sustain the rural economy.
 3. The government should initiate actions to recharge the groundwater table by building check dams and providing pipeline water and other irrigation facilities.

4. The government should either waive off or defer farmer loans and arrange for crop loss compensation.
- **Drought Early Warning Systems:** Drought forecasting and drought monitoring are two components of Drought Early Warning System. Indian Meteorological Department (IMD) along with National Centre for Medium Range Weather Forecasting offer support for early warning and drought preparedness.
- **Community Participation:** To increase the effectiveness of government efforts Gram Sabha and local bodies are included in recommending, sanctioning and monitoring of relief works.

CHALLENGES IN DROUGHT MANAGEMENT

- Unsustainable land and water management practices are the main culprits of drought intensification. No emphasis is given on rain water harvesting during building construction.
- In many situations, drought assistance or relief measures provided by governments and donor agencies exacerbate the societal vulnerability to drought and also move societies away from their traditional wisdom and pro-active risk management approach, making people more dependent on externalities.
- All contemporary knowledge, experience and information are not taken on board.
- Multiplicity of agencies further creates confusion and reduces effectiveness.
- The evolution and practice of standard procedures for declaration of drought including the time of declaration is not homogeneous and the gravity of the risk and the vulnerability of various States are not duly understood.
- Global and National best practices are yet to be integrated into the drought management policy.

CONCLUSION

- The word 'drought' indicates scarcity of water for ecosystems, land and human use, resulting in failing crops, livestock, livelihoods and human health.

- Drought is a complex and least understood natural disaster, the impacts of which often depend upon the nature of socioenvironmental background in the region, and affects more people than any other disaster.
- The world is witnessing a paradigm shift in disaster management, i.e. 'to ecosystem approach in climate change adaptation and disaster risk management.
- Implications of global climate-change impacts coupled with local environmental modifications (land use, geomorphological changes, natural resource degradation) need to be assessed with the application of strategic environmental assessments.
- Suitable models of anticipatory environmental impact assessment can be developed further for long-term drought risk management.
- While drought management integration with programmes of forestry, watershed, public health, pollution control, wetland conservation, and bio-village concept are recognized now, linkages with the management of epidemics, forest fire and pest, environmental health, power generation, and socio-political conflict, including risk of terrorism and war-related disasters still need to be institutionalized.
- It is also important to recognize the issues of 'urban drought' and 'water drinking industries' while developing the drought management framework.