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Drought Disaster and its Management Strategies: An Overview

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ABSTRACT

India has been traditionally vulnerable to natural disasters due to its unique geo-climatic conditions. Floods, droughts, cyclones, earthquakes and landslides are major natural disasters. The vulnerability in India is more compared to developed countries. In India due to different climatic and rainfall patterns in different regions some parts are suffering from flood and other prt are suffering from drought at the same time. Unlike floods, drought occurrence is a gradual process with long lasting effects. It causes huge losses in terms of human, financial, environmental, social , economical and livelihood. Thus there is a need for awareness, implementation of new activities to prevent water related disasters as well as reduce their impact through post disaster management policies. The new approach of the government of India proceeds from the conviction that development can not be sustainable unless disaster mitigation is built into the development process. This paper explores the drought disaster in several dimensions such as health, environmental,socioeconomic and management strategies.

Key words: *Natural Disaster, Drought, Environmental Impact and Management Strategies.*

Introduction

All living things need water to survive. Nevertheless, shortage of water may produce undesirable impact on human beings or the environment and even pose a threat to life. Due to urbanization, deforestation, different climatic and rainfall patterns, high evapotranspiration, over exploitation of water resources and large decrease in rainfall, water shortages may occur, resulting in drought. It might be difficult to identify the beginnings of a drought. Unlike many natural disasters that have immediate and spectacular consequences, such as earthquakes, floods and cyclones, drought can develop gradually and subtly. It reduces the recharge of surface and ground water resources and causes tremendous loss to agriculture, ecosystems, energy production, tourism, biodiversity and other sectors. It also affects the employment rates, food prices, food security and international trade. In turn, these can lead to increased poverty, migration and social unrest.

The study revealed that the strength of the South Asian monsoon determines the rainfall in India. It varies due to changes in internal boundary conditions, such as increasing tropical sea surface temperature and variations in Eurasian snow cover linking with the El Niño-Southern oscillation. At present drought has become so prominent that Cherrapunji, one of the world's highest rainfall areas in north east India, is considered facing drought-like conditions.

The frequency of drought is expected to be higher in the coming decades during 2020-2050. Over a fifth of India's land area (21.06 per cent) is facing drought-like conditions, according to recent data released by the Drought Early Warning System. This is 62 per cent more than the area under drought during the same period last year, which was 7.86 per cent.

Severity of the drought is difficult to determine. It is dependent not only on the duration, intensity, and geographical extent of a specific drought but also on the demands made by human activities and by the vegetation on a region's water supplies. The impact of a drought depends largely on society's vulnerability to drought at that particular moment. Subsequent droughts in the same region will probably have different effects, even if identical in intensity, duration, and spatial characteristics. Reliable drought monitoring and early warning are important for drought preparedness planning and mitigation to reduce potential impacts, especially for early famine warnings. With this background, the present study aims to analyze various impacts of drought on the environment, economy and society. Based on the review of information and past experiences, the study further explores solutions for management of drought in India.

Disciplinary view of Drought

Drought is defined according to disciplinary perspective. Based on the criteria and concept of its utilization, drought is broadly categorized into meteorological drought, hydrological drought, agricultural drought and socio-economic drought.

Meteorological Drought Is defined on the basis of the degree of dryness and the duration of the dry period. It occurs when rainfall is less than 75% of the normal value.

Hydrological drought The frequency and severity of hydrological drought is often defined on a watershed or river basin scale. It occurs when water scarcity leads to a situation where there is marked depletion of surface water causing low stream flow, drying of water bodies .

Agricultural drought is a period of dryness affecting the soil-moisture status and preventing the growth of plants. It occurs when water scarcity becomes so acute that the soil moisture is not sufficient for healthy growth of crops.

Socioeconomic drought is associated with the supply and demand of some economic goods with elements of meteorological, hydrological, and agricultural drought. It occurs when the demand for an economic good exceeds supply as a result of a weather-related shortfall in water supply.

Impacts of Drought

Drought affects almost all dimensions of the environment and society such as populations, with widespread impacts on society, economy, the environment and hence sustainable development. These impacts can be direct and indirect in nature, and are often difficult to quantify in economic terms. It has more severe impacts as the propagation in the hydrological cycle advances (Table 1).

The nature of the impact of drought is extensive or comprehensive, sometimes even difficult to identify. It has a range of direct and indirect impacts (Table 2).

Table 1. Schematic representation of drought propagation through the hydrological cycle

Drought Stages	Natural Climate Variability	Anthropogenic climate variability	Indicators
Meteorological Drought	Rainfall deficiency in term of amount, Intensity, timings	High temperature, low humidity, less cloud cover etc.	SPI, Precipitation percentile, Temperature variations, heat waves etc.
	Reduce infiltration, runoff, deep percolation, groundwater recharge	Increase evaporation and transpiration	
Agricultural drought	Soil water deficiency	Plant water stress, reduce biomass	Soil moisture anomaly, Vegetation stress
Hydrological drought	Reduce stream flow and inflow to reservoir, lakes, ponds, low groundwater levels, reduced wetlands		Low flow reservoir level, groundwater levels

	Environmental	agricultural production, public water supply, waterborne disease transportation, loss of biodiversity and natural ecosystem, reduced water quantity of surface water, depletion of groundwater, reduction in soil quality, Food chain disturbance, reduction in wildlife habitat,Heat wave, forest fire etc.
Direct Impact	**Social**	Food crises, health impact, anxiety, depression, human death, Migration, unemployment, availability of fodder, water scarcity. malnutrition
	Economic	Loss of economy in agricultural sector, Impact on manufacturing products by other industry due to water scarcity, Decline in GDP, impact on tourism
Indirect Impact	**Environmental, social and economic**	reduced income for farmers and agri-business, increased prices for food and timber, unemployment, reduced purchasing capacity and demand for consumption, default on agricultural loans, and reduction in agricultural employment leading to migration

Management Strategies

Unlike other disasters, drought is a slow phenomenon that gives sufficient time to act on warnings. An effective drought management strategy provides a framework for an ongoing set of actions to prepare for and effectively respond to drought. New innovative drought management systems which are based on advanced technology in crop and water management are helpful in reducing the adverse consequences of drought. Basically drought management strategy includes institutional mechanisms, employment generation and social welfare practices, community participation and operation of EWS.

The National Disaster Response Fund (NDRF) and State Disaster Response Fund (SDRF), National Disaster Management Cell (NDMC), National Center for Calamity Management (NCCM), and National Agricultural Insurance Scheme (NAIS) provide immediate drought relief to the affected people. Environmental Knowledge for Disaster Risk Management (ekDRM) and Hydro-meteorological Disaster Division focusing on climate change, land use and natural resource linkage with disaster management.

Several programmes of the Government of India help build resilience of communities against drought such as Drought Prone Area Development Programme and Desert Development Programme use the plans prepared on the basis of the integrated estimation. Other programmes include the National Watershed Development Project for Rainfed Areas, National Food Security Mission, National Horticulture Mission ,Rashtriya Krishi Vikas Yojana, National Mission on Micro Irrigation, National Mission for Green India, Integrated Watershed Management Programme, Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) etc.

International Crops Research Institute for Semi-arid Tropics (ICRISAT), Central Arid Zone Research Institute, Indian Grassland and Fodder Research Institute, Indian Council of Forestry Research and Training etc. are some of institutes that are involved in drought management.

Community attentiveness can play a key role in the effectiveness of government efforts.Local water management and rainwater harvesting can bring sustainability to the water sector and mitigates the effects of drought.

Early warning systems monitor the impact of the monsoon on agricultural operations and also suggest corrective measures to minimize any possible adverse impact of aberrant monsoon conditions on crop production.

Conclusion

This review focused on the drought, its impact and management strategies. The impacts of drought do not affect the agriculture sector alone but they inuence the other sectors such as forestry, tourism, energy, health, environment, marketing and economics.Proper drought management practices can help in reducing the adverse consequences for the people at large.

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