WELCOME

Understanding of Drought

- Characteristics
- Hazard
- Vulnerability & Capacity

By :

UMESH CHANDRA JOSHI

National Facilitator, Leadership Skill Development Programme

Master Trainer, DoPT, Govt. of India


उत्तर प्रदेश
राज्य मानचित्र
N
उत्तराखंड
नेपाल
राजस्थान
मध्य प्रदेश
बिहार
झारखंड
हरियाणा
भारत
सहारनपुर
शामली
मुज़फ्फरनगर
बिजनौर
बागपत
मेरठ
मुरादाबाद
रामपुर
हापुड़
अमरोहा
गौतमबुद्ध नगर
बुलंदशहर
बरेली
पीलीभीत
सम्भल
बदायूँ
शाहजहांपुर
लखीमपुर खीरी
अलीगढ़
कासगंज
मथुरा
हाथरस
एटा
फर्रुखाबाद
सीतापुर
बहराइच
श्रावस्ती
बलरामपुर
आगरा
फिरोज़ाबाद
मैनपुरी
हरदोई
सिद्धार्थ नगर
महाराजगंज
कन्नौज
लखनऊ
गोंडा
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इटावा
औरैया
कानपुर देहात
उन्नाव
फैज़ाबाद
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गोरखपुर
देवरिया
जालौन
कानपुर
रायबरेली
अमेठी
सुल्तानपुर
आजमगढ़
मऊ
बलिया
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फतेहपुर
प्रतापगढ़
जौनपुर
गाजीपुर
झांसी
हमीरपुर
महोबा
बाँदा
चित्रकूट
कौशाम्बी
इलाहाबाद
वाराणसी
चन्दौली
मिर्जापुर
ललितपुर
सोनभद्र
संकेत
अंतर्राष्ट्रीय सीमा
राज्य सीमा
जिला सीमा
राज्य मुख्यालय
जिला मुख्यालय
Map not to Scale
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(Updated on 11th November 2014)

प्रशासनिक इकाइयां

- मण्डल : 18
- जनपद : 75
- तहसील : 350
- सामुदायिक विकास खण्ड : 821
- वर्तमान में 821 विकास खण्ड संचालित है तथा 30 विकास खण्ड नये घोषित किये गये है।

Drought

- In India, meteorological drought is defined as **a condition when an area receives less than half the amount of normal rainfall** (India Meteorological Department, 1971 report) due to variation of onset, magnitude and intensity of rainfall

Drought in India

- 18 meteorological and 16 hydrological droughts occurred in India in the time span of **1870 to 2018**. The most severe meteorological droughts were in the years 1876, 1899, 1918, 1965, and 2000, while the five worst hydrological droughts occurred in the years 1876, 1899, 1918, 1965, and 2000.

Hazards in Drought

- During drought, there is an **increased risk for wildfires and dust storms**. Particulate matter suspended in the air from these events can irritate the bronchial passages and lungs. This can make chronic respiratory illnesses worse and increase the risk for respiratory infections like bronchitis and pneumonia.

Vulnerability of Drought

- **As high as 68 percent of the cropped area in India is vulnerable to droughts** of which 33 percent is classified as 'chronically drought-prone' comprising desert and semiarid regions that receive less than 750 mm mean annual rainfall.

- A recent study considered drought vulnerability as being driven by three factors: **exposure, sensitivity and adaptive capacity**. The study defined: Exposure - the frequency of drought, the state's population, and the freshwater ecosystems that could be affected.

5.1 Capacity Building

Human Resource Development, Training, Education and Capacity Building are essential components of the strategy for effective Drought mitigation and management. The objective of Capacity Building is to put in place a systematic functional mechanism with trained human resources. It has to be understood with a broad perspective to include Knowledge, Skill, Attitude and Resources in an integrated manner.

Capacity Building is a long-term phenomenon which has to be at the policy, implementation, Institutional and individual levels. It also includes development of appropriate tools that will be used to convey useful information pertaining to drought. Capacity development generally encompasses

various layers of governance by the central and state governments, district administration, local authorities, PRIs, ULBs and NGOs. Capacity Building will address the needs of all the target groups of government functionaries. Components of the multi-layer capacity development framework include training, techno-legal framework, knowledge management and developing organizational/ institutional and individual capacities.

DROUGHT

DEFINITION

Temporary reduction in water and moisture availability significantly below normal or expected amount for specific period.

किसी क्षेत्र में एक सूखा या सूखा नीचे-औसत वर्षा की एक प्राकृतिक आपदा है, जिसके परिणामस्वरूप पानी की आपूर्ति में लंबे समय तक कमी होती है, चाहे वायुमंडलीय, सतह का पानी या भूजल।

CAUSES

- Climate change and global warming
- Inadequacy of rainfall
- Lack of irrigation
- Over exploitation
- Deficient availability of water
- Excessive evapotranspiration
- Low soil water holding capacity
- High temperature
- Urbanisation
- Deforestation
- Construction on fertile land
- Inter-state water dispute
- Faulty cropping pattern
- Loss culture connection
- Hydroelectric dam

WATER TABLE RUNS DRY

FACING A CRISIS

1,071

Of 6,607 units (including blocks, mandals, talukas and firkas) assessed by the Central Ground Water Board across India have been categorised as 'over-exploited'.

217

units classified as 'critical' as the status of groundwater extraction in these places was over 90 per cent of reserves

697

units were classified as 'semi-critical', which means extraction here was estimated to be between 70 and 100 per cent

ON ALERT TOO

- **GROUNDWATER** extraction in these areas is over 70 per cent
- **AREAS** here are largely on the threshold of 'critical', while some qualify as 'over-exploited'

Delhi is among the regions where more water is extracted than replenished each year

OVER-EXPLOITED

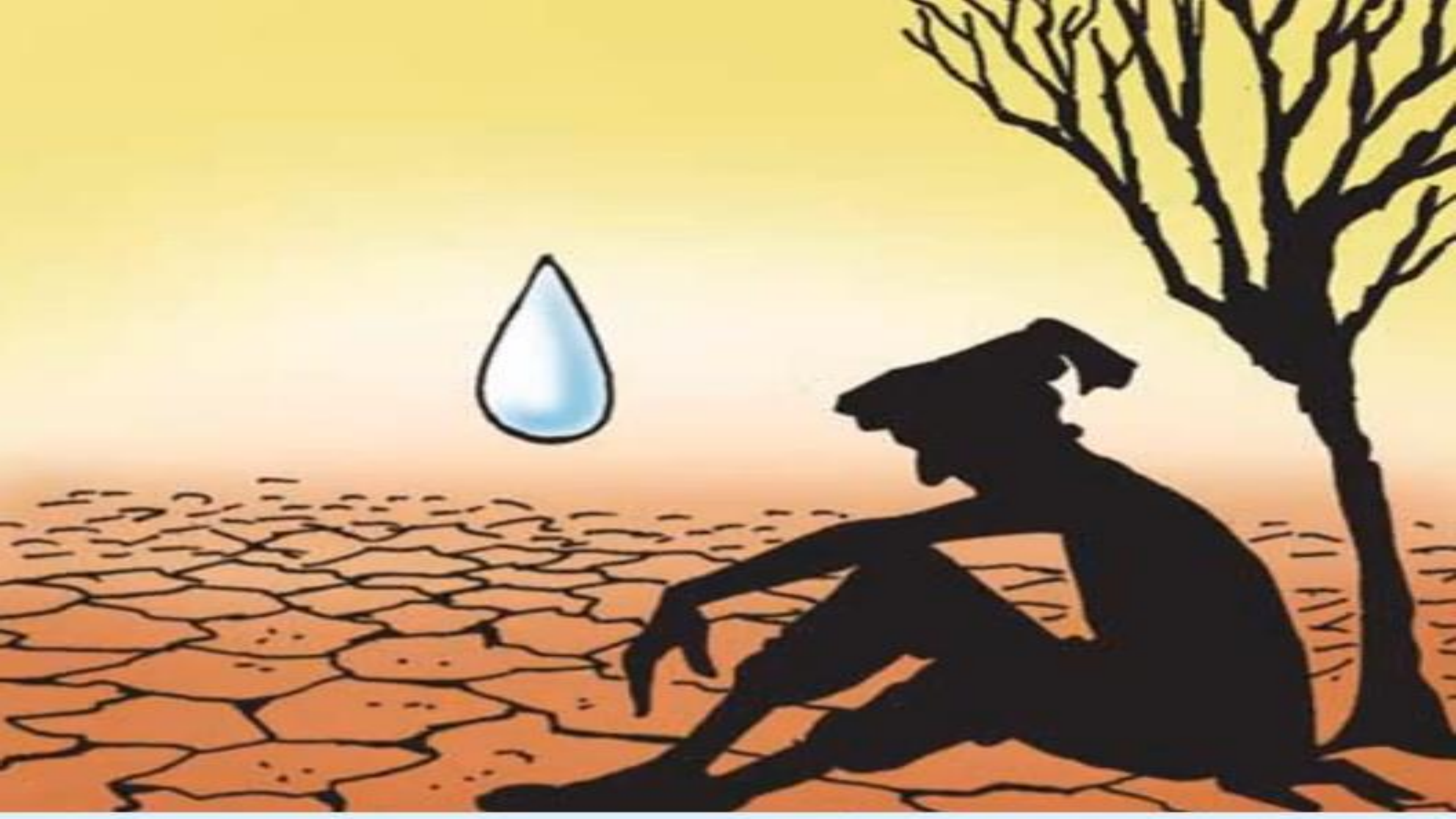
- **THE PROPORTION** of extraction to annual recharge is over 100 per cent, which means groundwater is being extracted faster than it is replenished

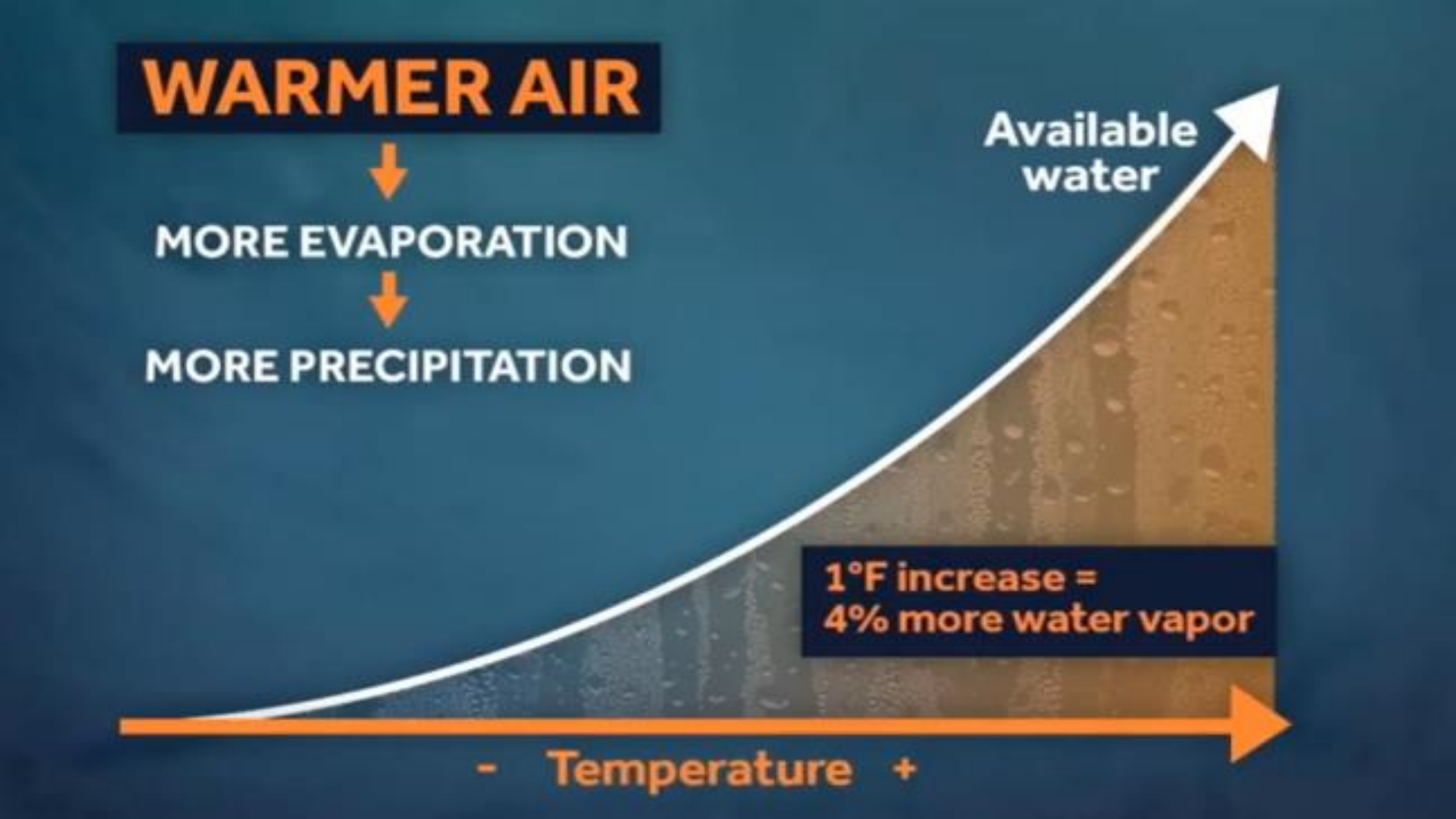
- **ACCORDING TO** leading water conservation activist Vikrant Tongad, 18 of 27 sub-divisions in Delhi and 71 of 116 blocks in Haryana are over-exploited. In Uttar Pradesh, 111 of 820 units are over-exploited.

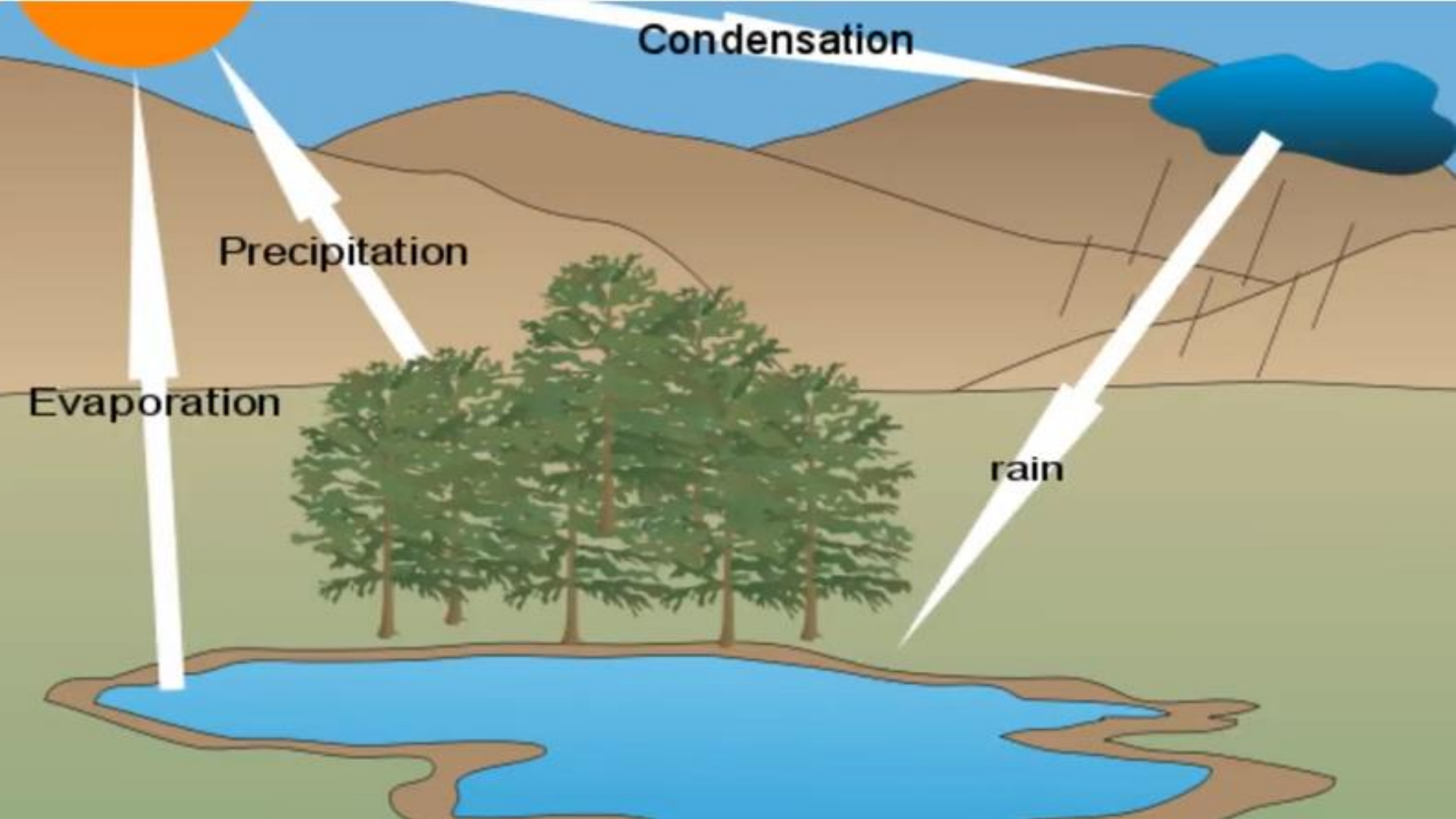
The over-exploited areas are mostly concentrated in northwestern, western and peninsular India

What makes matters worse for western states Gujarat and Rajasthan is the arid climate that leads to reduced groundwater recharge

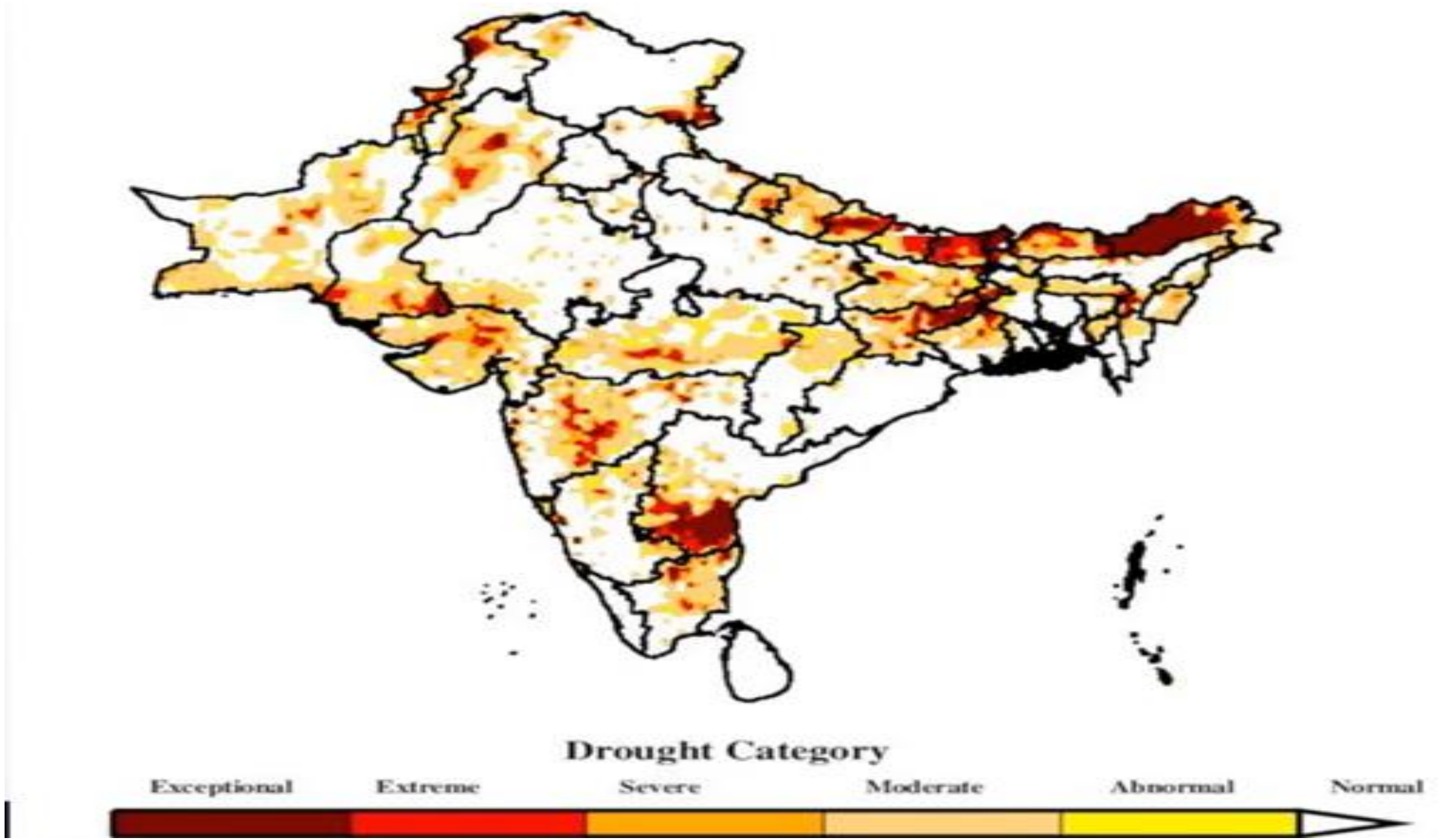
In the peninsular states of Karnataka, Andhra Pradesh and Tamil Nadu, the groundwater availability was lower due to poor aquifers (a body of permeable rock which can contain or transmit groundwater)




WARMER AIR
MORE EVAPORATION
MORE PRECIPITATION
Available water
1°F increase =
4% more water vapor
- Temperature +


Condensation
Precipitation
Evaporation
rain

- वर्षा की अपर्याप्तता
- सिंचाई की कमी
- अत्यधिक दोहन
- पानी की कमी की उपलब्धता
- अत्यधिक वाष्पीकरण
- कम मिट्टी की जल धारण क्षमता
- उच्च तापमान
- जलवायु परिवर्तन और ग्लोबल वार्मिंग
- शहरीकरण
- वनों की कटाई
- उपजाऊ भूमि पर निर्माण
- अंतर-राज्यीय जल विवाद
- दोषपूर्ण फसल पैटर्न
- हानि संस्कृति कनेक्शन
- पनबिजली बांध


Drought Category
Exceptional
Extreme
Severe
Moderate
Abnormal
Normal

- Affect soil moisture recharge
- Surface runoff
- Decrease ground water level
- Change in cropping pattern
- Impolishment of cattle
- Decline agriculture production
- Employment in agriculture will decline

- मिट्टी-नमी रिचार्ज पर असर
- सतह अपवाह
- भूजल स्तर में कमी
- फसल के पैटर्न में बदलाव
- मवेशियों का विध्वंस
- कृषि उत्पादन में गिरावट
- कृषि में रोजगार घटेंगे

Prediction : studies of → anonymous circulation pattern in ocean/atmospheric
→ soil moisture
→ remotely sense data
→ knowledge of stored water(domestic / irrigation)

Monitoring : ground based information → rainfall/weather/crop condition
→ water availability
→ satellite observation

Impact assessment : carried out land use site, demographic, public-health, water quantity and quality

Response: improve drought monitoring, water & crop management, micro-irrigation

What is Drought ?

- Drought, lack or insufficiency of rain for an extended period that causes a considerable hydrologic (water) imbalance and, consequently, water shortages, crop damage, streamflow reduction, and depletion of groundwater and soil moisture.
- It occurs when evaporation and transpiration (movement of water in the soil through plants into the air) exceed precipitation for a considerable period.
- Drought is the most serious physical hazard to agriculture in nearly every part of the world.

Drought

- The India Meteorological Department (IMD) defines drought in any area **when the rainfall deficiency in that area is ≥25% of its long term normal**. It is further classified into moderate and severe drought depending upon whether the deficiency is between 26 to 50% and more than 50% respectively.

Types of Drought

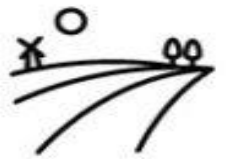
- Meteorological Drought
- Hydrological Drought
- Agricultural Drought
- Socioeconomic Drought
- Ecological Drought

FIVE TYPES OF DROUGHT

1 **METEOROLOGICAL** drought refers to an extended period of dry weather patterns.

2 **HYDROLOGICAL** drought refers to low water supply in our rivers, lakes, aquifers, and other reservoirs that often follows meteorological drought.

3 **AGRICULTURAL** drought occurs when a water shortage significantly damages or destroys agricultural crops.



4 **ECOLOGICAL** drought is the most recently defined type of drought and refers to widespread ecological damage caused by the lack of soil moisture.

5 **SOCIOECONOMIC** drought refers to when a water shortage affects the supply and demand of drought commodities, such as water, food grains, and fish.

Meteorological drought

- Meteorological drought is defined usually on the basis of the degree of dryness (in comparison to some “normal” or average amount) and the duration of the dry period. Definitions of meteorological drought must be considered as region specific since the atmospheric conditions that result in deficiencies of precipitation are highly variable from region to region.
- For example, some definitions of meteorological drought identify periods of drought on the basis of the number of days with precipitation less than some specified threshold.

Hydrological Drought

- Hydrological drought is associated with the effects of periods of precipitation (including snowfall) shortfalls on surface or subsurface water supply (i.e., streamflow, reservoir and lake levels, groundwater).
- The frequency and severity of hydrological drought is often defined on a watershed or river basin scale.
- Although all droughts originate with a deficiency of precipitation, hydrologists are more concerned with how this deficiency plays out through the hydrologic system.
- Hydrological droughts are usually out of phase with or lag the occurrence of meteorological and agricultural droughts.

Agricultural Drought

- Definition of agricultural drought should be able to account for the variable susceptibility of crops during different stages of crop development, from emergence to maturity.
- Deficient topsoil moisture at planting may hinder germination, leading to low plant populations per hectare and a reduction of final yield.
- However, if topsoil moisture is sufficient for early growth requirements, deficiencies in subsoil moisture at this early stage may not affect final yield if subsoil moisture is replenished as the growing season progresses or if rainfall meets plant water needs.

Socioeconomic Drought

- Socioeconomic definitions of drought associate the supply and demand of some economic goods with elements of meteorological, hydrological, and agricultural drought.
- It differs from the aforementioned types of drought because its occurrence depends on the time and space processes of supply and demand to identify or classify droughts.
- The supply of many economic goods, such as water, forage, food grains, fish, and hydroelectric power, depends on weather. Because of the natural variability of climate, water supply is ample in some years but unable to meet human and environmental needs in other years.

Ecological drought

- Ecological drought is an “**episodic deficit in water availability that drives ecosystems beyond thresholds of vulnerability, impacts ecosystem services, and triggers feedbacks in natural and/or human systems**”

Drought Monitoring Cells and Drought Declaration

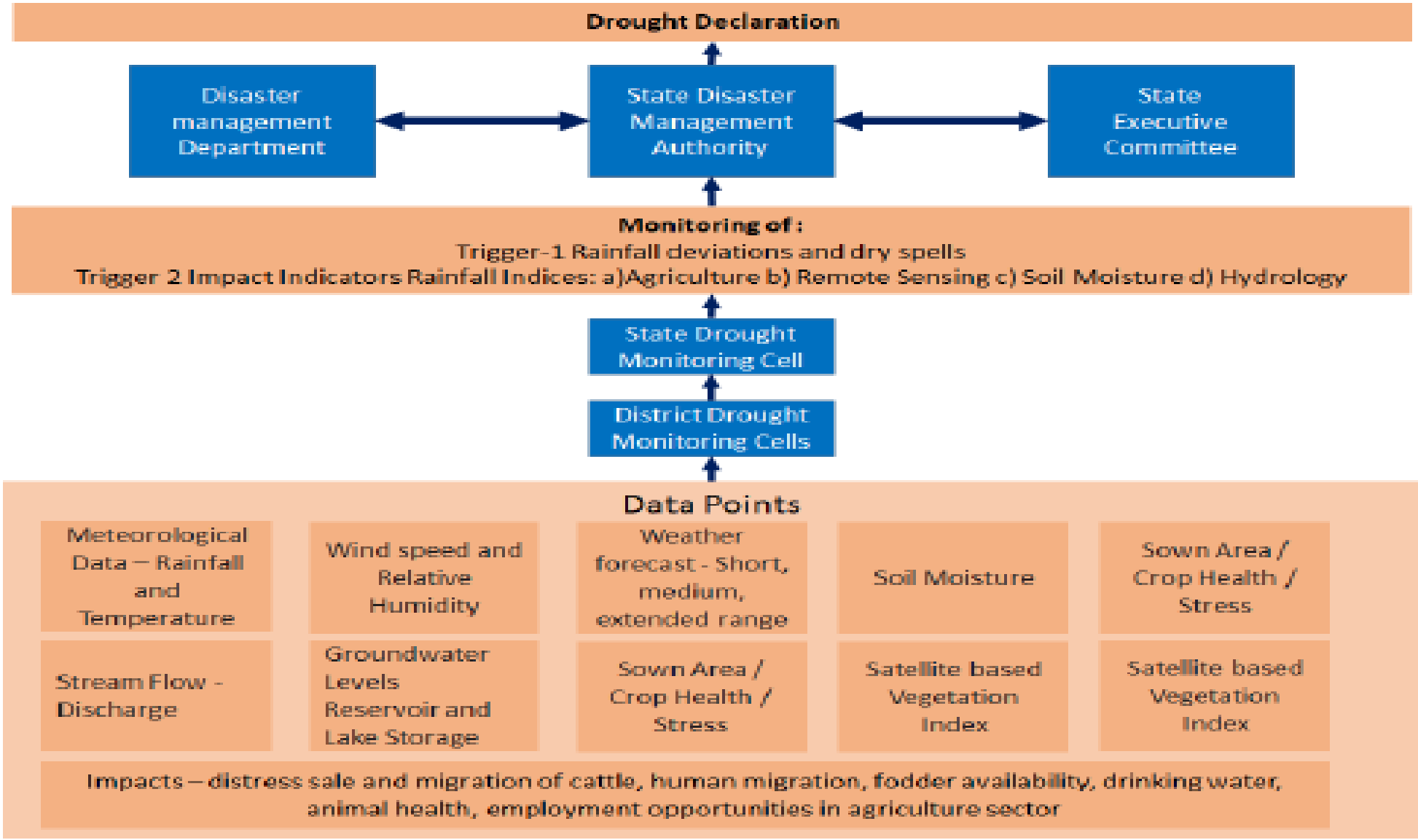
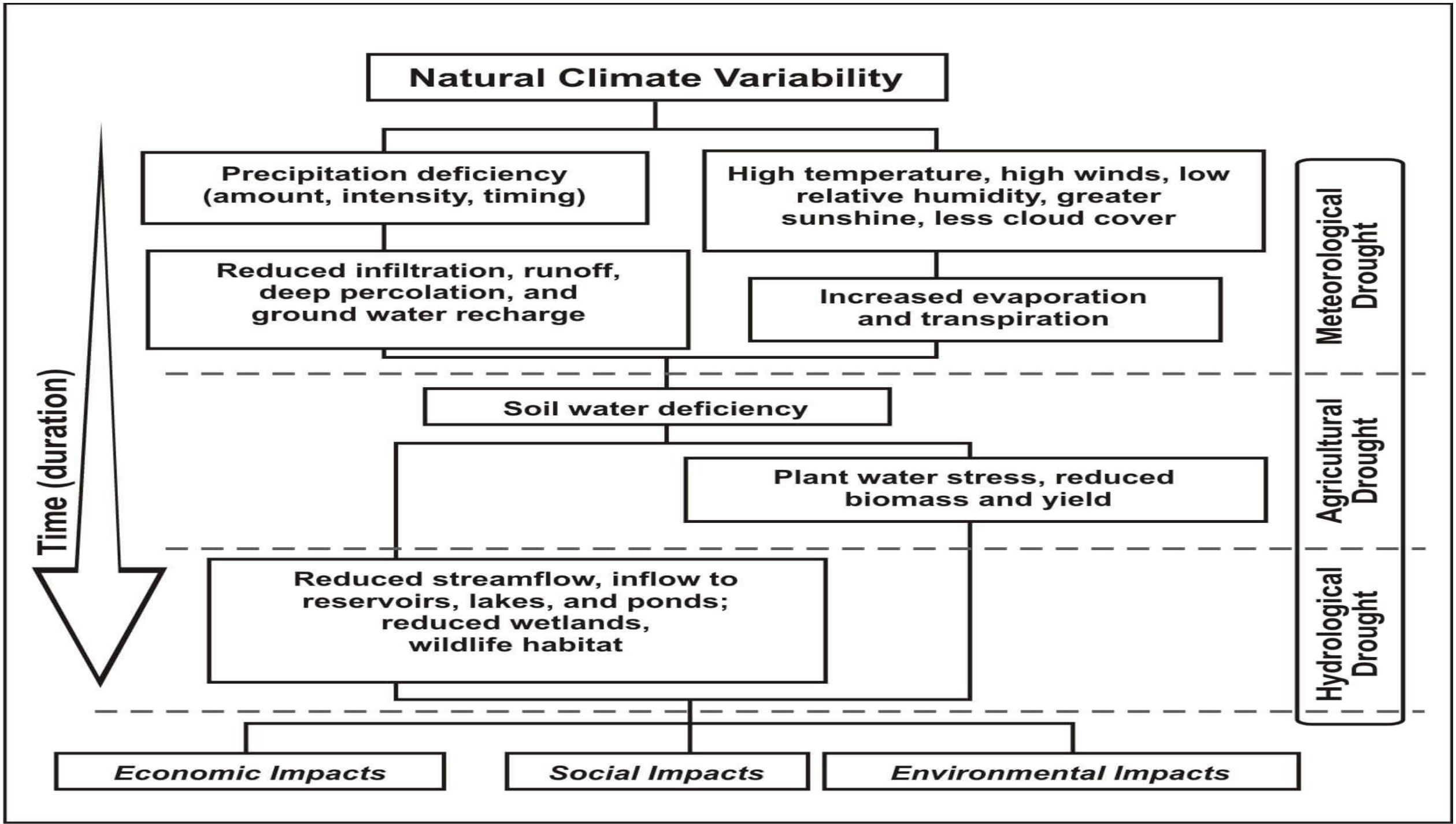


Figure 2: Drought Declaration Process

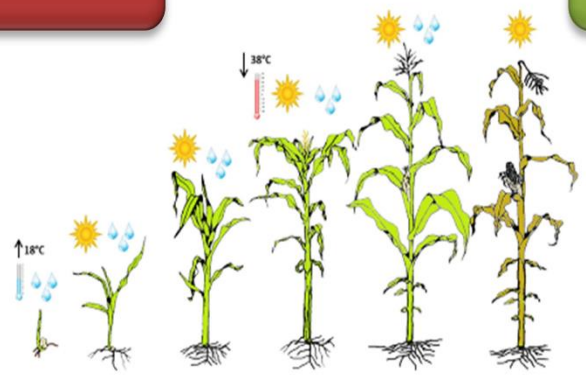

Natural Climate Variability
Precipitation deficiency (amount, intensity, timing)
High temperature, high winds, low relative humidity, greater sunshine, less cloud cover
Reduced infiltration, runoff, deep percolation, and ground water recharge
Increased evaporation and transpiration
Soil water deficiency
Plant water stress, reduced biomass and yield
Reduced streamflow, inflow to reservoirs, lakes, and ponds; reduced wetlands, wildlife habitat
Time (duration)
Meteorological Drought
Agricultural Drought
Hydrological Drought
Economic Impacts
Social Impacts
Environmental Impacts

Major Agricultural Problems

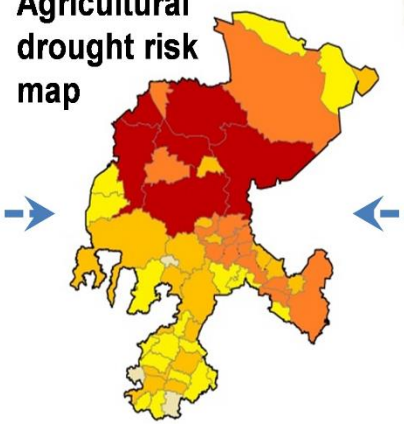
- Small and fragmented land-holdings
- Seeds
- Manures, Fertilizers and Biocides
- Irrigation
- Lack of mechanization
- Soil erosion
- Agricultural Marketing
- Inadequate storage facilitie

Agricultural Drought Risk

Hazard



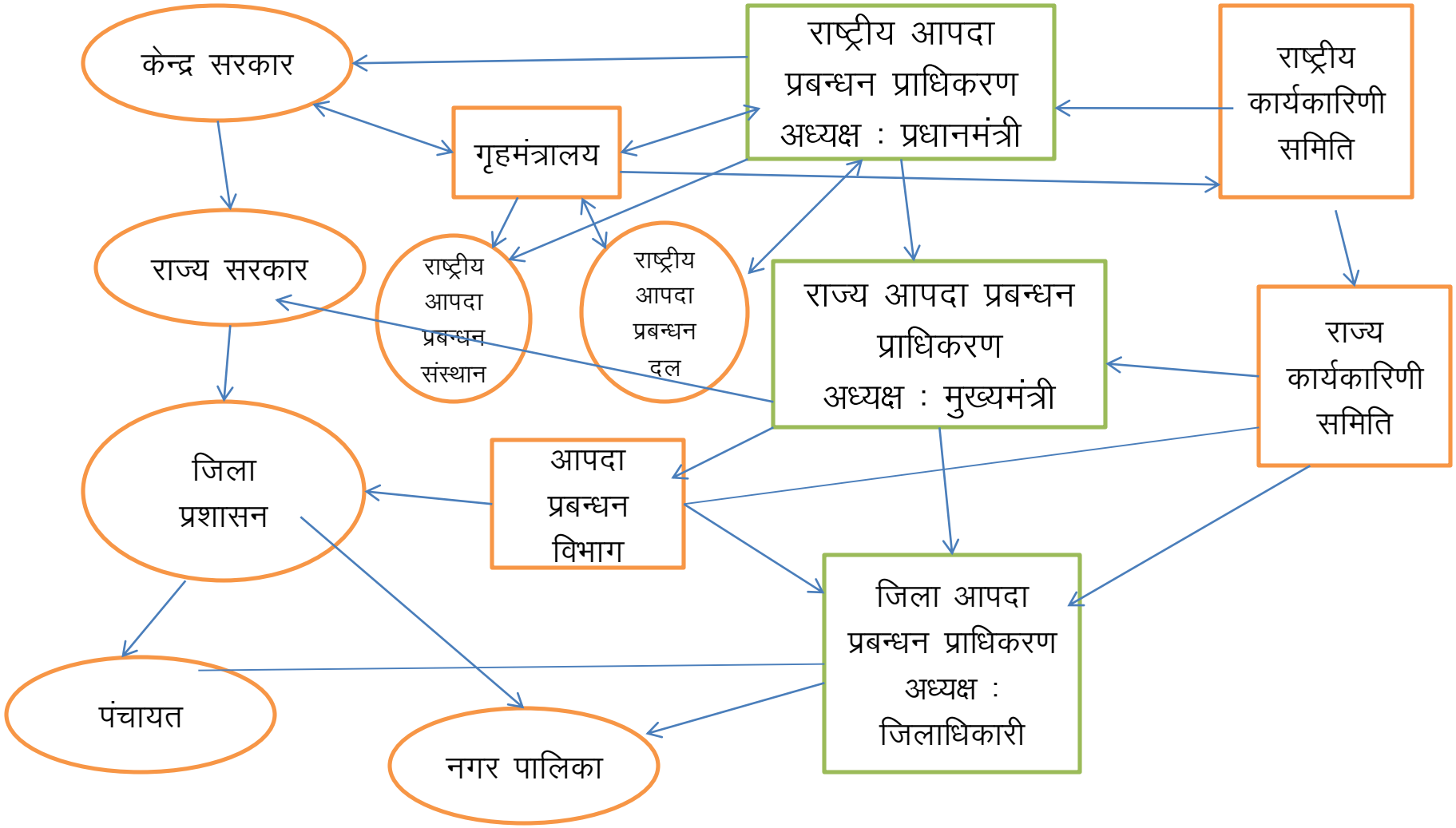
Exposure



Vulnerability

- Droughts occur when there is abnormally low rainfall for an extended period of time. This means that a desert would not be considered in drought unless it had less rainfall than normal, for a long period of time. Droughts can last from weeks to months and even years.

भारत में आपदा प्रबन्धन की संस्थागत संरचना



आपदा जोखिम

$$\text{आपदा जोखिम} = \frac{\text{खतरा X संवेदनशीलता}}{\text{क्षमता विकास}}$$

District Level Coordination Mechanism for Drought Relief and Response