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Q14

What is water stress? How and why does it differ regionally in India?

UPSC Civil Services Mains 2019 · GS I · 15 marks · World's Physical Geography

Salient features of world's physical geography.

Core demand of the question

- What is water stress?
- How does it differ regionally in India?
- Why does it differ regionally in India?

Revision summary

Water stress is when demand and pollution outrun reliable, usable supply per person or per basin.

India's north-west plains show groundwater overdraft under rice-wheat.

The rain-shadow Deccan and Bundelkhand show drought and tanker dependence.

The north-east can be wet yet locally stressed by flood and quality.

Monsoon seasonality, aquifer type, crop choice, and cities explain the pattern.

Jal Jeevan, Atal Bhujal, PMKSY, and river tribunals must follow regional maps.

Introduction

Water stress is the squeeze when demand and pollution outrun reliable supply. In India that squeeze is not one map: the north-west plains, the rain-shadow Deccan, the coasts, and the wet north-east live different water lives because of monsoon, rivers, aquifers, and how we farm and urbanise.

Body

What water stress is

- **Hydrologists often use the Falkenmark idea:** when renewable water per person falls toward or below about 1,700 cubic metres a year, a society is water-stressed; near 1,000 it is water-scarce.
- **Stress is also a ratio of withdrawal to availability, plus quality:** a full canal of polluted water is still stress.
- Physical stress is too little water in the basin; economic stress is water present but unpaid pipes, power, and treatment.
- **NITI Aayog's** Composite Water Management Index and Central Ground Water Board "dark" blocks are Indian ways of saying the same thing at state and taluk scale.
- India's average per-person availability has fallen with population, but averages hide the regional story the question asks.

How it differs on the map

- The Indus-Ganga-Yamuna belt of Punjab, Haryana, western Uttar Pradesh, and north Rajasthan shows groundwater overdraft, falling water tables, and canal-plus-tube-well wheat-rice stress.
- Marathwada, north Karnataka, Rayalaseema, Bundelkhand, and interior Tamil Nadu face drought years, tank decay, and tanker towns; Chennai's 2019 crisis made the urban face of this visible.
- The north-east and many Himalayan and Western Ghat catchments have high rainfall, yet local stress still appears as flood, erosion, and dirty surface water, not as desert.
- Gujarat's Kutch and Saurashtra, and parts of Rajasthan, are arid by climate; the Konkan and Kerala coasts are wet but can still lack summer drinking water when wells go saline.
- Peninsular interstate rivers (Cauvery, Krishna, Godavari, Narmada) create legal stress between states even when the basin is not empty in a wet year.

Why the regional pattern exists

- The south-west monsoon is seasonal and patchy; 80 per cent or more of rain in a few months means storage and groundwater decide summer survival.
- Himalayan snow-and-rain rivers differ from rain-fed peninsular rivers with hard-rock aquifers that recharge slowly.
- Green Revolution rice in low-rainfall Punjab and sugarcane in drought-prone western Maharashtra are crop choices that manufacture stress.
- Urban leakage, untreated sewage, and industrial effluents turn available water into unusable water, especially in the Yamuna and Musi belts.
- Power subsidies for pumps, weak groundwater law, and incomplete AIBP-irrigation reform reward extraction over recharge.

Institutions and schemes that mark the difference

- The **Mihir Shah Committee** argued for a shift from construction to water governance; **CGWB assessment units** show over-exploited blocks clustered in north-west and south India.
- Jal Jeevan Mission, **Atal Bhujal Yojana**, PMKSY, Namami Gange, and state river-linking or tank-revival programmes try to answer different regional deficits.
- The **Cauvery Water Management Authority** and similar tribunals show that regional stress is also a federal political fact.
- Flood-prone Bihar and Assam need embankments and drainage; arid Rajasthan needs tanks, canals, and managed aquifers; one national slogan cannot fit both.

Way forward for policy

- **Match crops to rainfall:** less paddy in overdraft Punjab, more millets and pulses in the dry Deccan, with MSP and procurement that do not punish the shift.
- Treat aquifers as common property through Atal Bhujal-type community measurement, and repair tanks and wetlands on Survey of India and CGWB maps.
- Cut urban leakage and reuse treated sewage for industry and parks so cities stop mining distant villages.

Flow diagram

Monsoon aquifer crops -> Water stress
Water stress -> North-west overdraft
Water stress -> Peninsular drought
Water stress -> East flood and pollution
Water stress -> Arid west scarcity
Governance schemes tribunals -> Regional remedies

Conclusion

Water stress is shortage plus pollution relative to need. India feels it as overdraft in the green-revolution north-west, drought in the rain-shadow peninsula, flood-and-filth in wet eastern valleys, and legal fights on shared rivers, because monsoon, rock, crops, and cities differ. Policy has to follow that map, not a single national average.

Facts & figures

Falkenmark threshold

About 1,700 cubic metres per person per year as a common mark of water stress in global hydrology talk.

CGWB assessment units

Blocks classified as over-exploited, critical, or safe; clusters in Punjab, Haryana, Rajasthan, and parts of the south.

NITI Aayog CWMI

Composite Water Management Index used to rank states on water data, supply, and efficiency.

Atal Bhujal Yojana

Central scheme for community groundwater management in stressed districts.

Cauvery Water Management Authority

Federal body that shows peninsular water stress as an interstate legal problem.

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