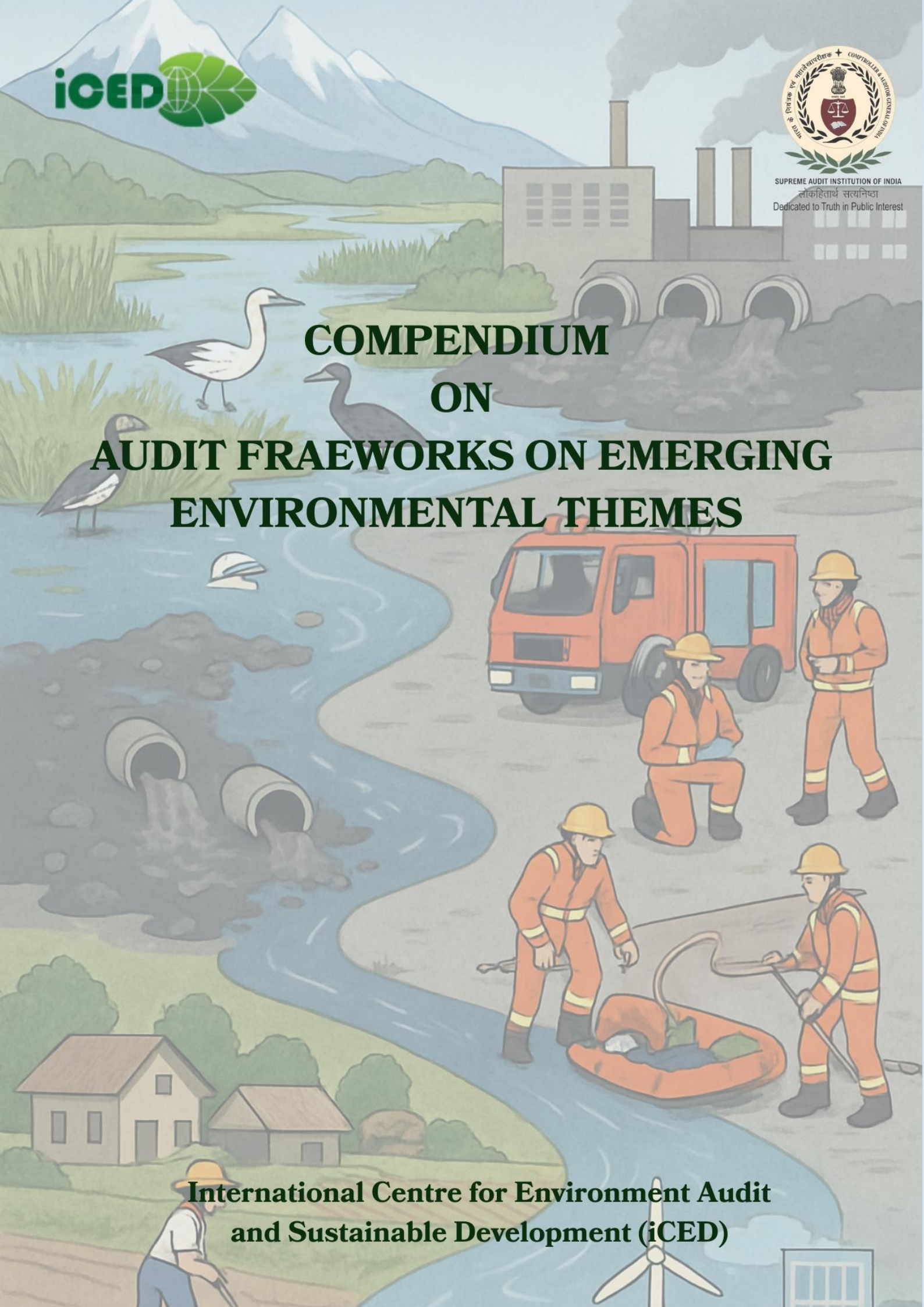


SUPREME AUDIT INSTITUTION OF INDIA
लोकहितार्थ सत्यनिष्ठा
Dedicated to Truth in Public Interest

COMPENDIUM ON AUDIT FRAEWORKS ON EMERGING ENVIRONMENTAL THEMES

International Centre for Environment Audit and Sustainable Development (iCED)

Preface

Environmental challenges today are increasingly complex, interconnected, and urgent. They touch every aspect of human well-being, clean air, safe water, sustainable food systems, disaster resilience, and healthy ecosystems.

At a time when India has committed itself to ambitious goals such as the Sustainable Development Goals (SDGs), Nationally Determined Contributions (NDCs) under the Paris Agreement, and Mission LiFE (Lifestyle for Environment), the role of oversight institutions in ensuring environmental accountability becomes even more significant. Recognising this, the International Centre for Environment Audit and Sustainable Development (iCED), Jaipur, under the guidance of Sh. Abhishek Gupta, Director General, iCED, and Shri Mehul Grover, Director (Training & Research) and Ms. Meena Bisht, Director (Training and Research), has curated this compilation of audit frameworks on ten critical environmental issues.

The issues have been carefully selected based on their environmental significance, audit relevance, and alignment with India's current environment policies. These are areas where public spending, regulatory interventions, and environmental outcomes intersect—making them ideal for performance audits and compliance reviews.

In selecting themes for the environmental audit, iCED has prioritized critical issues to address novel challenges and gaps in current environmental management practices. Traditional topics such as forest conservation, solid waste management etc. which have already been extensively covered and audited by SAI India have not been emphasised in this compendium as also the ongoing efforts and substantial existing work by SAI India in these domains have already established robust frameworks and interventions.

The audit framework in this compilation is designed to ensure comprehensive and effective audits by covering several key thematic areas. It starts by outlining the background and rationale for auditing, providing context and highlighting the importance of the issue at hand. It then identifies major issues, relevant data points, and indicators that help in assessing performance and pinpointing areas of concern. The framework also includes important information of applicable policies, schemes, and legal frameworks at both national and state levels to ensure alignment with statutory and regulatory requirements. Notable case studies are presented to offer practical insights and illustrate challenges and good practices observed in previous audits. In addition, the framework references important directives issued by the National Green Tribunal, the Supreme Court, and various High Courts to underscore judicial perspectives and compliance obligations.

Finally, it incorporates a comprehensive checklist to guide auditors through each stage of the audit process—from planning and scoping to execution and reporting—ensuring a structured and methodical approach throughout.

The research and data analysis has been done by Research Section, iCED led by Sr. Audit Officer Shri Manoj Kumar and the following team -

Sh. Vijender Kumar Tanwar, Asst .Audit Officer
Sh. Rohan Sharma, Asst. Audit Officer
Sh. Ajay Babu Meena, Asst. Audit Officer
Sh. Rohit Kirodiwal, Asst. Audit Officer
Sh. Rahul Yadav, Asst. Audit Officer

With administrative assistance of the Sh. Ravi Kumar, Sr. Auditor and Ms. Manju Godara, Auditor.

The compendium includes Audit frameworks on the following ten environmental issues:

01 Agricultural Sustainability and Groundwater

explores the challenges of declining soil health, shrinking farmland, excessive chemical input use, post-harvest losses, and overexploitation of groundwater.

02 Air Pollution

highlights the silent crisis of air pollution in Indian cities, with focus on monitoring infrastructure, NCAP implementation, EV penetration, and health impacts.

03 Renewable Energy Transition and Energy Efficiency

examines India's shift from fossil fuels to renewable energy sources.

04 Liquid and Fecal Sludge Management

addresses the challenges of urban sanitation, untreated sewage, and the health risks of improper sludge disposal.

05 Wetlands

includes assessment of wetland pollution levels (based on BOD, DO, coliform), encroachment, invasive species, funding gaps, and lack of health card coverage.

06 Rivers

focuses on pollution in Indian rivers, toxic metals, sewage discharge, encroachments, and highlights data from CPCB on polluted river stretches.

07 Rural Development

covers themes such as vacant villages, water stress, agricultural decline, and access to sanitation and health infrastructure.

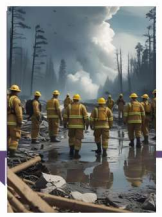
08 Environment Impact Assessment

examines the implementation of the EIA process, identifying areas of concern such as weakened legal frameworks, post-clearance compliance.

09 Sustainable Cities

focuses on urbanization trends, municipal service delivery, public transport inadequacies, and water stress

10 Disaster Management



focuses on disaster preparedness, early warning systems, and post-disaster recovery.

The audit frameworks discussed herein are not exhaustive blueprints but living tools and are open to updates, regional customization, and further enrichment through field experience.

We hope this compendium serves as a catalyst for more impactful environmental audits, ones that not only assess performance but also help shape stronger policies, improve governance, and foster sustainability.




AGRICULTURAL SUSTAINABILITY AND GROUNDWATER

International Centre for Environment Audit and Sustainable Development

Why to Audit, Agricultural Sustainability and Groundwater?

1. **Composite Index of Agriculture Sustainability-State wise**

Rajasthan sits lowest in India's Agricultural Sustainability Index (0.42) due to its arid climate, poor soil, and overexploited groundwater, while states with diverse cropping, better credit, and infrastructure score much higher.

2. **Agriculture Budget, Expenditure and Output**

Since 2001–02, agri output grew 3% annually—doubling in size—while non-agri output rose 4.6 times with 7% yearly growth.

3. **Post Harvest Loss due to shortage of Cold storage facilities:** In 2020–21, agriculture made up 19.9% of GDP, with estimated losses of ₹1.52 lakh crore—mainly from livestock, which accounted for 21.7%.

4. The Disappearing Acre: As cities grow and industries boom, farmland is shrinking — dropping from 62.33% in 1952–53 to just 58.69% by 2022–23.

5. **Shrinking Millet Fields, Growing Concerns:** Millet area shrank from 27.5 to 12.4 million ha (1950–2023), even though they're vital for nutrition, resilience, and dryland food security.

6. **From Farm to Fork: Tracing Pesticide Residues**

Over 1.3 lakh samples (2018–2023) were tested; 28% had pesticide residues, and 3.5% exceeded FSSAI limits.

7. **Irrigation Dependence:**
    - Tubewells are predominant in 12 states, especially in Uttar Pradesh, Punjab, and Rajasthan.
    - Only 56.37% of net sown area is irrigated, highlighting rainfed agriculture's dominance.

8. **Soil Health Crisis**

- Severe deficiencies across macronutrients:
    - **Nitrogen**: Deficiency in >90% samples in 27 states/UTs, **Phosphorus**: 19 states have >90% deficient samples, **Potassium**: 71% of samples deficient, **Organic Carbon**: >50% samples deficient in 24 states; Haryana worst affected.
    - Organic fertilizer output surged till 2017–18, then plunged 99% by 2020–21, while chemical fertilizer use rose 75% due to subsidy bias.

Groundwater

9. **Over exploitation of Groundwater**
    - Punjab (166%), Rajasthan (151%), and Haryana (134%) exceed critical groundwater extraction thresholds.
    - Tubewell irrigation surged from 0.55% (1960–61) to 43.34% (2022–23).

10. **Contamination:**
    - Fluoride > 1.5 mg/L in 26.98% locations in Rajasthan, leading to health issues like fluorosis and thyroid dysfunction.
    - Nitrate > 45 mg/L in multiple states; causes birth defects and cancer risk.
    - Rajasthan and Gujarat show high chloride levels due to natural hydrochemical Na-Cl formations.

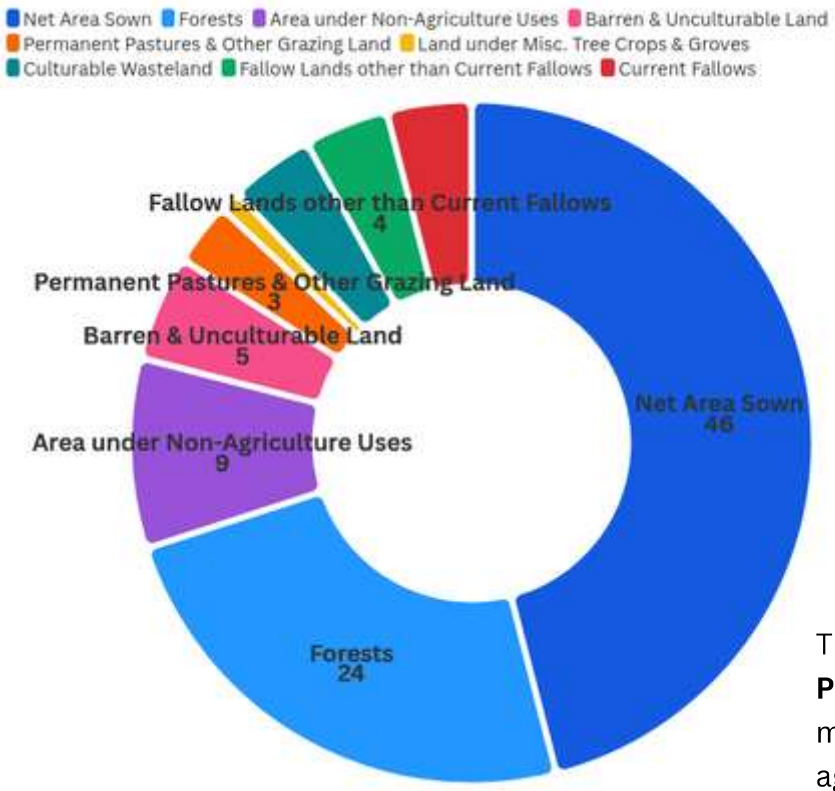
11. **National Green Tribunal (NGT) orders (2022–2025)**

NGT Orders on Groundwater Issues: Illegal Borewells, Contamination in Punjab, Arsenic & Fluoride, Industrial Extraction (Haryana & Prayagraj), Construction Site Use, and EIA-Based Regulation

NGT Orders on Agriculture Issues: Stubble Burning, Crop Residue in Pollution Plans, Waste Composting for Soil Health, Wastewater in Irrigation, Pesticide Runoff, and Fertilizer Overuse.

Sustainable agriculture focuses on efficient, long-term production of safe, high-quality agricultural products while protecting and improving the environment, social conditions, and the health of all farmed species.(ICAR)

Percentage Classification of Land Utilisation in the Country, 2022-23

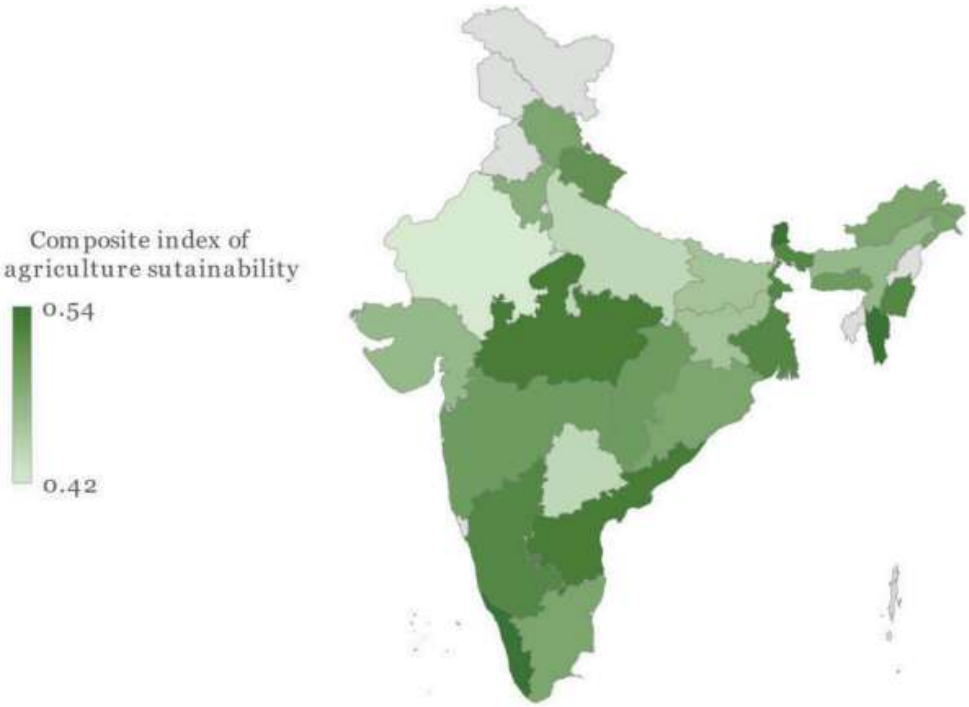


The union territory Lakshadweep and States **Punjab, West Bengal, Manipur** have utilized more than 98 percent of the available agriculture land for cultivation purposes.

https://desagri.gov.in/wp-content/uploads/2024/09/Final-file-of-LUS-2022-23-for-uploading.pdf

Composite index of agriculture sustainability-State wise

ICAR developed a Composite Index of Agricultural Sustainability using 51 indicators. The national average score is 0.49, indicating moderate sustainability. States like Mizoram, Kerala, MP, Andhra Pradesh, Manipur, West Bengal, and Uttarakhand scored above average.



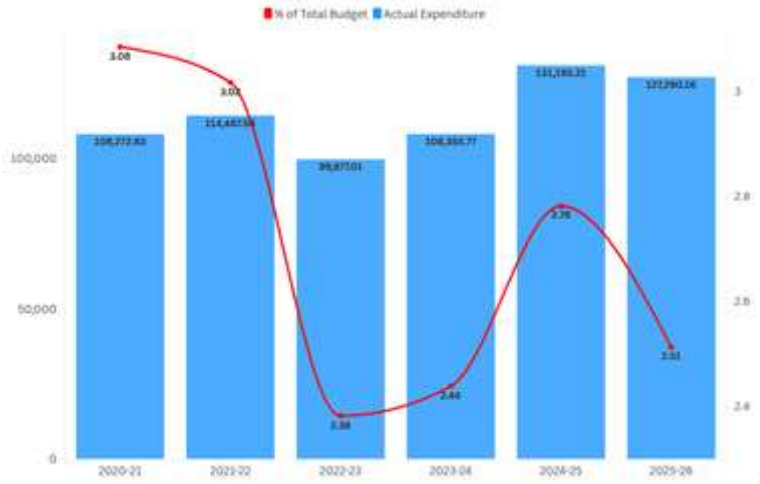
Below National Average (CIAS < 0.49)

1. Rajasthan (0.42):
Struggles due to arid climate, erratic rainfall, poor soil & water

2. Uttar Pradesh, Punjab, Bihar, Haryana, Jharkhand, Assam:
Vulnerable owing to intensive rice–wheat farming, groundwater depletion, excess agrochemicals, soil degradation, and urbanisation-driven land loss

Source: A Spatial Assessment of Sustainability in Indian Agriculture, Policy paper 42, 2024, ICAR

Agriculture Budget, Expenditure and output



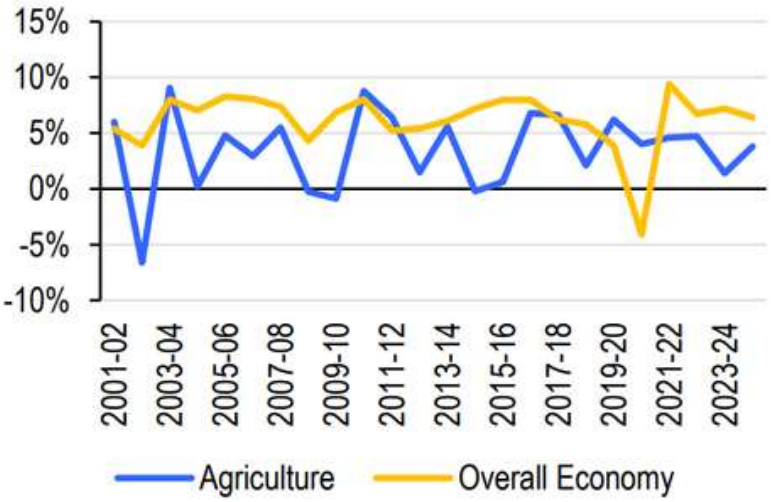
Reduction in Agriculture budget

Agriculture Budget has grown over last years. However, the share of Agriculture Budget in total Budget expenditure is **reducing**.

Source: Indian Budget documents yearwise

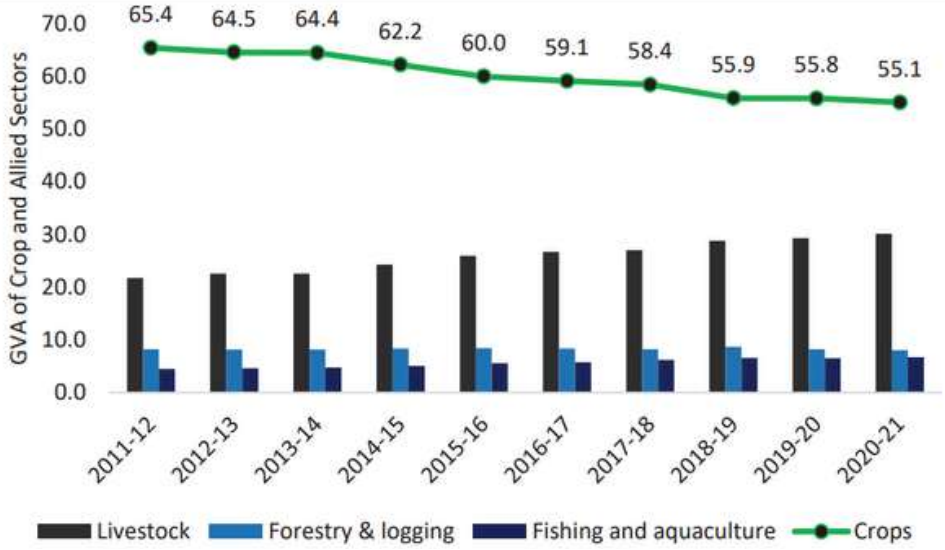
Comparison of Agriculture output with Overall economy

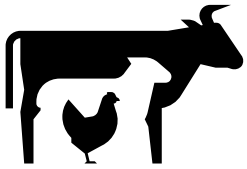
Since 2001–02, India's agricultural output has grown at a modest average of **3% per year**, while the rest of the economy expanded at around **7% annually**, causing agricultural output to double, compared to a 4.6 times increase in non-agricultural output.



Sources: Statistical Appendix, Economic Survey, MoSPI

Allied Sectors: Animal Husbandry, Dairying and Fisheries Catching Up in Recent Years

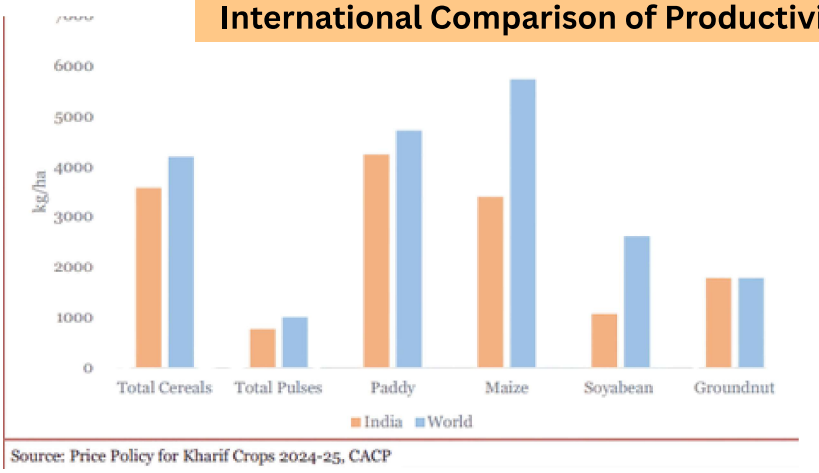




*Though the Crop sector is still the major contributor to agriculture GVA, the **livestock sector** is catching up (per cent)*

https://www.indiabudget.gov.in/budget2023-24/economicsurvey/doc/eschapter/echap08.pdf

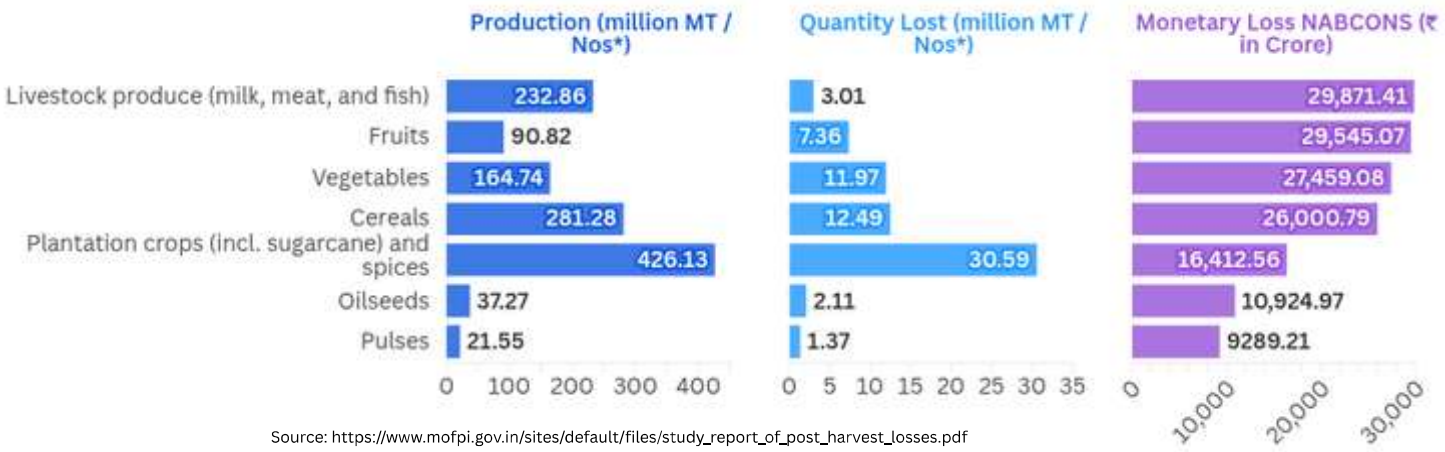
International Comparison of Productivity for Selected Crops, 2022



Source: Price Policy for Kharif Crops 2024-25, CACP

Most crops in India yield significantly less per hectare than global averages.

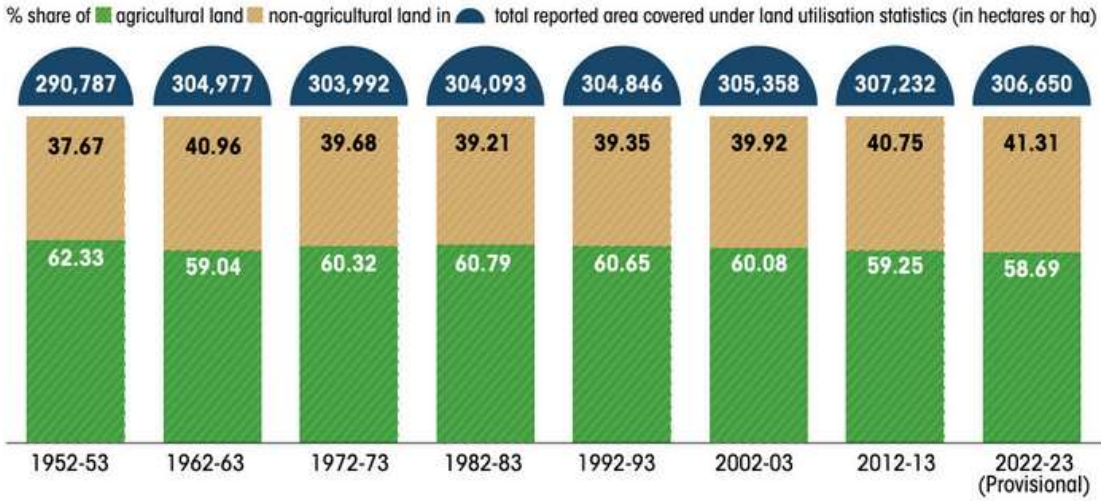
Post Harvest Loss due to shortage of Cold storage facilities



Source: https://www.mofpi.gov.in/sites/default/files/study_report_of_post_harvest_losses.pdf

In 2020–21, agriculture contributed 19.9% to India's GDP. A study estimated ***₹1,52,790.42*** *crore in losses across 54 crops and commodities, surpassing previous ICAR-CIPHET assessments.* ***Livestock*** *produce had the highest share in economic loss (21.70%), followed by fruits (19.34%), vegetables (17.97%), cereals (17.02%), plantation crops and spices (10.74%), oilseeds (7.15%), and pulses (6.08%).*

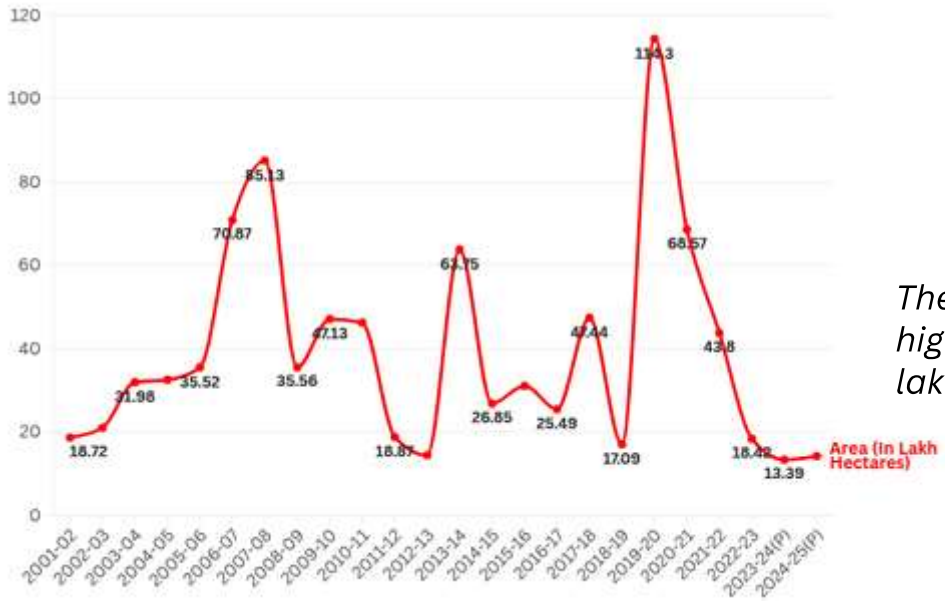
The Disappearing Acre



"As cities grow and industries boom, farmland is shrinking — dropping from 62.33% in 1952–53 to just 58.69% by 2022–23."

Source: "Land Use Statistics at a Glance: 2022-23", Union Ministry of Agriculture and Farmers Welfare

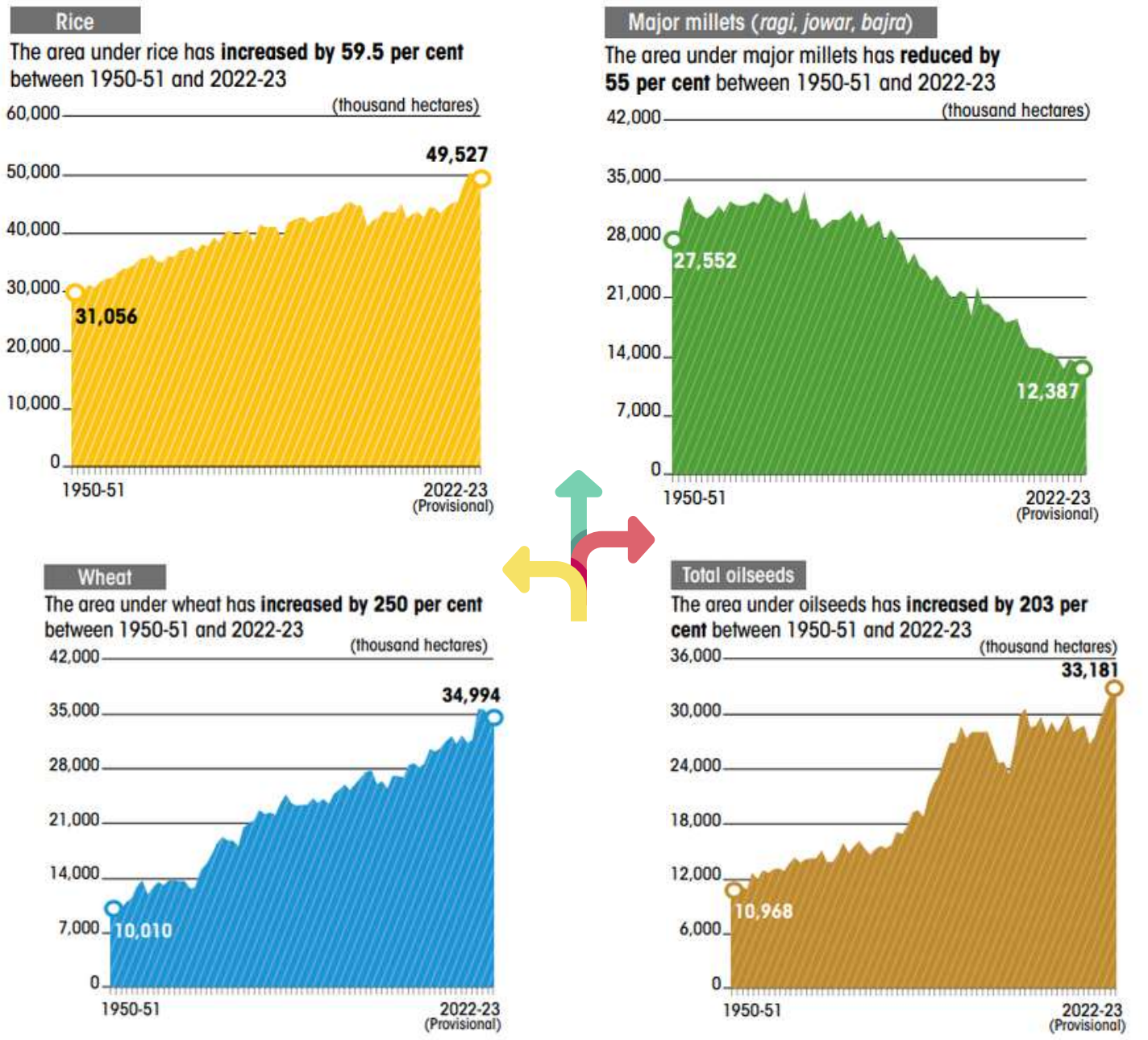
Crop area affected (in Lakh Hectares) due to extreme natural events in India



The crop area affected was highest in 2019-20, with ***114.3*** *lakh hectares damaged*

https://www.mospi.gov.in/sites/default/files/reports_and_publication/statistical_publication/EnviStats/Complete_ES1_2025.pdf

Shrinking Millet Fields, Growing Concerns

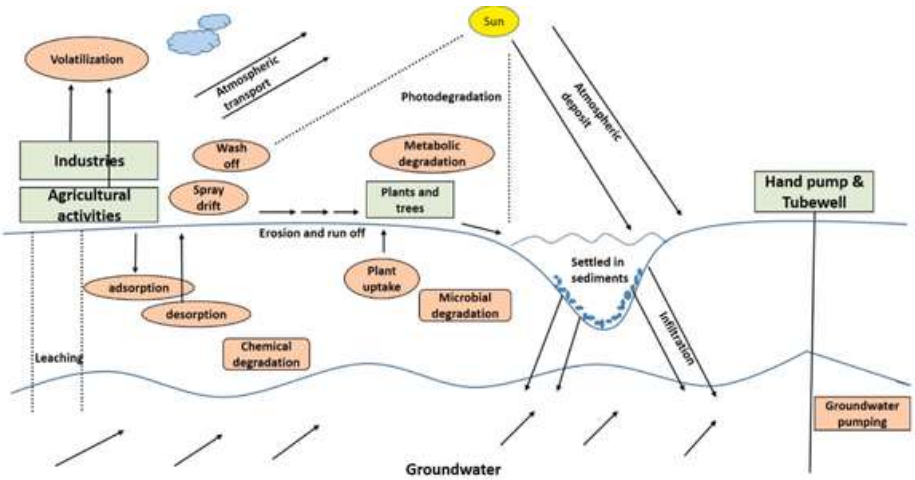


Source: "Land Use Statistics at a Glance: 2022-23", Union Ministry of Agriculture and Farmers Welfare

The area under millets like ragi, jowar, and bajra has dropped from 27.5 to 12.4 million hectares (1950–2023), while rice, wheat, and oilseeds have expanded. This decline is worrying, as millets are nutritious, climate-resilient, and vital for food security in dry regions.

From Farm to Fork: Tracing Pesticide Residues

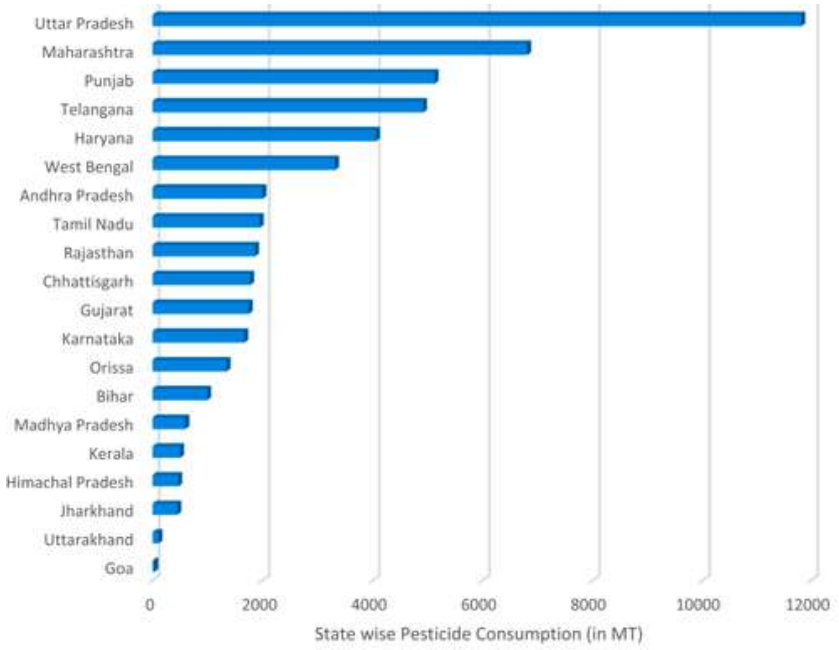
- 20–30% of crop yield in India is lost to pests like insects, diseases, weeds, and rodents.
- Pesticides are used to protect crops, but misuse can lead to harmful residues on food.
- AINP-PR (ICAR) develops protocols for safe pesticide use through field trials across agro-climatic zones.
- The MPRNL scheme monitors residues in food items like vegetables, fruits, cereals, milk, fish, etc., across India.
- Over 1.3 lakh samples (2018–2023) were tested; 28% had pesticide residues, and 3.5% exceeded FSSAI limits.



Pesticide fate and transport in the hydrogeological system.

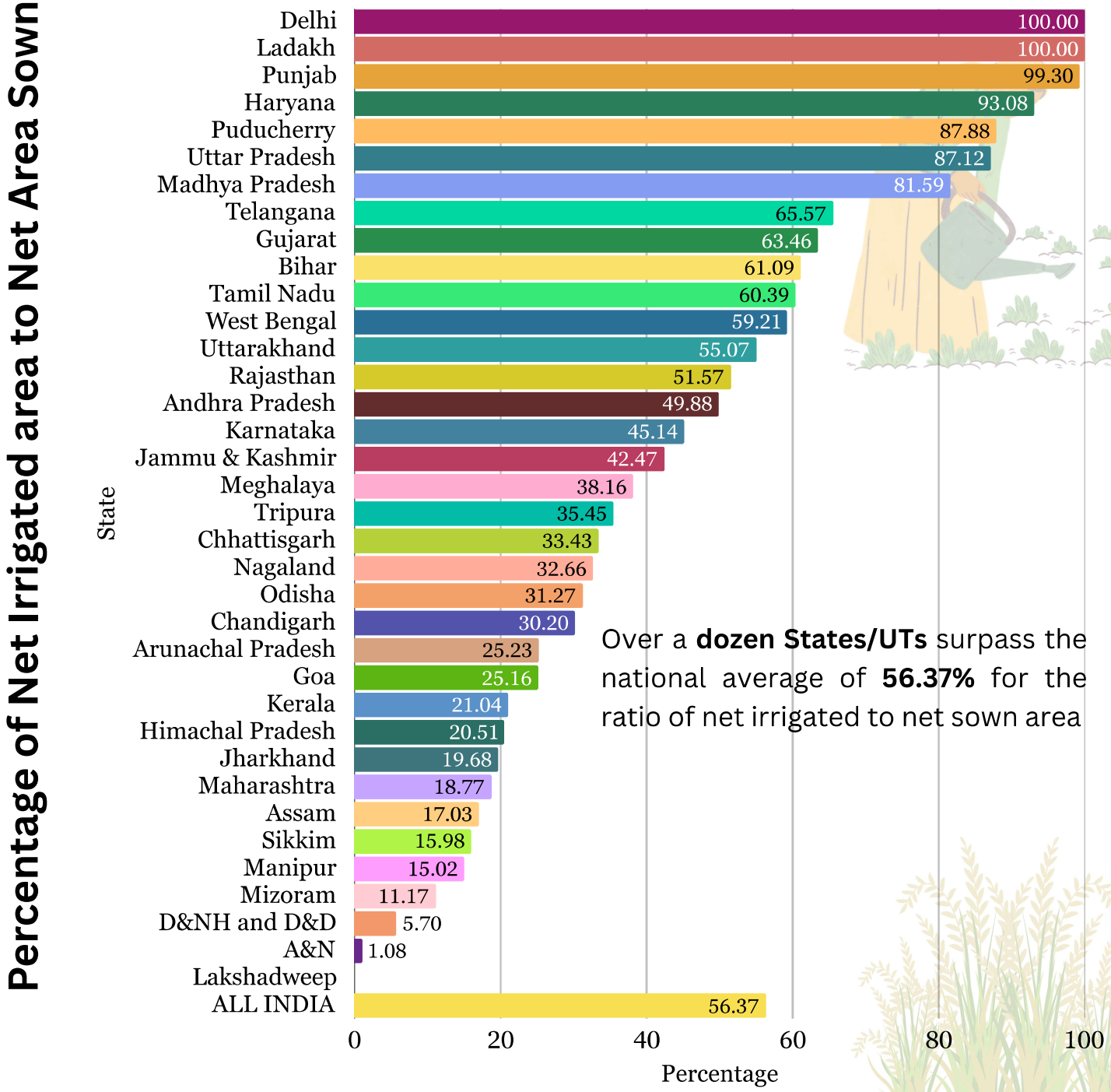
Source: ICAR

Source: https://www.sciencedirect.com/science/article/pii/S2214750024001847



- Agricultural intensification to meet food demand and crop diversification (cash crops, veggies) has increased pesticide reliance.
- Climate change (higher temps, less rainfall) has worsened pest pressure, especially in states like Punjab, Haryana, and UP.
- Lack of awareness and limited access to alternatives like IPM keeps small farmers dependent on chemical pesticides.
- Government subsidies and policies often favor chemical inputs over sustainable practices.
- Pest resistance and aggressive marketing lead to more frequent and stronger pesticide applications, especially in Maharashtra, Karnataka, and UP.

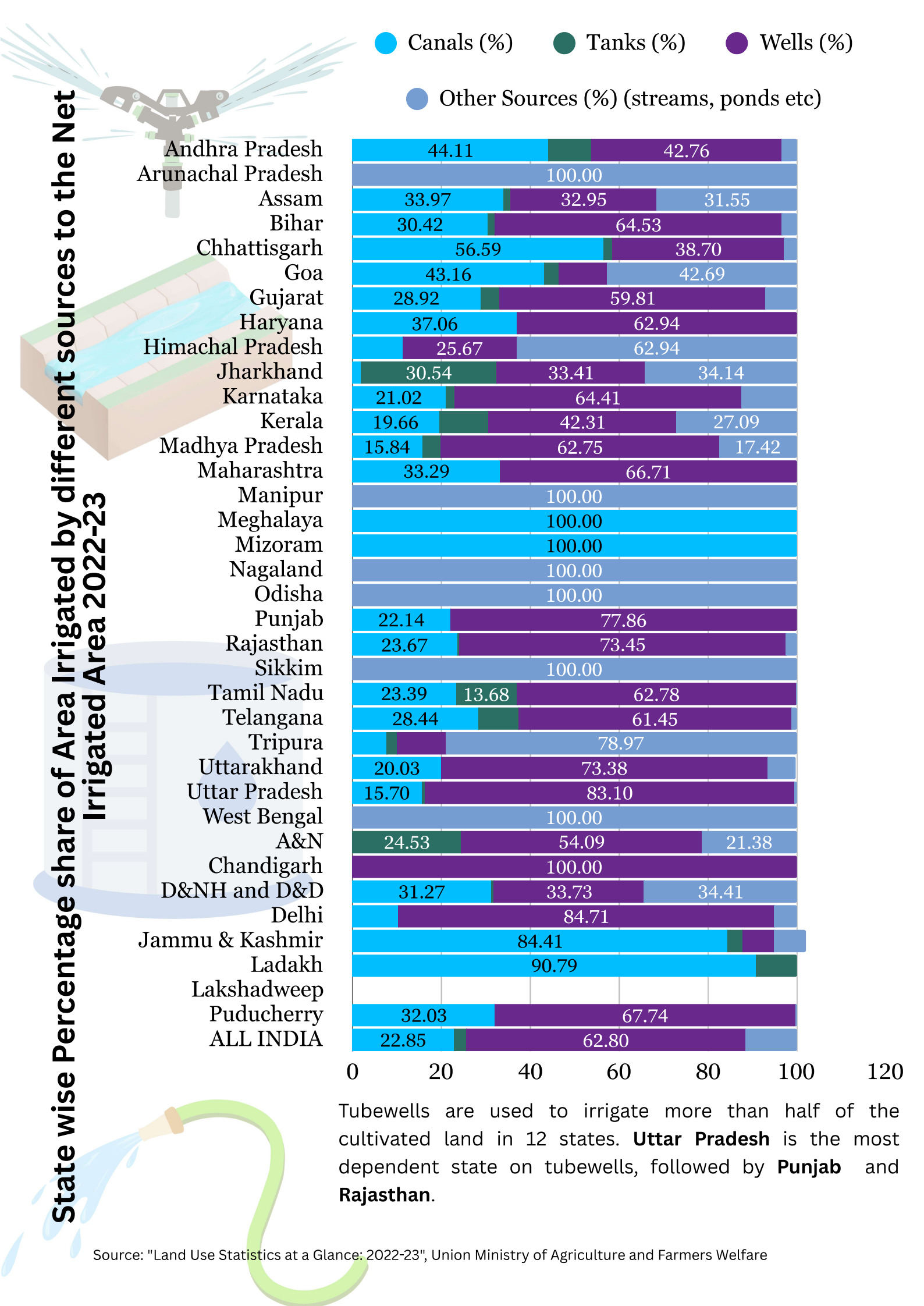
Irrigation Dependence



Over a **dozen States/UTs** surpass the national average of **56.37%** for the ratio of net irrigated to net sown area

Source: "Land Use Statistics at a Glance: 2022-23", Union Ministry of Agriculture and Farmers Welfare

State wise Percentage share of Area Irrigated by different sources to the Net Irrigated Area 2022-23



Tubewells are used to irrigate more than half of the cultivated land in 12 states. **Uttar Pradesh** is the most dependent state on tubewells, followed by **Punjab** and **Rajasthan**.

Source: "Land Use Statistics at a Glance: 2022-23", Union Ministry of Agriculture and Farmers Welfare

Soil health Crisis

Under the Soil Health Card scheme, soils are classified as deficient in macronutrients (N, P, K, organic carbon) if levels are “very low,” “low,” or “medium,” and considered sufficient if levels are “high” or “very high.”

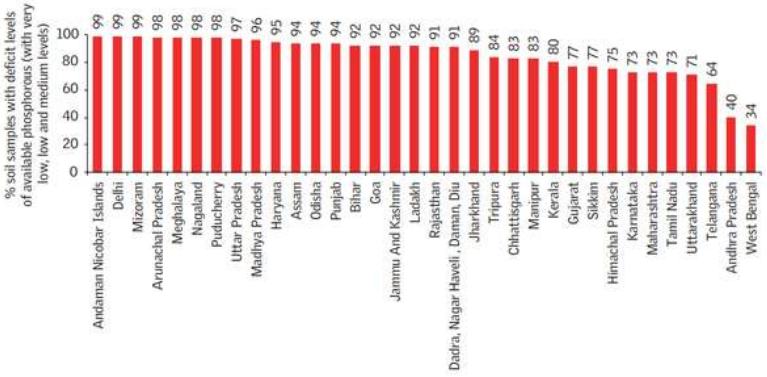
Organic carbon deficiency in soils of states and Union territories

Organic carbon deficiency is widespread in India: 24 states/UTs have over 50% of their soil samples deficient, and **seven of these report over 90% deficiency—Haryana being the worst affected, followed by Punjab, Uttar Pradesh, Rajasthan, Tamil Nadu, Mizoram, and the Andaman & Nicobar Islands**

Deficiency of available nitrogen in soils of states and Union territories

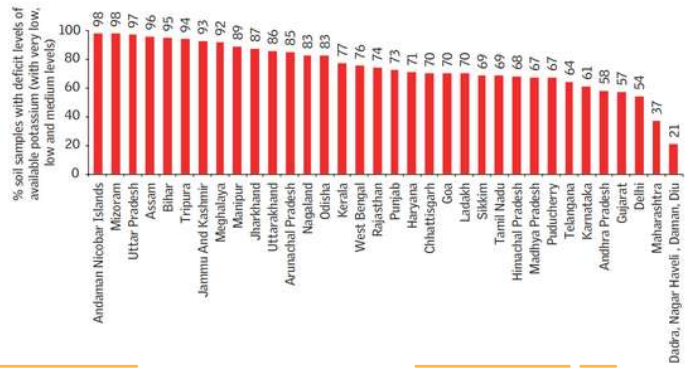
Nitrogen deficiency in Indian soils is widespread: 32 states/UTs have it in at least half their samples, **27 of those have over 90% deficient**, and 15 report deficiency in nearly all (99–100%) samples

Deficiency of available phosphorus in soils of states and Union territories



Phosphorus deficiency affects over half the soil samples in 32 Indian states/UTs, with **19 of them showing deficiency in more than 90% of samples.**

Deficiency of available potassium in soils of states and Union territories

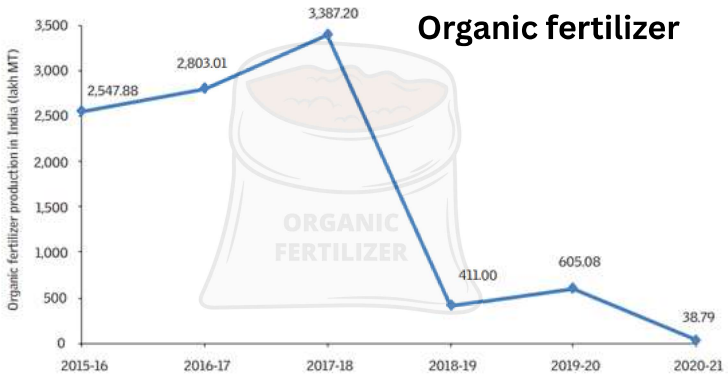


About 71% of Indian soil samples are deficient in potassium, with 32 states/UTs showing deficiencies in at least half their samples, and **8 of these having over 90% of samples affected.**

Organic fertilizer output in India skyrocketed from 2,547 lakh tonnes in 2015–16 to 3,387 lakh tonnes by 2017–18, then crashed by **99% to just 38.8 lakh tonnes by 2020–21**—driven by low demand, quality issues, and minimal government support.

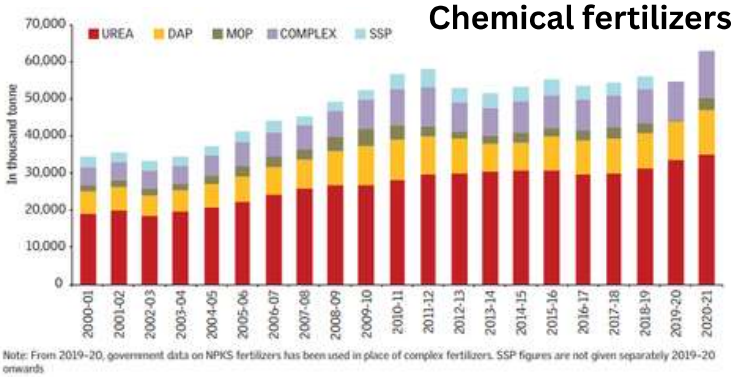
India’s fertilizer use jumped from 92 kg/ha in 2000–01 to 161 kg/ha by 2020–21—a **75% increase**—primarily driven by heavy government subsidies favoring chemical over organic fertilizers.

Organic fertilizer



Source: Lok Sabha unstarred question 1,656, 2 July 2019, Ministry of Agriculture and Farmers' Welfare, Government of India (for 2015–16 to 2017–18 data); Lok Sabha unstarred question 2,184, 10 December 2021, Ministry of Agriculture and Farmers' Welfare, Government of India (for 2018–19 to 2020–21 data)

Chemical fertilizers

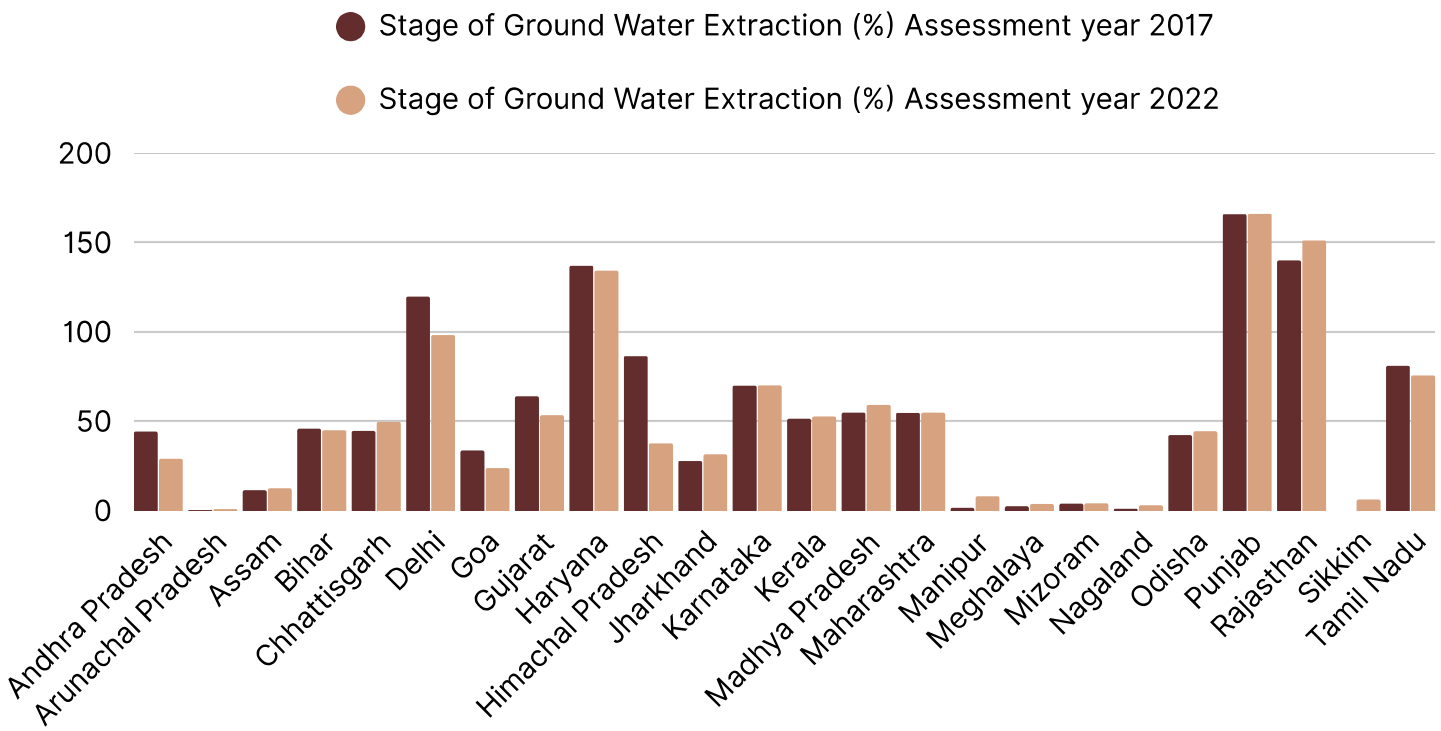


Note: From 2019-20, government data on NPKS fertilizers has been used in place of complex fertilizers. SSP figures are not given separately 2019-20 onwards

Source: Study of system of fertilizer subsidy, fifth report, Standing Committee on Chemicals and Fertilizers (2019-20), March 2020, Seventeenth Lok Sabha. Data for 2019-20 onwards is sourced from Lok Sabha unstarred question 2,119, 10 December 2021, responded to by Ministry of Chemicals and Fertilizers, Government of India

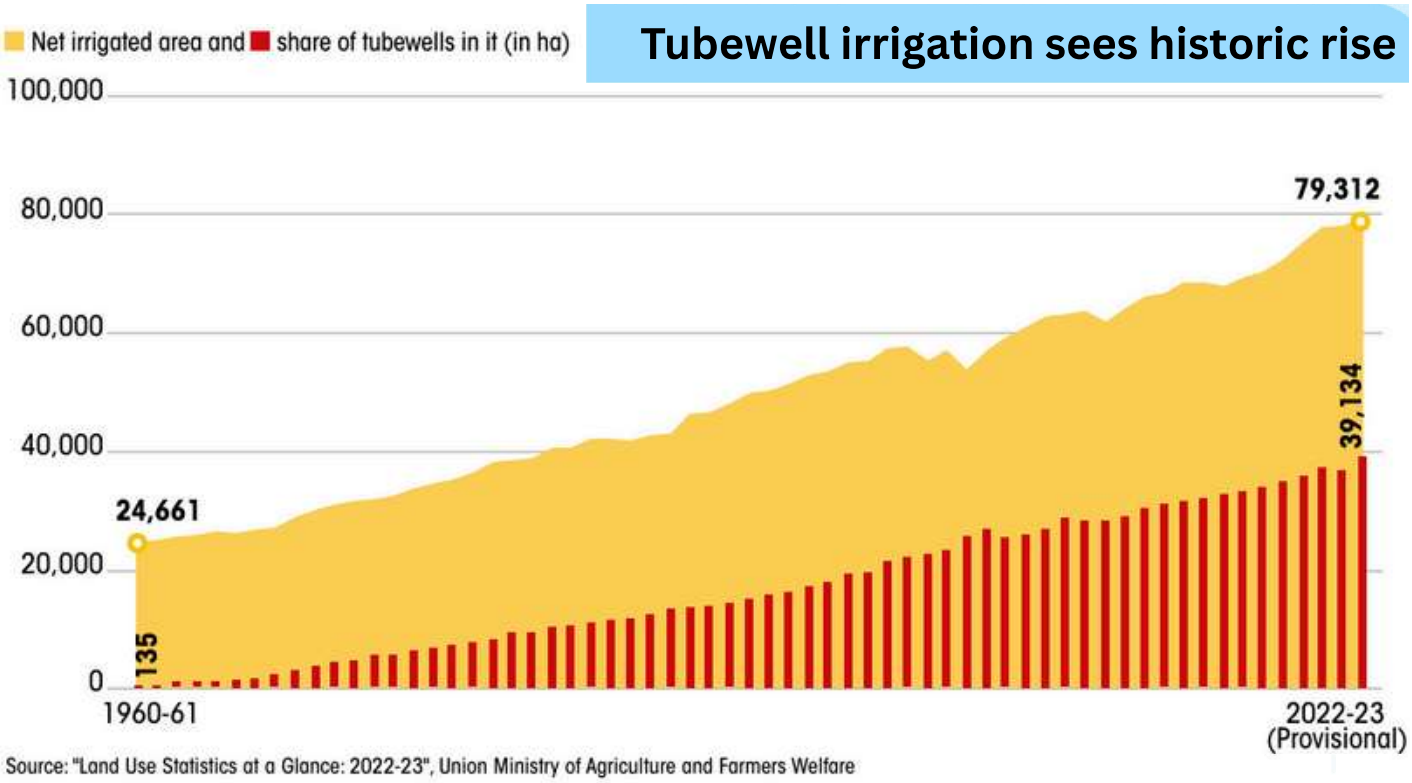
Source: Soil Health Card (SHC) scheme, Union Ministry of Agriculture and Farmers’ Welfare, India

Overexploitation of Groundwater



*States like **Punjab (165.99%), Rajasthan (151.07%), and Haryana (134.14%)** show critical groundwater overuse, threatening long-term sustainability. In contrast, **Arunachal Pradesh (0.79%), Nagaland (2.89%), and Meghalaya (3.55%)** exhibit low extraction, indicating relatively sustainable use.*

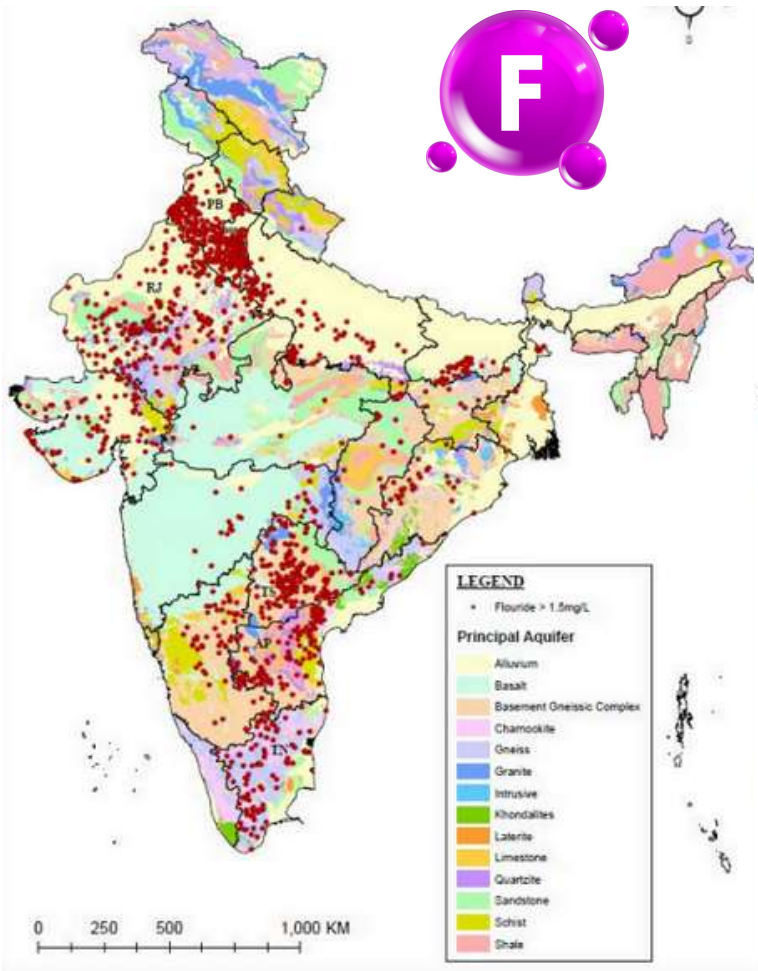
Tubewell irrigation sees historic rise

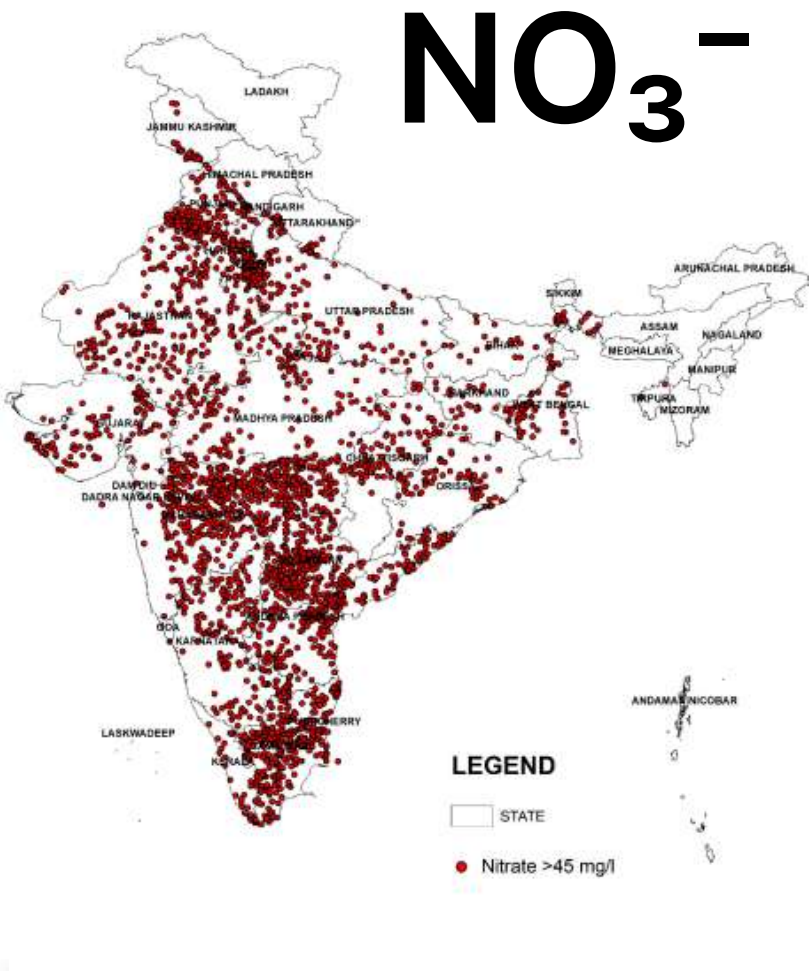


Source: "Land Use Statistics at a Glance: 2022-23", Union Ministry of Agriculture and Farmers Welfare

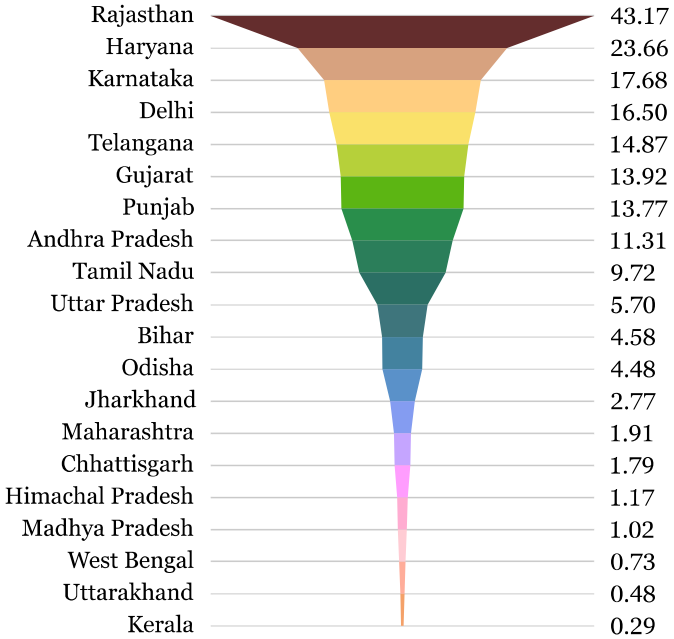
Tubewell irrigation surged from 0.55% in 1960–61 to a record 43.34% in 2022–23 — the highest in 70 years

Contamination in Groundwater

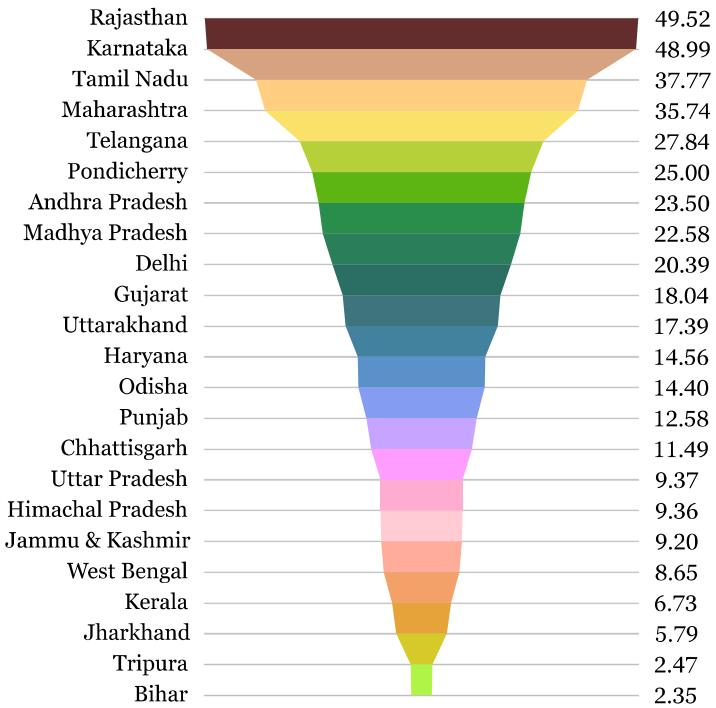




Locations having Fluoride concentration >1.5 mg/L during Pre-Monsoon 2023



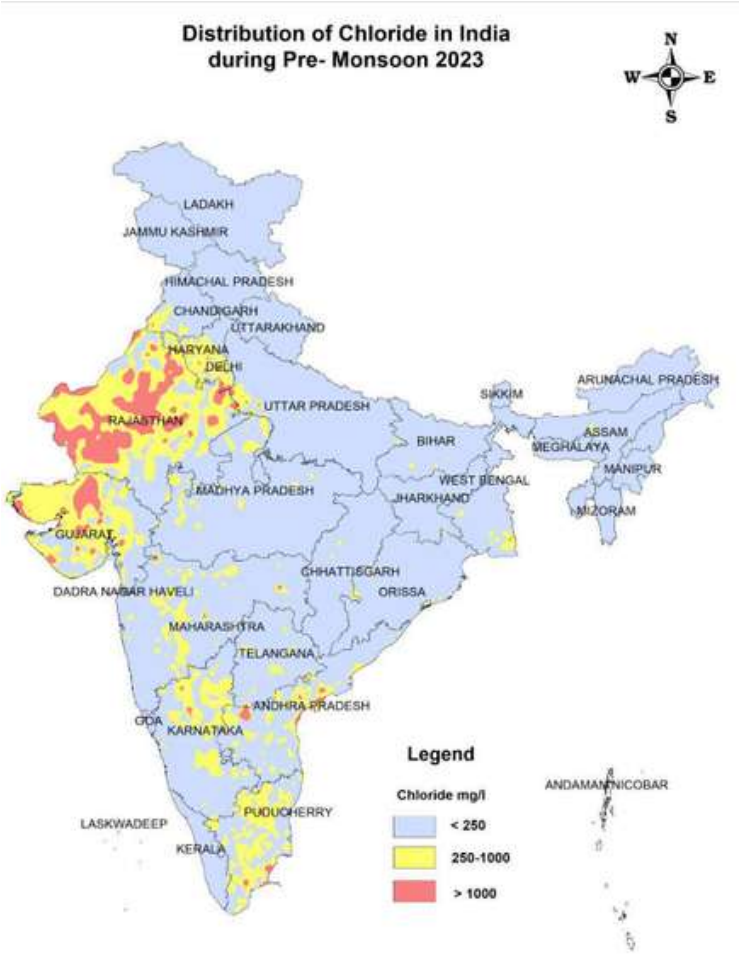
Locations having Nitrate concentration > 45 mg/L during Pre monsoon 2023

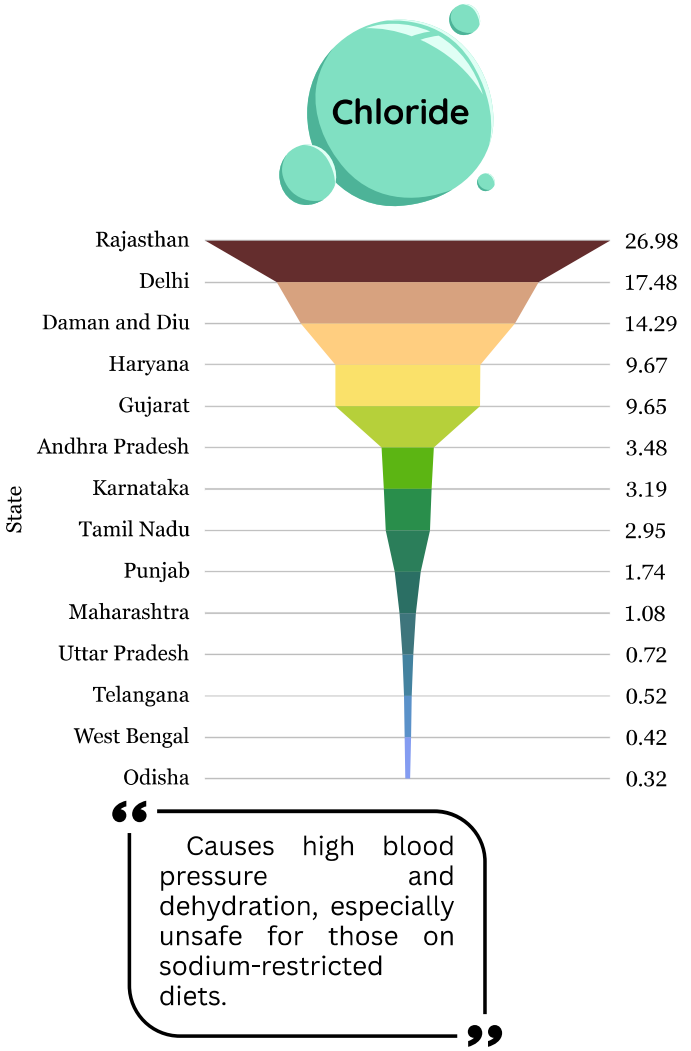


Excessive exposure to Fluoride causes:

1. Dental Fluorosis
2. Skeletal Fluorosis
3. Thyroid malfunctions
4. Abnormalities in babies born to women with Fluorosis

"Nitrate contamination may cause **birth defects in infants, thyroid complications and certain types of cancers.**"





https://cgwb.gov.in/cgwbpnm/public/uploads/documents/17363272771910393216file.pdf

Key Government Initiatives for Groundwater Management

Initiative	Focus Area	Key Objective
NAQUIM (CGWB)	*Aquifer mapping & management*	*Identify and manage groundwater aquifers*
Master Plan 2020	*Artificial recharge (rural & urban)*	*Enhance recharge in water-scarce areas*
Jal Shakti Abhiyan	*Conservation & source sustainability*	*Promote recharge, watershed, and afforestation efforts*
Atal Bhujal Yojana	*Community-based groundwater use in stressed areas*	*Demand-side management with local participation*

National Mission for Sustainable Agriculture
Department of Agriculture & Farmers Welfare
Ministry of Agriculture & Farmers Welfare, Government of India

The National Mission for Sustainable Agriculture (NMSA), launched under the National Action Plan on Climate Change, aims to enhance agricultural productivity, particularly in rainfed regions, by promoting integrated farming systems, efficient water management, soil health, and climate resilience.

Component	Objective
Rainfed Area Development (RAD)	Enhance productivity and resilience in rainfed regions through integrated farming
On-Farm Water Management (OFWM)	Improve water use efficiency at the farm level
Soil Health Management (SHM)	Improve soil fertility via balanced nutrient management
Climate Change & Sustainable Agriculture: Monitoring, Modeling & Networking	Strengthen climate resilience through data, modeling, and networking

National Green Tribunal (NGT) orders (2022–2025) related to Groundwater management and Agriculture in India:

S. No.	Issue	Date	NGT Action	Key Outcome
1	**Illegal Borewells in Delhi**	May 1, 2025	Directed sealing of unauthorized borewells; 15,962 sealed; 4,033 untraceable	₹1.2 crore collected in penalties; new borewell policy under development
2	**Groundwater Contamination in Punjab**	Mar 1, 2024	Took suo motu cognizance of agricultural runoff polluting groundwater	Ordered demarcation of contaminated sources; mandated provision of safe water
3	**Arsenic and Fluoride in Groundwater**	Dec 1, 2023	Issued notices to 24 states and 4 UTs over toxic groundwater contamination	Sought urgent preventive and protective measures from states and UTs
4	**Illegal Groundwater Extraction in Haryana**	Mar 1, 2023	Sought factual report on unauthorized groundwater use by industrial unit	Directed joint committee to assess violations and recommend remedial actions
5	**Illegal Groundwater Extraction in Prayagraj**	Oct 1, 2024	Ordered district magistrate to address unauthorized groundwater extraction	Mandated action within 60 days; emphasized enforcement of groundwater regulations
6	**Groundwater Use at Construction Sites in Haryana**	Jul 1, 2023	Directed formation of committee to inspect groundwater use at construction sites	Aimed to prevent illegal extraction in overexploited areas
7	**Groundwater Extraction Based on EIA**	Jul 1, 2020	Called for Environmental Impact Assessments (EIA) before granting extraction permissions	Emphasized need for water mapping and management plans in overexploited areas

S. No.	Issue	Date	NGT/Court Action	Key Outcome
1	**Stubble Burning (Punjab)**	May 1, 2025	Monitored ₹500 Cr plan implementation	Promoted bio-decomposer, mechanization, and ex-situ solutions
2	**Air Pollution & Crop Residue**	Dec 1, 2023	Directed 53 cities to submit action plans	Included agricultural residue in city-level pollution control measures
3	**Soil Health via Waste Use**	Feb 1, 2024	Directed states to promote composting of municipal waste	Encouraged reuse as organic fertilizer to improve soil fertility
4	**Wastewater in Irrigation**	Mar 1, 2024	NGT flagged untreated sewage use in irrigation (UP, MP)	Ordered treatment before use to protect crop safety and soil quality
5	**Pesticide Pollution**	Apr 1, 2023	NGT sought reports on pesticide runoff in rivers	Urged stricter agrochemical use guidelines near water bodies
6	**Fertilizer Overuse (Punjab)**	Aug 1, 2023	High Court raised concern on nitrate levels in groundwater	Pushed for balanced nutrient management and soil testing-based fertilizer use

Audit Assessment Checklist

1. Composite Index of Agricultural Sustainability
Audit Focus: Crop diversity, credit access, irrigation, climate resilience
- Are states promoting diverse, sustainable cropping patterns?
- Is infrastructure (storage, irrigation) equitably developed across agro-climatic zones?
- Are credit and insurance schemes reaching marginal farmers?

Schemes: PMKSY, RKVY, NICRA
Example: Rajasthan lowest (0.42); Kerala, Tamil Nadu score higher.
Audit Checks:
- Check agricultural department reports on crop rotation, cropping intensity
- Verify credit access data from banks and cooperative societies
- Interview farmers on irrigation support and climate adaptation practices
- Compare district-wise sustainability scores if available

2. Agriculture Budget, Expenditure & Output
Audit Focus: Link budget with output growth and outcomes
- Are fund allocations under agri schemes translating into measurable yield/income growth?
- Is there transparency in expenditure across districts?

Schemes: RKVY, NMSA, Agri Infrastructure Fund
Example: 3% agri output growth (2001–21) vs. 7% in non-agri.
Audit Checks:
- Cross-check fund utilization with physical outputs (acreage, productivity)
- Compare DPRs, UCs (Utilization Certificates) with ground-level results

3. Post-Harvest Losses & Cold Storage
Audit Focus: Infrastructure gaps, value chain efficiency
- Is cold chain infrastructure available for livestock and perishables?
- Are farmer collectives supported for storage/processing?

Schemes: PM Kisan SAMPADA, MIDH
Example: ₹1.52 lakh crore losses in 2020–21; 21.7% from livestock.
Audit Checks:
- Inspect availability and distance of cold storage from production sites
- Assess usage logs of existing storage units (are they underutilized?)
- Survey farmers on post-harvest losses, especially in livestock and fruits

4. Shrinking Farmland
Audit Focus: Land use conversion, digital tracking
- Is farmland being diverted for non-agri use without proper approvals?
- Are digital land records updated to reflect land use change?
- **Schemes:** DILRMP, NRLM

Example: Farmland fell from 62.33% (1952) to 58.69% (2023).
Audit Checks: Review satellite data and revenue records for land use conversion

5. Declining Millet Cultivation
Audit Focus: Promotion, procurement, nutrition linkage
- Are millet cultivation and marketing supported in dryland zones?
- Are millet-based meals promoted in nutrition schemes?

Schemes: National Millet Mission, POSHAN Abhiyaan
Example: Millet area declined from 27.5M ha to 12.4M ha.
Audit Checks: Review procurement records and MSP coverage for millets

6. Pesticide Residues in Food
Audit Focus: Testing, awareness, enforcement
- Are adequate food samples tested for pesticide residues?
- Are safe alternatives like biopesticides promoted?

Schemes: FSSAI standards, NHM, NMSA (IPM)
Example: 3.5% of samples exceeded limits.
Audit Checks:
- Visit food testing labs and check number of samples tested annually
- Review awareness and training materials distributed to farmers

7. Irrigation Dependence & Groundwater Stress
Audit Focus: Source mapping, water-use efficiency
- Are tubewells overused in vulnerable states?
- Are water-saving methods being adopted at scale?

Schemes: PMKSY, Atal Bhujal Yojana
Example: Groundwater overdrawn in Punjab (166%), Rajasthan (151%).
Audit Checks:
- Verify percentage of tube well vs. surface irrigation in blocks
- Inspect if micro-irrigation (drip/sprinkler) units are functional
- Assess implementation of groundwater recharge works

8. Soil Health Crisis
Audit Focus: Nutrient status, organic input use
- Are farmers using Soil Health Cards to guide fertilizer use?
- Is organic carbon content monitored regularly?

Schemes: Soil Health Card, INM, PKVY
Example: >90% samples N-deficient in 27 states; 99% fall in organic fertilizer.
Audit Checks:
- Sample and review Soil Health Cards issued to farmers
- Inspect local compost units and organic input production centers
- Interview farmers: are they aware of nutrient deficiencies & recommended doses?

9. Groundwater Over-Exploitation
Audit Focus: Extraction regulation, sustainable irrigation
- Are critical and overexploited blocks identified and regulated?
- Is treated wastewater being reused for irrigation?

Schemes: CGWA norms, Atal Bhujal Yojana
Example: Tubewell use rose from 0.55% to 43.34% of net irrigated area.
Audit Checks:
- Review records of new borewell registrations and permission status
- Check for water metering, groundwater level monitoring systems
- Inspect agricultural fields: observe spacing, tube well density

10. Water Contamination (Fluoride, Nitrate, Chloride)
Audit Focus: Drinking water safety, public health
- Are contaminated zones mapped and monitored?
- Are households provided access to clean water alternatives?

Schemes: Jal Jeevan Mission, NGT Compliance
Example: Fluoride >1.5 mg/L in 27% of Rajasthan locations.
Audit Checks:
- Collect sample water test reports from PHED and health department
- Interview residents on health symptoms linked to water quality

11. NGT Orders Compliance (2022–2025)
Audit Focus: Pollution control, sustainable practices
- Are NGT directives on stubble burning, borewell use, etc. implemented?
- Are local administrations tracking and reporting actions?

Schemes: CPCB guidelines, CGWA, state action plans
Example: Orders on illegal borewells, stubble burning (Punjab, Haryana).
Audit Checks:
- Collect compliance status reports from Pollution Control Boards
- Visit sites with past violations (e.g., illegal borewells, stubble fields)
- Assess IEC (Information, Education, Communication) done locally

AIR QUALITY MANAGEMENT

International Centre for Environment Audit and Sustainable Development

Why to Audit, Air Quality Management?

1. Air Pollution: The Silent Killer

- 7 Million Deaths every year in the world, including 2 Million deaths in South-east region.
- From 2021 to 2025, 13 of 26 state capitals faced poor air quality at least once every three days.
- Residents in 18 of 28 state capitals face higher life expectancy loss from air pollution than state averages—e.g., Lucknow loses 6.5 years v/s UP's 5.9 years.

2. Monitoring Stations required v/s Monitoring Stations exist in India

- India's current air monitoring coverage is only **6–8%** of the recommended level (IS 5182: Part 14).
- Severe shortfalls in PM2.5, PM10, SO_2, NO_2, CO, and O_3 monitors across regions.

3. EV Penetration

- Over 3.4 million EVs registered between 2019–2024.
- EVs form ~3.4% of all new vehicle registrations.
- Delhi, Karnataka, and UP lead the adoption curve.

4. Steps Toward Cleaner Air

- FAME-II policy, mechanical sweeping, anti-smog guns, water sprinkling, CRM schemes, Standards for SO_2/NO_x, FGD mandate, CEMS

5. NCAP (National Clean Air Programme) Performance

- PM 2.5 Pollutant level in **Kota, Chandrapur and Nagpur** has been increased by more than 40 percent whereas there is improvement in cities like Varanasi and Patna.
- 131 cities covered: Some saw PM2.5 reduction, but issues remain.

6. Underutilization of Funds: Tracking the Fight Against Air Pollution

- ₹19,612 crore allocated (2019–2025), but only ~57% utilized for NCAP.
- In 2024–25, less than 1% of the ₹858 crore budget was used for the Control of Pollution Scheme.
- NCAP fund- In 2023, ₹4,974 crore was spent mainly on road dust (64%), biomass burning (14.5%), and vehicles (12.6%), with **just 0.6% on industry** and ~6% on capacity building, highlighting **industrial emissions remain under-addressed**.

7. NGT orders on Air Quality Management

- SO_2 checks on thermal plants, oversight of Punjab's ₹500 Cr stubble plan, GRAP enforcement in Delhi-NCR, DPCC staffing fix, firecracker ban monitoring, and CPCB directives on odour & VOC standards.

8. Audit Reports: Performance Audit reports of Air Pollution in Gujarat (first time) and Delhi

9. A case study in Billaua, Gwalior

- Billaua, Gwalior, with **47 stone crushing units**, recorded PM10 levels of **313–784 µg/m³**—far above national limits—and a health survey linked the pollution to respiratory and related **health issues**.

What is Air Quality?

Air quality refers to the state of the atmosphere, particularly in terms of the presence and levels of pollutants. It's a measure of how clean or polluted the air is, and it can have significant impacts on human health and the environment.

The Air Quality Index (AQI) in India, as developed by the Central Pollution Control Board (CPCB), is calculated using the concentrations of key pollutants measured over a specified averaging period. These pollutants include PM10, PM2.5, NO_2, SO_2, CO, O_3, NH_3, and Pb (lead).

MAJOR SOURCES OF AIR POLLUTION

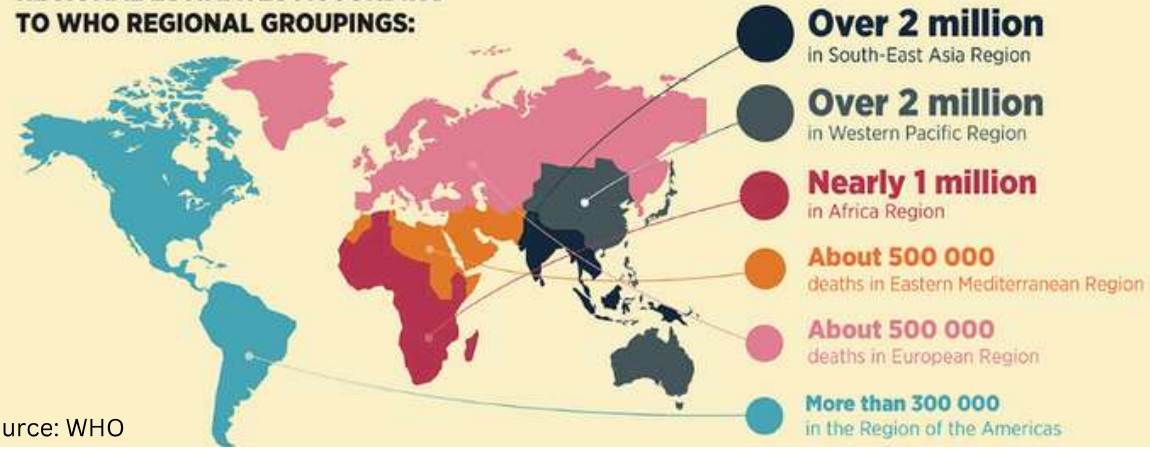
AIR POLLUTION – THE SILENT KILLER

Every year, around **7 MILLION DEATHS** are due to exposure from both outdoor and household air pollution.

Air pollution is a major environmental risk to health. By reducing air pollution levels, countries can reduce:

- **Stroke**
- **Heart disease**
- **Lung cancer, and both chronic and acute respiratory diseases, including asthma**

REGIONAL ESTIMATES ACCORDING TO WHO REGIONAL GROUPINGS:



- **Over 2 million** in South-East Asia Region
- **Over 2 million** in Western Pacific Region
- **Nearly 1 million** in Africa Region
- **About 500 000** deaths in Eastern Mediterranean Region
- **About 500 000** deaths in European Region
- **More than 300 000** in the Region of the Americas

Source: WHO

The Health Price of Dirty Air

$6 trillion in annual global health costs.

Source: World Bank.

5% reduction of global GDP, due to health impacts, lost productivity and reduced life expectancy.

Source: World Bank.

1.2 billion work days lost globally each year, which could reach 3.8 billion days by 2060.

Source: OECD

Shortening of Average Life Expectancy

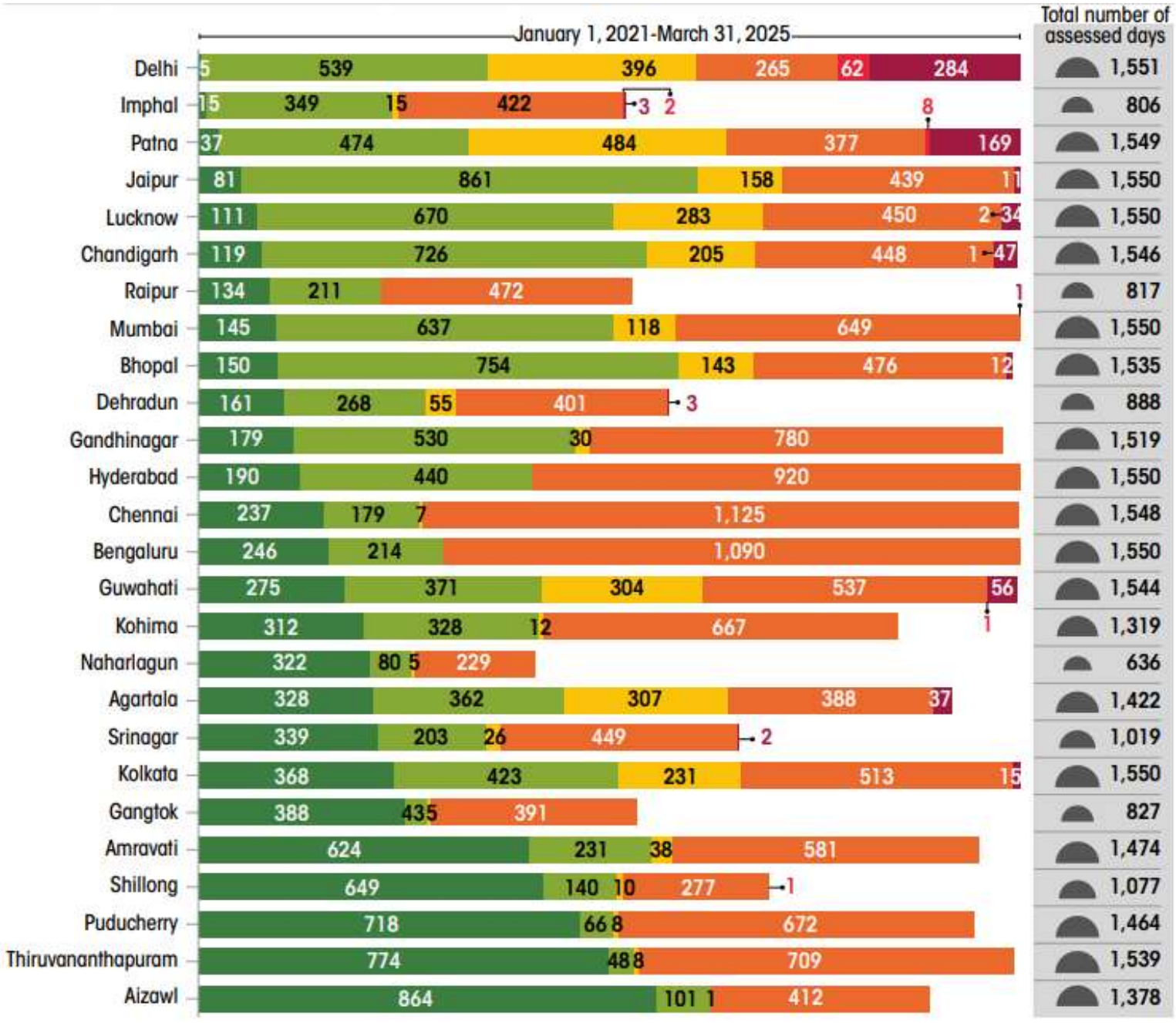
Residents in the capital cities of **18 out of 28** states face greater potential life expectancy losses due to air pollution than their statewide averages. For example, someone in **Lucknow district** could lose about 6 years 5 months, compared to the Uttar Pradesh average of 5 years 11 months.

Toxic Air in State Capitals

Source: district-level Air Quality Life Index (AQLI) released by Energy Policy Institute at the University of Chicago, US, released in 2024.

Between January 1, 2021, and March 31, 2025, residents in **13 out of 26 evaluated state capitals** in India experienced air pollution levels categorized as moderate, poor, very poor, or severe on at least one out of every three days.

AQI	Colour code	Remark	Possible Health Impacts
0-50		Good	Minimal impact
51-100		Satisfactory	Minor breathing discomfort to sensitive people
101-200		Moderate	Breathing discomfort to the people with lungs, asthma and heart diseases
201-300		Poor	Breathing discomfort to most people on prolonged exposure
301-400		Very Poor	Respiratory illness on prolonged exposure
401-500		Severe	Affects healthy people and seriously impacts those with existing diseases

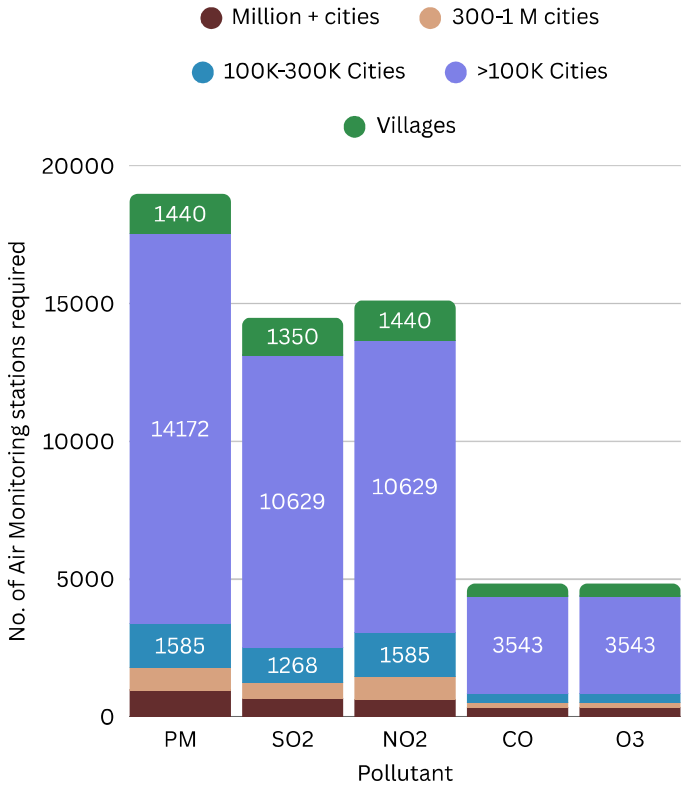


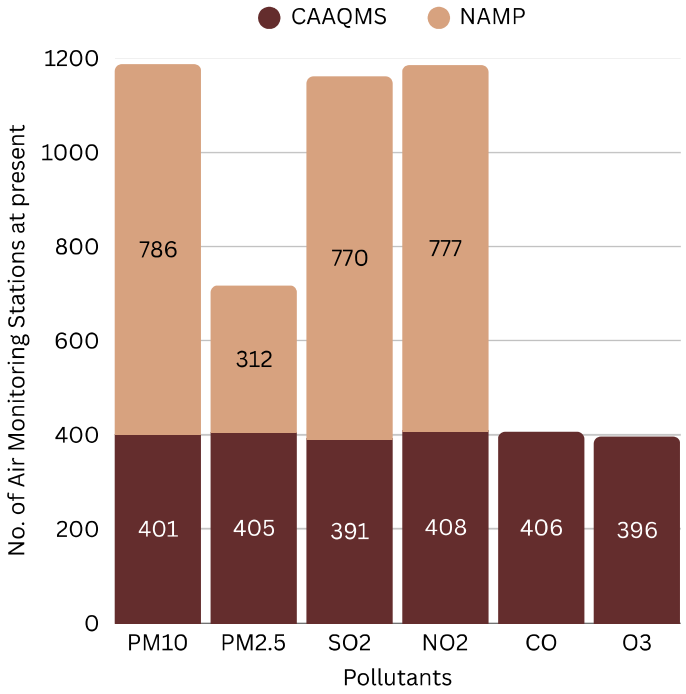
Data not available: Panaji (Goa), Shimla (Himachal Pradesh), Bhubaneshwar (Odisha), Sri Vijaya Puram (Andaman), Daman (Dadra); Leh (Ladakh), Kavaratti (Lakshadweep), Ranchi (Jharkhand). Source: National Air Quality Index, Central Pollution Control Board, accessed on June 1, 2025

Monitoring Stations required v/s Monitoring Stations existing in India

Air quality Monitoring is an exercise to measure pollutants in air.

Monitor pollutants like **PM10, PM2.5, NO_2, SO_2, CO, O3**

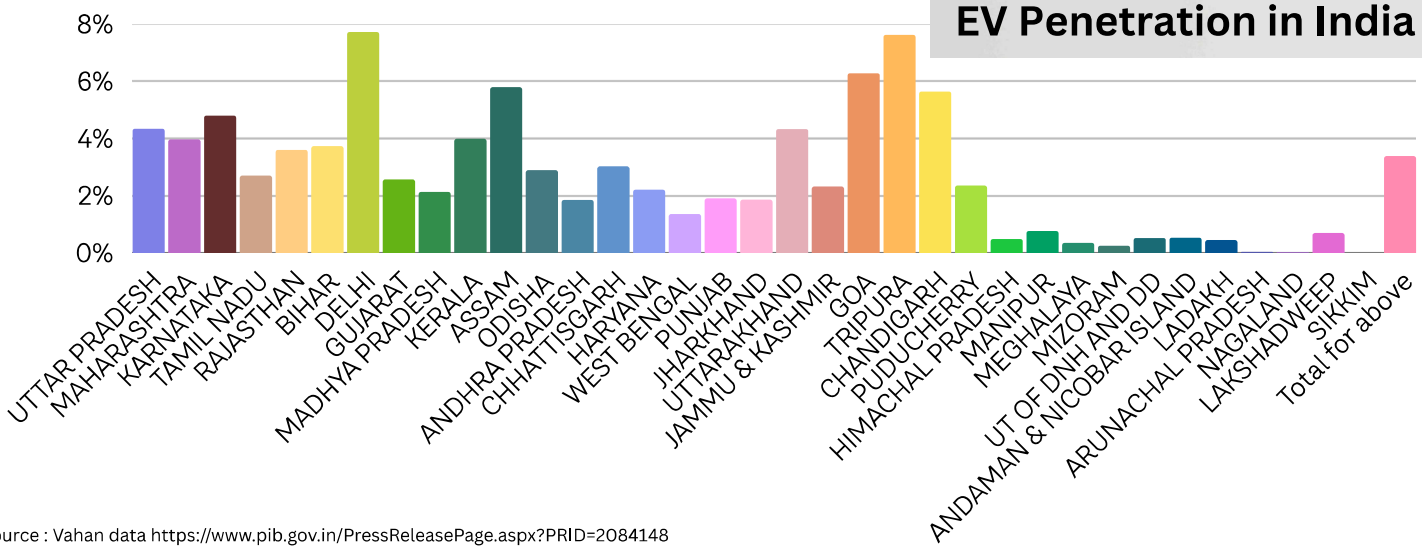




*The capacity of monitoring that exists in India as of 1 January 2023 barely adds up to **6-8 per cent** of the minimum monitoring recommended as per IS 5182: Part 14. There are only **1,187** PM10 monitors, **717** PM2.5 monitors, 1,161 SO2 monitors, 1,185 NO2 monitors, 406 CO monitors and 396 surface ozone monitors*

Source: https://www.cseindia.org/Note-AQM-Network-analysis.pdf

EV Penetration in India



Source : Vahan data https://www.pib.gov.in/PressReleasePage.aspx?PRID=2084148

*India's EV uptake has surged—from just over 3.4million vehicles registered between April 1, 2019, and March 31, 2024, EVs now make up roughly **3.4%** of all new registrations, with leading states like **Delhi, Karnataka, and Uttar Pradesh** recording the highest shares .*

Steps Toward Cleaner Air

Vehicular emissions

Leapfrogging from BS-IV to BS-VI fuel standards, Vehicle scrappage policy & RFID for ELVs, FAME-II

Industrial emission

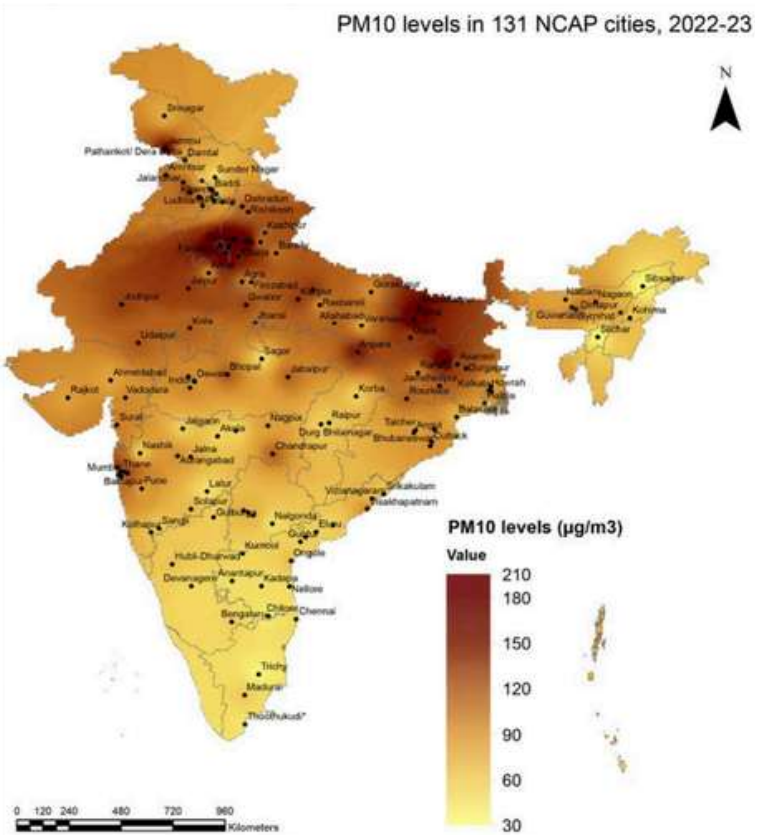
Standards for SO_2/NO_x, FGD mandate, CEMS, Ban on pet-coke/furnace oil in NCR

Dust & Construction

Mechanical sweeping, water sprinkling, anti-smog guns, C&D site regulation & green barriers (NCAP mandates),

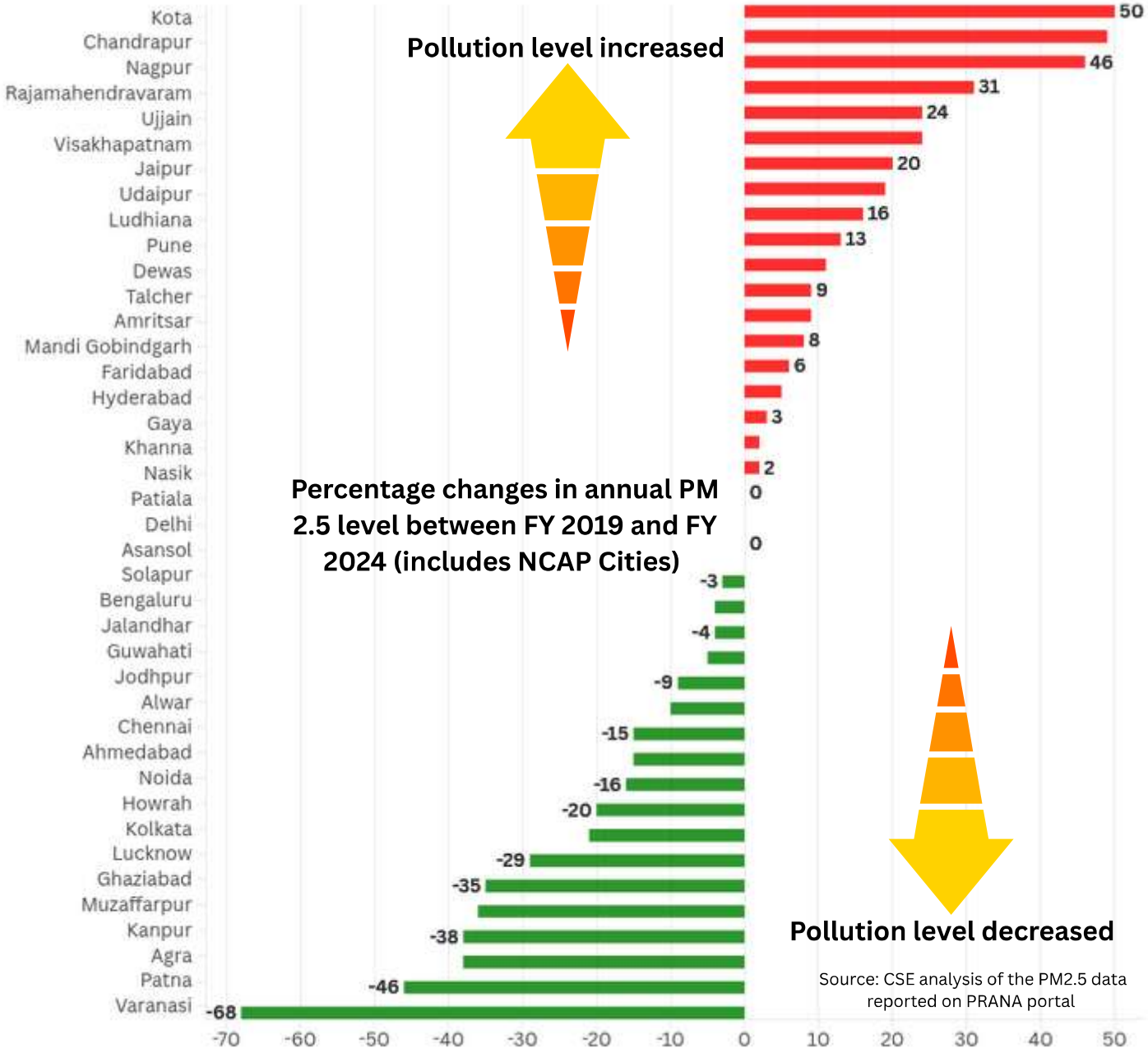
Crop residue burning

CRM schemes under SMAM/RKVY & Pusa bio-decomposer, Co-firing biomass in thermal plants, State initiatives (e.g., Punjab's ₹500 cr plan, UP portal)



Source: Created by CSE. Data based on PRANA Portal & Minutes of thirteenth meeting of implementation committee for National Clean Air Programme, CPCB, 26 June 2023

Air quality trends in non-attainment cities under the NCAP programme



Source: CSE analysis of the PM2.5 data reported on PRANA portal

Underutilization of Funds: Tracking the Fight Against Air Pollution

Air Pollution Expenditure in India

Financial Year	Scheme	Allocated Amount (₹ Crore)	Utilised Amount (₹ Crore)	Utilisation Rate
2024–25	Control of Pollution	858	7.22	<1%
2019–2025	NCAP (131 cities)	19,612	11,211	~57%
2019–2024	CPCB – EPC & EC Funds	826.56	160.29	~19%

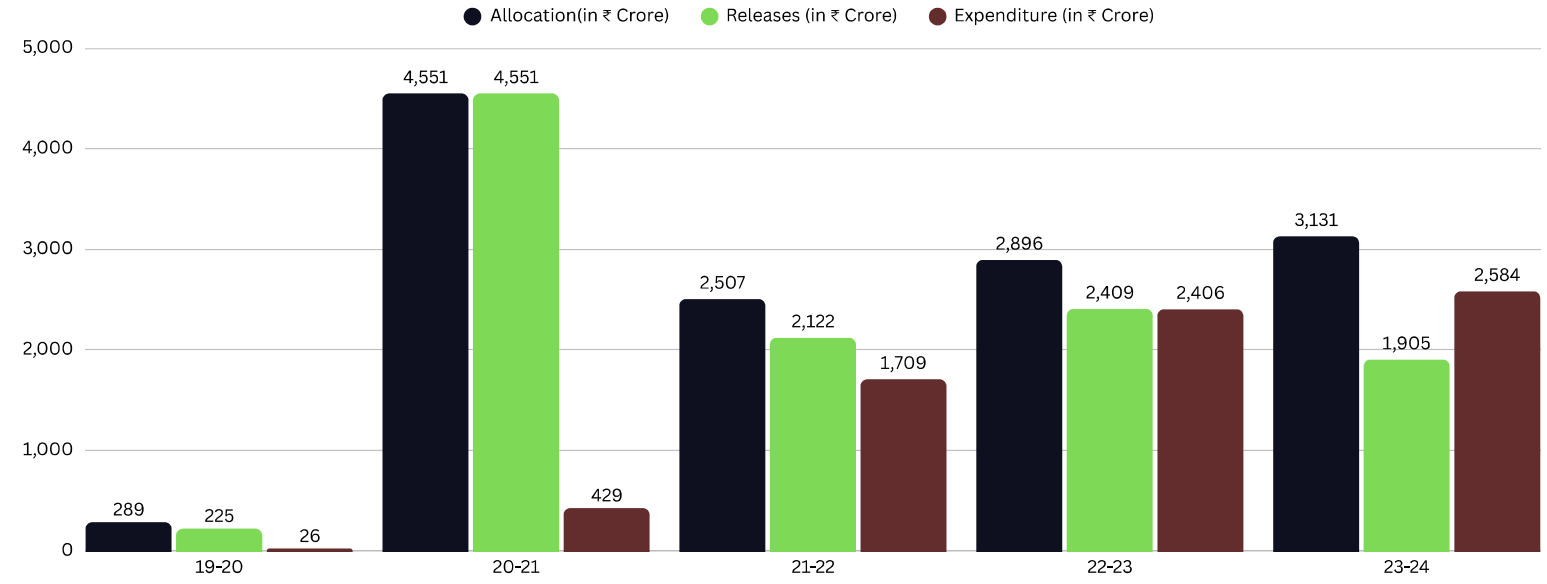
Source: Ministry of Environment, Forest and Climate Change

Only ₹7.22 crore utilized; underutilization attributed to pending approval for scheme continuation. (as on 31.1.2025)

Performance-based grants allocated; efforts include reducing PM10 levels and improving waste management.

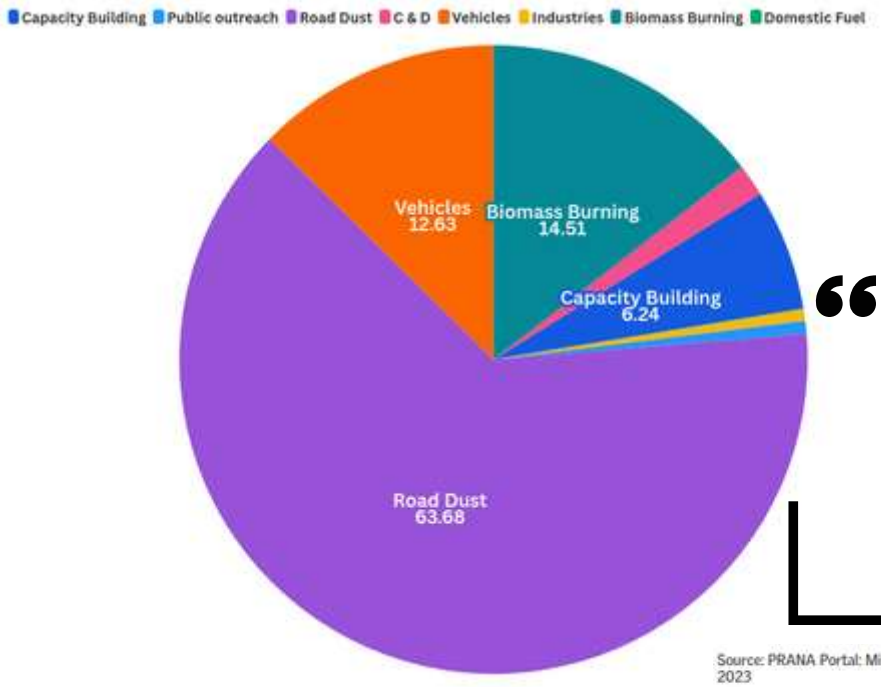
CPCB received ₹422.56 crore as Environment Protection Charge and ₹404 crore as Environmental Compensation; utilization remained low.

Low Expenditure under NCAP



Allocations, releases, and expenditures under the NCAP

Source: RTI Response by CPCB dated 1 January 2025. (2) XV Finance Commission Report for 21-26 (October 2020)



Sector-wise fund utilized in 131 NCAP cities (2023)

In 2023, Nearly ₹4,974 crore was spent as follows:
64% on road-dust control
14.5% on biomass burning
12.6% on vehicles
0.6% on industry
~6% on capacity building
This shows industrial emissions are barely addressed and household solid fuels aren't even on the agenda.

Source: PRANA Portal: Minutes for 15th Meeting of Implementation Committee for National Clean Air Programme, 24 November 2023

NGT orders on Air Quality Management (2022–2025)

S. No.	Issue	Date	NGT Action	Key Outcome
1	**Thermal Power Plant Emissions (Delhi-NCR)**	Nov 1, 2024	Suo motu notice to Centre over SO_2 emissions	Highlighted need for stricter emission norms for TPPs
2	**Stubble Burning Control (Punjab)**	May 1, 2025	Monitored ₹500 Cr state action plan	Focus on bio-decomposer, machines, and ex-situ
3	**Graded Response Action Plan (GRAP) in Delhi-NCR**	Oct 1, 2024	Directed transparent staging and stricter enforcement	Ensured targeted action during poor AQI episodes
4	**DPCC Staffing Crisis (Delhi)**	May 1, 2025	Ordered state to fill critical pollution control vacancies	Staff shortfall dropped from 60% to 34%; SC mandated full fill
5	**Air Pollution in 53 Cities**	Dec 1, 2023	Sought city-wise action plans and underutilized fund status	Emphasized better use of NCAP & 15th Finance Commission grants
6	**Firecracker Pollution (MP, NCR)**	Nov 2023–24	Ordered state-wise monitoring of banned	Strengthened seasonal air quality enforcement
7	**Odour & VOC Pollution (Taloja MIDC, Maharashtra)**	Dec 1, 2024	Directed CPCB to develop standards for odour and volatile organic compounds	Laid groundwork for new regulatory category

Audit reports

Region/Report	Audit Focus	Key Findings
Report No. 2 of the year 2022 -Performance Audit on "Prevention and Mitigation of Vehicular Air Pollution in Delhi" (Tabled in 2025)	Vehicular Air Pollution	Inaccurate AQ data, weak enforcement of Odd-Even scheme, inadequate EV promotion, poor emission testing infrastructure
Report No. 02 of the year 2022 - Performance Audit of Air Pollution Control by Government of Gujarat	Air Pollution Control	Inadequate AQ monitoring, high PM10/PM2.5 levels, poor regulation of brick kilns and crushers, absence of emission control roadmap

Effect of Air Quality in vicinity of Stone crusher: A case study in Billaua, Gwalior

Air pollution from harmful emissions, including dust from crushing units, severely impact the environment and human health. **Billaua, Gwalior**, hosts **47 stone crushing units**, a major source of particulate matter (**PM10**) pollution. Monitoring at eight locations showed PM10 levels between **313.42 to 784.11 µg/m³** near the source, surpassing national limits. A health survey revealed **respiratory and other issues** among workers and nearby residents. Better dust control and regular air quality checks are essential. Full details can be found here.

Source: International Research Journal of Engineering and Technology (IRJET)

Audit Assessment Checklist

1. Air Pollution: The Silent Killer
Audit Focus: Health impact, air quality trends, urban exposure
Key Questions:

- Are AQI levels monitored and reported regularly in urban hotspots?
- Is public health surveillance linked to air quality data?
- Are vulnerable groups (children, elderly) protected via advisories and interventions?

Data Highlight:

- 7 million deaths annually from air pollution; Lucknow loses 6.5 years of life expectancy vs. UP's average of 5.9 years

Audit Checks:

- Compare AQI records and alert frequency across capital cities (2021–2025)
- Assess convergence between health department and pollution control boards
- Visit urban PHCs to review respiratory illness trends and record-keeping
- Evaluate communication of air quality advisories (apps, hoardings, mobile alerts)

2. Monitoring Stations: Gap Between Norms & Reality
Audit Focus: Adequacy of monitoring infrastructure, spatial coverage
Key Questions:

- Does the state meet CPCB standards for pollutant-specific monitoring?
- Are rural, industrial, and peri-urban regions covered?
- Standards: IS 5182: Part 14

Data Highlight: Only 6–8% of required coverage exists; PM2.5, SO_2, O_3 under-monitored
Audit Checks:

- Compare existing stations with prescribed norms by CPCB
- Verify station uptime, data integrity, and calibration logs
- Physically inspect under-reporting zones or regions with outdated sensors
- Review state action plans on expansion of air quality monitoring

3. EV Penetration
Audit Focus: E-mobility adoption, infrastructure readiness
Key Questions:

- Are EV incentives translating into adoption across vehicle segments?
- Is charging infrastructure expanding in sync with registrations?
- Data Highlight: 3.4M EVs (2019–24); ~3.4% of all new vehicle registrations

Audit Checks:

- Scrutinize EV registration data by vehicle type and region
- Inspect charging station availability and functionality (esp. in rural/urban fringe)
- Cross-verify FAME-II subsidy beneficiaries with vehicle ownership
- Interview RTOs and local bodies on EV adoption barriers and incentives

4. Steps Toward Cleaner Air
Audit Focus: Implementation of pollution control measures
Key Questions:

- Are mechanical sweepers, anti-smog guns, and CRM schemes functional and used regularly?
- Are emission control technologies (like FGDs, CEMS) installed in thermal plants?
- Schemes/Tools: FAME-II, SO_2/NOx standards, CRM

Audit Checks:

- Field-inspect CRM machine usage and maintenance records in NCR/pollution hotspots
- Review CEMS data logs submitted by industries for compliance
- Check deployment logs of smog guns, sprinklers, and sweepers by urban local bodies
- Examine CPCB audit reports of thermal plants for FGD installation

5. NCAP Performance (National Clean Air Programme)
Audit Focus: Impact tracking, pollution trend analysis, city compliance
Key Questions:

- Are cities showing actual pollutant reduction or just reporting expenditure?
- Are funds used for long-term outcomes or short-term visibility?
- Data Highlight: PM2.5 levels worsened >40% in Kota, Chandrapur, Nagpur

Audit Checks:

- Cross-check annual air quality trend reports with NCAP expenditure
- Review city-level CAPs (Clean Air Plans) for goal-setting and result tracking
- Interview local authorities on public engagement and grievance mechanisms
- Compare progress among high-performing vs low-performing NCAP cities

6. Underutilization of Funds: Air Pollution Expenditure Analysis
Audit Focus: Fund utilization vs. pollution reduction
Key Questions:

- Are NCAP funds spent as per priority pollutants and high-burden sectors?
- Are outcomes tracked against investments (e.g., reduction in dust, NOx)?
- Data Highlight: ₹19,612 Cr allocated (2019–25), only 57% utilized

Audit Checks:

- Review Utilization Certificates, DPRs, and tender records under NCAP
- Trace fund flow from MoEFCC to cities and verify actual implementation
- Audit fund split by source category (dust, transport, industry, etc.)
- Assess whether low-capacity ULBs received additional support for execution

7. NGT Orders on Air Quality Management
Audit Focus: Judicial directive compliance (state & CPCB)
Key Questions:

- Are NGT orders enforced on stubble, odour, thermal emissions, crackers?
- Are SPCBs sufficiently staffed and empowered to take enforcement action?

Examples: Orders on SO_2 controls, firecracker ban, DPCC staffing
Audit Checks:

- Review state action taken reports (ATRs) on NGT orders
- Conduct field inspection of stubble burning hotspots during key seasons
- Verify status of odour and VOC standards at waste/industrial sites
- Assess recruitment/staffing files of SPCBs and DPCCs

RENEWABLE ENERGY TRANSITION AND ENERGY EFFICIENCY

International Centre for Environment Audit and Sustainable Development

Why to Audit, Renewable Energy Transition?

Key Highlights

Green House Gas Emissions from Energy Industries

- In 2020, Energy industries are a major contributor in GHG emissions with 42.77 per cent contribution.

Renewable Energy Potential in India V/s Installed Renewable Energy Capacity

- As of March 2025, India has installed 220 GW of renewable energy which is only 10% of its estimated potential of 2,109.65 GW.

India's Energy Trade Balance

- While India exports excess energy it produces, to meet its domestic demands (peak hour demands) India imports electricity.

India's Journey to Energy Sufficiency

- Renewable energy forms 36% of total installed capacity but contributes less than 14% to actual electricity generation.

Energy Generation Review from Renewable Source

- Under PM-KUSUM, solar CUF has remained below the 19% eligibility mark for five years, trailing behind wind and hydro despite higher potential.

Issues with Renewable Energy Transition in India

- Cost Disparity: Indian-made solar modules cost over twice the global average (US¢20.2/Wp vs. US¢8.5/Wp).
- Tender Cancellations: 38.3 GW of RE capacity was cancelled between 2020–24.
- Tender Undersubscription: 8.5 GW of tenders were undersubscribed in 2024, five times higher than 2023.
- PSA Signing Delays: SECI's 12 GW solar tender remains unsigned nearly 5 years post-auction.

Energy Efficiency in India

- AT&C losses remain high at 19 per cent in 2023–24, with 13 states failing to meet RDSS targets.
- Transmission and Distribution (T&D) losses at 15 per cent persist.

Schemes and Policies -

- Low achievement against targets under National Solar Mission, PM KUSUM and RDSS.
- Outlay of Rs. 3.04 lakh crore for Revamped Distribution Sector Scheme (RDSS). (2021-26)
- Outlay of Rs. 10141.68 crore for Intra-State Transmission System (InSTS) Green Energy Corridor (GEC)-I scheme. (2015-16 to 2019-20)
- Outlay of Rs. 858 crore under National Bio-energy Program. (2021-26)
- Outlay of Rs. 34,422 crore under PM KUSUM Scheme. (2021-26)

DISCOM Health -

- DISCOMs reported a collective financial loss of ₹78,663 crore in 2023–24, driven largely by high operational costs.

Compliance with Renewable Purchase Obligations (RPOs)

- Compliance with RPOs remains inadequate.

C&AG Audit Report -

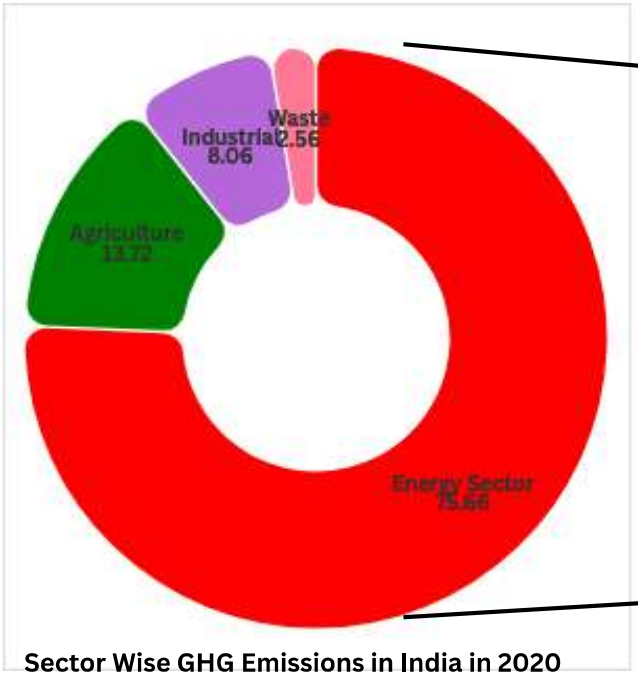
- Last C&AG Audit Report on Renewable Energy Sector of India was Report No. 34 of 2015 which covered period from 2007-08 to 2013-14.

India, the world's third-largest energy consumer, is undergoing a significant energy transition to meet its increasing energy demand and climate commitments. It has pledged:

- 500 GW of non-fossil fuel capacity by 2030
- 50% electricity from renewable sources by 2030
- Net-zero emissions by 2070

Green House Gas Emissions from Energy Industries

Source: UNFCCC

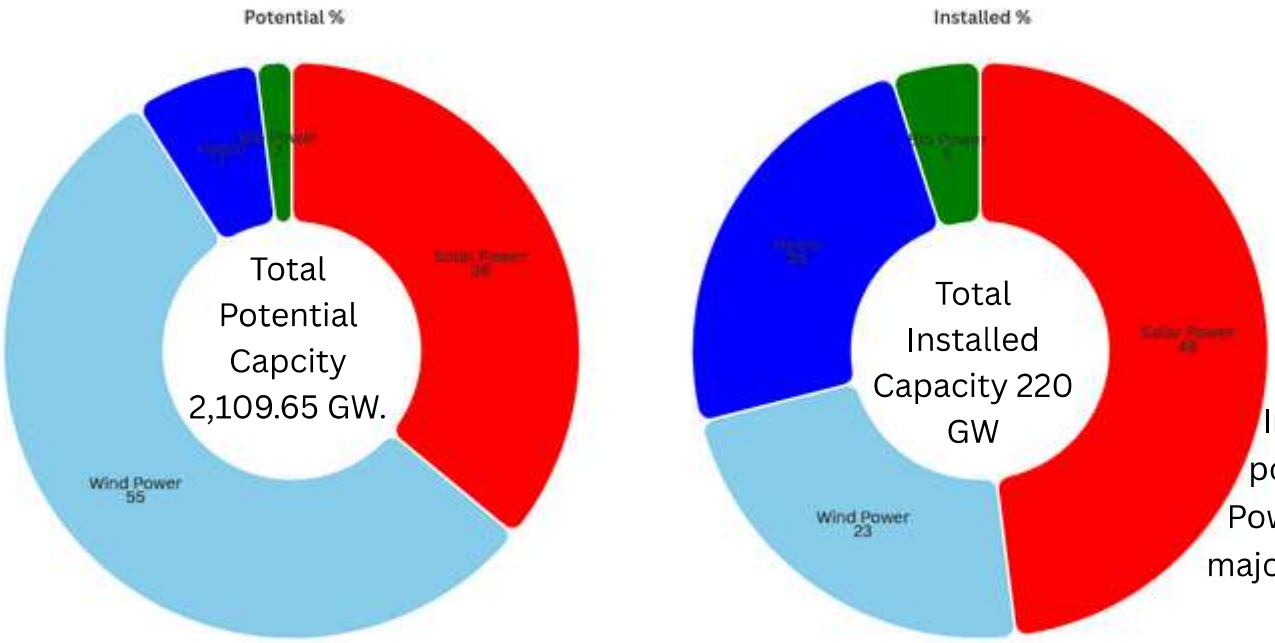


Sector Wise GHG Emissions in India in 2020

Energy Sector GHG Emissions in India in 2020

In 2020, Industries of Energy Sector contributed majorly towards green house emissions. Energy Industries (which encompasses all activities related to the production, distribution, and consumption of energy.) account for major green house gas emissions.

Renewable Energy Potential in India V/s Installed Renewable Energy Capacity

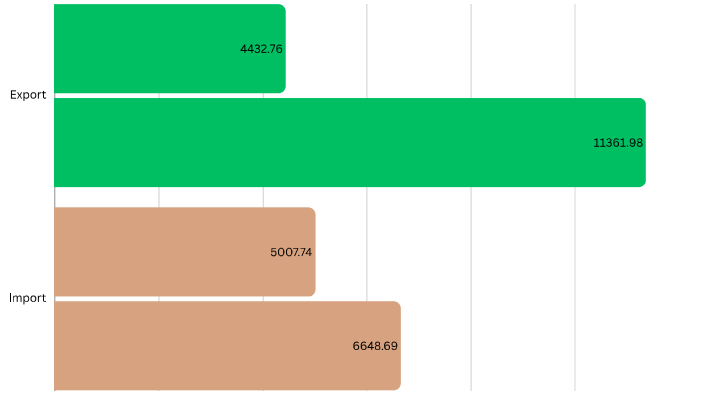


India has major potential in Wind Power, however, the major focus is towards Solar Power.

Renewable Energy Potential in India v/s Installed Capacity

India's Energy Trade Balance

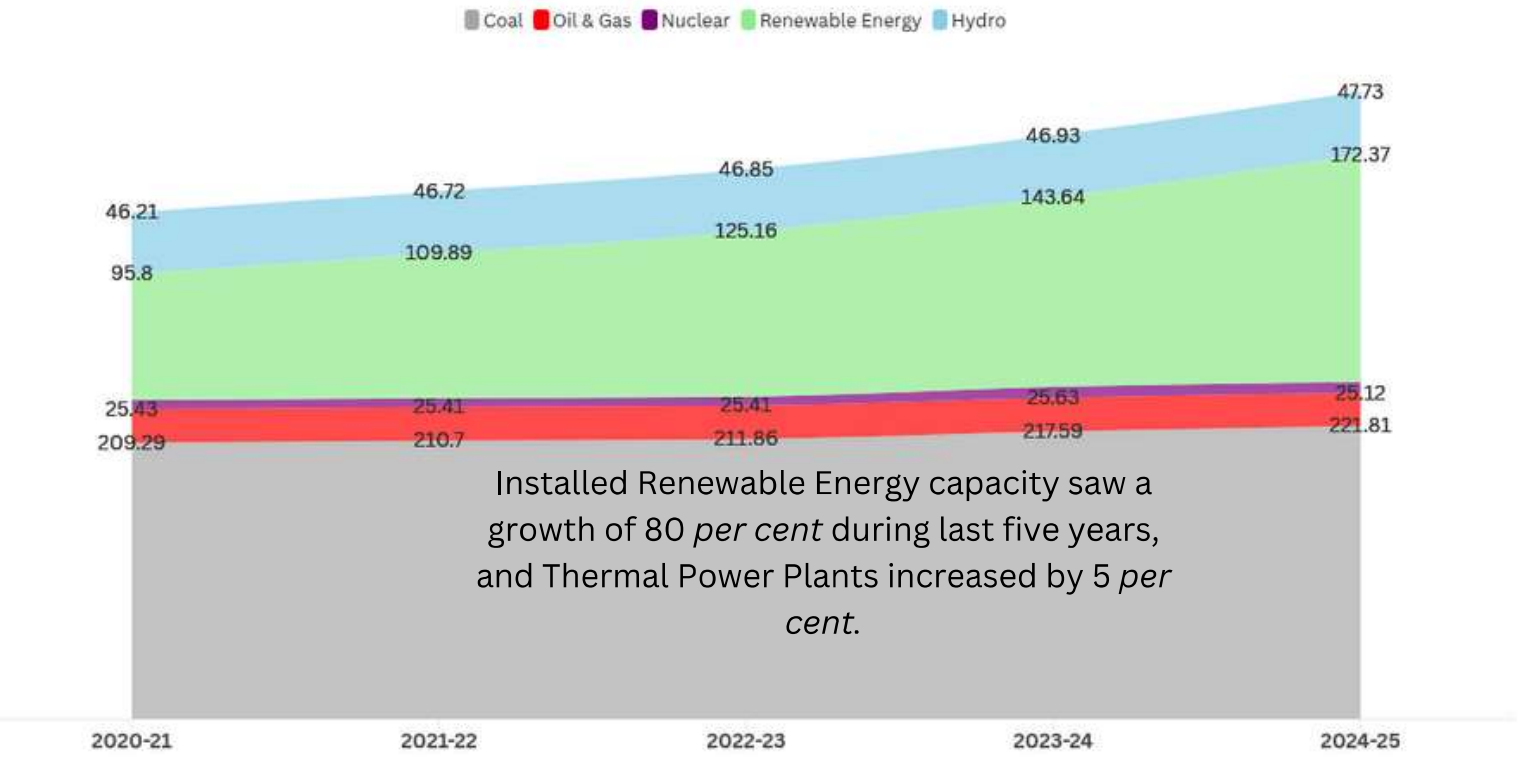
While India exports excess energy it produces, however, to meet its domestic demands India imports electricity.



Electricity Import and Export (in GWh) from 2014-15 to 2023-24

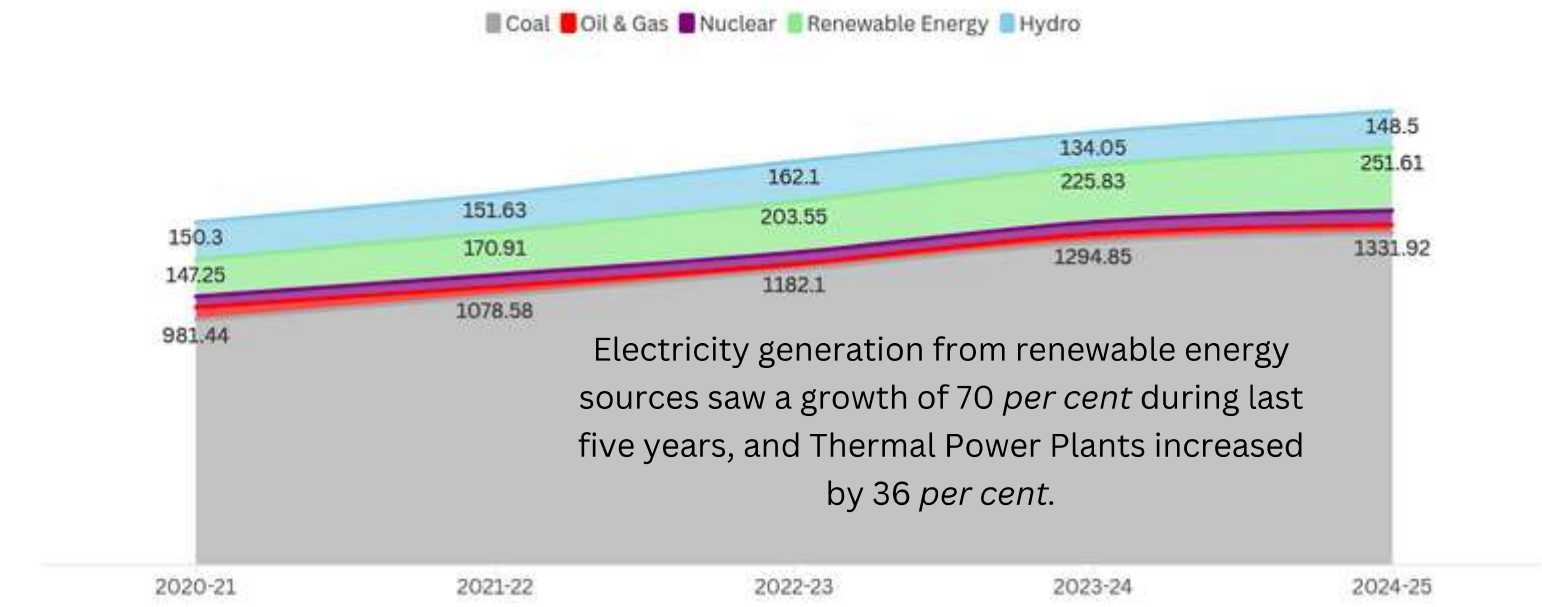
Source: Energy Statistics India 2025

India's Journey to Energy Sufficiency



Installed Renewable Energy capacity saw a growth of 80 *per cent* during last five years, and Thermal Power Plants increased by 5 *per cent*.

Installed Energy Capacity in India (in Giga Watt)

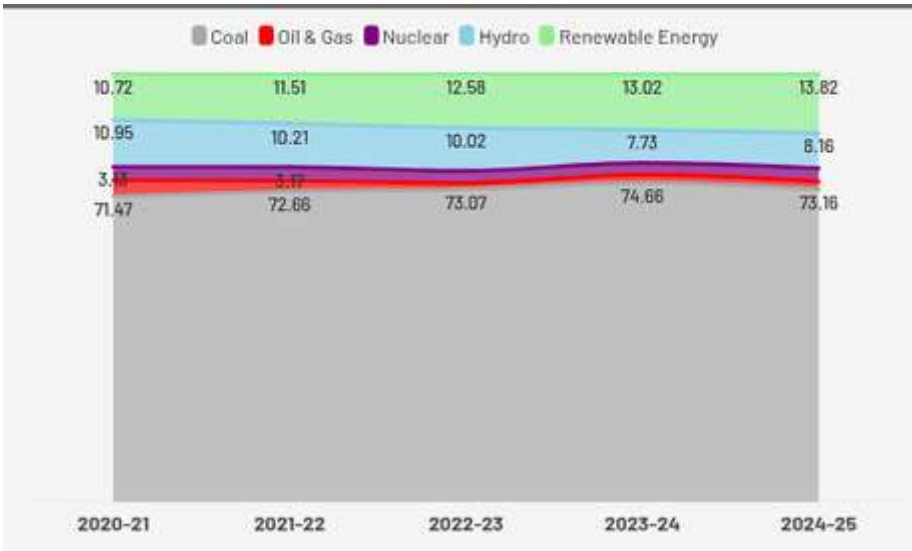


Electricity generation from renewable energy sources saw a growth of 70 *per cent* during last five years, and Thermal Power Plants increased by 36 *per cent*.

Source Wise Energy Generation in India (in Billion Units)

Installed renewable energy capacity in India accounts for 36 *per cent* of total installed energy capacity of India. However, the share of renewable energy in energy mix remains below 14 *per cent*.

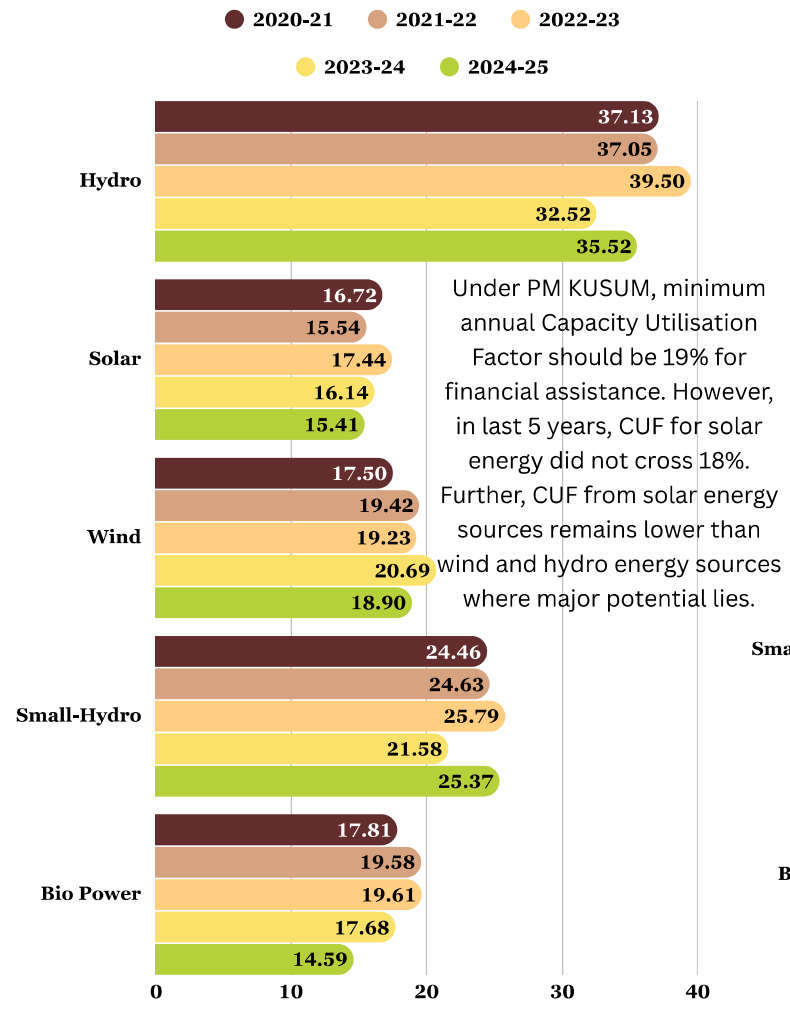
Renewable Energy into the energy mix presents a challenge for maintaining grid stability and uninterrupted power supply



Source: NITI Aayog, ICED Dashboard

Energy Mix of India during 2024-25

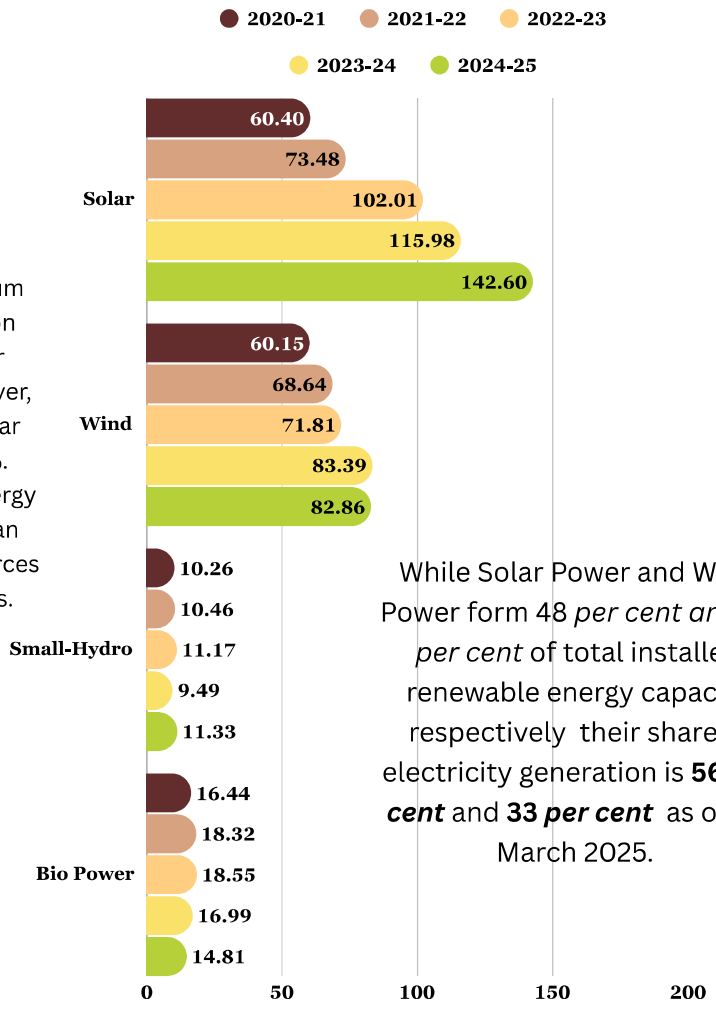
Energy Generation Review from Renewable Source



Year wise Capacity Utilisation Factor (in %)

CUF is the ratio of actual energy generated by the plant during a specific period to the maximum possible energy it could have generated if it operated at full rated capacity during that period.

Under PM KUSUM, minimum annual Capacity Utilisation Factor should be 19% for financial assistance. However, in last 5 years, CUF for solar energy did not cross 18%. Further, CUF from solar energy sources remains lower than wind and hydro energy sources where major potential lies.

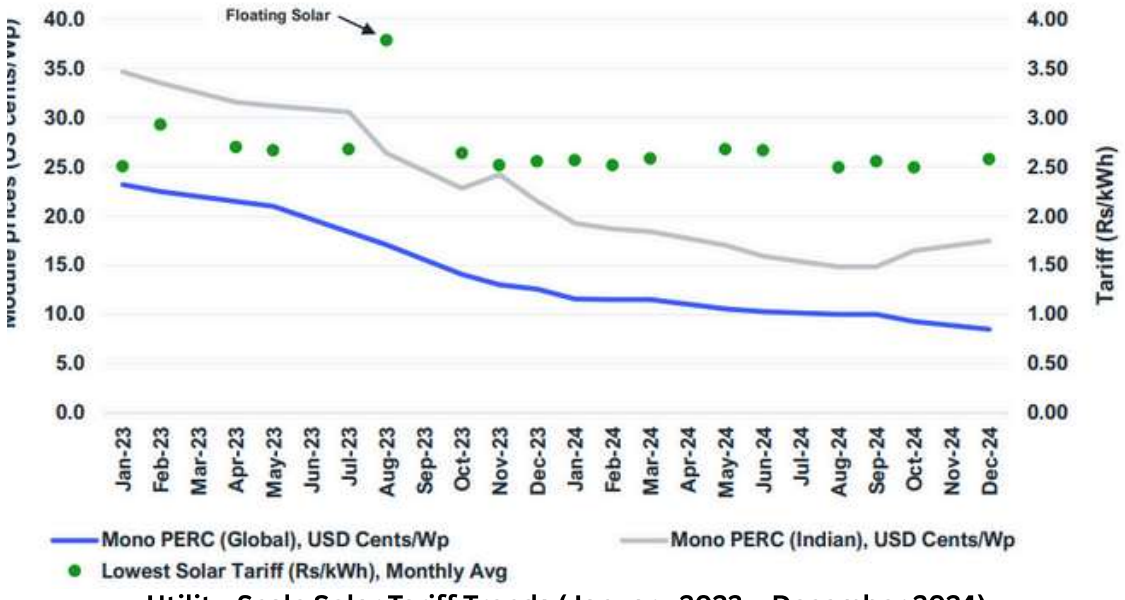


Energy Generation through Renewable Sources in Billion Units

While Solar Power and Wind Power form 48 *per cent and 28 per cent* of total installed renewable energy capacity respectively their share in electricity generation is **56 *per cent*** and **33 *per cent*** as on 31 March 2025.

Source: NITI Aayog, ICED Dashboard

Issues with Renewable Energy Transition in India

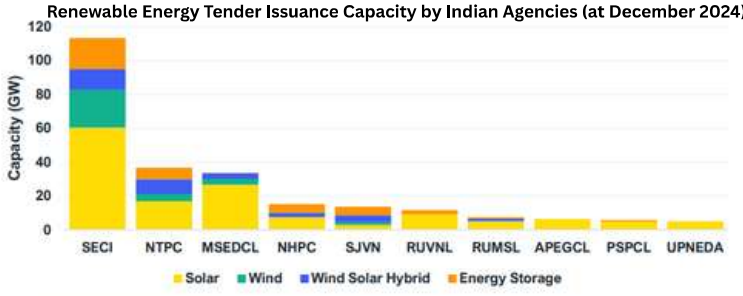


Utility-Scale Solar Tariff Trends (January 2023 – December 2024)

In December 2024, the cost of a solar module manufactured in India was US¢20.2 per Watt-peak (Wp) output, more than double the price in global markets, i.e. US¢8.5/Wp.3

Source: Institute for Energy Economics and Financial Analysis Report on Challenges in India's Tender-Driven Renewable Energy Market

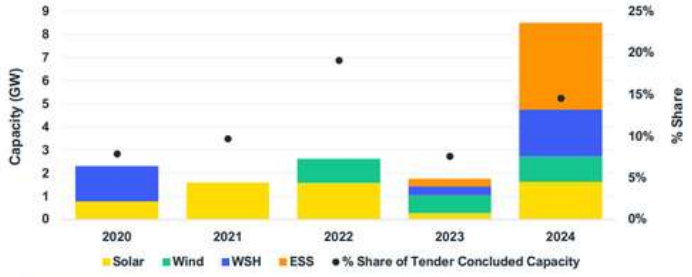
Renewable Energy Tender Issuance Capacity by Indian Agencies (at December 2024)



Source: JMK Research database

Note: Energy storage capacity includes WSH (with storage), Solar + ESS and firm and dispatchable renewable energy (FDRE). It does not include standalone storage.

In 2024, India's tendering agencies issued a record-breaking cumulative capacity of about 73GW utility-scale renewable energy tenders

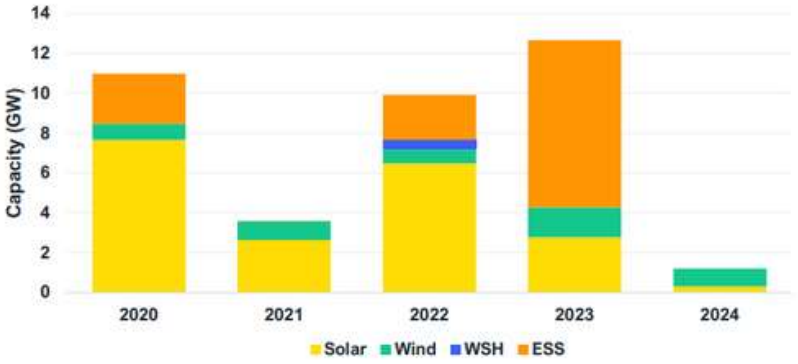


Source: JMK Research database

Note: Energy storage capacity includes WSH (with storage), Solar + ESS and firm and dispatchable renewable energy (FDRE). It does not include standalone storage.

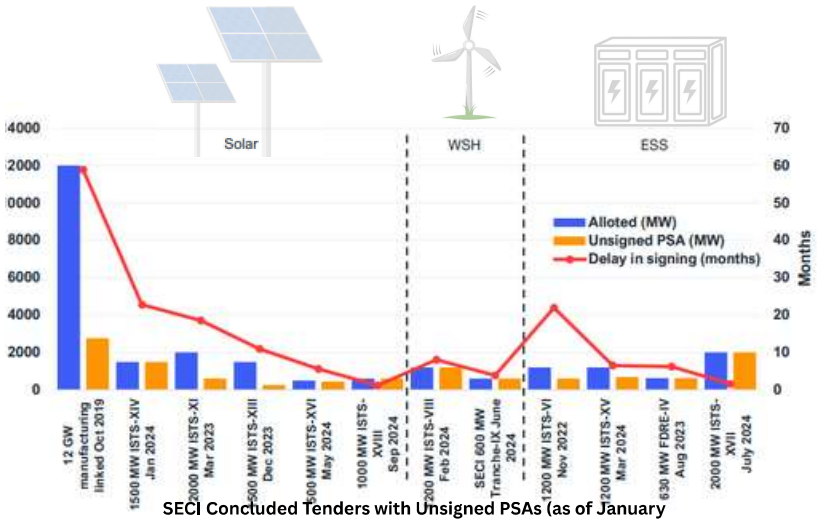
Renewable Energy Tender Undersubscription,

In 2024, approximately 8.5GW of capacity in utility-scale renewable energy tenders was undersubscribed, five times higher than the undersubscription in 2023.



Utility-Scale Renewable Energy Tender Cancellations,

From 2020 to 2024, 38.3GW of utility-scale renewable energy capacity was cancelled, accounting for about 19% of the total issued capacity during that period



SECI Concluded Tenders with Unsigned PSAs (as of January 2025)

Sources: SECI, JMK Research database

Note: Energy storage capacity includes WSH (with storage), Solar + ESS and firm and dispatchable renewable energy (FDRE). It does not include standalone storage.

SECI's 12GW manufacturing-linked solar tender has the highest unsigned PSA capacity (2,766MW) and faces the longest delay—nearly five years since its April 2020 allotment. The high tariff of ₹2.92/kWh discouraged DISCOMs, prompting SECI to bundle it with other tariffs in September 2020, lowering the effective rate to ₹2.42/kWh.

Source: Institute for Energy Economics and Financial Analysis Report on Challenges in India's Tender-Driven Renewable Energy Market

Source: Institute for Energy Economics and Financial Analysis Report on Challenges in India's Tender-Driven Renewable Energy Market

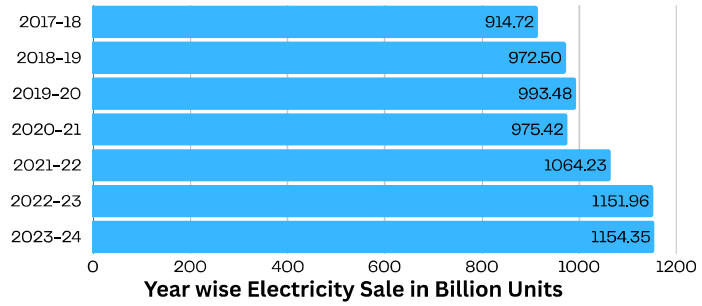
Issues Affecting Project Realisation of Utility-Scale Renewable Energy Tenders

Title	Description	Leading to ->		
		Undersubscription	Delay in power agreement signing	Cancellation
Financial pre-requisites	Stringent financial prerequisites such as high bank guarantees and financial closure deadlines	■		
Land prices and availability	Stringent commercially useful function (CUF) requirements in tenders push up land prices in high-irradiance locations	■	■	
Power evacuation infrastructure	ISTS transmission infrastructure is overstressed, with a shortage of connectivity margin at ISTS substations	■		
Policy irregularity	Policy irregularities include ALMM imposition, ISTS waiver expiration, renewable energy development fee (RDEF), etc.	■	■	
Aggressive bidding	Aggressive bidding by renewable energy developers during reverse auctions may lead to inaccurate tariff discovery	■		■
Tender design	Challenging power delivery requirements, solution complexity and unfavourable tender types inhibit market participation	■	■	■
Offtaker backout	Energy offtakers (DISCOMs) may back out of the tendering process after allotment		■	■
Falling tariffs	Anticipation of reduced tariffs will hinder the project realisation of concluded renewable energy tenders		■	■

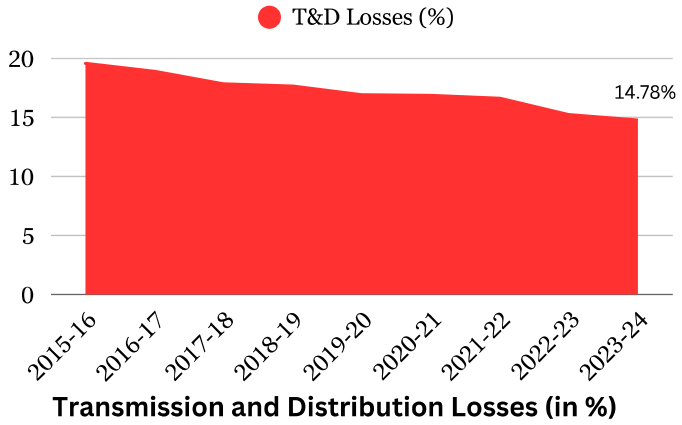
Source: JMK Research

Energy Efficiency in India

In 2023-24 total energy generation was 1734.38 billion units whereas the sale accounted to 1154.35 billion units which indicates electricity loss of 33 per cent in 2023-24. Further, in 2023-24, energy requirement of India was 1627 billion units.

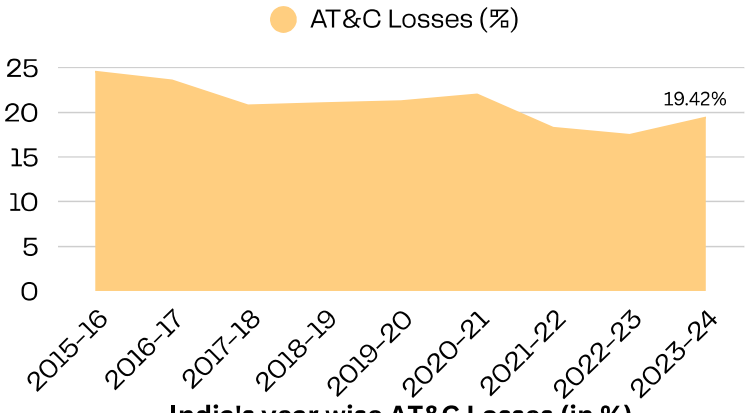


Year wise Electricity Sale in Billion Units



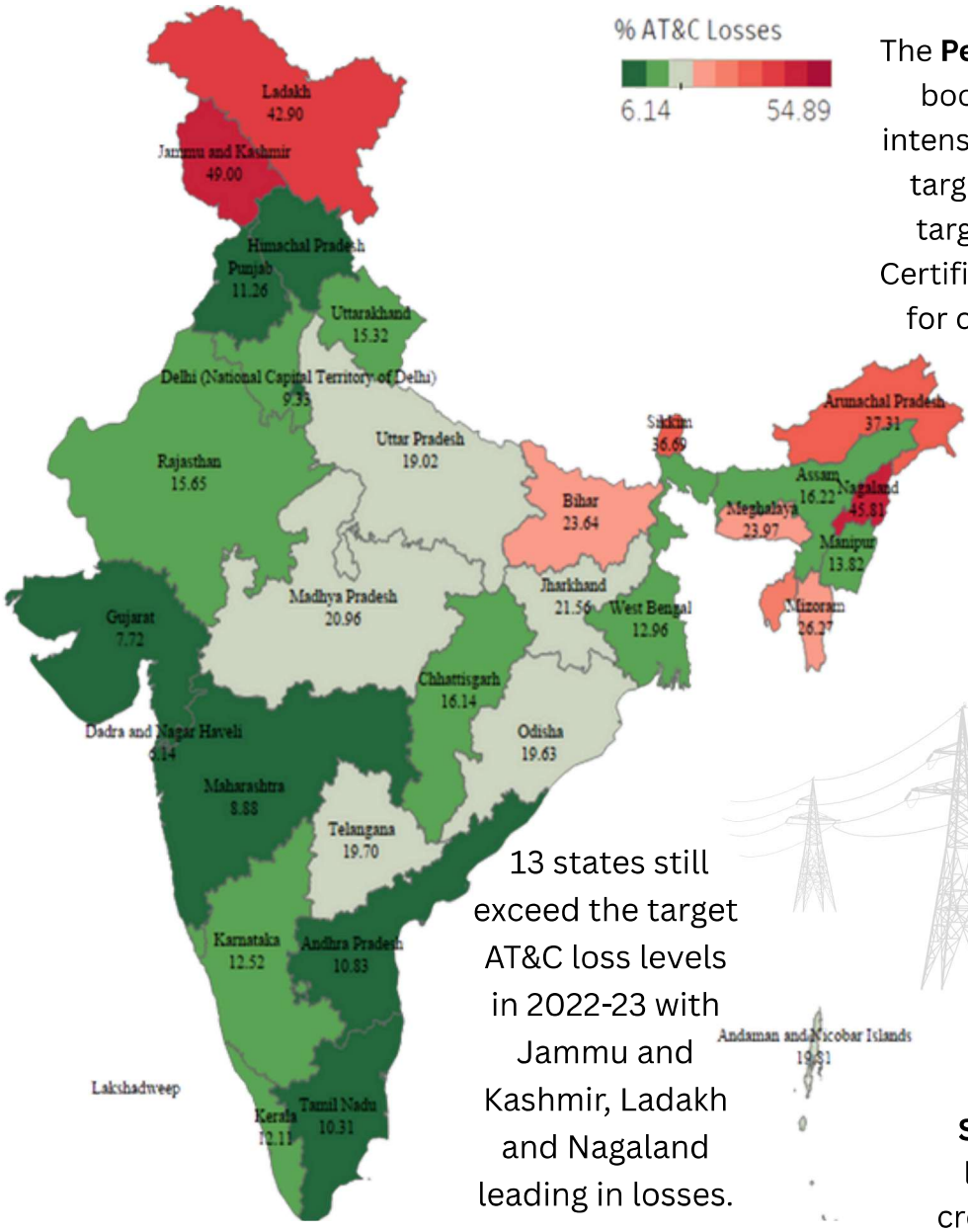
Transmission and Distribution Losses (in %)

From generation to sale of electricity, more than 33 *per cent* of electricity is lost.



India's year wise AT&C Losses (in %)

Perform, Achieve and Trade (PAT) Scheme targets to reduce the Transmission and Distribution Losses (T&D Losses).

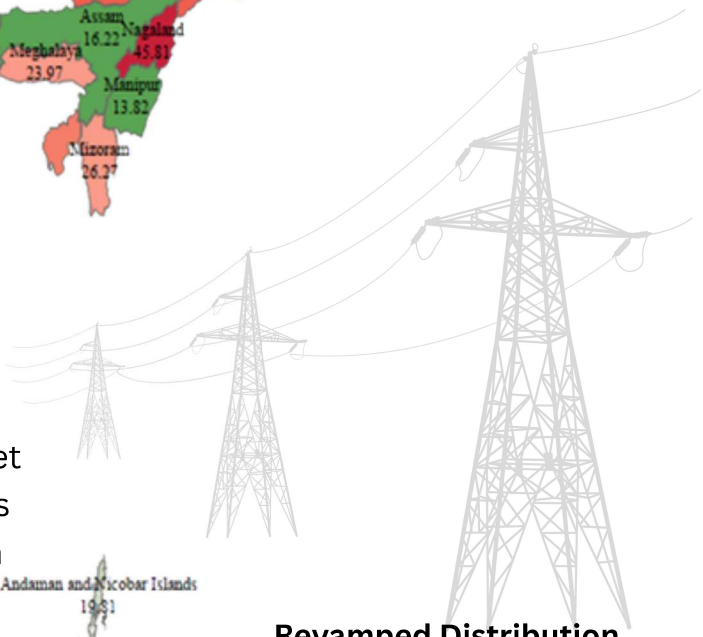


State Wise AT&C Losses in 2022-23 (in %)

Source: NITI Aayog, ICED Dashboard

13 states still exceed the target AT&C loss levels in 2022-23 with Jammu and Kashmir, Ladakh and Nagaland leading in losses.

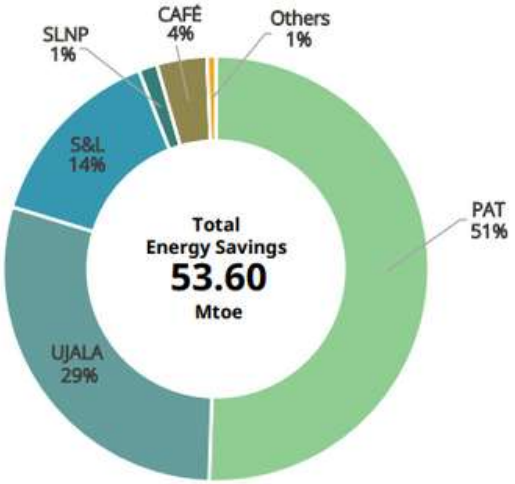
The **Perform, Achieve and Trade scheme** boosts energy efficiency in energy-intensive industries by setting reduction targets. Industries that exceed these targets earn tradable Energy Saving Certificates, creating financial incentives for cost-effective energy savings and compliance flexibility.



Revamped Distribution Sector Scheme (RDSS) was launched with a ₹3.04 lakh crore outlay and ₹97,631 crore central support for FY 2021–26 to reduce AT&C Losses.

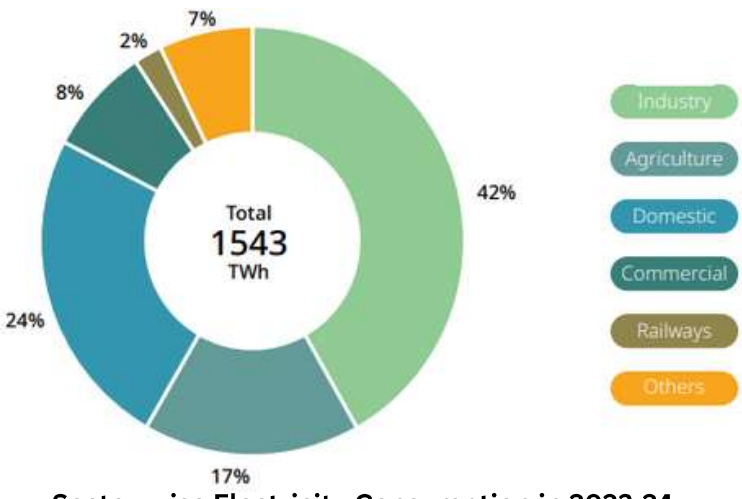
The **Bureau of Energy Efficiency (BEE),** under the Ministry of Power, drives India's energy efficiency efforts to reduce greenhouse gas emissions and tackle global warming. Key initiatives include appliance standards and labeling, sustainable building codes, industrial efficiency programs, transport sector improvements, demand side management, and the Indian Carbon Market.

Source: India Energy Scenario: For the year 2023–24 | 2nd Edition

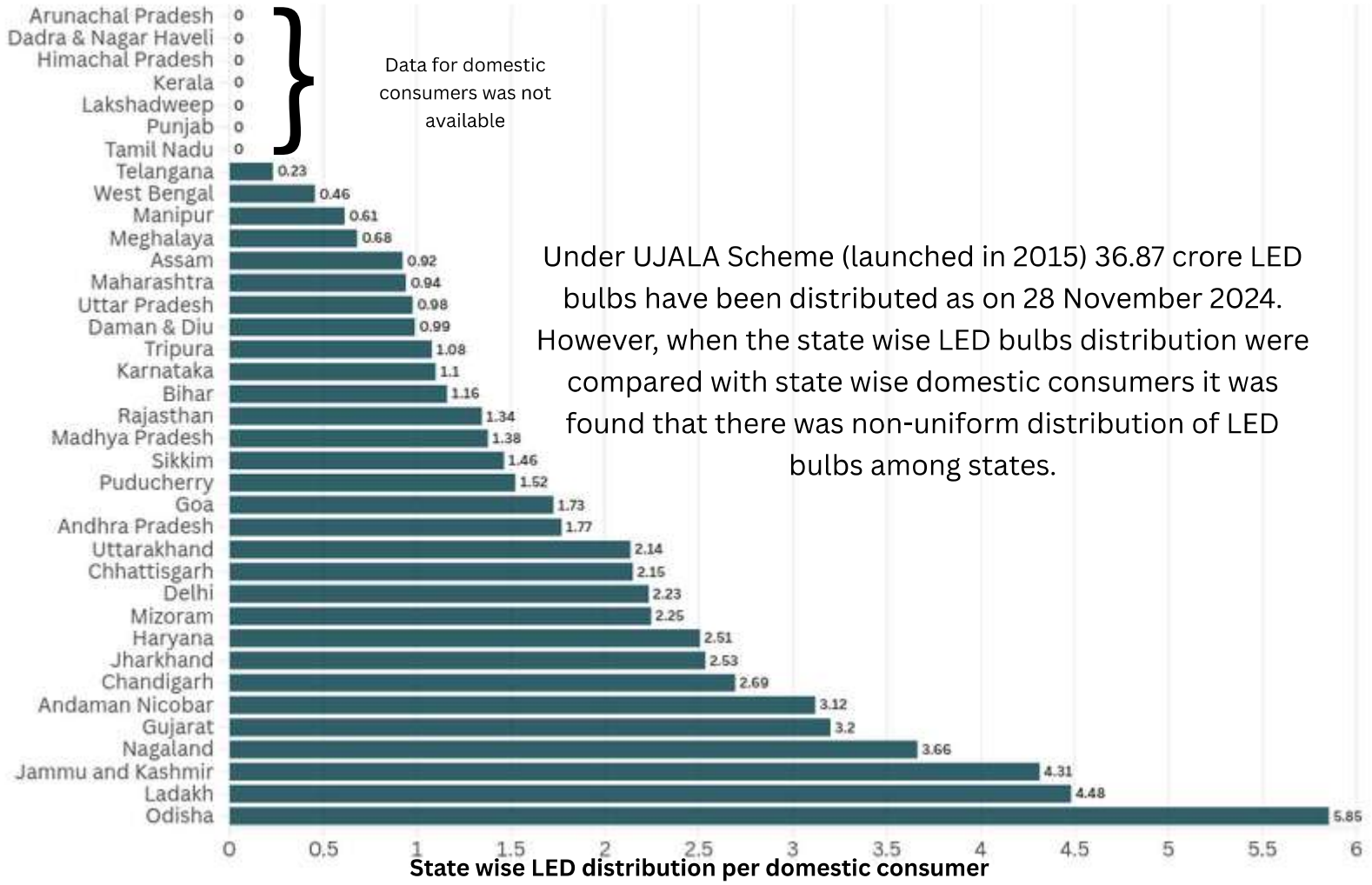


Scheme wise Total Energy Savings, FY 2023-24

Street Light National Programme (SLNP)
Standards & Labeling (S&L) Programme
Corporate Average Fuel Efficiency (CAFE) standards



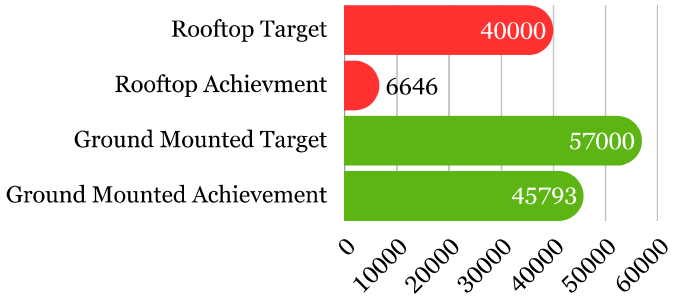
Sector-wise Electricity Consumption in 2023-24



State wise LED distribution per domestic consumer

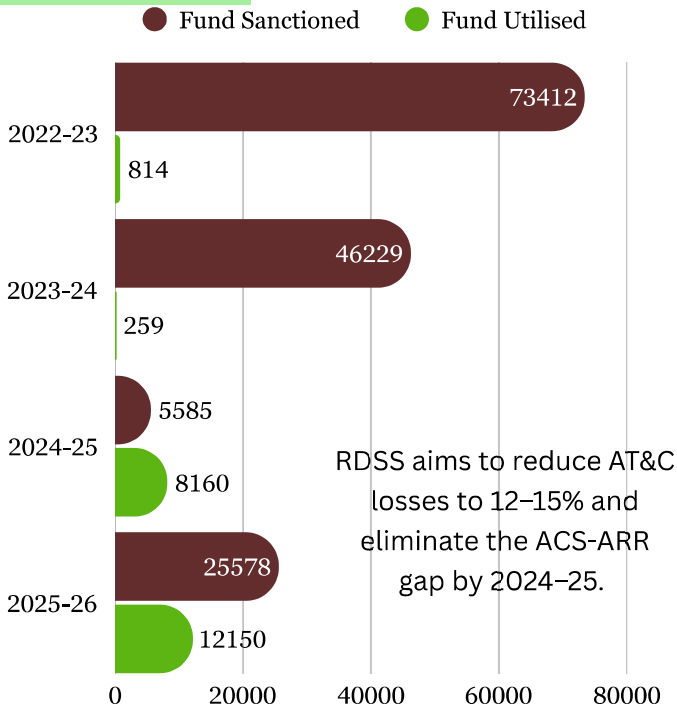
Under UJALA Scheme (launched in 2015) 36.87 crore LED bulbs have been distributed as on 28 November 2024. However, when the state wise LED bulbs distribution were compared with state wise domestic consumers it was found that there was non-uniform distribution of LED bulbs among states.

Renewable Energy Schemes



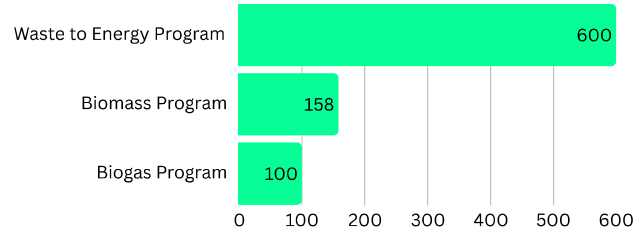
Progress under National Solar Mission as on 31 March 2022

Target under **National Solar Mission** of grid connected Solar Power project was 1,00,000 MW by 2021-22.
However, the same was unachieved as on 31 March 2022.



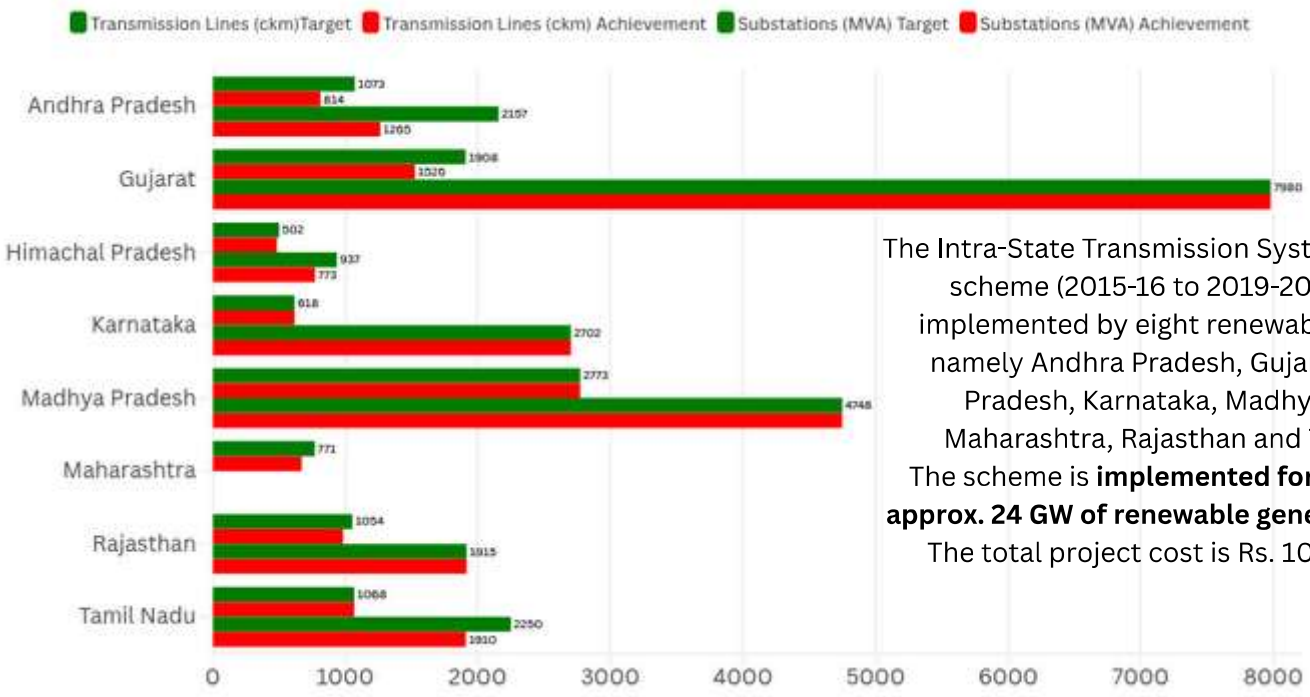
RDSS aims to reduce AT&C losses to 12–15% and eliminate the ACS-ARR gap by 2024–25.

Progress of Reduction of loss works under RDSS Scheme



Budget Allocation under National Bio-energy Program (Rs. in crore)
Source: Lok Sabha/ Rajya Sabha Answers

Under **National Bio-energy Program** from 2021-22 to 2025-26, Government of India sanctioned outlay of Rs. 858 crore to support the setting up of Waste to Energy projects for generation of Biogas/ BioCNG/ Power/ producer or syngas from urban, industrial and agricultural wastes/residues.

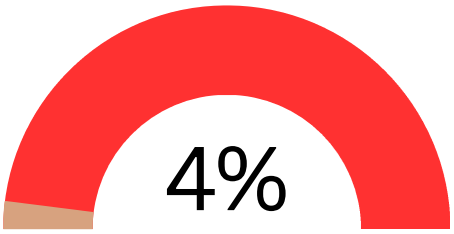


The Intra-State Transmission System (InSTS) GEC-I scheme (2015-16 to 2019-20) to is being implemented by eight renewable rich States, namely Andhra Pradesh, Gujarat, Himachal Pradesh, Karnataka, Madhya Pradesh, Maharashtra, Rajasthan and Tamil Nadu. The scheme is **implemented for integration of approx. 24 GW of renewable generation capacity**. The total project cost is Rs. 10141.68 crore.

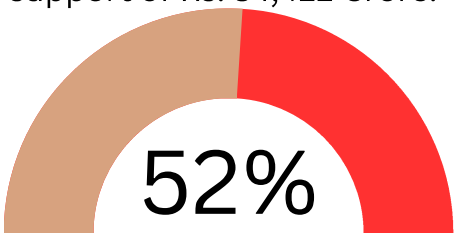
Physical Progress of Intra-State GEC-I as on 31.07.2023:

While Andhra Pradesh lags behind in achieving both targets, only Karnataka and Madhya Pradesh achieved both targets.

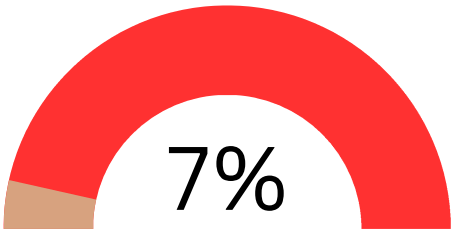
PM KUSUM Scheme (2019-2026), aims to add 25,750 MW of renewable capacity with a financial support of Rs. 34,422 Crore.



Progress under Component A
10,000 MW of grid-connected solar power plants up to 2 MW.

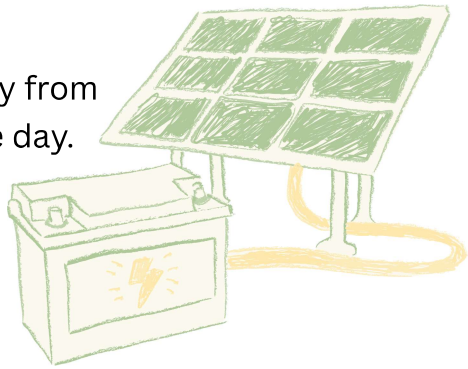


Progress under Component B
20 lakh standalone solar agricultural pumps up to 7.5 HP



Progress under Component C
Solarization of 15 lakh grid-connected agricultural pumps up to 7.5 HP.

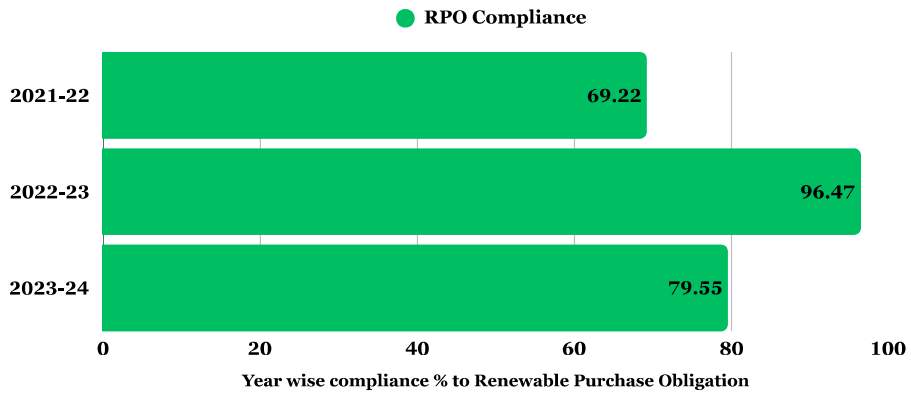
Energy Storage Systems (ESS) can be used for storing available energy from Renewable Energy and further can be used during peak hours of the day.



The energy storage capacity requirement under **Scheme for Battery Energy Storage Systems** is projected to be 82.37 GWh in year 2026-27. This requirement is further expected to increase to 411.4 GWh in year 2031-32 with budgetary allocation of Rs 3,760 Cr. through VGF.

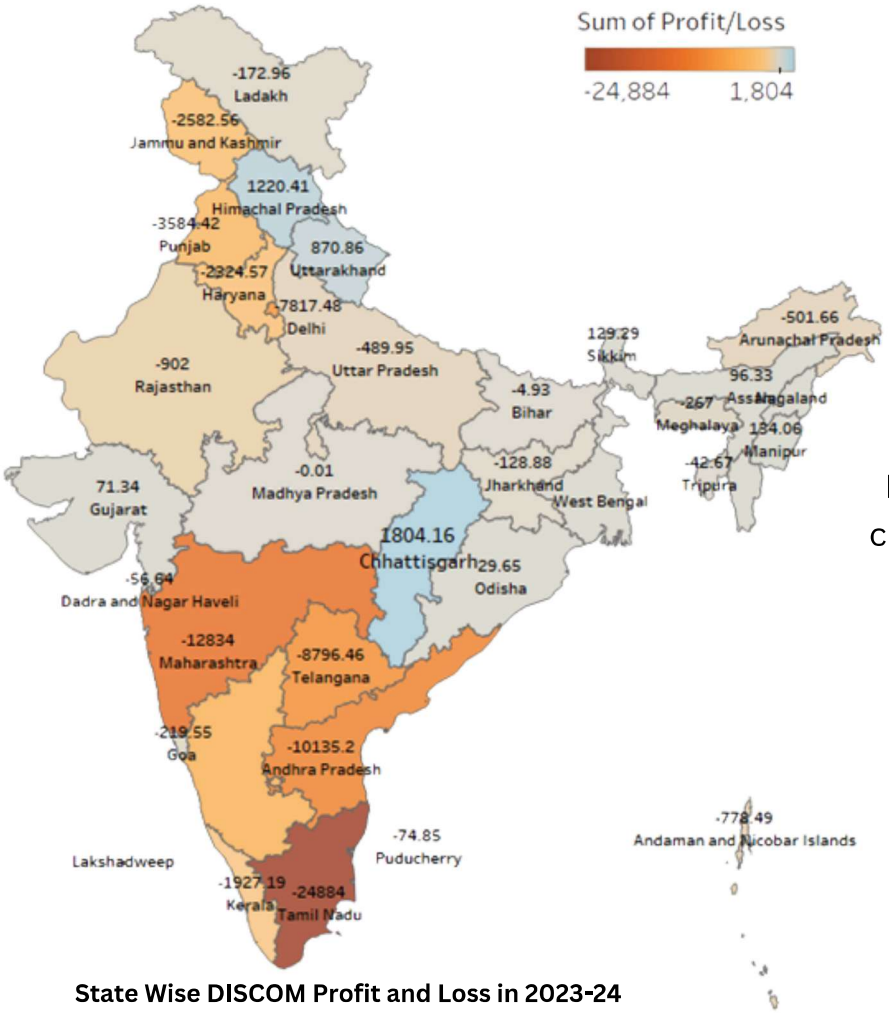
India launched the **National Green Hydrogen Mission** in January 2023 with a budget of ₹19,744 crores, allocated as ₹17,490 crores for the SIGHT program, ₹1,466 crores for pilot projects, ₹400 crores for R&D, and ₹388 crores for other components targeting an annual production of 5 MMT by 2030.

Source: Lok Sabha/ Rajya Sabha Answers



However, the compliance to Renewable Purchase Obligations (RPO) remains unachieved.

Degrading Health of DISCOMs in India



State Wise DISCOM Profit and Loss in 2023-24

Source: NITI Aayog, ICED Dashboard

During 2023-24, aggregate DISCOM loss in India was ₹78663 crore with DISCOMs in Tamil Nadu, Karnataka, Andhra Pradesh, Telangana having higher losses.

Out of 70 DISCOMs in India in 2024-25, 51 DISCOMs were loss making with 47 DISCOM having high cost of supply than revenue.

Major Policies/ Schemes

- National Wind-Solar Hybrid Policy
- National Bio-Energy Mission
- National Solar Mission
- Green Hydrogen Mission
- FAME I & II
- PM-KUSUM
- Revamped Distribution Sector Scheme (RDSS)
- Perform, Achieve, Trade (PAT) Scheme

Audit Assessment Checklist

1. **Realisation of Renewable Energy Potential**

Audit Focus: Barriers to full utilisation of India's vast renewable energy capacity

- Why has only 10% of the renewable energy potential (2,109 GW) been realized?
- Have land acquisition issues, grid constraints, or policy uncertainty hindered capacity addition?
- Are delays in clearances and lack of investor interest slowing project execution?
- Have environmental and social impact assessments delayed project implementation timelines?
- Have projects received all necessary environmental and forest clearances before construction?
- Are the state-specific Renewable Energy policies aligned with central-level goals?
- Whether allocated lands for renewable energy projects are utilised to its full potential?
- What is coordination mechanism between different Renewable Energy project executing agencies such as MNRE, state nodal agencies, SECI etc.?
- Are underperforming renewable energy assets being tracked and replaced/upgraded timely?
- Is there a feedback mechanism for developers to report issues in real-time?

Schemes/Programs: National Solar Mission, Wind Energy Programme, CPSU Scheme, Solar Park Scheme.

“Audit may use GIS tools to compare RE potential, project siting, and transmission corridors.”

2. Generation vs Installed Capacity Gap

Audit Focus: Capacity Utilisation Factors (CUF), actual energy output

- Why does renewable energy contribute only 14% to actual generation despite being 36% of installed capacity?
- Does CUF of Renewable Energy projects matches with declared CUF in tenders?
- Is the solar CUF below 19% despite financial assistance? What are the causes for low performance?
- Are Indian solar modules underperforming despite BIS certification?
- Is actual generation data (vs declared CUF) being monitored and published transparently?
- Are there weather-specific forecasting systems in place to ensure efficient scheduling of RE?
- Are modules and turbines being regularly maintained to avoid generation losses?
- Is generation infrastructure designed for regional climate/terrain suitability?
- Are developers adhering to minimum performance obligations as per PPA?
- Are rooftop solar systems monitored for post-installation generation consistency?

Schemes/Programs: Approved Models and Manufacturers of Solar Photovoltaic Modules (Requirements for Compulsory Registration) Order, 2019, VGF Scheme, CPSU Scheme Phase-II.

“Audit may Conduct sample field inspections with thermal cameras to detect module degradation.”

3. Auction Participation & Project Execution

Audit Focus: Tender response, cancellations, PPA delays

- What led to the undersubscription of 8.5 GW RE tenders in 2024?
- What are the reasons behind large-scale cancellations of awarded RE projects?
- Why are PPAs delayed or renegotiated by DISCOMs even after project award?
- Are tariff caps and risk allocation clauses discouraging participation?
- How many commissioned projects are generating below expected levels post award?
- Are PLI scheme beneficiaries meeting annual targets and quality benchmarks?
- Is there underperformance or early degradation in field-deployed domestic modules?
- Are quality labs conducting regular third-party inspections of solar panels?
- How does the cost of domestic modules affect project viability?
- Are renewable energy tenders (solar, wind, hybrid) receiving adequate participation from eligible bidders?
- Are tariff ceilings, ALMM requirements, or payment security mechanisms influencing bidder interest?
- Are Power Purchase Agreements (PPAs) being signed within the stipulated period post-auction?
- What is the average time gap between auction award and project financial closure?
- Are awarded projects being commissioned within timeline? If delayed, what are the primary reasons (land, evacuation, policy shifts)?
- Are there mechanisms to penalise developers for non-execution or delays (e.g., bank guarantee forfeiture, blacklisting)?
- Are auction guidelines clear, transparent, and consistent across states?
- Are reasons for cancellation or failure (like DISCOM resistance, lack of infrastructure) being analysed and reported?
- Have policy changes post-auction (e.g., retrospective ALMM enforcement, tariff renegotiations) caused project withdrawals or litigation?

Schemes/Programs: SECI Tenders, ISTS Projects, ISTS-Green Energy Corridor

“Audit may review bid-level documentation, compare award timelines, and analyse reasons for project cancellations to assess auction effectiveness and execution bottlenecks.”

4. Technology Costs and Domestic Manufacturing

Audit Focus: Cost competitiveness of domestic modules vs global imports

- What impact do ALMM and import duties have on solar adoption and project viability?
- Are incentives under PLI and Make-in-India achieving self-reliance goals?
- What is the average manufacturing capacity utilization of Indian PV module and cell producers?
- Whether the PSUs are complying with production-linked benchmarks?
- Are quality and durability benchmarks of PLI beneficiaries being independently audited?
- Are ALMM-certified solar modules complying with BIS testing standards?

Schemes/Programs: PLI Scheme for High-Efficiency Solar PV Modules, ALMM Policy

5. Transmission Infrastructure & Grid Integration

Audit Focus: Timely completion, integration of RE into national grid

- Why do high T&D losses persist despite interventions?
- Is evacuation infrastructure ready and aligned with RE plant commissioning?
- Are states implementing GEC projects as per planned timelines?
- Is the transmission infrastructure (intra-state and inter-state) ready and commissioned before or alongside renewable energy (RE) project completion?
- What percentage of commissioned RE projects are experiencing delays in grid connectivity?
- Are Green Energy Corridor (GEC) projects implemented as per schedule, and are they meeting their designed evacuation capacity?
- Are there bottlenecks in transmission leading to renewable energy curtailment?

Schemes/Programs: Green Energy Corridor (GEC-I & II), RDSS, POSOCO Initiatives

“Audit may evaluate forecasting tool usage in Load Dispatch Centres.”

6. Energy Efficiency & Demand-Side Management

Audit Focus: Impact of energy efficiency programs and audits

- Has PAT improved industrial energy efficiency and reduced transmission losses?
- Are BEE-certified appliances and Demand Side Management (DSM) programs achieving projected savings?
- Was the UJALA LED distribution equitable and effective across all regions?
- Are DISCOMs implementing mandatory energy audits as per 2021 BEE Regulations?
- Are SLNP projects using smart controls and remote diagnostics to reduce maintenance costs?
- Are Super-Efficient Equipment Programmes reaching rural and low-income areas?
- Are Public Distribution System (PDS) warehouses and cold storage units adopting energy-efficient practices?
- Are PAT cycle targets met with verified savings?
- Are Energy Conservation Building Code (ECBC) followed in new public sector buildings?
- Are non-compliant DCs being penalised under the PAT mechanism?
- Are SLNP lights fitted with smart controllers for adaptive dimming and remote diagnostics?
- Is LPG usage consistent among Ujjwala and PAHAL beneficiaries, or are traditional fuels still being used?

Schemes/Programs: PAT, PAHAL, UJALA, SLNP, S&L, DSM Guidelines

7. DISCOM Financial Health and RPO Compliance

Audit Focus: Financial stress, renewable power procurement obligations

- What are the key contributors to DISCOM losses?
- Why is RPO compliance below target in many states despite policy mandates?
- Are smart metering initiatives improving billing efficiency and reducing AT&C losses?
- How many DISCOMs have established dedicated RE procurement cells or teams?

Schemes/Programs: UDAY, RDSS, RPO Framework, Electricity Act Amendments

LIQUID WASTE AND FAECAL SLUDGE IN INDIA

International Centre for Environment Audit and Sustainable Development

Why to Audit, Liquid Waste and Faecal Sludge?

Key Highlights

Environmental & Health Hazards:

- Contaminated water, skin and waterborne diseases, greenhouse gas emissions, soil pollution, and biodiversity loss are rampant due to untreated sludge.

Urban Sewage Scenario in India

- In 2020–21, India generated 72,368 MLD of sewage in urban areas, but had capacity to treat only 31,841 MLD.
- Only 28% of sewage was actually treated, with just 64% utilization of installed capacity leaving 72 *per cent* of wastewater untreated.
- Class I & II cities generated 33,212 MLD, but treatment capacity was only 6,190 MLD (~18%).

Impact of untreated sewage on water

- 72% of urban wastewater remains untreated, leading to direct discharge into rivers and lakes.
- In 2022, 46% of rivers analysed were found polluted.

Compliance Status and Data Discrepancies

- In 2021, 47% of Sewage Treatment Plants (STPs) were non-compliant or lacked compliance data.
- Despite prohibition laws, 377 deaths from manual scavenging were reported between 2019–2023.
- Inconsistencies in number and performance of STPs/ FSTPs across platforms like SBM Dashboard, CPCB, and state portals.

Investment Trends and Scheme Interventions

- Outlay of ₹31,344 crore under Namami Gange.
- Outlay of ₹1 lakh crore under AMRUT & AMRUT 2.0
- Outlay of ₹1.40 lakh crore under SBM Grameen Phase II.
- Outlay of ₹15,883 crore under SBM Urban 2.0

C&AG Audit Report -

- Though, there have been many of Audit Reports on Groundwater management, specific Audit on Liquid waste and Faecal Sludge was conducted by Tamil Nadu and Odisha.

Faecal sludge and liquid waste are by-products of onsite sanitation systems requiring proper management to prevent environmental and public health issues.

Faecal Sludge: A mixture of human excreta, water, and solid waste from pit latrines, septic tanks, and other containment facilities, categorized by consistency (liquid, slurry, semi-solid, solid).

Liquid Waste: Effluent or wastewater from domestic activities, which can be combined with faecal sludge, making management complex.

Wastewater is any used water, from homes, industry, or runoff, which may contain contaminants while sewage is a type of wastewater from households that includes human waste and grey water, and is usually more polluted, requiring thorough treatment.

Environmental Impact

Health Hazard

- Create breeding grounds for disease-carrying mosquitoes and flies
- Waterborne/ skin diseases

Water Pollution

- Contaminating surface and ground water
- Eutrophication

Soil Pollution

- Contaminating surface and ground water
- Eutrophication

Air Pollution

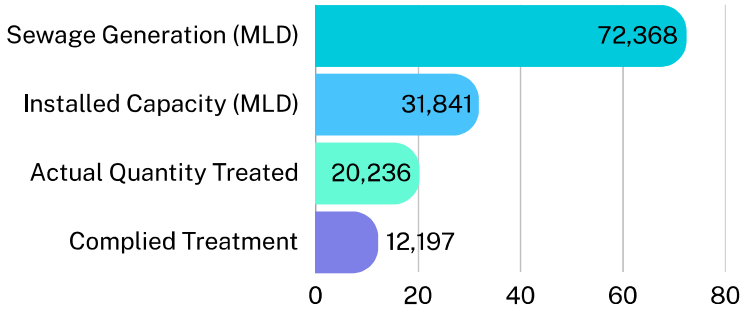
- Emitting particulate matter and volatile organic compounds
- Generates potent greenhouse gases

Ecological Impact

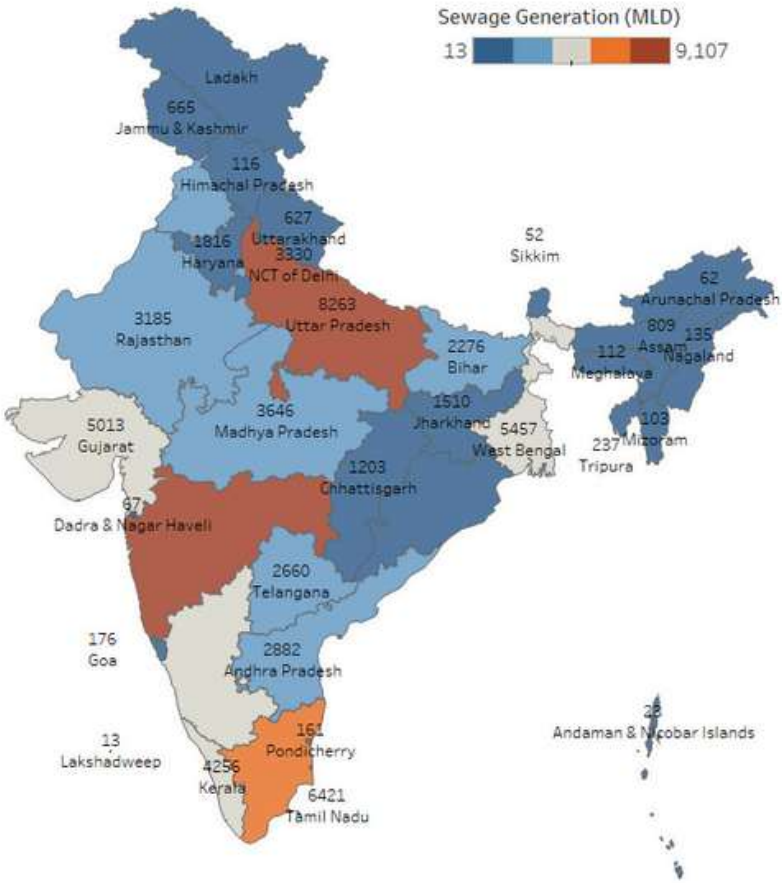
- Degrades sensitive wetlands
- Reduces biodiversity

Urban Sewage Scenario in India

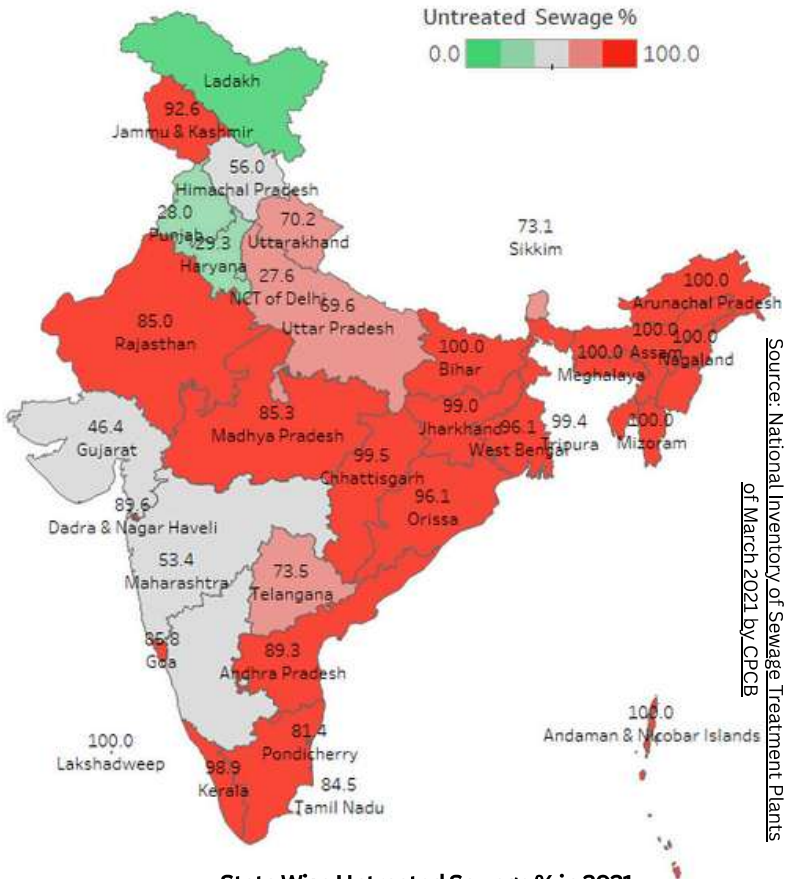
- In 2020-21, only 28 *per cent* of sewage generated in urban areas was treated with 64 *per cent utilisiation of sewage treatment capacity.*
- In Class I cities and Class II towns, NITI Aayog estimated sewage generation of 33212 MLD against which treatment capacity is only of 6190 MLD which is only 18 per cent.



Sewage Generation in Urban areas in 2020-21



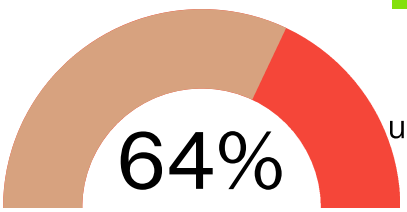
State Wise Sewage Generation and treatment in 2021



State Wise Untreated Sewage % in 2021

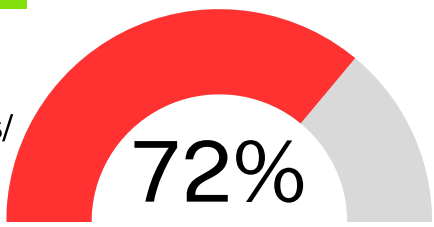
Source: National Inventory of Sewage Treatment Plants of March 2021 by CPCB

Impact of untreated sewage on water



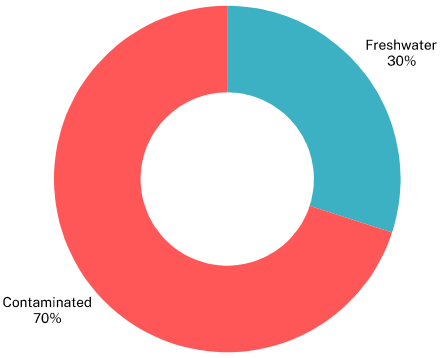
Installed Sewage Capacity Utilisation

72 per cent of wastewater from urban areas remain untreated which is likely discharged into rivers/ canals/ lakes which further pollutes them and make them unusable for public use.



Untreated Sewage

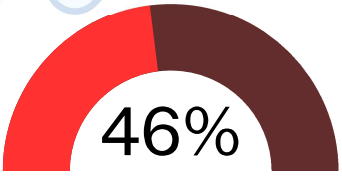
Source: PIB, NITI Aayog Report on Water Crisis



NITI Aayog Water Management Index, 2018

In June 2018, NITI Aayog published Composite Water Management Index which placed India at 120th place out of 122 countries in water quality index .

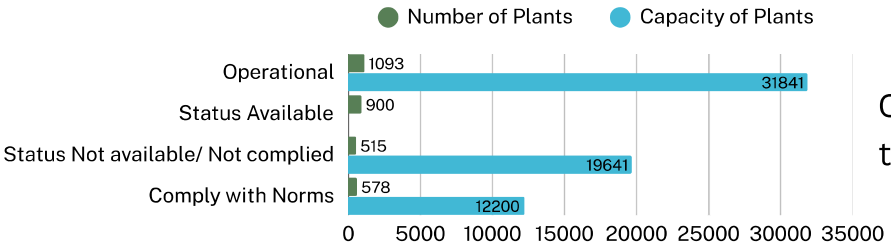
In 2022, CPCB analysed water quality of 603 rivers out of which 209 rivers were polluted with untreated sewage as primary cause.



% of Rivers Polluted

Source: PIB, Analysis of water quality of rivers by Central Pollution Control Board

Compliance Status and Data Discrepancies



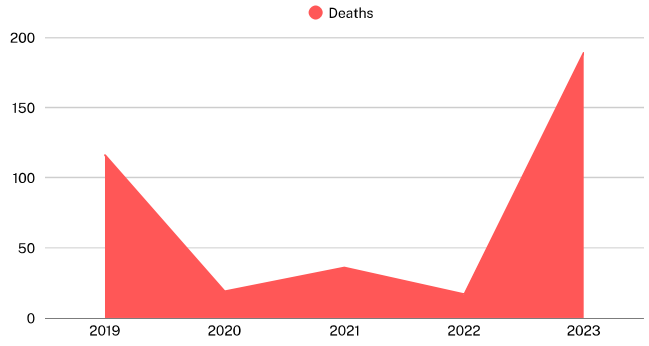
Compliance Status of Sewage Treatment Plants in 2021

Overall, 47% of STPs, representing 62% of total capacity, were either non-compliant or lacked compliance data.

Source: National Inventory of Sewage Treatment Plants of March 2021 by CPCB

Source: Lok Sabha/ Rajya Sabha Answers by MInistry

Despite the 2013 Rules mandating safety measures and Supreme Court directions for phased eradication of manual scavenging, there were 377 deaths from sewer and septic tank cleaning between 2019 and 2023, with 58,098 manual scavengers identified as of July 2024



Deaths due to Manual Scavenging

No uniformity of data available in different Government sources such as CPCB showed in 2021 there were 1093 STPs, however as per SBM (U) dashboard, there are 1057 STPs at present.

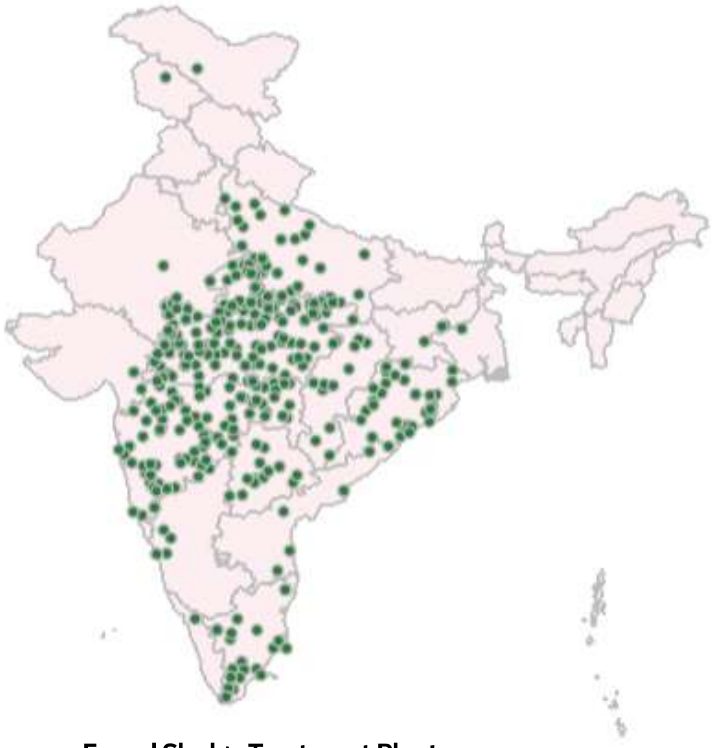
India | Status of Liquid Waste Treatment Plant

** Primarily plants having designed capacity >= 5 MLD/KLD*

Sewage Treatment Plant (STP)	
Total no of Plants	Designed Capacity (ML
1057	38,270.00

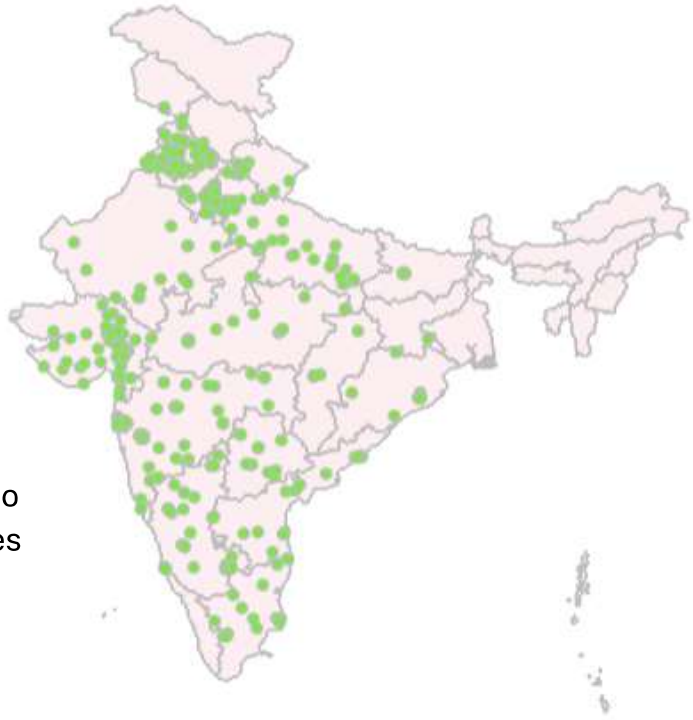
Faecal Sludge Treatment Plant (FSTP)	
Total no of Plants	Designed Capacity (KL
1039	54,747.00

Source: Swachh Bharat Mission (Urban) Dashbaord



Faecal Sludge Treatment Plants

The STPs and FSTPs shown under SBM (U) are also not uniform according to the states, as many states lag behind in installed liquid waste and faecal sludge treatment capacity.



Liquid Waste Treatment Plants

Investment Trends and Scheme Interventions

Investments by Government of India in Sewage and Faecal Sludge Management

i. Under the Namami Gange Programme, ₹31,344 crore was sanctioned for 195 projects to create/rehabilitate 6,173 MLD of STP capacity.

ii. AMRUT and AMRUT 2.0 have funded 1,481 projects worth over ₹1 lakh crore for STP creation and reuse.

iii. Swachh Bharat Mission (Grameen) Phase 2 has total outlay of ₹1.40 lakh crore.

iii. Swachh Bharat Mission (Urban) 2.0 allocated ₹15,883 crore for STPs/FSTPs in smaller ULBs, with ₹1,125 crore spent till 2023–24.

iv.NRCP has also developed 2,746 MLD capacity across 80 towns. Given these large allocations, a performance and utilisation audit is essential.

Source: Government Websites/ Lok Sabha and Rajya Answers/ PIB

Legal and Regulatory Framework

Swachh Bharat Mission
•Launched in 2014
•Under MoHUA
- With an aim to Improve cleanliness, hygiene and eliminating open defection, accelerate, developing community managed sanitation via safe sludge collection, treatment, reuse; subsidies for Faecal Sludge Treatment Plants (FSTPs), equipment, training

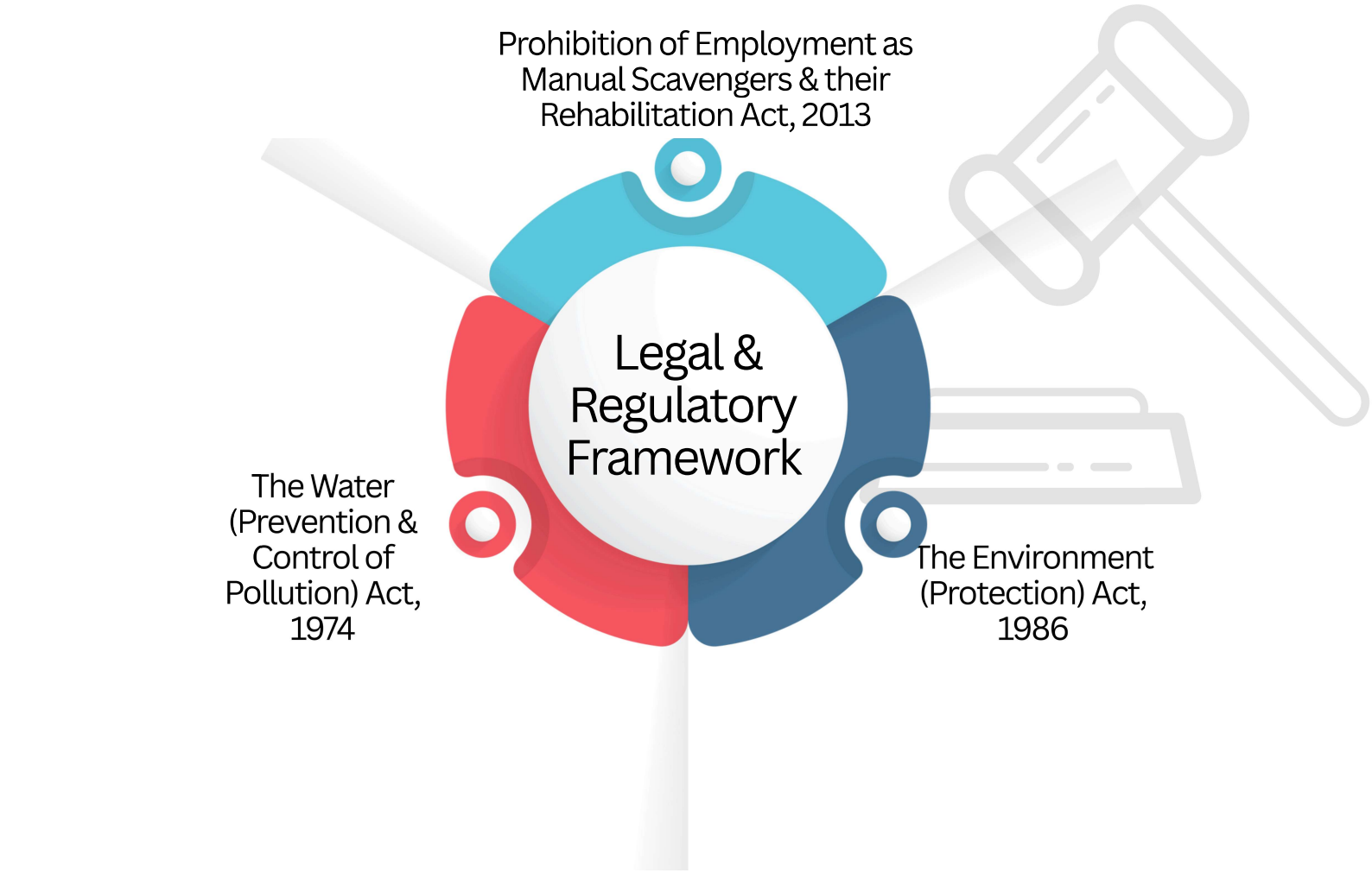
Namami Gange Program
•Launched in 2014
•Under Ministry of Jal Shakti
- With an aim of focusing on abating pollution and rejuvenating the Ganga River. It encompasses pillars such as sewerage treatment, river-front development, biodiversity conservation, afforestation, and public awareness.

AMRUT
•Launched in 2015
•Under MoHUA
•With an aim to provide Capital support for sewer networks & FSTP/STP infrastructure in selected cities

Source: Scheme Document

Guidelines and Policies

- National Policy on Faecal Sludge and Septage Management (FSSM) , 2017
- CPCB Faecal Sludge Management Guidelines, 2018
- Liquid Waste Management Rules , 2024



Performance Review and Gaps

Major Causes of pollution in river Yamuna -

i. Discharge of untreated/ partially treated sewage into river Yamuna. As informed by the Delhi Pollution Control Committee (DPCC), **Gap in treatment in January 2025 is 822.8 MLD;**

ii. **Absence of Common Effluent Treatment Plants (CETPs)** in some approved industrial areas;

iii. **Delay in completion** of new projects and rehabilitation and/or upgradation of sewage treatment projects.

Source: Lok Sabha Answers by MInistry

Liquid and Faecal Sludge in News

- Out of 37 Sewage Treatment Plants installed in Delhi, 21 failed to meet standards in August 2024.
- World Economic Forum in its Global Risk Report 2025 identified that water supply shortage will be the biggest risk for India for next two years.
- In 2020, the waste sector, which includes GHG emissions from microbiological processes occurring in organic waste under anaerobic degradation and the anaerobic treatment of domestic and industrial wastewater, accounted for only 2.56 per cent of GHG emissions
- In Uttar Pradesh, as of December 2024, 19 out of 39 towns with FSTPs and six out of 20 towns with co-treatment facilities are operating at 20 per cent or lower treatment capacity.

National Green Tribunal (NGT) orders

S. No.	Date of NGT Order	NGT Action	Key Outcome	Issue(s) Addressed	Concerned Party / State / Ministry
1	**May 1, 2019**	Directed uniform effluent discharge norms for all STPs	Standardized effluent norms (BOD, COD, TSS, faecal coliform) for all cities, removing exemptions	Pollution from non-compliant STPs; relaxed norms in small towns	CPCB, MoEFCC, State Pollution Control Boards (SPCBs), ULBs
2	**Feb 1, 2023**	Assessed sewage management performance	Identified sewage treatment gap (531 MLD in Gujarat, 146.9 MLD in Odisha); flagged underutilized STPs	Inadequate STP capacity, low utilization, untreated sewage in rivers	Gujarat & Odisha governments, SPCBs, ULBs, Jal Shakti Ministry
3	**Sep 29, 2022**	Tribunal directed half-yearly compliance reports	Requirement for Telangana to deposit ₹3,800 Cr in ring-fenced account and scale-up FSM & STP capacity	Sewage and solid waste treatment gaps; delay in infrastructure & funding	Govt. of Telangana, MoEFCC, CPCB, TSPCB
4	**Feb 1, 2024**	Reviewed Kerala's FSM strategy	Approved cluster-based FSTPs within 15 km radius due to scattered settlements	Inefficiency in FSM infrastructure for low-density areas	Kerala Urban Development Department, SBM-U, CPCB
5	**2022–2023**	Imposed Environmental Compensation (EC)	Fined Bihar (₹4,000 Cr), Telangana (₹3,800 Cr), Punjab (₹2,000 Cr) for LFSM failures	Failure to treat sewage, open discharge, pollution of rivers and groundwater	Respective State Govts, MoEFCC, SPCBs, Jal Shakti Ministry

C&AG Audit Reports on Liquid Waste and faecal Sludge Managment

S. No.	Report No.	Area Covered	Topic of Report	FSM-Related Focus
1	Report No. 4 of 2020	Government of Tamil Nadu	Performance Audit on Sewage Management in Chennai Metropolitan Area	Slow STP rollout, poor sewer coverage, operational inefficiencies in sewage systems
2	REPORT NO. 2 OF 2022	Government of Arunachal Pradesh	Performance Audit on Implementation of Swachh Bharat Mission in Arunachal Pradesh	Identified missing septage systems, non-functional STPs, FSM roll-out deficiencies
3	Report No. 06 of 2023	Government of Madhya Pradesh	Audit of Degradation of Kshipra River	Noted lack of FSM data, septage record, desludging systems at ULBs
4	Report No. 8 of the year 2024	Government of Odisha	Audit of Stormwater Drainage & Sewerage Management	Highlighted poor sewer infrastructure and underperforming STPs affecting FSM

Audit Assessment Checklist

1. Infrastructure & Treatment Capacity

Audit Focus: Availability, functionality, and adequacy of treatment infrastructure

- Are all constructed Sewage Treatment Plants (STPs) and Faecal Sludge Treatment Plants (FSTPs) fully operational and functioning at design capacity?
- Is the installed capacity adequate to treat the sewage generated in urban and rural areas?
- What percentage of households and establishments are connected to sewerage networks?
- Are containment structures (septic tanks, twin pits) built as per national standards?
- Are STPs and FSTPs strategically located to cover dense and scattered settlements efficiently?
- Is sufficient recycling waste water plant installed to meet freshwater needs of area?
- Is detailed plan been prepared for management of liquid waste and faecal sludges in both urban and rural areas?
- Is generation of liquid waste and faecal sludge being monitored in rural areas?
- What is the gap between sewage generation and treatment capacity in each city/town?
- Are rural/peri-urban areas adequately covered by cluster-based FSTPs or mobile units?
- Are twin-pit latrines and septic tanks being constructed as per national standards?
- Are public toilets and community sanitation complexes connected to STPs/FSTPs?
- Are treated effluents being reused for irrigation, industrial use, or groundwater recharge as per norms?
- Are there provisions for co-treatment of faecal sludge in existing STPs?
- What is the design life of constructed treatment units, and are they being maintained?

Schemes/Programs: AMRUT, SBM-U 2.0, Namami Gange, National Septage Management Guidelines

“Audit may use GIS mapping to assess infrastructure coverage and identify gaps in service delivery.”

2. Compliance and Monitoring

Audit Focus: Adherence to environmental standards and data transparency

- Are the STPs/FSTPs compliant with effluent discharge standards (BOD, COD, TSS, faecal coliform)?
- Is compliance data available and updated regularly across CPCB, SBM Dashboard, and State portals?
- What is the frequency and quality of monitoring by Pollution Control Boards and ULBs?
- Is real-time data on sewage and faecal sludge treatment publicly available and credible?
- Are non-compliant plants penalized or issued notices by SPCBs/ULBs?
- Are real-time monitoring systems (e.g., SCADA) installed in treatment plants?
- Have environmental compensations (ECs) imposed by NGT been deposited and used properly?

- Are there independent third-party verifications/audits of effluent and sludge management?
- Are decentralized wastewater treatment systems (DEWATS) included in the compliance framework?

Schemes/Programs: Environment (Protection) Act, 1986; Water (Prevention & Control of Pollution) Act, 1974; NGT directions

"Audit may verify effluent quality of STPs and FSTPs using lab test results and SCADA/IoT-based monitoring systems where available."

3. Manual Scavenging & Health Risks

Audit Focus: Safety, prohibition compliance, and public health

- Have states complied with the Prohibition of Manual Scavenging Act, 2013 and rehabilitated identified manual scavengers?
- How many manual scavenging-related deaths occurred, and were compensations given as per law?
- Are ULBs equipped with mechanical desludging and protective gear for sanitation workers?
- What public health risks (e.g., disease outbreaks, groundwater contamination) are reported near untreated discharge points?
- Are sanitation workers provided with PPE, training, health insurance, and mechanized equipment?
- Have all identified manual scavengers under SRMS (Self-Employment Scheme for Rehabilitation of Manual Scavengers) been rehabilitated with financial support and alternative livelihoods?
- Are ULBs maintaining records of sewer/septic tank cleaning activities and contracts?
- Are emergency response protocols in place in case of septic tank accidents or gas inhalation incidents?
- Are desludging vehicles fitted with GPS and scheduling systems for accountability?

Schemes/Programs: SRMS (Self-Employment Scheme for Rehabilitation of Manual Scavengers), SBM Guidelines

"Audit may inspect desludging vehicles and verify the safety training records and PPE distribution."

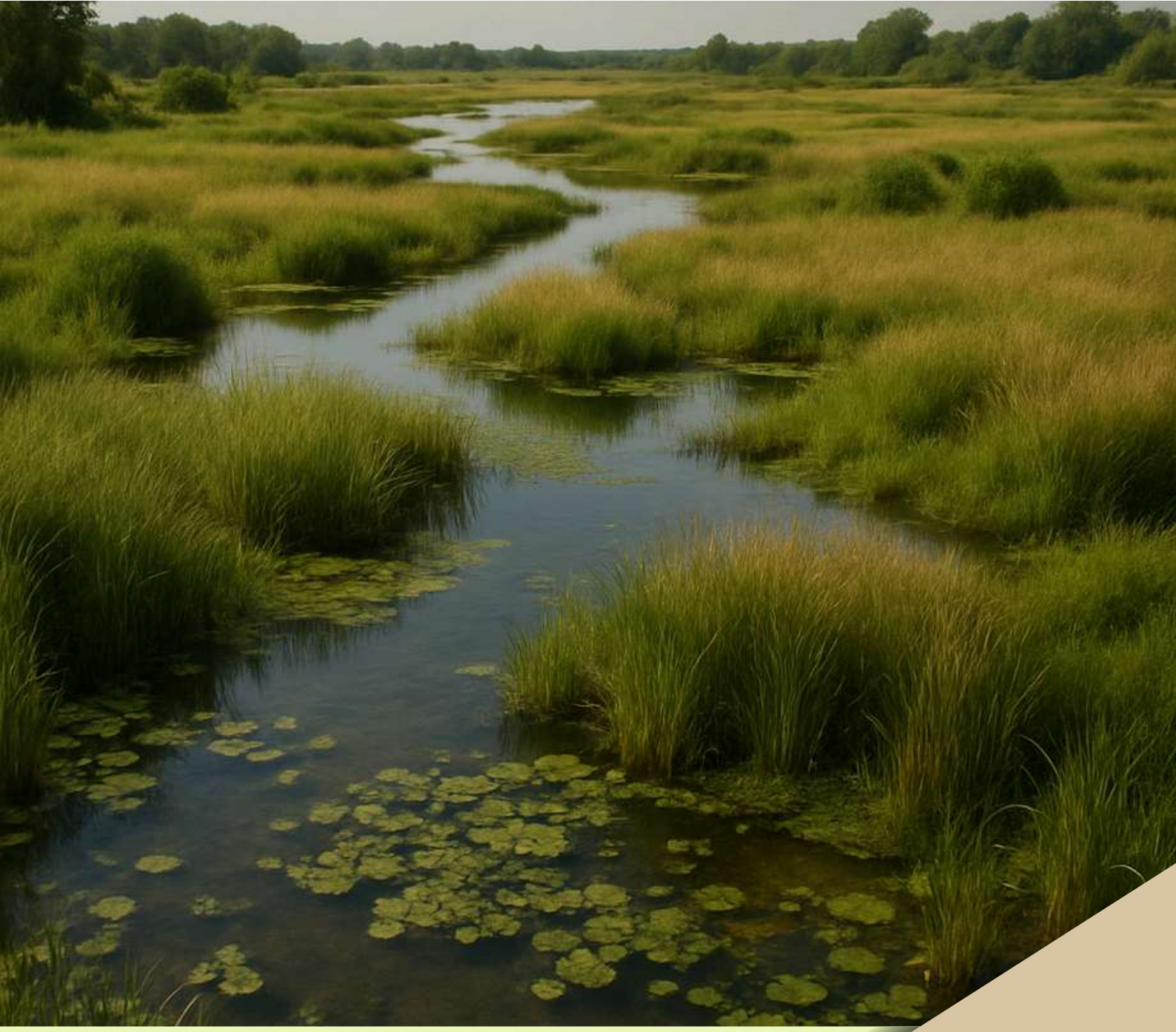
4**. Environmental Impact & River Pollution**

Audit Focus: Pollution of rivers, groundwater, and urban ecosystems

- How much untreated wastewater is discharged into water bodies in each state?
- Are state action plans aligned with CPCB's directives on river pollution control?
- What role has untreated sewage played in degradation of water quality in rivers like Yamuna, Kshipra, and Ganga?
- Are CETPs in industrial areas functional and meeting discharge norms?
- Are designated drains and nalas monitored for pollutant load regularly?
- Is sludge disposal compliant with CPCB guidelines (e.g., no open dumping)?
- Are STP by-products (biosolids, treated effluent) being reused or safely disposed of?
- Are high-pollution zones (e.g., Yamuna stretch in Delhi) being prioritized for infrastructure upgrade?
- Have pollution sources (industrial, domestic) been properly mapped and categorized?
- Are EIA/EMP studies mandated before setting up new STPs/FSTPs?
- Are their air quality monitoring system installed at STPs/ FSTPs?

Schemes/Programs: Namami Gange, National River Conservation Plan, State River Action Plans

"Audit may use satellite imagery to identify pollution hotspots and track changes in water body health."



WETLANDS

International Centre for Environment Audit and Sustainable Development

Why to audit, Wetlands?

Wetlands distribution

- Wetlands smaller than 2 hectares are the most numerous, while very large wetlands exceeding 500 hectares cover the greatest total area.

Ecosystem services provided by wetlands are:

- Provisioning, Regulating, Supporting and Cultural services

Values and benefits of wetlands

- Carbon Sequestration, Maintain Groundwater level and prevent Droughts etc.

Threats to Wetlands

- Alteration of natural hydrological regimes, Catchment degradation, pollution, invasive species, Microplastics in freshwater lakes etc.

Polluted Wetlands as per Primary Water Quality Criteria for Bathing

- More than 265 wetlands are having pH < 7.
- More than 532 wetlands do not satisfy the Primary Water Quality Criteria for Bathing.

Wetlands affected by invasive alien species

- Sankhya Lake, Madhya Pradesh & East Calcutta Wetlands, West Bengal affected by Water Hyacinth.

Funding to States under National Wetlands conservation program

- Only 18 states have been granted funds under wetlands conservation program.

Assessment and monitoring of wetlands through Wetlands Health Cards

- Area of 46% wetlands converted to non-wetland use since year 2000.
- Invasive Macrophytes invaded area of 44% wetlands.

Wetlands Conservation A key focal point in the Media

- Media publications such as The Times of India, India water portal etc. have consistently highlighted the Wetlands conservation issue.

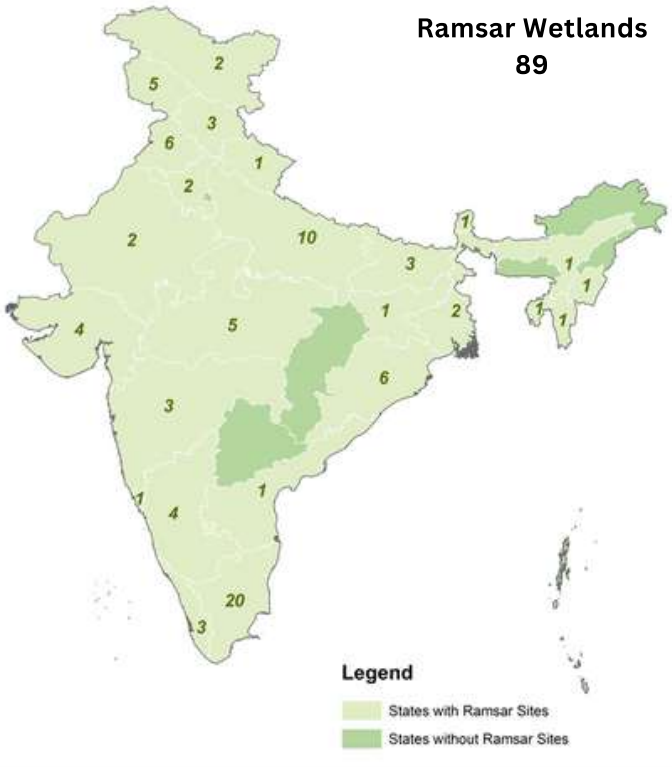
Notable Supreme Court/High Court/NGT Judgements on Wetlands conservation

- Supreme Court directs demarcation and ground truthing of Wetlands in India and 85 Ramsar sites to be monitored by respective High Courts.

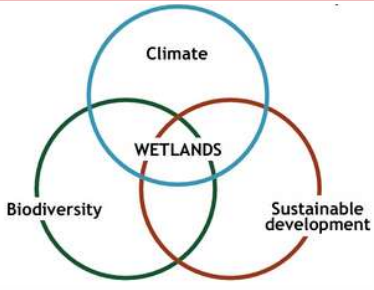
What is a Wetland?

An area of marsh, fen, peat land or water; whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters, are considered as wetlands.

Source: Ramsar Convention

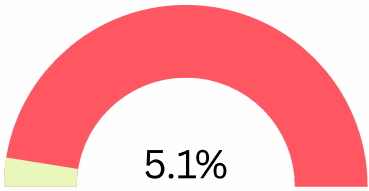


Source: Wetlands Portal of India

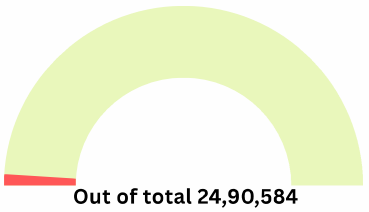


Wetlands are one of the most productive ecosystems of the world.

Nearly 35 % of world's wetlands lost in last five decades.



(16.89 Mha) of total Geographical Area of the Country

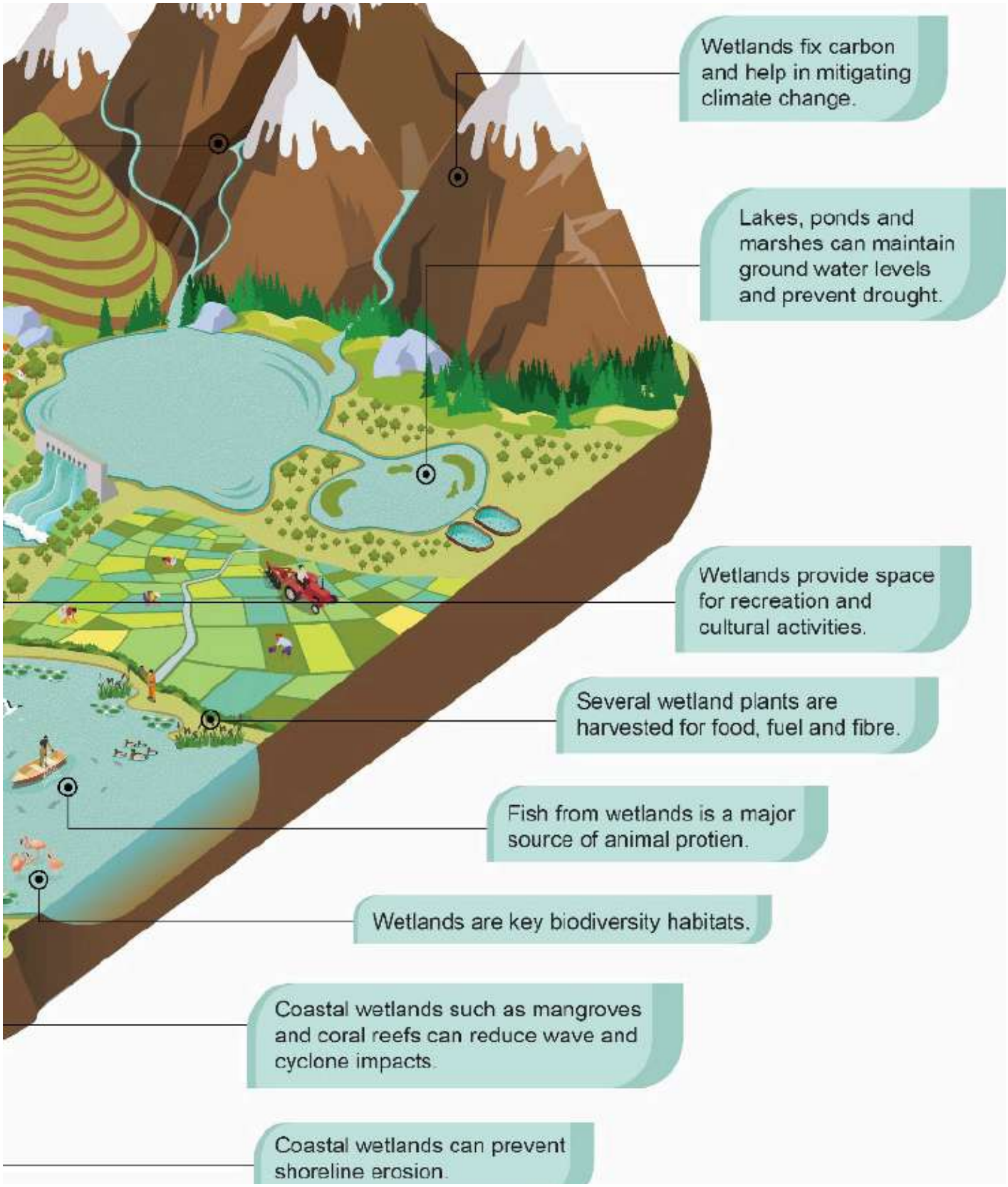


Out of total 24,90,584 Wetlands, only 102 wetlands are notified.

Source: Wetlands Atlas & Wetlands Portal of India

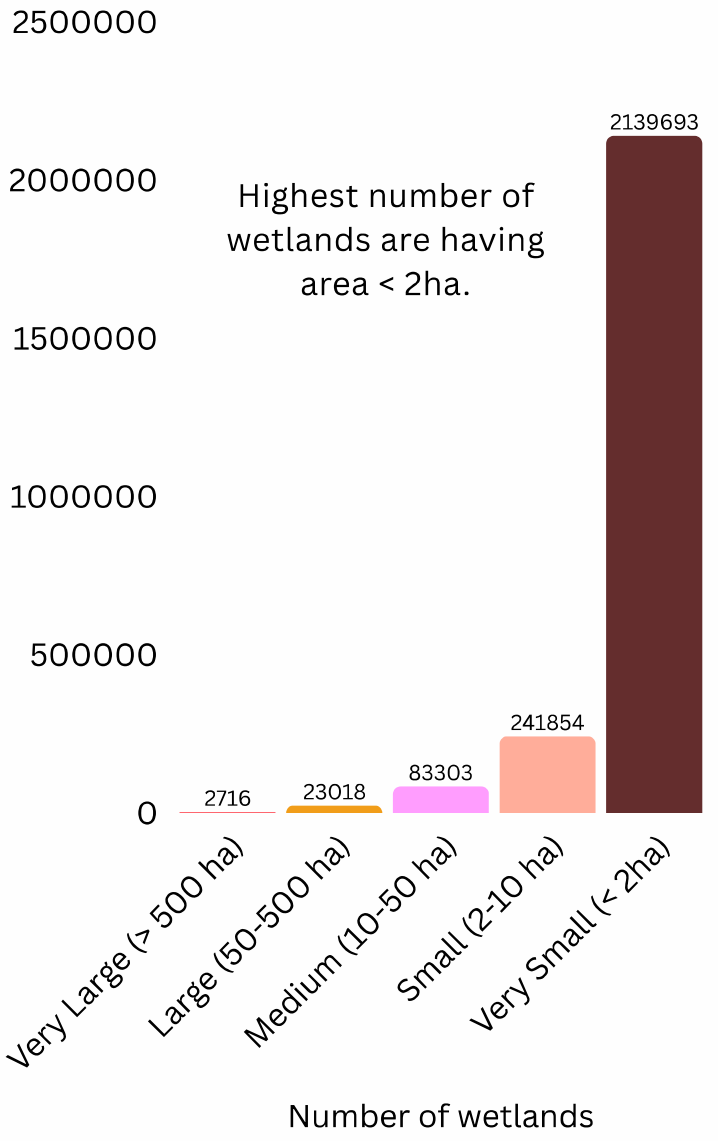
Ecosystem services provided by wetlands

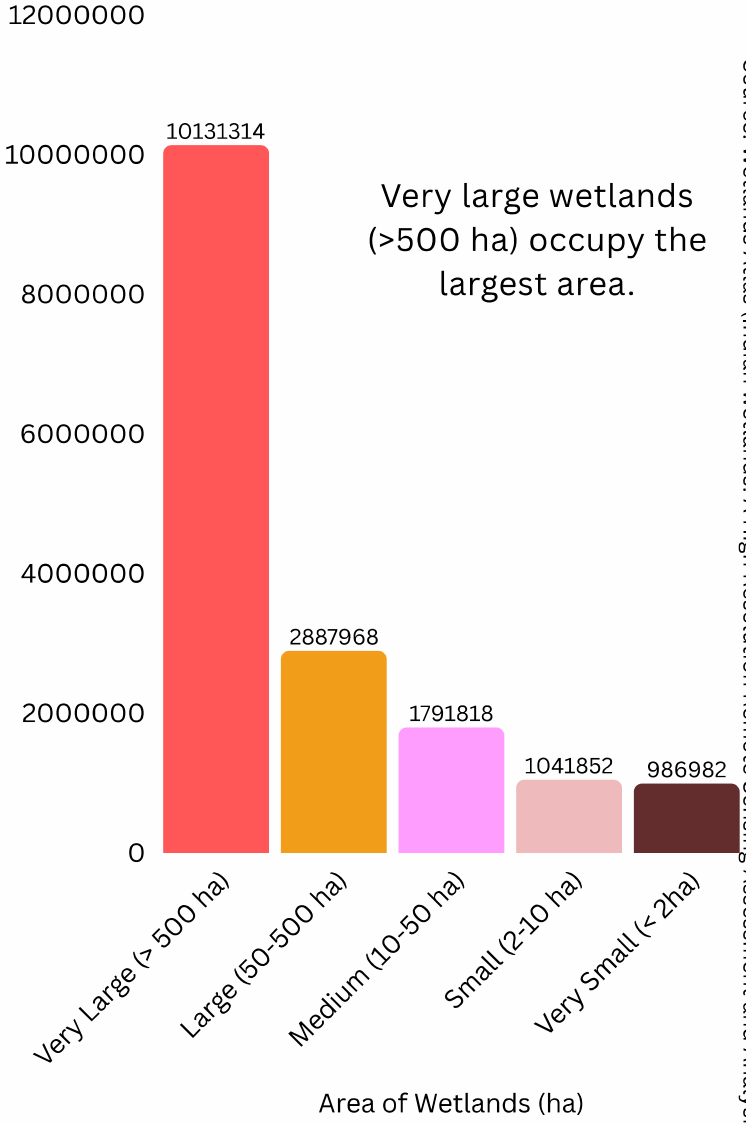
Values and benefits of wetlands



Source: Wetlands Division, Ministry of Environment, Forest and Climate Change

Wetlands distribution





Source: Wetlands Atlas (Indian wetlands: A High Resolution Remote Sensing Assessment and Analysis)

Source: Wetlands Atlas (Indian wetlands: A High Resolution Remote Sensing Assessment and Analysis)

Size wise wetland distribution in India as per "National Wetland inventory and Assessment phase-II

Threats to wetlands

The Punarbhaba dam in the Krishna basin altered the hydrological regime of the surrounding wetlands

Alteration of natural hydrological regimes

The Yamuna River and its associated wetlands are suffering from various forms of degradation

Catchment degradation

The Anchar Lake in J&K has become a marsh due to encroachment and the discharge of sewage.

Pollution

Kole wetlands of Kerala, which are threatened by Cabomba furcuta, water hyacinth, and Salvinia molesta.

Invasive species

Over-harvesting of resources

The Loktak Lake has seen local fishermen removed from the core area due to detrimental fishing practices.

Unregulated tourism

Unregulated tourism in Tsomoriri Lake is cited as a major threat, with tourist facilities built near the lake shore.

Climate Change

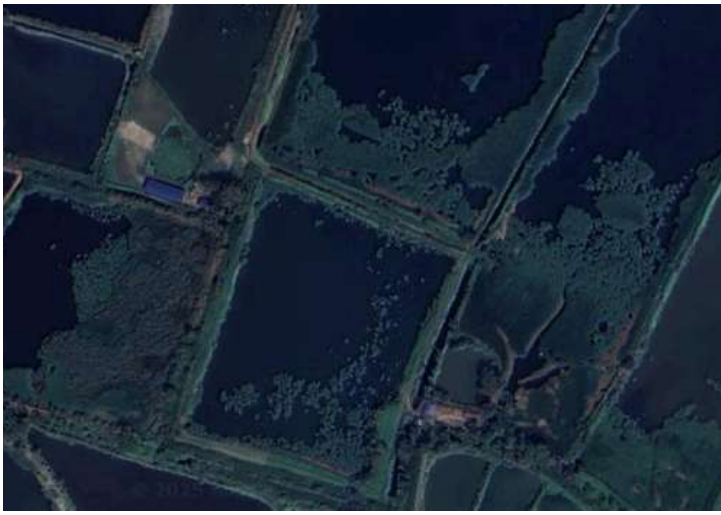
salinity intrusion in the Sundarbans due to rising sea levels, the degradation of urban wetlands like the Bellandur Lake in Bengaluru due to pollution.

Invasive fish like common carp have also been introduced into wetlands, harming native species and causing pollution in places like the Ganges and Loktak Lake. Additionally, the Nilgiri Biosphere Reserve in the Western Ghats is affected by Lantana camara, Prosopis juliflora, and Chromolaena odorata.

Wetlands affected by invasive alien species

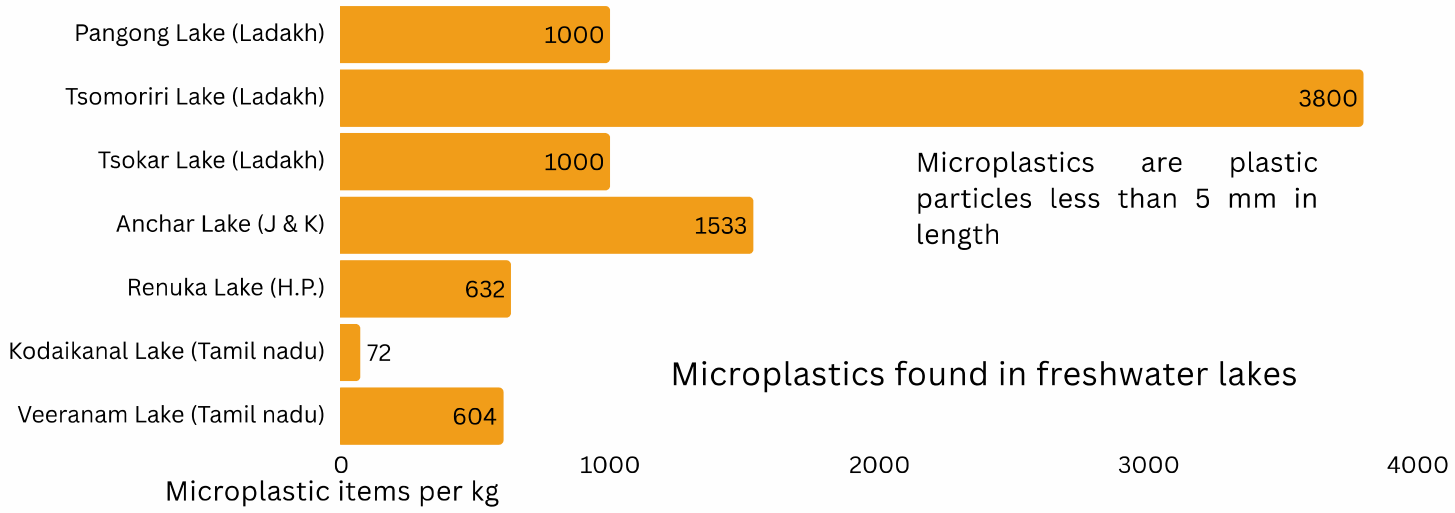
Spreading of Water Hyacinth in Sankhya Lake, Madhya Pradesh

Source: Wetland analysis using Google Earth

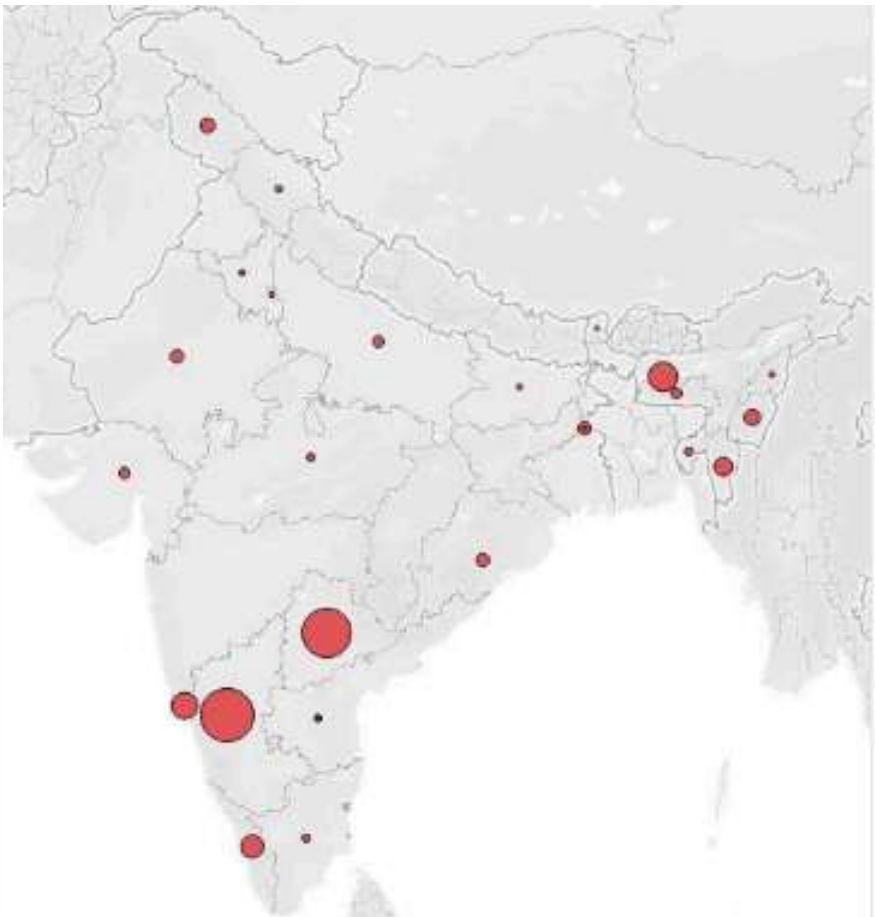


Spreading of Water Hyacinth in East Calcutta Wetlands, West Bengal

Microplastics in Freshwater Lakes



Source: Study published in American Chemical Society Omega 2023,8,34235-34248

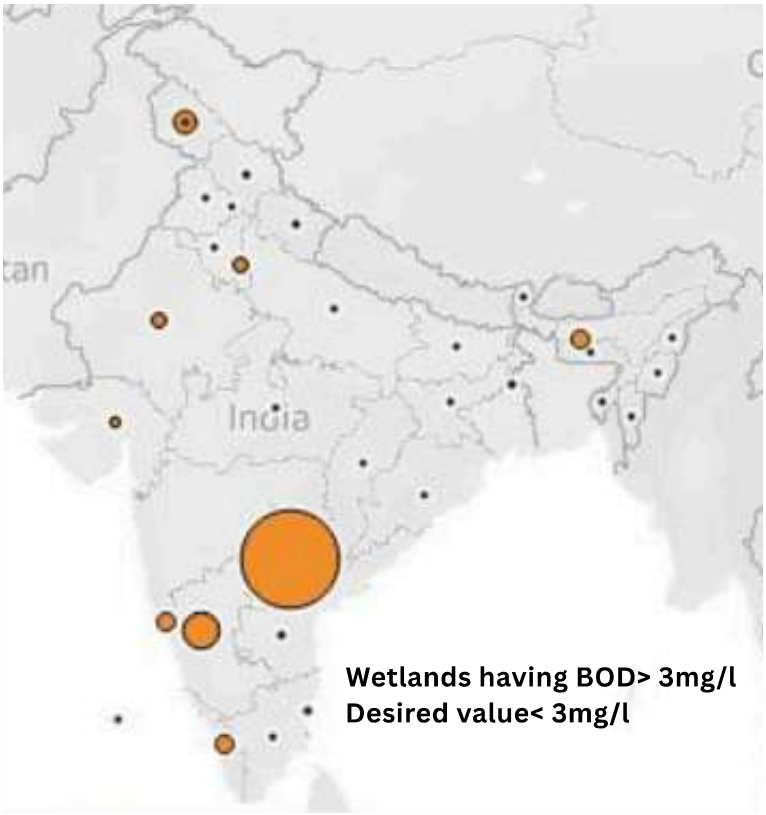


Number of Polluted wetlands (Statewise)

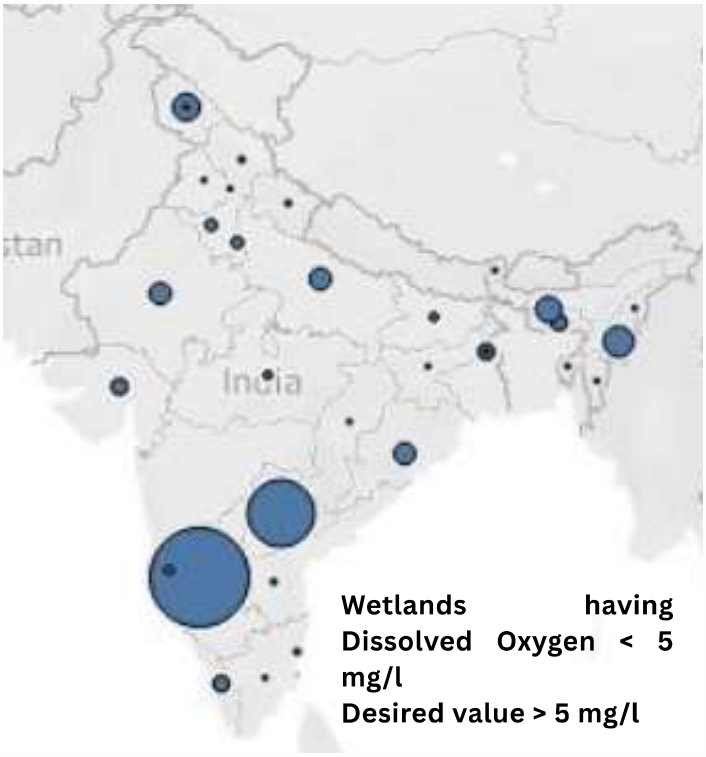
More than 532 wetlands do not satisfy the Primary Water Quality Criteria for Bathing notified under the E (P) Rules,1986 (Year 2023).

Source: Central Pollution Control Board Water Quality data of Lakes, Ponds, Tanks and Wetlands 2023

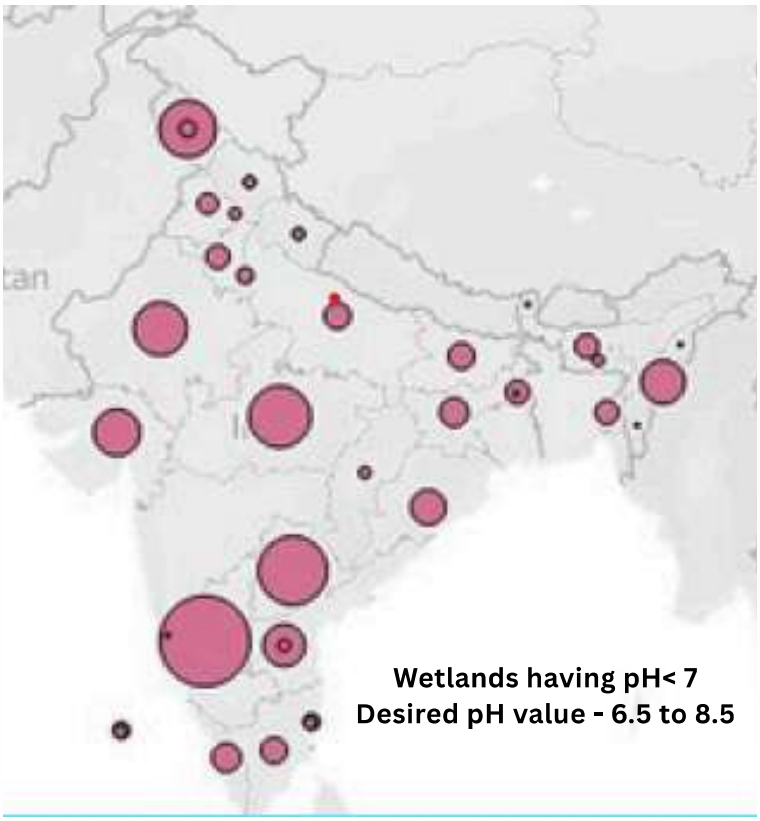
Polluted Wetlands as per Primary Water Quality Criteria for Bathing



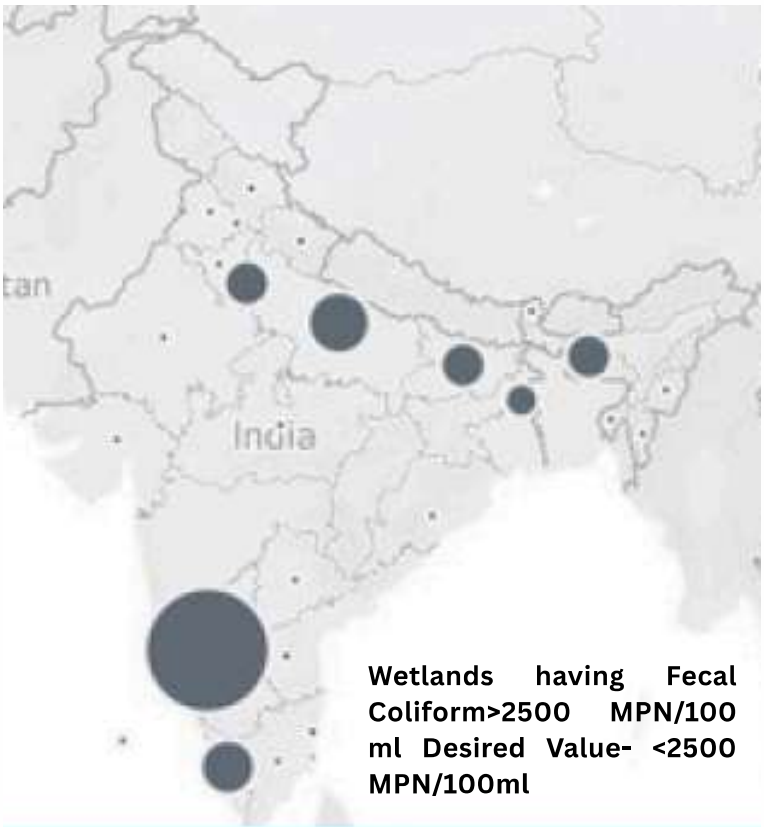
More than 128 wetlands are having BOD > 3mg/l. Telangana and Karnataka have most number of wetlands with BOD above the threshold limit.



More than 293 wetlands are having Dissolved Oxygen < 5mg/l. Telangana and Karnataka have most number of wetlands with DO below the threshold limit.



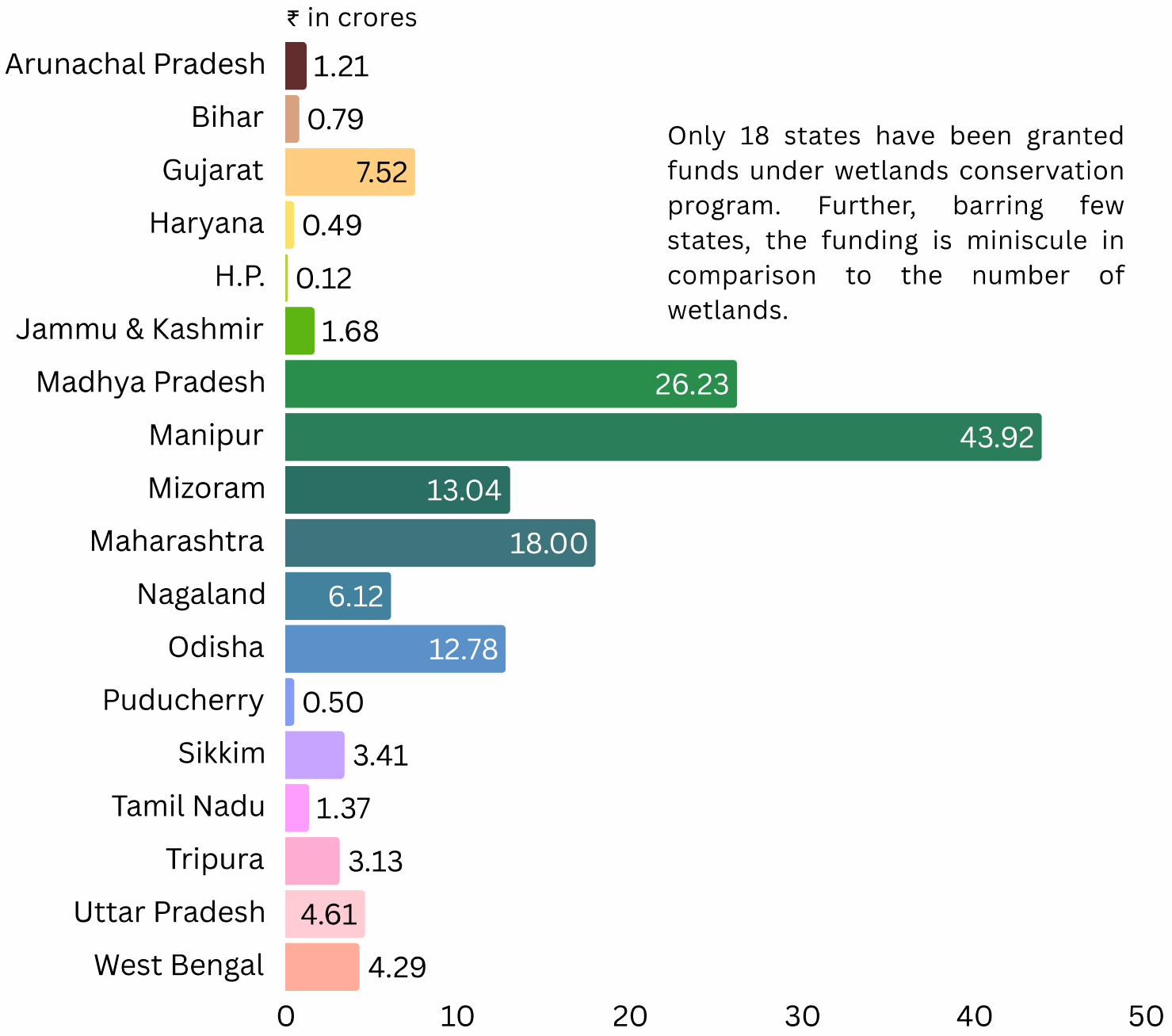
More than 265 wetlands are having pH < 7. Telangana, Karnataka, Madhya Pradesh, Jammu & Kashmir have most number of wetlands having lower pH value then the threshold limit.



More than 32 wetlands are having Fecal Coliform more than 25ooMPN/100ml. Karnataka has most number of wetlands with Fecal Coliform above the threshold limit.

Source: Central Pollution Control Board Water Quality data of Lakes, Ponds, Tanks and Wetlands 2023

Funding to States under National Wetlands conservation program



Source: MoEFCC Press Information Bureau release dated 27th March, 2023

Only 18 states have been granted funds under wetlands conservation program. Further, barring few states, the funding is miniscule in comparison to the number of wetlands.

Funding to various States & U.T. under 'National Wetlands Conservation Programme from 2019-20 to 2021-22

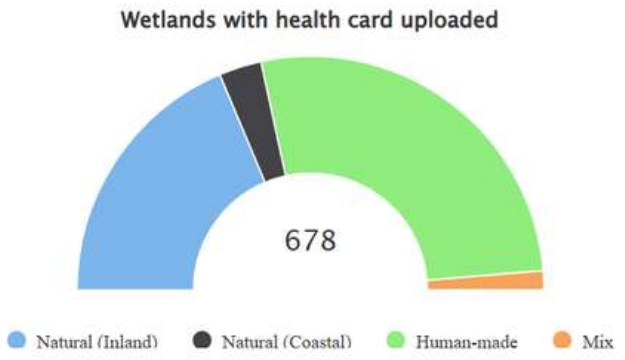
Latest audits conducted by the CAG of India on wetlands.

Report Name	Union/State	Timeframe Covered	Report No.
Performance Audit on Conservation of Wetlands	Gujarat	April 2010 to March 2015	Report No 5 of 2015
Performance Audit on Conservation of Coastal Ecosystems	Union Government	2015 to 2020	Report no. 04 of 2022

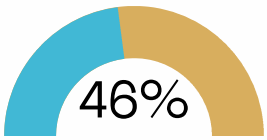
Very few audits on conservation of wetlands have been conducted by the CAG of India. Hence, an audit on conservation of wetlands is imminent.

Assessment and monitoring of wetlands using Wetlands Health Cards

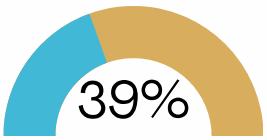
Health Cards of 655 wetlands available on National Wetlands Portal were analysed.



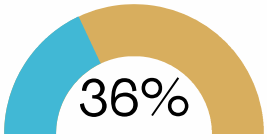
Out of 2492982 wetlands, only 678 wetlands have uploaded Health Cards (A tool used to assess and monitor the health of wetlands).



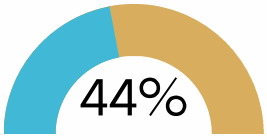
Wetlands have wetland area converted to non-wetland use since year 2000. 30 wetlands have more than 20% area converted.



Wetlands have natural inlets choked and diverted. 13 wetlands have more than 80% chocked inlets.



Wetlands have natural outlets choked and diverted. 18 wetlands have more than 80% outlets chocked.



Wetlands have wetland area covered by invasive macrophytes. 32 wetlands have more than 40% of area under invasive macrophytes.

Source: Analysis of Wetlands health cards uploaded on National Wetlands Portal

Wetlands Conservation: A key focal point in Media

1. "55 Asiatic softshell turtles found dead in Solapur lake" May 10, 2025 – The Times of India
2. Fish Continue to Die in Thane Lake Despite TMC Action. May 11, 2025 – The Times of India
3. Aquatic Insects Choke as Heavy Metals Poison Asan Wetland. June 23, 2024 – India Water Portal
4. Microplastic Contamination in Fishes of Loktak Lake. April 2024 – PubMed
5. Poisoned Wetlands, Toxic Fish in East Kolkata Wetlands. June 27, 2022 – India Water Portal
6. Effluents Causing Mass Mortality of Fish and Turtles in Haiderpur Wetland. February 4, 2022 – The Times of India

Notable Supreme Court/High Court/NGT Judgements on Wetlands conservation

- Supreme Court directs demarcation and ground truthing of Wetlands in India and 85 Ramsar sites to be monitored by respective High Courts.
- National Green Tribunal- Orders Survey of Pallikaranai Marshland amid Concerns over Encroachment, Imposes ₹ 10,000 Fine on Kerala for Delay in Ashtamudi Wetland Report and Forms Committee to Investigate Alleged Encroachment of Karbatal Wetland in Bihar.
- Himachal Pradesh High Court Seeks Report on Mining Activities Near Asan Wetland.
- National Green Tribunal Orders Investigation into Environmental Damage in Mysore's Lingabudhi Lake Area.
- Manipur High Court Calls for Reorganisation of Loktak Development Authority.
- National Green Tribunal Directs Government of Tamil Nadu to Take Swift Action Against Invasive mussels
- in Ennore Wetlands.

Audit Assessment Checklist

Biodiversity & Vegetation Cover

Audit Focus: Documentation and monitoring of native and invasive species, habitat quality, Assessment of vegetation types, density trends, and degradation

Key Questions:

- Are native species of flora and fauna adequately documented?
- Is there evidence of migratory bird presence during appropriate seasons?
- Are invasive species identified and controlled?
- How is habitat quality assessed and monitored?
- What are the dominant vegetation types across seasons?
- Is there a record of vegetation density trends over recent years?
- Has any degradation in vegetation cover been observed?

Water Quality

Audit Focus: Monitoring of chemical and biological parameters

Key Questions:

- Are regular tests conducted for pH, BOD, COD and nutrient levels?
- Are heavy metals and toxic contaminants monitored?
- How frequently are water quality reports generated and shared?

Ecosystem Services, Water Regime

Audit Focus: Evaluation of wetland contributions to environmental benefits, Monitoring of water levels and flow patterns

Key Questions:

- Is there any assessment of the wetland's role in carbon sequestration?
- Does the wetland contribute to flood buffering? How is this documented?
- Are groundwater recharge benefits measured or estimated?
- Are seasonal water levels recorded consistently?
- Are inflow and outflow points identified and monitored?
- Are abnormal water level fluctuations recorded and addressed

Catchment Integrity, Connectivity & LIvelihoods

Audit Focus: Land use changes, encroachments, and sedimentation, Hydrological and ecological linkages & Community dependency and resource use

Key Questions:

• Have land use changes within the catchment been studied?

• Are there documented cases of encroachments within the catchment?

• Is sedimentation monitored? Are there efforts to mitigate it?

• Is the wetland hydrologically connected to rivers or streams?

• Has connectivity been disrupted due to infrastructure or encroachments?

• Are restoration efforts in place to improve ecological linkages?

• Do local communities depend on the wetland for fishing, grazing, agriculture or tourism?

• Has there been a change in resource dependency in recent years?

Compliance, Management Plans & Monitoring Mechanisms

Audit Focus: Adherence to Wetlands (Conservation & Management) Rules, 2017, Development and review of Integrated Management Plans & Effectiveness of management tools and audits

Key Questions:

• Are the provisions of Wetlands (Conservation & Management) Rules, 2017 being followed?

• Are wetlands notified and delineated as per the rules?

• Has an Integrated Management Plan (IMP) been prepared, implemented, and reviewed periodically?

• Is METT or a similar tool used to assess management effectiveness?

• Are third-party audits or reviews conducted?

Funding and Resource Allocation

Audit Focus: Efficiency of fund utilization and resource adequacy

Key Questions:

• Are funds from NPCA or state schemes being utilized efficiently?

• Is there a gap between allocation and expenditure?

• Are staff and infrastructure adequate for wetland management?

Satellite Imagery, Health Cards & Portal Integration

Audit Focus: Use of remote sensing for monitoring, Health Cards, Portal Integration

Key Questions:

• Is remote sensing data used to monitor wetland extent and encroachments?

• Are historical changes in wetland area analyzed?

• Are wetland health cards prepared as per WII guidelines?

• Are they updated regularly and publicly available?

• Is data for the wetlands regularly uploaded on Wetlands Portal of India?

• Are updates made in real-time or periodically?

Plastic Waste Presence & Waste Segregation and Recycling

Audit Focus: Management of plastic waste accumulation, Community and municipal waste management practices

Key Questions:

• Is there visible plastic waste accumulation in and around the wetland area?

• Are regular clean-up drives organized to manage plastic litter?

• Are waste segregation and recycling practices implemented at the community or municipal level near the wetland?

• Are there designated plastic waste collection or recycling points nearby?

Governance and Regulation

Audit Focus: Enforcement of plastic waste regulations

Key Questions:

• Are there any restrictions or bans on single-use plastics in the wetland buffer zone?

• Is there coordination with municipal solid waste departments for wetland specific plastic waste management?

• Are enforcement measures in place against illegal dumping of plastic waste in wetlands?

RIVERS

International Centre for Environment Audit and Sustainable Development

Why to audit, Rivers?

Pollution in Rivers & Polluted River Stretches in India

- 311 river stretches on 279 rivers were polluted based on Biological Oxygen Demand (BOD>3 mg/l). 46% of rivers (279 out of 603) monitored in 2022 are identified as polluted.

Toxic Metals in Rivers of India

- India tested only 37 per cent of its 870 river water quality monitoring stations. Nearly half of those recorded alarming levels of toxic heavy metals.

Funding to National Mission for Clean Ganga (NMCG)

- Funding to National Mission for Clean Ganga remained constant except during 2018-19 & 2022-23.

Funding to States under National River Conservation Project (NRCP)

- Almost 60% funds have been given to only two states, Maharashtra and Gujarat.

Case Studies on Encroachment in indian rivers.

- Analysis was done using Google Earth and encroachments were seen on various rivers.

Latest Audits conducted by CAG of India on Rivers

- Very few audits on conservation of rivers have been conducted by CAG of India making it imminent.

River Conservation A key focal point in the Media

- Media publications such as The Times of India, India water portal etc. have consistently highlighted the river conservation issue.

Notable Supreme Court/High Court/NGT Judgements on river conservation

- The Supreme court of India in M.C. Mehta vs Kamal Nath & Ors in 1996 quashed a lease granted to a private motel on the Beas River's riverbed, ordering restoration of the area to its original condition.

India is home to more than 400 rivers. The Ganga Basin traversing a distance of 2525 km from its source houses almost 40% population of India.

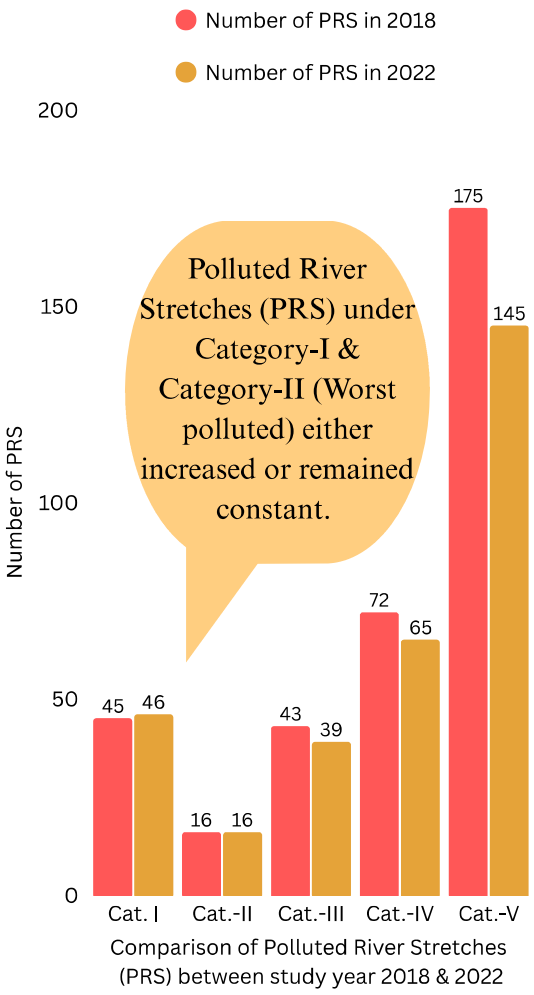
Five pillars of Namami Gange

Pollution in Rivers & Polluted River Stretches in India

Any location not complying to BOD (Primary water quality criteria for outdoor bathing, BOD<=3 mg/l) is classified polluted location.

Two or more polluted locations identified on a river in a continuous sequence are considered as a stretch and defined as Polluted River Stretch.

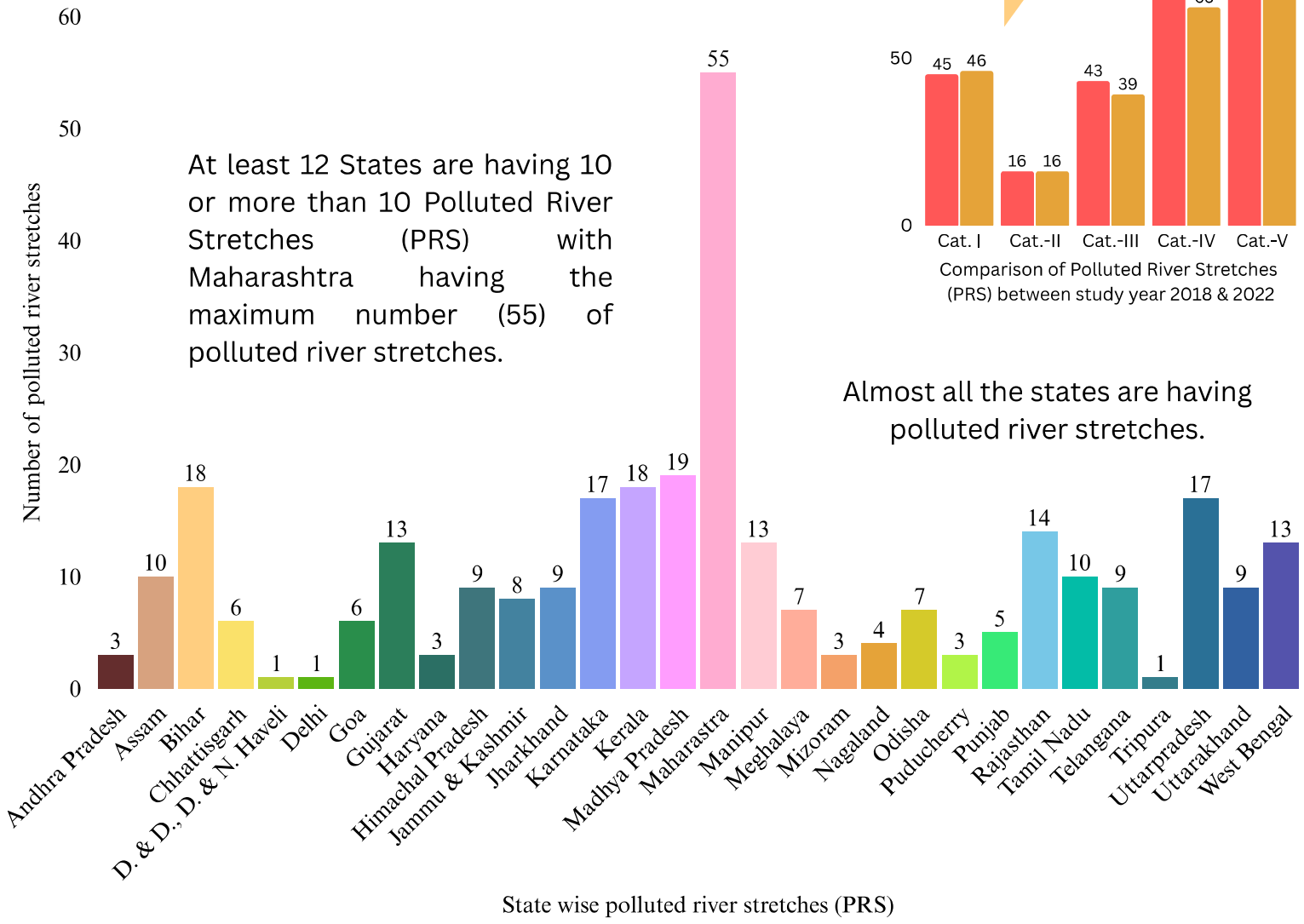
- Out of a total of 4484 locations monitored by CPCB for water quality, 2108 locations are situated on Rivers.
- 311 river stretches on 279 rivers were polluted based on Biological Oxygen Demand (BOD>3 mg/l)
- 46% of rivers (279 out of 603) monitored in 2022 are identified as polluted.
- 108 PRS identified in both the assessment years of 2018 & 2021 remained same indicating no improvement/change in their water quality.



Comparison of Polluted River Stretches (PRS) between study year 2018 & 2022

At least 12 States are having 10 or more than 10 Polluted River Stretches (PRS) with Maharashtra having the maximum number (55) of polluted river stretches.

Almost all the states are having polluted river stretches.



State wise polluted river stretches (PRS)

Source: Analysis of water quality of rivers by Central Pollution Control Board, PIB press release 20/07/2023

Toxic Metals in Rivers of India

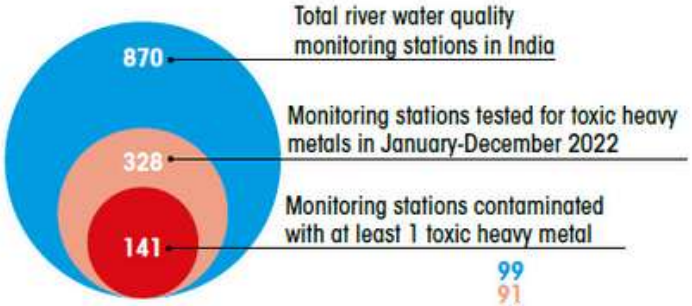
India tested only 37 per cent of its 870 river water quality monitoring stations

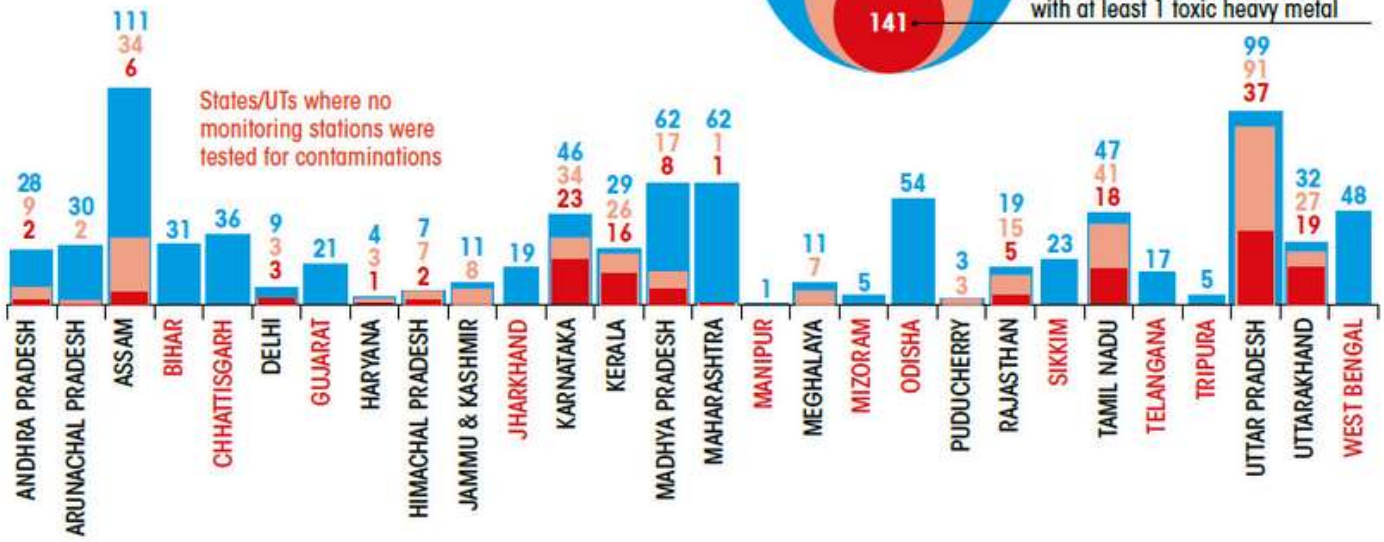
Nearly half of those recorded alarming levels of toxic heavy metals.

At 38 monitoring stations, high levels of two or more toxic metals were detected.

Limited scope

In 11 of the 28 states and Union Territories with monitoring stations, no stations were tested for heavy metals





MERCURY (HG)

18 monitoring stations contaminated

Permissible limit | **1 µg/L**

Polluted rivers: **11 rivers in 8 states**

Most polluted site: **Palla** (8.903 µg/L) **| Yamuna river**

Pollution sources: **Mining and refining of mercury, organic mercurials used in pesticides, laboratories using mercury**

Health effects: **Disruption of the nervous system, damage to brain functions, DNA and chromosomal, allergic reactions resulting in skin rashes, tiredness and headaches, negative reproductive effects (sperm damage, birth defects and miscarriages)**

LEAD (PB)

30 monitoring stations contaminated

Permissible limit | **10µg/L**

Polluted rivers: **25 rivers in 7 states**

Most polluted site: **Avershe** (63.483 µg/L) **| Seetha river**

Pollution sources: **Automobile emissions, lead smelters, burning of coal and oil, lead arsenate pesticides, smoking, mining and plumbing**

Health effects: **Anaemia, kidney disease, nausea, anorexia, and severe abdominal cramps, muscle aches and joint pain, lung damage, difficulty in breathing**

ARSENIC (AS)

30 monitoring stations contaminated

Permissible limit | **10 µg/L**

Polluted rivers: **14 rivers in 3 states**

Most polluted site: **Kora** (19.47 µg/L or 1.9 times the safe levels **| Rind river (tributary of Yamuna)**

Pollution sources: **Arsenic containing fungicides, pesticides and herbicides, metal smelters, byproducts of mining activities, chemical wastes**

Health effects: **Conjunctivitis, hyperkeratosis, hyperpigmentation, cardiovascular diseases, disturbance in the peripheral vascular and nervous systems, skin cancer, gangrene, leucomelonisis, non pitting swelling, hepatomegaly and splenomegaly**

IRON (FE)

74 monitoring stations contaminated

Permissible limit | **1000 µg/L (or 1.0 mg/L)**

Polluted rivers: **51 rivers in 9 states**

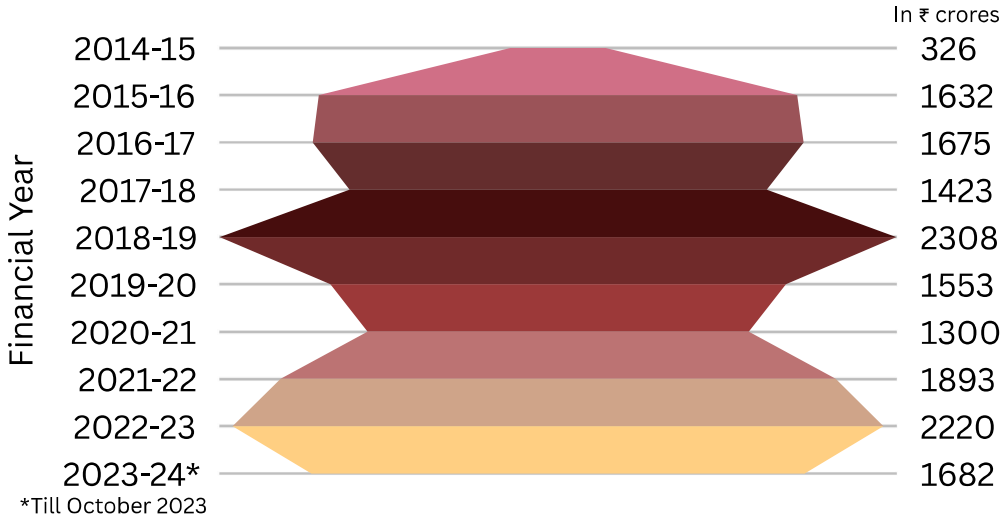
Most polluted site: **Kirtinagar** (11.387 mg/L) **| Alakananda river**

Pollution sources: **Cast Iron, Wrought Iron, steel, alloys, construction, transportation, machine manufacturing**

Health effects: **Liver cirrhosis, diabetes, and susceptibility to heart attacks**

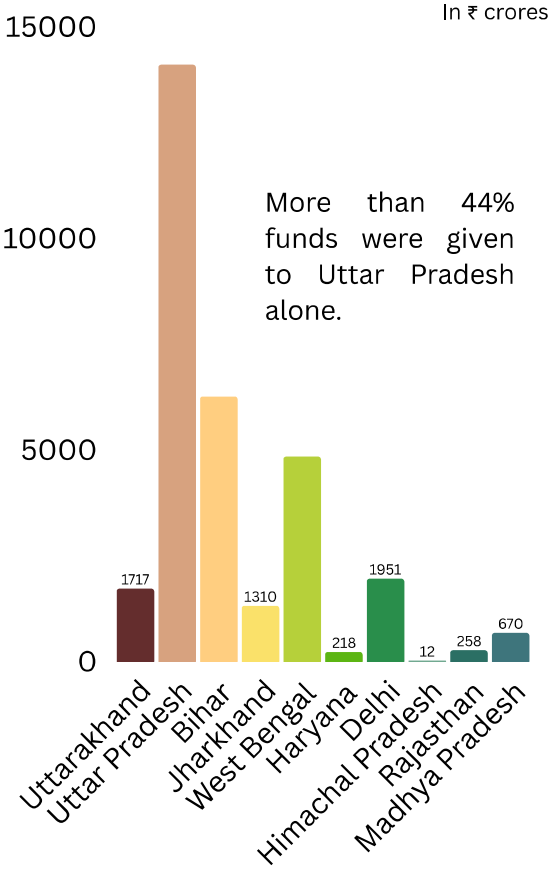
Source: **"Status of Trace & Toxic Metals In Rivers of India, January to December 2022"** by Central Water Commission

Funding to National Mission for Clean Ganga (NMCG)



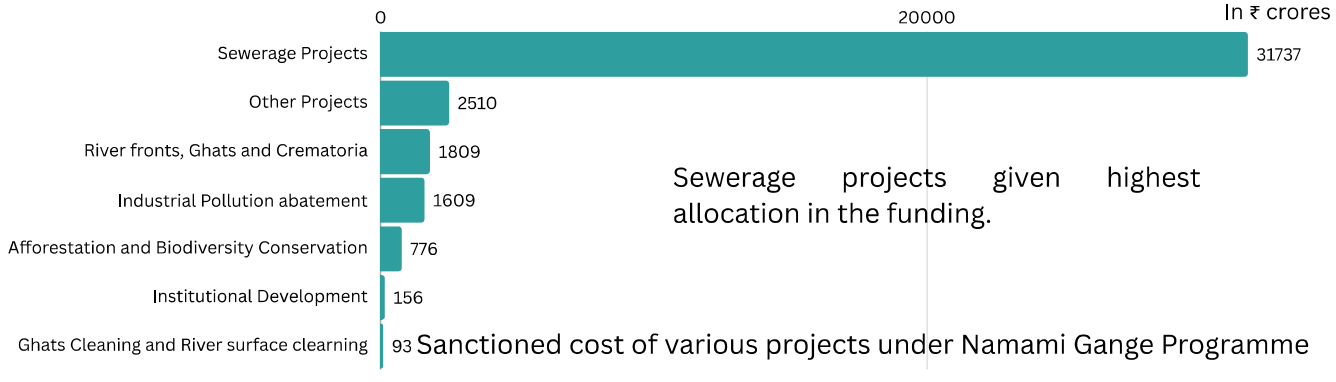
Funding to National Mission for Clean Ganga remained constant except during 2018-19 & 2022-23.

Funds released by Government of India to National Mission for Clean Ganga



More than 44% funds were given to Uttar Pradesh alone.

State-wise sanctioned cost of sewerage projects under Namami Gange Programme

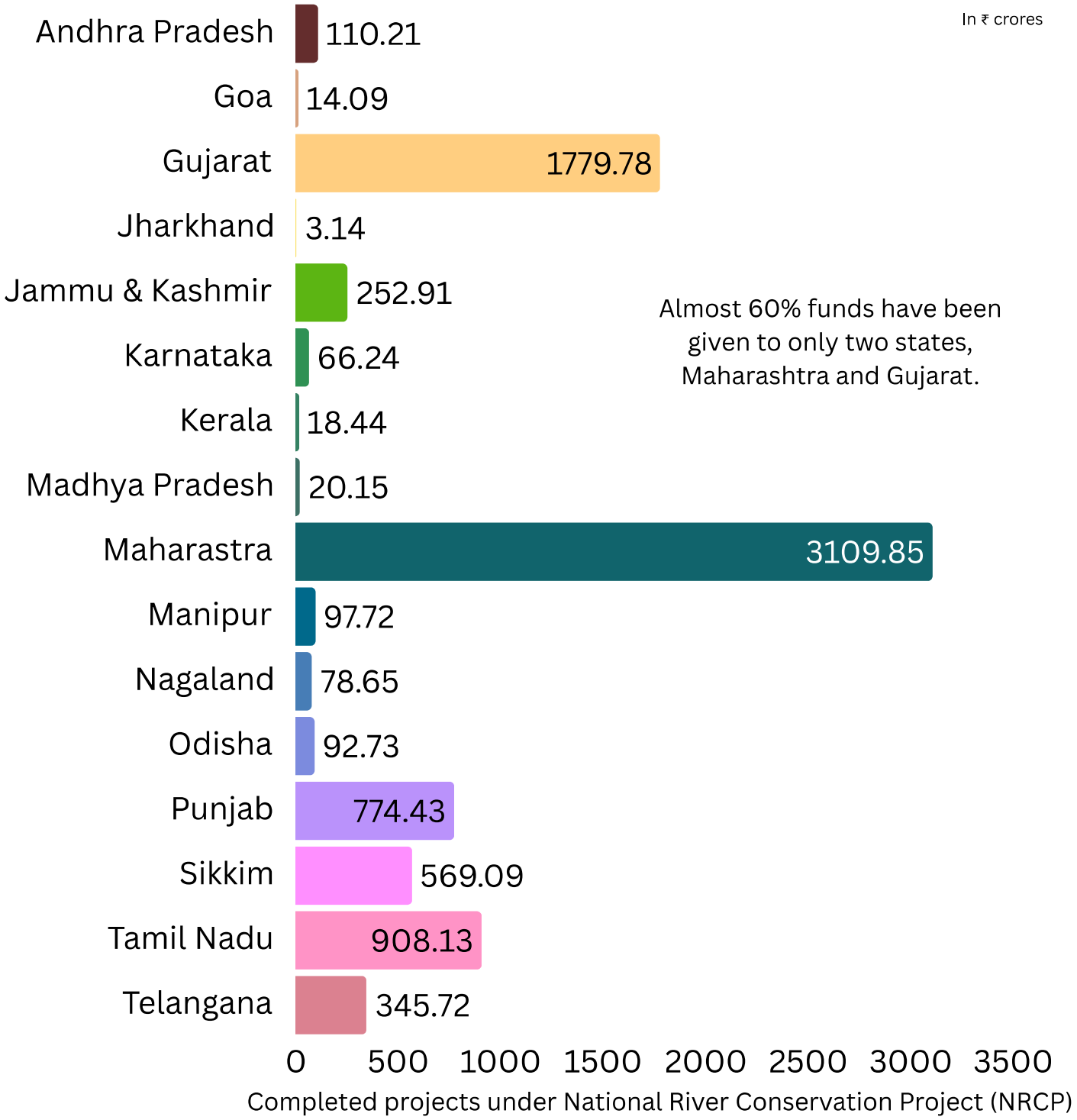


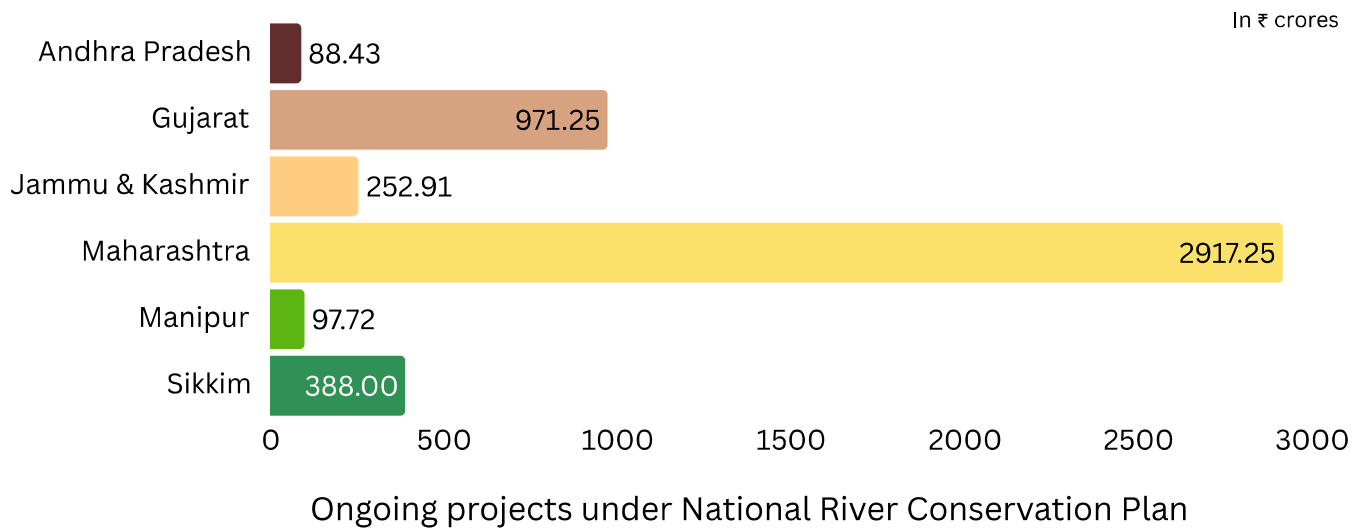
Sewerage projects given highest allocation in the funding.

Sanctioned cost of various projects under Namami Gange Programme

Source: National Mission for Clean Ganga (NMCG) Annual Report 2023-24, Data as on 31st March, 2024

Funding to States under National River Conservation Project (NRCP)

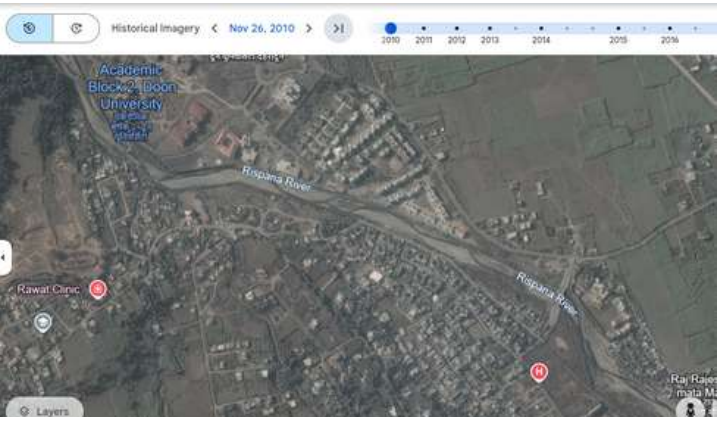


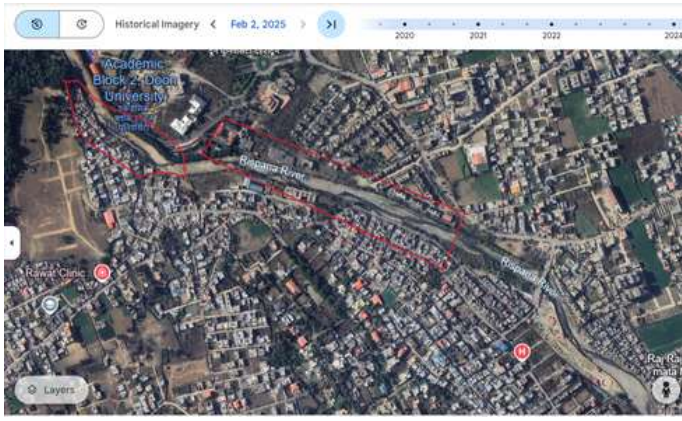


Source: Reply of Minister of State for Jal Shakti in Lok Sabha on 07.12.2023, Data as on 30th November, 2023

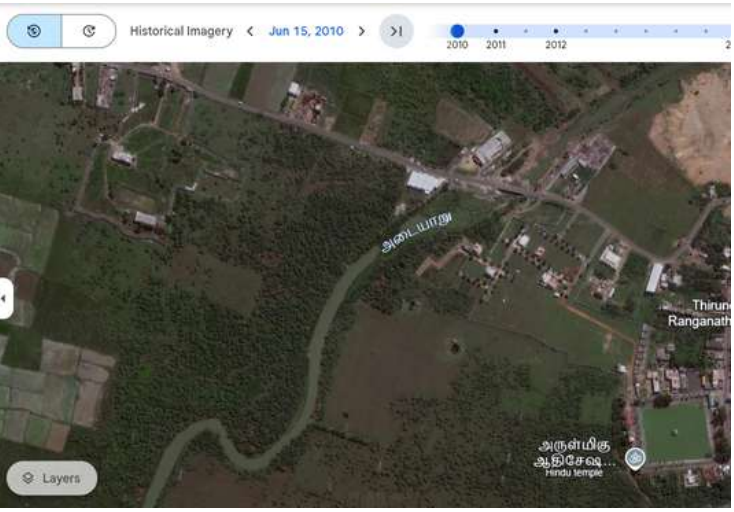
Case studies on encroachments on Indian rivers

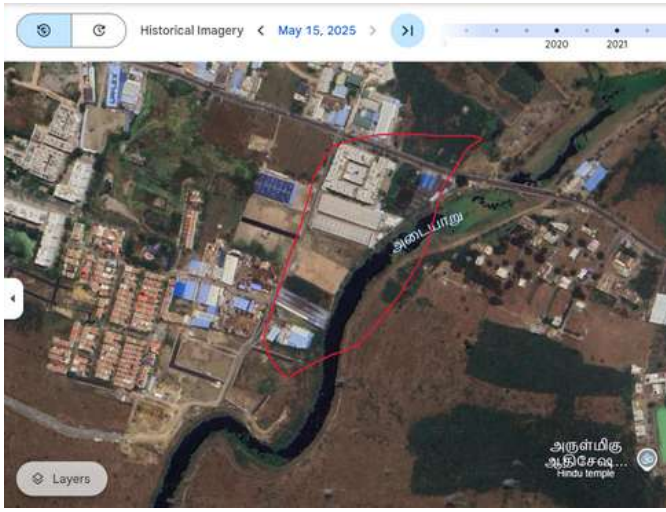
Encroachment on Rispna river, Dehradun, Uttarakhand b/w Nov. 2010 & Feb. 2025



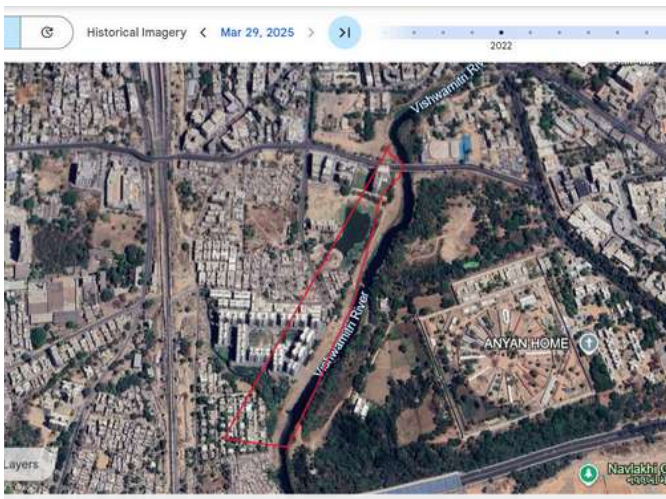


Encroachment on Adyar river, Chennai, Tamilnadu b/w June 2010 & May 2025

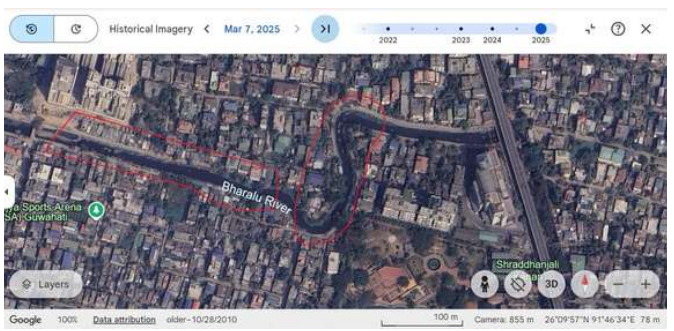




Encroachment on Vishwamitri river, Vadodara, Gujarat b/w March 2010 & March 2025



Encroachment on Bharalu river, Guwahati, Assam b/w Oct. 2010 & March 2025



Source: Analysis done using Google Earth Historical data

Latest audits conducted by the CAG of India on rivers.

Report Name	Union/State	Timeframe covered	Report No.
Performance Audit on Degradation of Kshipra River	Madhya Pradesh	2016-17 to 2020-21	Report no. 06 of 2023
Performance Audit of Rejuvenation of River Ganga (Namami Gange)	Union	2014-15 to 2016-17	Report no.39 of 2017
Performance Audit of Rejuvenation and Conservation of the Harmu River	Jharkhand	2014-15 to 2021-22	Report no. 01 of 2023
Performance Audit on Schemes for Flood Control and Flood Forecasting	Union	2007-08 to 2015-16	Report no. 10 of 2017

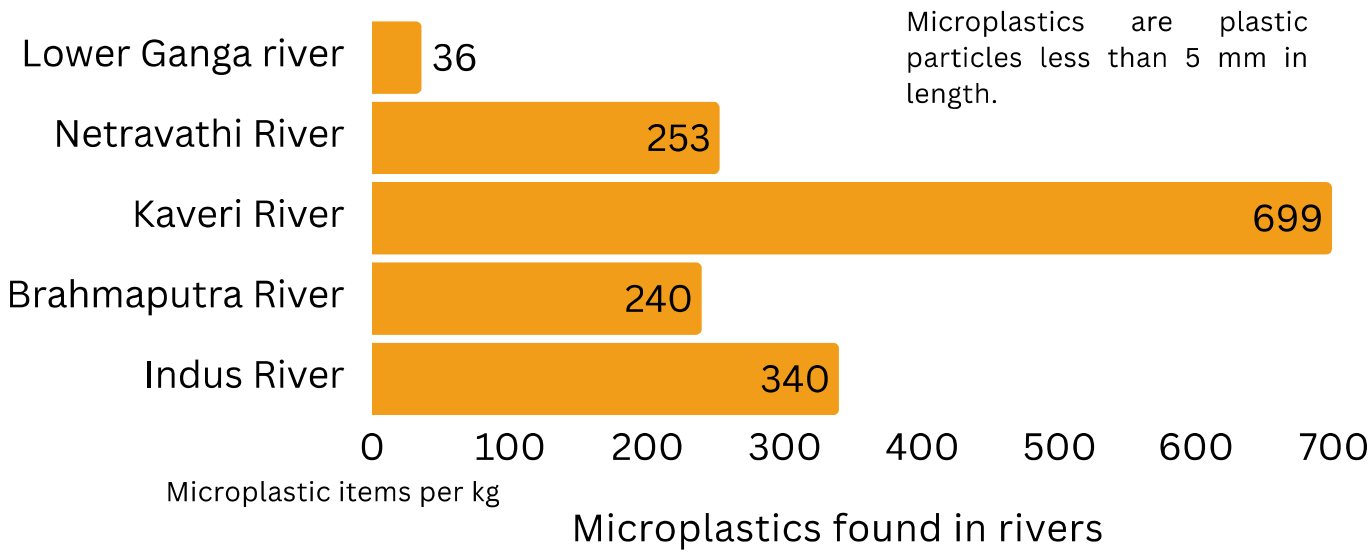
Very few audits on conservation of rivers have been conducted by CAG of India. Hence, an audit on conservation of rivers is imminent.

River Conservation: A key focal point in the Media

1. **Watered down: Almost half of India's rivers still remain polluted; here is why. July 18, 2023- Down to Earth**
2. **Rivers in peril: How pollution endangers India's water lifelines. March 13, 2025- The Indian Express**
3. **Telangana: Deepening pollution crisis in Godavari threatens lives, livelihoods. May 13, 2025- Telangana Today**
4. **Sewage pollution drives drastic deterioration of Brahmaputra in last six years. December 15, 2021-Dialogue Earth**
5. **India's polluted rivers are becoming a global pollution problem. July 25, 2024-Mongabay**
6. **23 Yamuna sites fail quality test, river can barely sustain life in Delhi: Parliamentary Panel report. March 13, 2025- The New Indian Express**

- **The Supreme Court of India in M.C. Mehta vs Kamal Nath & Ors in 1996 quashed a lease granted to a private motel on the Beas River's riverbed, ordering restoration of the area to its original condition.**
- **Bombay High Court directed the Maharashtra government to launch programmes to remove and curb pollution in the Godavari river. It also directed the state to consider formulating a "River Regulation Policy.**
- **NGT directed all State and Union Territory (UT) Governments to implement Action Plans approved by Central Pollution Control Board (CPCB) for rejuvenation/ restoration of polluted river stretches (PRS) falling in category priority I to priority IV**
- **NGT ordered West Bengal Govt. to remove encroachment from Saraswati river.**
- **NGT directed demolition of 36 illegally constructed villas within the floodplain of the Indrayani River in Pune.**

Microplastics in Rivers



Source: Study published in American Chemical Society Omega 2023,8,34235−34248

Audit Assessment Checklist

Water Quality and Pollution Load

Audit focus: Water pollution levels and Treatment

Key Questions:

- Are water samples tested regularly for pH, DO, BOD, TDS, nutrients and heavy metals?
- Are the results benchmarked against CPCB water quality standards?
- Are there seasonal trends or exceedances in pollution levels?
- Are tests conducted for fecal coliform and E. coli?
- Are the microbial parameters within safe limits for bathing or aquatic life?
- Have point sources like STPs, CETPs, and industrial outfalls been mapped?
- Are non-point sources such as urban run-off and agricultural discharge identified and monitored?
- Are any unauthorized drains or effluent channels discharging into the river?

River Morphology & Flow Regime

Audit focus: Ecological flow, Construction and Encroachments

Key Questions:

- Has minimum ecological flow (e-flow) been scientifically assessed?
- Is e-flow being maintained downstream of dams and barrages?
- re there signs of excessive sedimentation or riverbank erosion?
- Are riverbed profile changes being monitored?
- Have floodplains been mapped?
- Are there illegal constructions, agricultural encroachments, or sand mining in the floodplain?
- Are encroachments recorded using GIS or drone mapping?

Biodiversity & Ecosystem Health

Audit focus: Biodiversity Monitoring and Conservation

Key Questions:

- If fish diversity being monitored regularly?
- Are migratory species and macroinvertebrates being recorded?
- Are fish kill events documented and investigated?
- Is there a vegetative buffer along the riverbanks?
- Are invasive plant species present and managed?
- Are structures like dams and barrages fragmenting riverine habitats?
- Are fish passes or ecological corridors in place to mitigate fragmentation?

Infrastructure & Wastewater Management

Audit focus: Solid Waste Infrastructure, CPCB & SPCB Compliance

Key Questions:

- Are treatment plants operating within design capacity?
- What technology is used—secondary or tertiary treatment?
- Is treated water reused or discharged directly?
- What percentage of urban and peri-urban population is connected to sewerage networks?
- If untreated sewage or greywater entering the river?
- Is there dumping of solid waste along riverbanks or floodplains?
- Are bins and waste collection services available near the river?
- Are river water quality parameters within CPCB/SPCB permissible limits?
- Are industries complying with Consent to Operate (CTO) and Consent to Establish (CTE) norms?
- Is Zero Liquid Discharge (ZLD) implemented in identified units?

Governance & Institutional Mechanisms

Audit focus: River water monitoring & Action plans

Key Questions:

- Is the river covered under Namami Gange, NRCP, or any state river mission?
- Are action plans developed, implemented, and reviewed periodically?
- Are River Health Index or other composite indicators used?
- Are real-time or manual water quality stations functional?
- Is there regular coordination among CPCB, SPCB, ULBs, Water Resource Departments, and others?
- Are joint inspections and action plans conducted collaboratively?

Technology & Data Systems

Audit focus: Satellite & drone monitoring, Online data portals & livelihoods

Key Questions:

- Are satellite or drone-based tools used for mapping Rivers and encroachments?
- Is there a record of change detection over the years?
- Are automatic stations installed for continuous monitoring of water quality and flow?
- Is data being transmitted to central or state portals?
- Is water quality and pollution data available on public platforms like ENVIS, Ganga Tarang or state dashboards?
- Is there a system for citizen access and reporting?
- Are communities dependent on the river for fishing, agriculture or sand mining?
- Has any assessment of livelihood impacts due to river pollution or flow alteration been done?
- Are sustainable livelihood alternatives promoted as part of conservation plans?

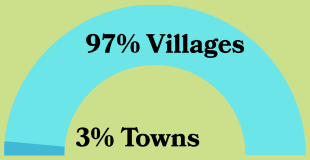
RURAL DEVELOPMENT

iCED
International Centre for Environment
Audit and Sustainable Development

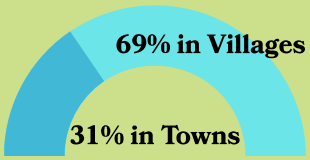
Why to Audit, Rural Development?

With nearly 69% of India's population residing in villages and over 97% of settlements being rural, evaluating the efficacy of rural development schemes is critical for inclusive national progress.

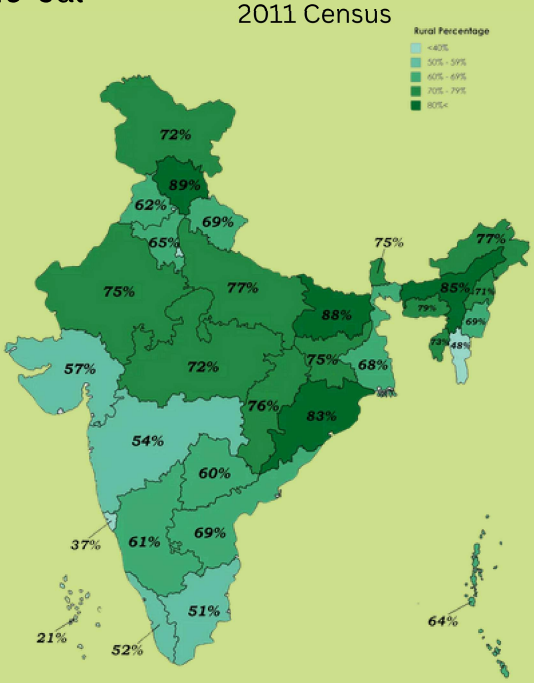
- **Vacant Villages:** Nearly 6.25% of total villages are uninhabited. This indicates a rising congestion issue on Urban Centres.
- **Demographic & Poverty Challenges:** Rural poverty remains high, with a 41.8% headcount ratio (Tendulkar Committee, 2009).
- **Five major schemes** account for 98% of the Ministry of Rural Development's budget
- Only **21%** of contaminated water samples have seen remedial action, water sampled in villages under the Jal Jeevan Mission.
- Delay in the PMAY-G first instalment release in many states **exceed 100 days** despite a 55-day national average.
- Inadequate number of Sub-Health Centres, PHCs and CHCs coupled with vacancies of specialist doctors as high as **83%** severely hampers access to essential healthcare services for the rural poor.
- A significant share of MGNREGS workers are elderly (33.87% above **60 years of age** in West Bengal).
- As per NSO, for the period 2017 to 2023, there has been volatility in the Crop Sector, Sharp Swings in Fishing & Aquaculture, and Stagnant Overall Agriculture Growth (~3.5%) while the Livestock Growth has remained near steady.



Area in Square Km.
2011 Census

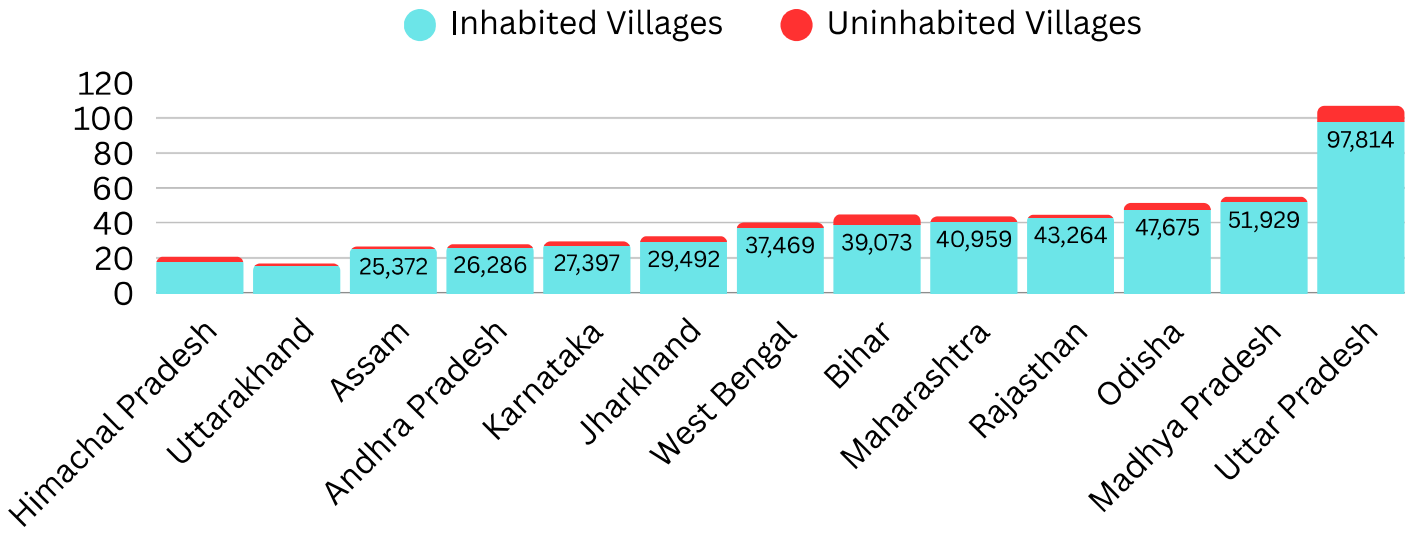


Population Residing
2011 Census



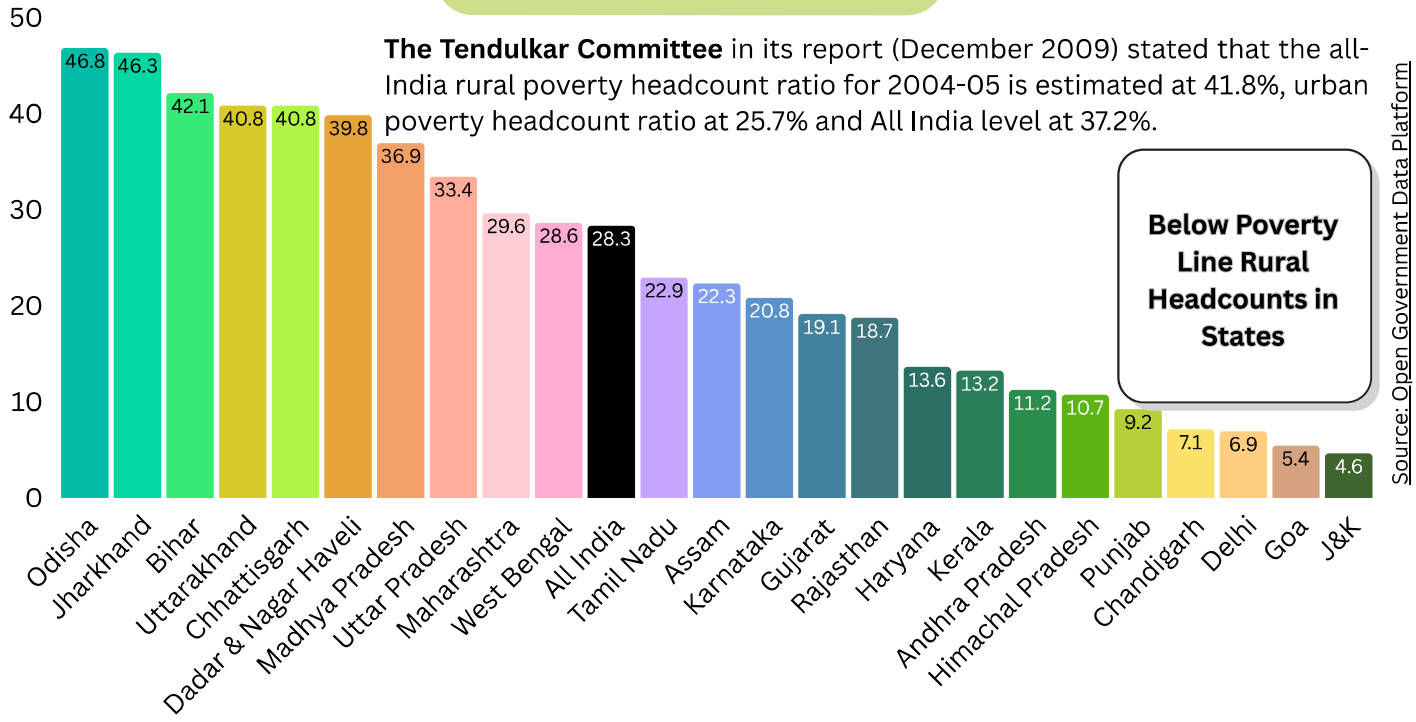
% of Rural Population 2011 Census

2011 Census: Uninhabited Villages vs Inhabited villages



Nearly 6.25% of total villages are uninhabited. This indicates a rising congestion issue on Urban centres.

Rural Poverty (2004-05)



The Tendulkar Committee in its report (December 2009) stated that the all-India rural poverty headcount ratio for 2004-05 is estimated at 41.8%, urban poverty headcount ratio at 25.7% and All India level at 37.2%.

Source: Open Government Data Platform

Ministry of Rural Development

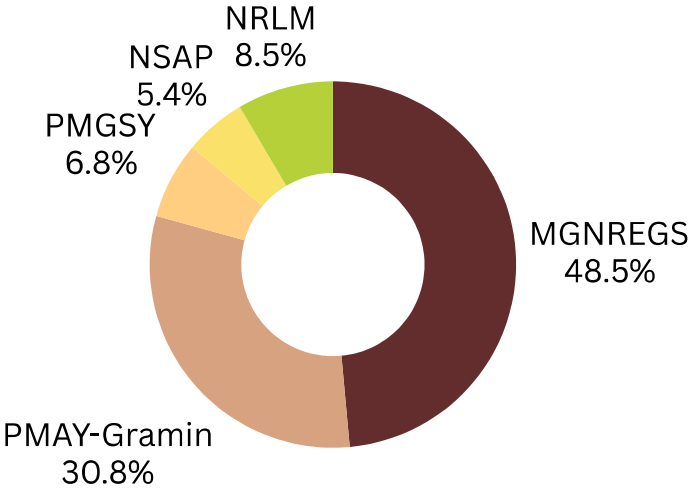
"The vision and mission of the Ministry is sustainable and inclusive growth of rural India through a multipronged strategy for eradication of poverty by increasing livelihood opportunities, providing a social safety net and developing infrastructure for growth."

Budgetary Allocation & distribution

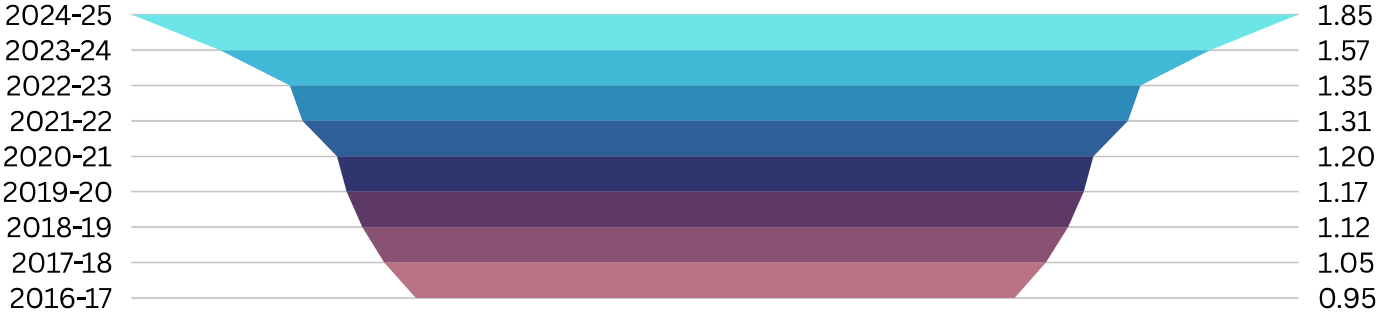
The Indian government's rural development budget primarily focuses on schemes that address employment, infrastructure, livelihoods, and social security. Key initiatives include MGNREGS (providing employment), PM Gram Sadak Yojana (improving rural connectivity), National Rural Livelihood Mission (supporting livelihoods through self-help groups), and PM Awas Yojana-G (providing housing).

98% of the Budget provided to the Ministry of Rural Development is utilised for five major schemes, MGNREGS, PMGSY, PMAY-G, NSAP, and NRLM.

Major Schemes under Rural Development



Source: 2024-25 Budget Estimates

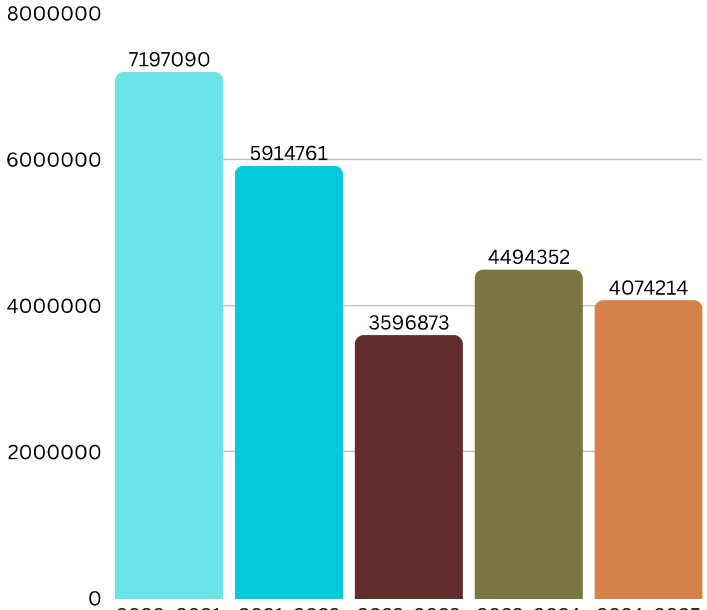


The Ministry has consistently spent above one lakh crore rupees on rural development. The budget has more than doubled from 0.85 lakh crore in 2016-17 to 1.85 lakh crore in 2024-25.

Source: PRS India and Open Budgets India Dataset

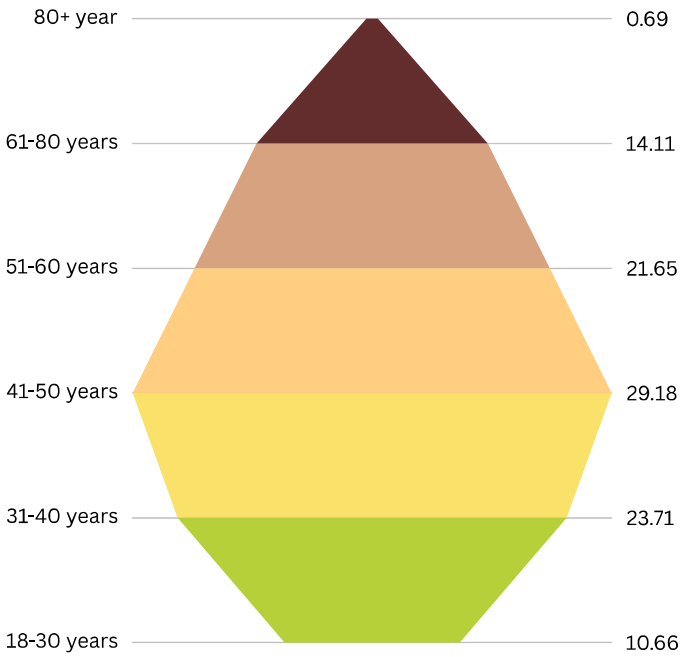
Employment in Rural Areas

Total No. of HHs completed 100 Days of Wage Employment



Source: MNGERA Dashboard

MGNREGS Portal: Age Wise % Employed

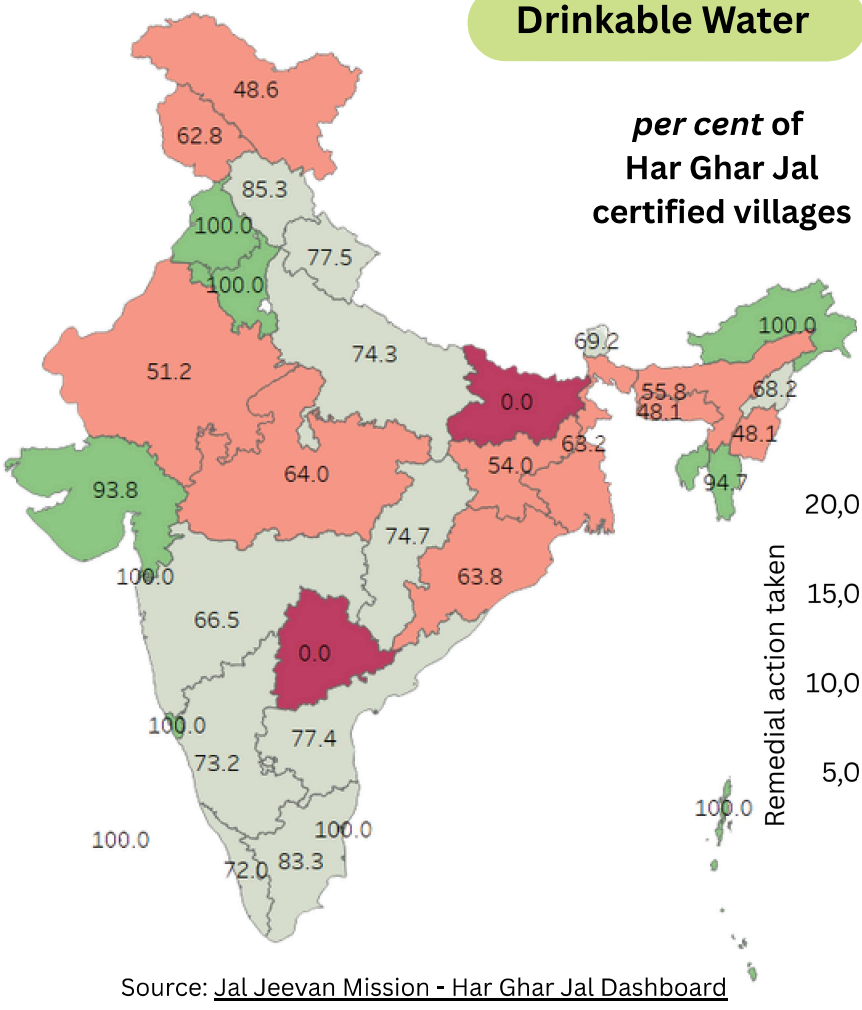


Source: MNGERA MIS Reports

The **MGNREG Scheme**, which provided over 72 lakh households (HH) with 100 days of Employment in 2020-21, has reduced the number to only 40 lakh in 2024-25. Furthermore, through the scheme, 33.87% of the total employed people in West Bengal are above the age of 60. Overall, 15% of the total employed population is in the age band of 60 and above.

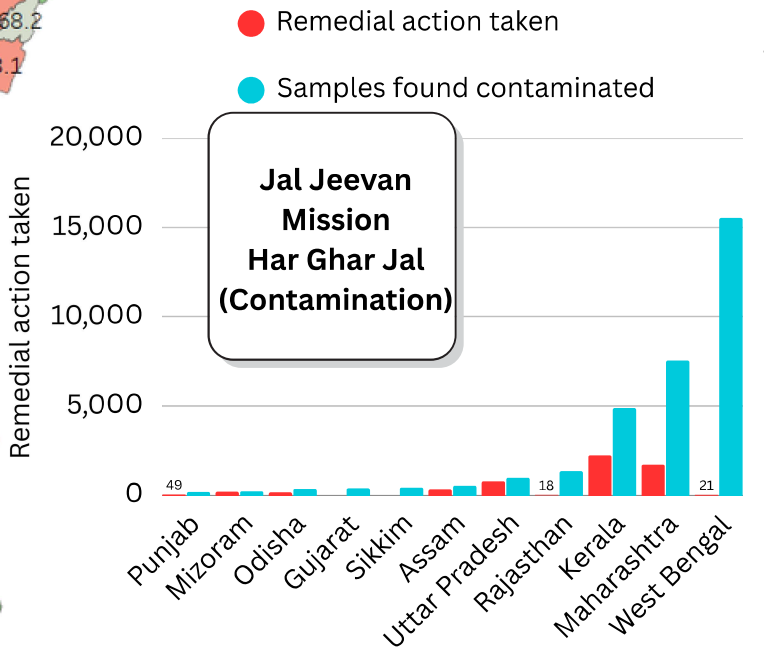
Drinkable Water

***per cent* of Har Ghar Jal certified villages**



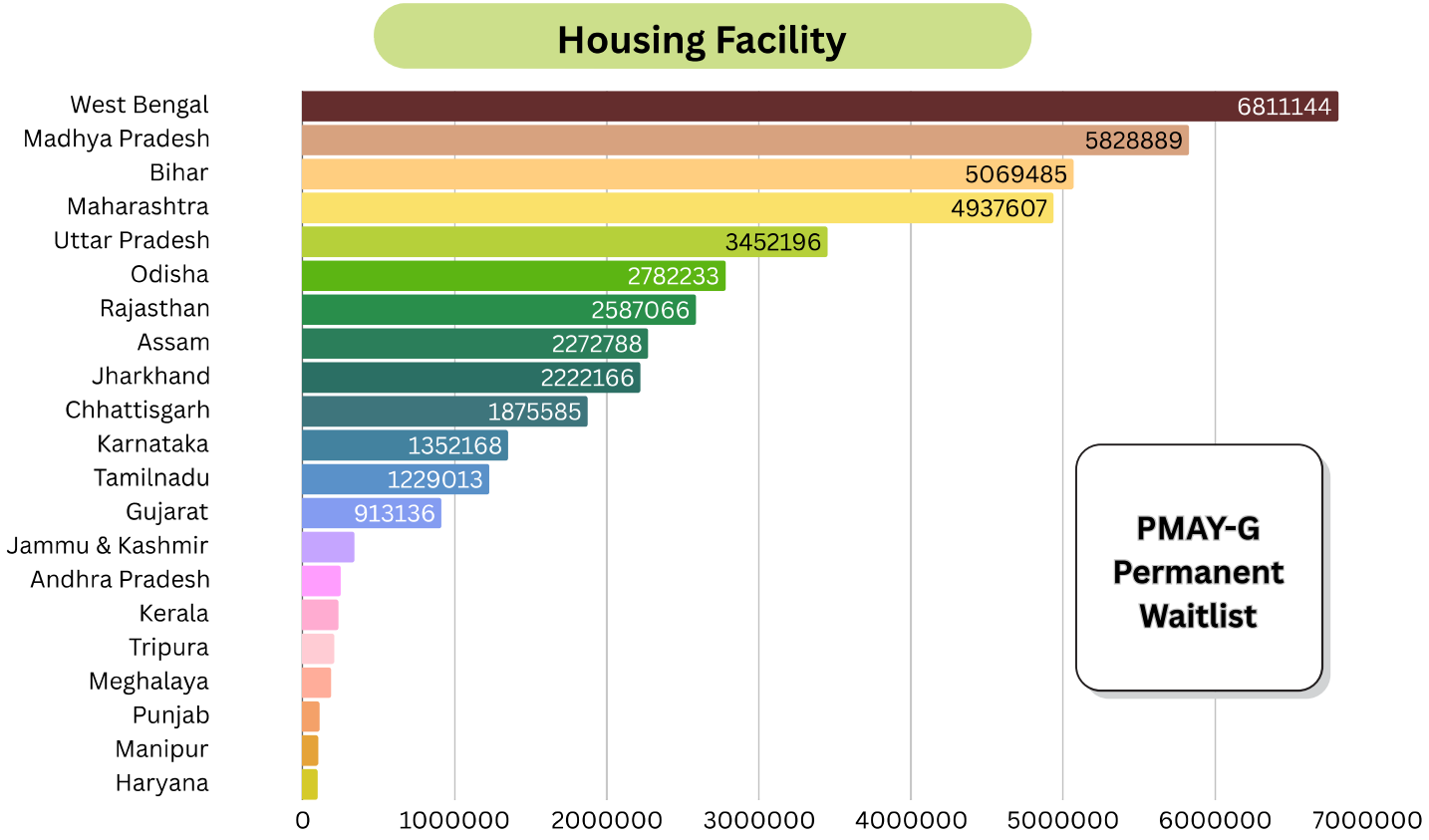
Source: Jal Jeevan Mission - Har Ghar Jal Dashboard

Out of 35,271 total contaminated samples found, at only 21% of places, i.e. 7,504, remedial actions have been taken. In 79% of villages with water samples found contaminated have not seen any remedial action.



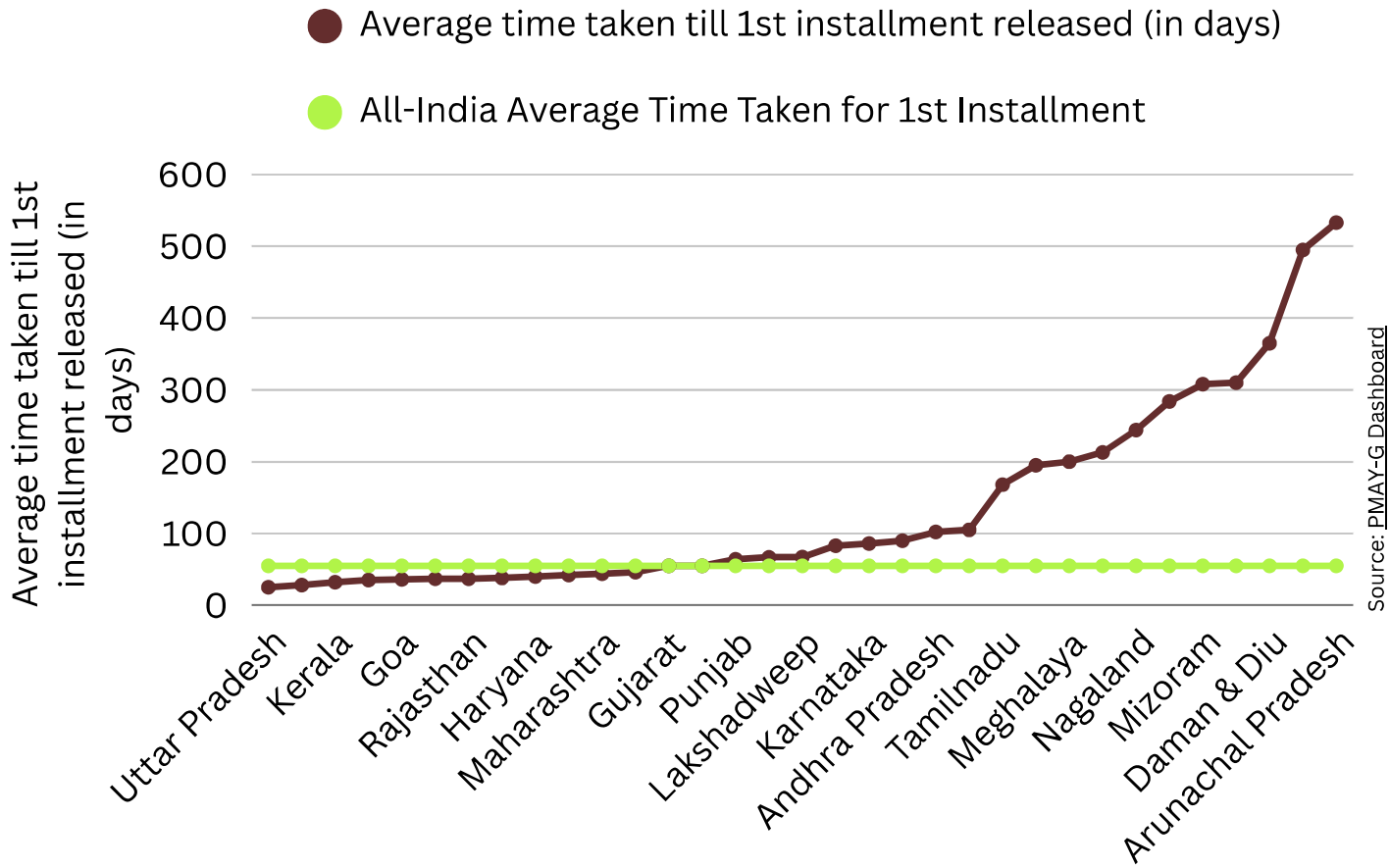
Source: Jal Jeevan Mission Water Quality Management Information System

Villages certification for 100% tap connection under Har Ghar Jal ranged from 0-100 per cent with **Bihar** and **Telangana** showing nil certified villages.



Source: Gram Panchayat wise Permanent Wait List as on 18 september 2023

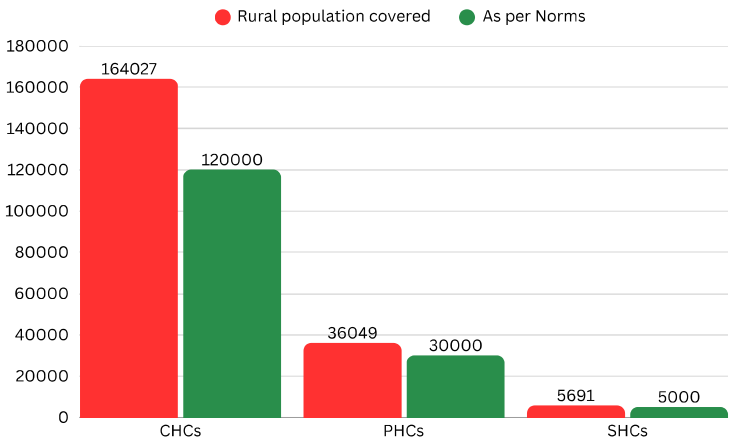
Pradhan Mantri Awas Yojana - Gramin (PMAY-G): In the Permanent Wait List (PWL), a list of eligible beneficiaries who have been identified for assistance under the scheme but haven't yet been sanctioned a house, at least 13 individual states have more than 9 lakh people in the PMAY-G Permanent Waitlist.



In 13 states the average time for release of first installment of PMAY-G was more than 100 days. Though the national average is 55 days only.

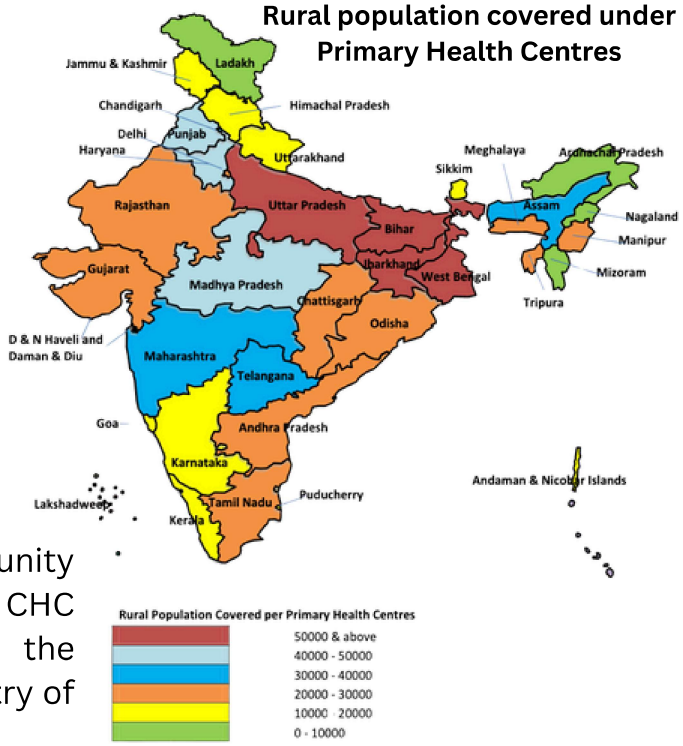
Health Infrastructure

Rural Population under SHCs, PHCs, and CHCs



Source: Rural Health Statistics 2021-22

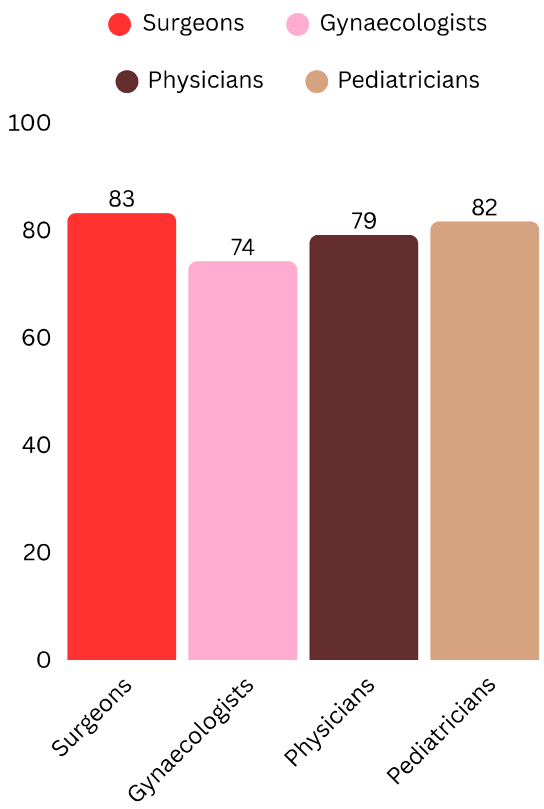
Rural population covered under Primary Health Centres



Inadequate number of Primary and Community Health Centres (PHCs and CHCs) in rural areas. A CHC on average covers 1,64,027 people against the prescribed limit of 1,20,000 people by the Ministry of Health and Family Welfare.

In *ten* states, the rural population covered by Primary Health Centres exceeds the limit established by norms.

% Vacancy in CHCs in Rural Areas

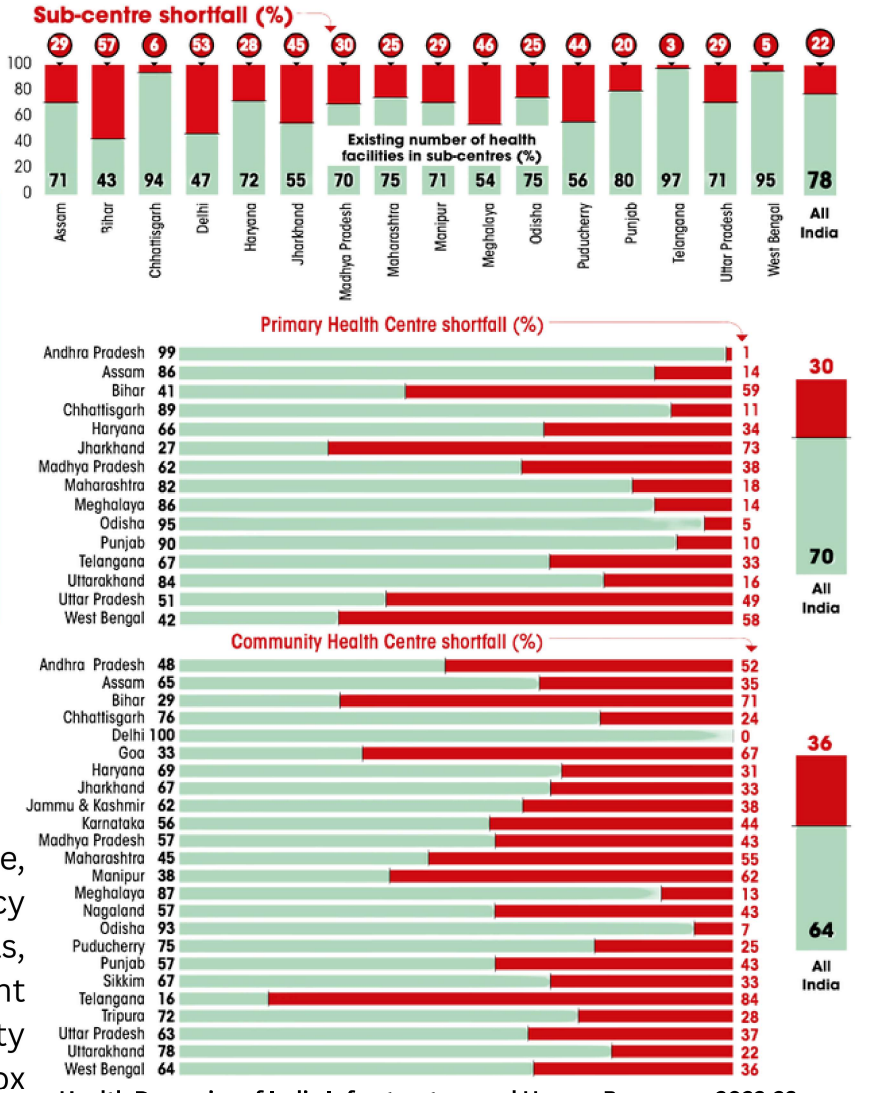


Source: Rural Health Statistics 2021-22

Apart from limited infrastructure, there is High percentage of vacancy in Health Services in the Rural areas, with as high as 83% for important specialists at the level Community Health Centres with approx population of 1.64 lakhs.

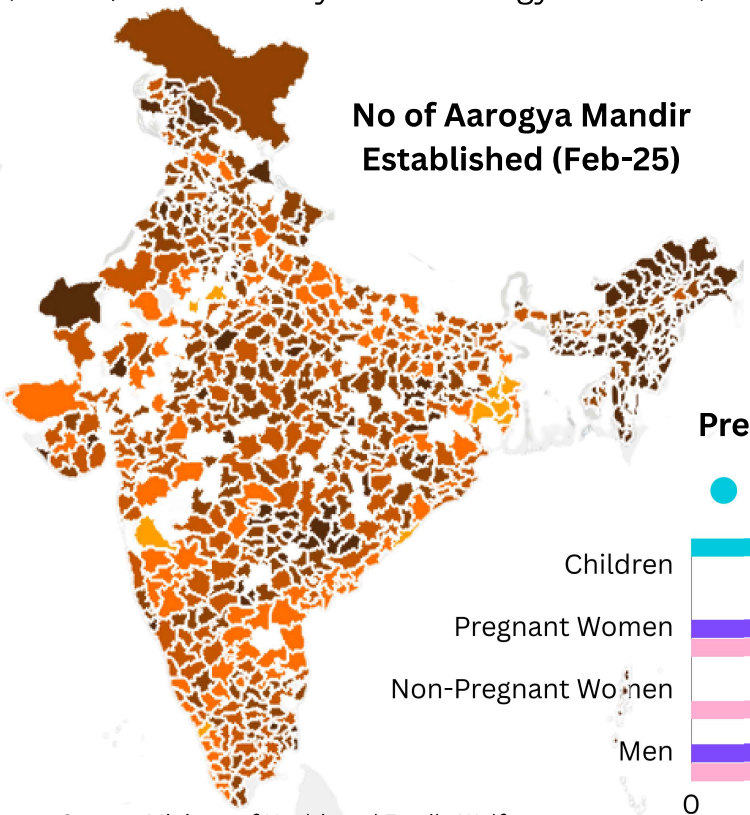
LIMITED INFRASTRUCTURE

Although rural health infrastructure faces gaps at all three tiers, the shortfall is most acute at Community Health Centres—the only tier where the rural population can access specialist doctors and radiographers



Health Dynamics of India Infrastructure and Human Resources 2022-23, Ministry of Health & Family Welfare (Down To Report Annual)

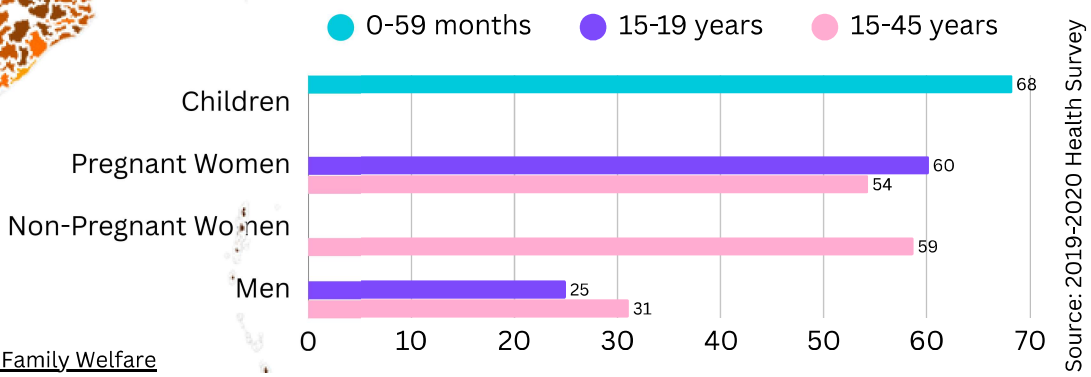
A total of 1,76,573 AAMs have been operationalised across the country till February, 2025 (States/UTs on the Ayushman Arogya Mandir (AAM) portal).



Source: Ministry of Health and Family Welfare

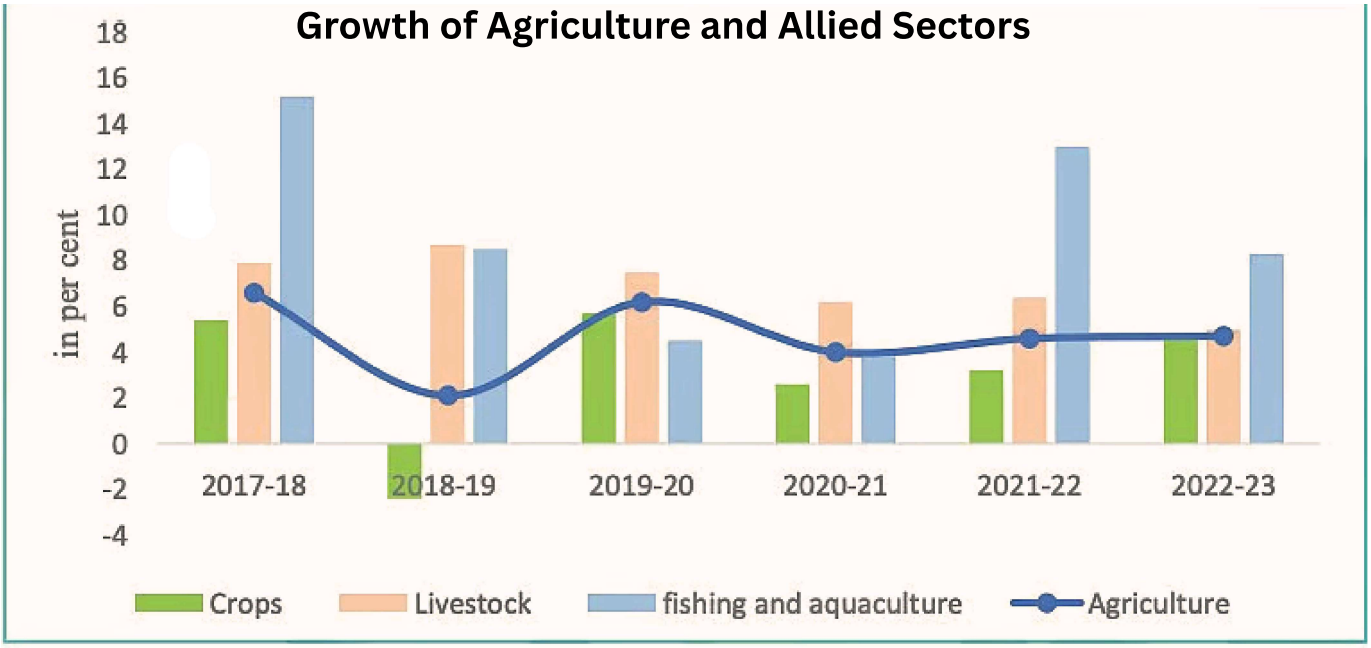
As on 31st March, 2022, the overall shortfall (which excludes the existing surplus in some of the States) in the posts of HW(F) / ANM is 3.5% of the total requirement as per the norm of one HW(F) / ANM per Sub Centre and PHC. There is a vacancy of 14.4% HW (Female)/ ANM (at SCs+PHCs) when compared with the sanctioned posts.

Prevalence of Anaemia: 2019-2020 Health Survey



The prevalence of anaemia in rural children and women is high compared to men. The disease reflects a deficiency of iron, Vitamin B12 and folate this can be countered by monitored dosage by Aanganwadi workers.

Rural Economy



Source: National Statistical Office (NSO) M/o Statistics & PI

As per NSO, for the period 2017 to 2023, there has been volatility in the Crop Sector, Sharp Swings in Fishing & Aquaculture, and Stagnant Overall Agriculture Growth (~3.5%) while the Livestock Growth has remained near steady.

- Disparity between subsectors suggests poor integration of schemes.
- Underperformance in crops despite budgetary prioritisation.
- No visible structural reforms impact on growth figures despite flagship missions.

Audit Reports

Latest audit conducted by the CAG of India covered period up to 2021. Hence, an audit of the Ministry of Rural Development for the latest period up to March 2025 is imminent.

Report Name	Union / State	Timeframe Covered	Report No.
PA on MGNREGA implementation	Punjab	Up to March 2021	No. 1 of 2023
PA of National Social Assistance Programme (NSAP)	Union Government	Up to March 2021	No. 10 of 2023
PA of Rural & Urban Water Supply Schemes	Haryana	Up to March 2021	No. 3 of 2023
PA of Karnataka Rural Infrastructure Development Ltd.	Karnataka	Up to March 2021	No. 9 of 2022
PA of ARWSP (Accelerated Rural Water Supply Programme)	Union Government	Up to March 2007	No. 12 of 2008

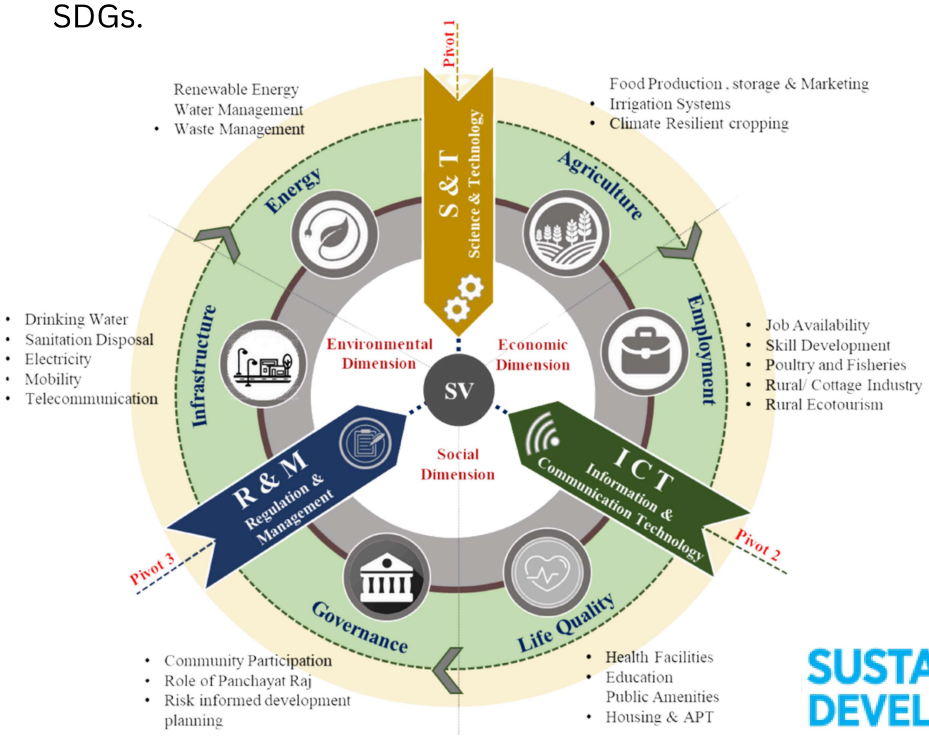
Mission LiFe & SDGs

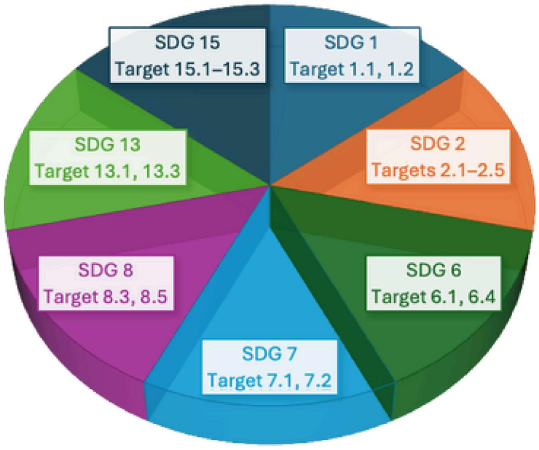
LiFE
Lifestyle for Environment

Integration of Mission LiFE into rural development audits:

- Scheme activities that align with sustainability can be tagged.
- Indicators of environmental outcomes, not just outputs, can be used.

Rural development is a critical domain for auditing as it directly intersects with several SDGs.





SUSTAINABLE DEVELOPMENT GOALS

Rural development can be ensured by prioritising clean energy access, climate-smart agriculture, and essential services like health, education, and sanitation. An integrated, people-centric approach will foster sustainable, resilient, and inclusive rural growth.

Government's Objectives for Rural India

1. Poverty Alleviation and Inclusive Growth
2. Agricultural Sustainability & Doubling Farmers' Income
3. Sustainable Infrastructure Development
4. Water Resource Management
5. Renewable Energy and Clean Energy Access
6. Rural Sanitation and Health
7. Education and Skill Development
8. Women's Empowerment and Gender Equity
9. Sustainable Livelihood Diversification
10. Climate Change Adaptation and Resilience
11. Strengthening Local Governance and Decentralized Planning

Theoretical Understanding:

1. Big Push Theory (Rosenstein-Rodan)
Large-scale coordinated investment is needed to break the cycle of underdevelopment.

2. Asset Threshold Models (Carter & Barrett, 2006)
Below a minimum level of assets (land, livestock, education), households can't escape poverty on their own.

Rural Poverty Trap

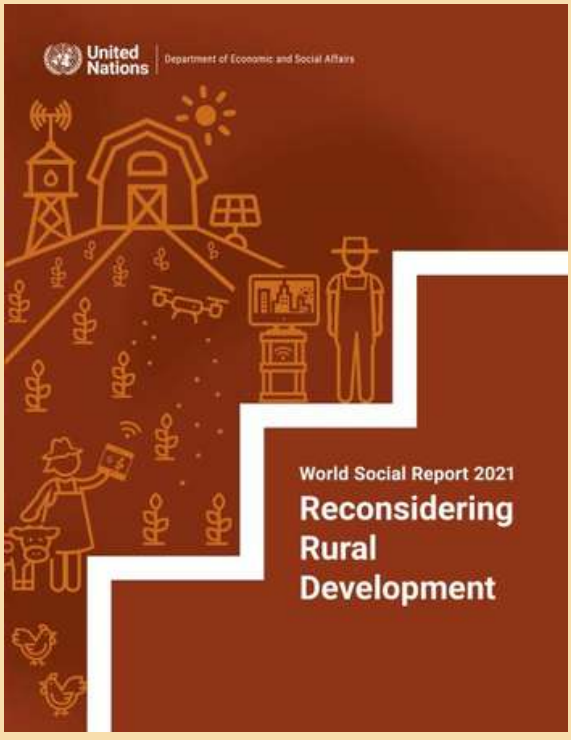
"Rural poverty trap is a situation in which the poor in rural areas are unable to accumulate the capital needed to improve their livelihoods, thus remaining in a chronic state of poverty."

Key highlights from the World Social Report 2021 Reconsidering Rural Development by UN DESA

Urgent Shift to "In-Situ Urbanisation": The report champions improving rural living standards directly, enabling rural residents to enjoy urban-level services without migrating

Core Recommendations

1. Reorient rural policy around in situ urbanisation.
2. Scale up agriculture through tech, infrastructure, and research.
3. Safeguard the environment with sustainable land and water use.
4. Bridge digital gaps to unlock new rural opportunities.
5. Promote non-farm diversification and value chain development.
6. Advance equity via land rights, gender, and social inclusion.
7. Strengthen infrastructure, institutions, and social safety nets.



Audit Assessment Checklist

1. Community Engagement & Capacity Building

Audit Focus: Evidence of bottom-up planning and stakeholder ownership.

- Is there inclusion of local stakeholders in the planning stages?
- Whether training and resource allocation are provided to rural communities for effective participation?

2. Strategic Alignment with National Rural Objectives

Key Focus: Outcome-based planning, convergence of rural schemes

- Are scheme outputs aligned with national objectives of poverty alleviation, livelihood enhancement, and doubling of farm income?
- Is there a clear linkage between inputs, outputs, and outcomes at the village level?

Schemes: PMAY-G, MGNREGS, NRLM, PMGSY

"The government may develop and mandate Village-Level Outcome Maps that consolidate activities across schemes toward measurable targets such as income generation, productivity increase, and infrastructure access."

3. Income Enhancement and Livelihood Diversification

Key Focus: SHG income, off-farm jobs, market linkages

- Has NRLM improved the household income of SHGs?
- Are MGNREGS and skilling programs increasing farm and non-farm employment?
- Are there micro or agro-processing clusters or rural industrial parks supporting value addition?

Schemes: NRLM, MGNREGS, PMFME, RSETI

"The government may develop Agri-Rural Industrial Zones (ARIZ) per district for food, craft, fibre, and forest produce, linking NRLM, agri-value chains, and skill training to promote cluster-based entrepreneurship models with marketing support."

4. Rural Health Infrastructure and Human Resource Deployment

Key Focus: Health coverage, workforce gaps

- Are Ayushman Arogya Mandirs functional and accessible, or whether duplication exist in the counting of health infrastructures?
- Conduct a beneficiary survey with questions on regular health precautionary health checkups, availability of medicine and doctors at the time of need, pocket expenses on health.

Schemes: NHM (Rural), Ayushman Bharat, AAM, AB-HWC

"The government may establish basic test centres in each gram-panchayat with mandatory Summer-Winter basic health check-ups for the entire population of the village."

5. Quality and Functionality of Assets Post-Completion

Key Focus: Post-creation monitoring, usability, maintenance provisioning

- Whether rural assets (toilets, houses, water taps, roads) serve their intended purpose sustainably.

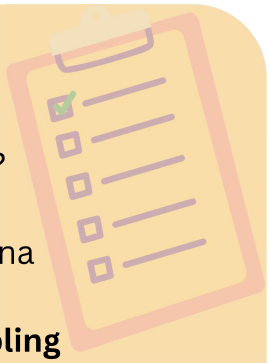
Schemes: SBM-G, PMAY-G, JJM, PMGSY, MGNREGS

6. Organic Farming, Renewable Energy and Green Livelihoods

Key Focus: Agro-ecology, solarisation, Mission LiFE

- Are farmers adopting organic, zero-budget, or climate-smart agriculture?
- Are solar pumps, biogas units or micro-grids reaching remote villages?

Schemes: PM-KUSUM, Paramparagat Krishi Vikas Yojana (PKVY), Biourja Yojana



7. Infrastructure, Outcomes, Deployment, and Digital Access in Rural Schooling

Key Focus: Infrastructure gaps, child-centric facilities, and digital gaps

- Are rural schools meeting prescribed norms for infrastructure (classrooms, toilets, drinking water, electricity, ICT)?
- Are learning outcomes in rural schools improving year-over-year, especially in foundational literacy and numeracy (FLN)?
- Are teacher vacancies, absenteeism, and multi-grade teaching conditions audited regularly?

8. Livability and Basic Service Availability in Villages

Key Focus: Integrated service access – housing, water, electricity, sanitation

- Do rural households have access to livable housing along with functional tap water, electricity connections, and sanitation?
- Are villages moving toward in-situ urbanisation, enabling residents to stay rather than migrate?

ENVIRONMENTAL IMPACT ASSESSMENT

International Centre for Environment Audit and Sustainable Development

Why to Audit, Environmental Impact Assessment?

Co-lead of the project and audit by SAI India:

- The SAI India was the co-lead in the Environmental Impact Assessment (EIA) Research Project of the INTOSAI WGEA Work Plan 2014-16.
- The only Performance audit conducted on Environmental Clearance and Post EC monitoring was up to March 2015, published in 2016.

Weakening of environmental legislation:

- Environmental Clearances were granted to violators through the amnesty scheme of 2017.
- From 2017 to 2023, 101 ECs were granted to the violation category.
- Draft EIA notification of 2020 further weakens the legislation by reducing the time for public consultation (20 days), increasing the validity of ECs from 30 to 50 years, and making mandatory biannual reporting annual, and so on.

Proponents often do not comply with EIA requirements and conditions:

- Ineffectiveness of post-project compliance, with no general standards to determine project compliance with the mitigation measures, and
- No process for informing the decision makers of the relative success of mitigation measures.

Insufficient evaluation of the environmental impacts of projects after their implementation:

- No mechanism to assess the effectiveness of the environmental impact of the project after it has been set up.

Deficient analysis of the interrelationships and integration of social, economic, and biophysical aspects:

- No process is available to assess the cumulative impacts of the proposed project on the geographical area, in terms of impacts on biodiversity, pollution, social, economic, and so on.

16 May 2025: Judgement of the Supreme Court

- The Court emphasised that ex post facto environmental clearances are contrary to the Environment (Protection) Act, 1986, and the EIA Notification of 1994, reinforcing the need for prior environmental clearance for projects.

Auditing EIA under the Environmental Clearance can contribute in improving EIAs and increasing their effectiveness through:,

- improved compliance monitoring, identification of gaps in mitigation measures
- contributing to the wider policy debate, and
- providing well-considered pointers on improving the process to decision makers,

EIA is useful tool for decision-making, based on an understanding of the environmental implications, including social, cultural and aesthetic concerns, which could be integrated with cost-benefit analysis of projects.

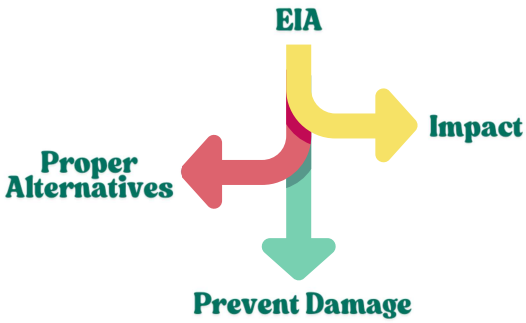
Evolution of EIA in India

1970 — EIA was introduced in the USA. In India (1976-77), the Planning Commission asked for river-valley projects to be examined.

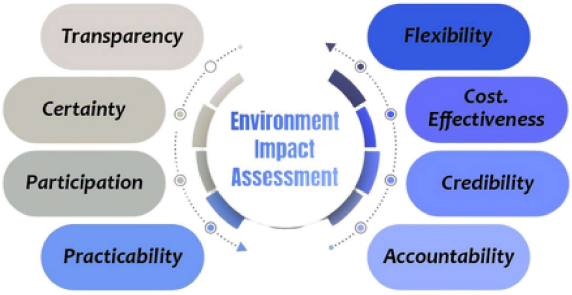
1994 — Under EPA 1986, EIA notification made ECs mandatory for the expansion or modernisation of listed projects.

2006 — EIA notification 2006, put the onus of clearing projects on the state governments depending on size/capacity of the project

2020 — The draft EIA notification was made public for review, but it has not been notified yet.



Objectives of EIA



Decentralization of EC Process

Based on the type of projects and its magnitude, the powers to issue ECs is decentralised.

Category A (National level appraisal)

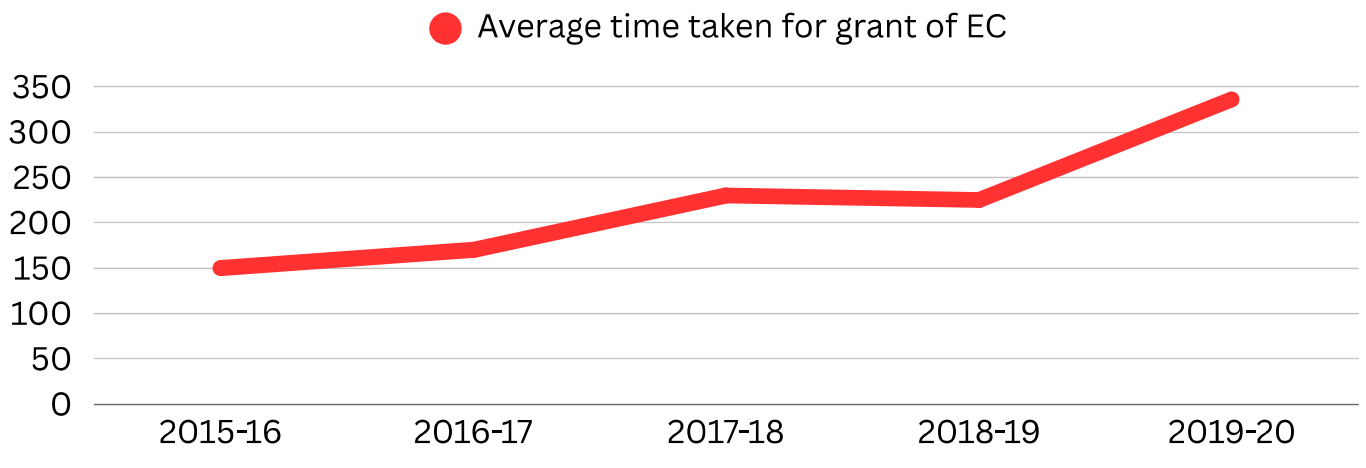
- Require mandatory environmental clearance.
- Appraised at the national level by the Impact Assessment Agency (IAA) and the Expert Appraisal Committee (EAC)

Category B (State level appraisal)

Further, classified into:

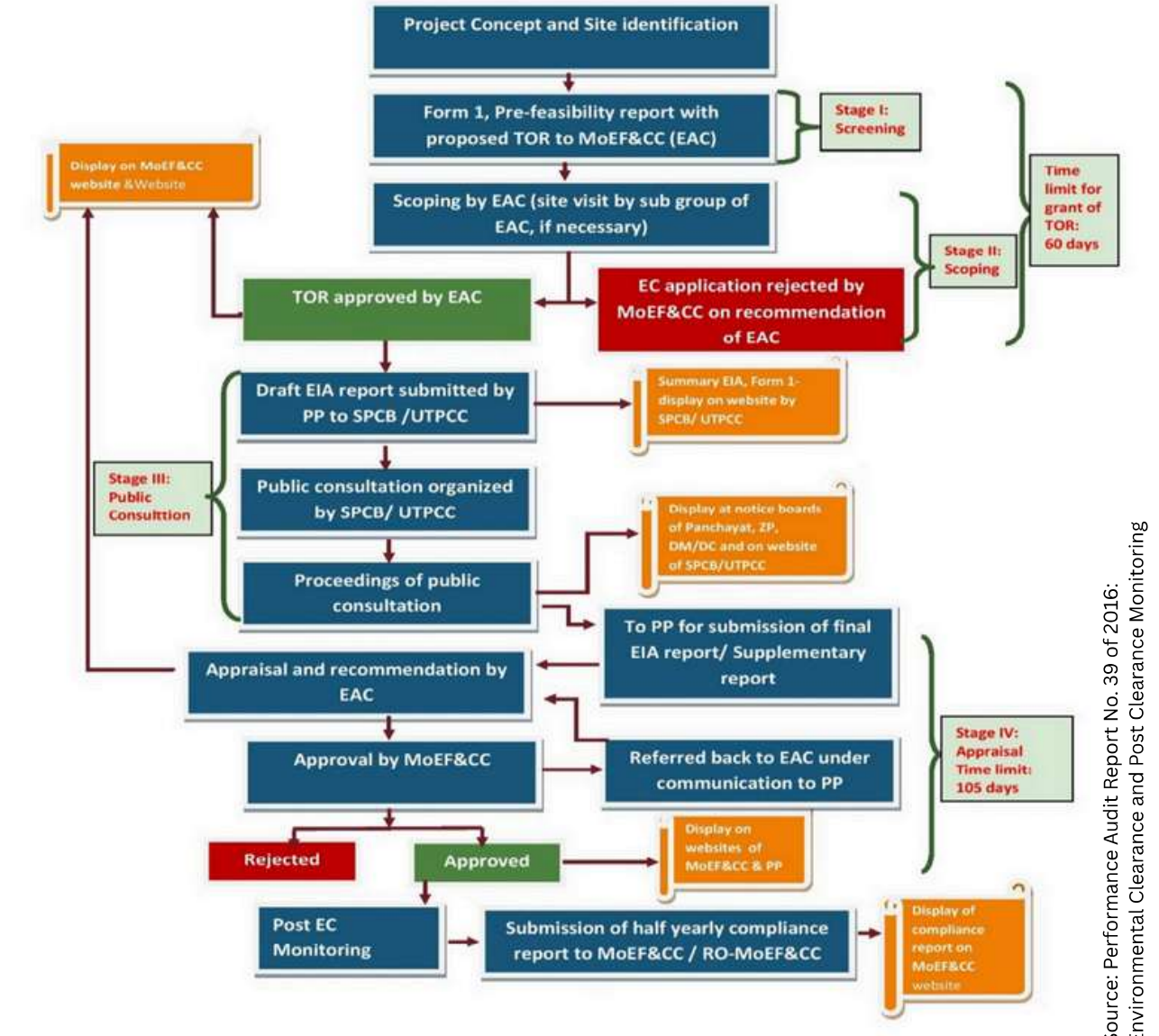
1. Category **B1 projects** (Mandatorily requires EIA).
2. Category **B2 projects** (Do not require EIA).
   - appraised by State Level Environment Impact Assessment Authority (SEIAA) and State Level Expert Appraisal Committee (SEAC)

The EIA Notification provides a time period of 105 days for granting EC which includes 60 days for appraisal and 45 days for decision by regulatory authority.



Source: Rajya Sabha Session 252: Question Reply

Process of the obtaining Environmental Clearance and follow-up.



Source: Performance Audit Report No. 39 of 2016: Environmental Clearance and Post Clearance Monitoring

SPCB: State Pollution Control Board, UTPCC: Union Territory Pollution Control Committee, EIA: environment Impact Assessment, PP: Project Proponent, EAC: Expert Appraisal Committee, TOR: Terms of Reference, EC: Environmental Clearance

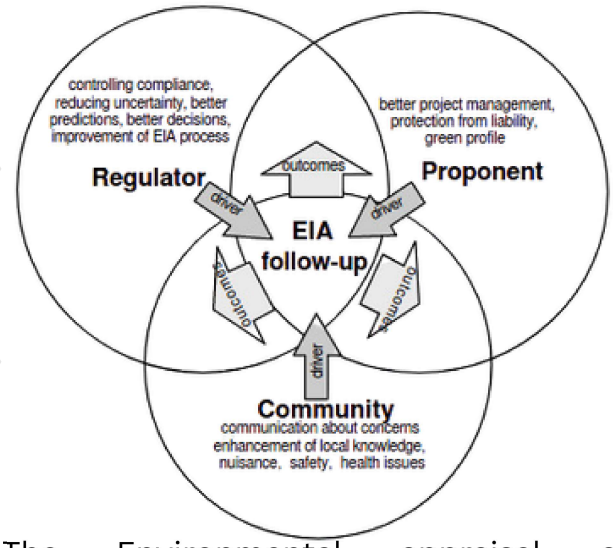
Four Stages in Prior EC

1. Screening: To determine whether the project requires further study to prepare for the Environmental Impact Assessment (EIA).

2. Scoping: Setting clear guidelines that state the environmental concerns identified in the project.

3. Public Consultation: To ascertain the concerns of the local persons affected by the environmental impacts of the project.

4. Appraisal: The EAC studies the application, final EIA report, and outcome of the public consultations and makes its recommendations to the MoEF.



The Environmental appraisal of Development Projects is undertaken as per the provisions of the ElA Notification, 2006 based on the EIA and EMP reports prepared by the Project Proponent in association with their Consultants.

Projects Cleared under Violation Category & increased exemptions from Public Hearing

Projects that started work without obtaining a mandatory prior environmental clearance or exceeded the limits set as clearance conditions fall under the **"violation category"**.

From 2017 to 2023, after the amnesty scheme, 101 projects were cleared under the violation category. The validity of which was challenged in courts and by the recent SC judgement is held to be unlawful.

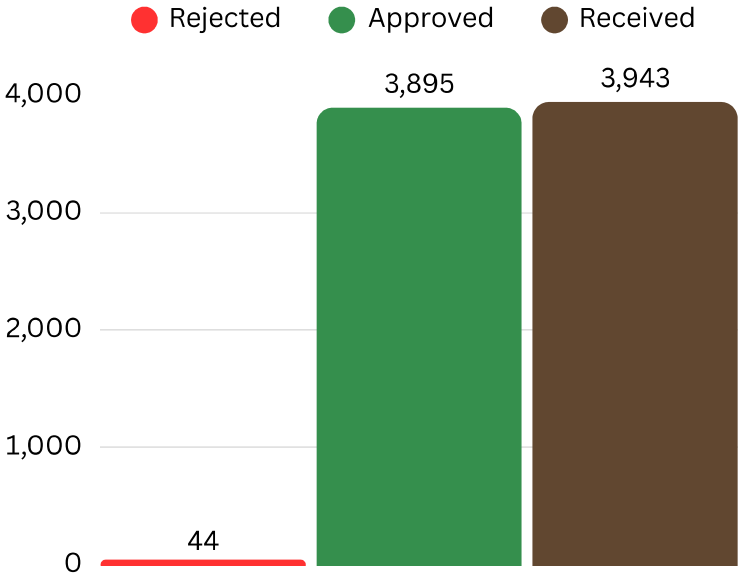
Image Source: The Indian Express

PROJECTS* CLEARED UNDER VIOLATION CATEGORY

	Jun 2017-21	Jul 2021-Dec 2023					
EACs	Violation	Industry	Coal Mining	Non-Coal	Infra	Power	Total
TOR	57	68	7	10	10	2	154
EC	55	27	9	5	2	3	101

*Minimum numbers from available records; EACs: Ministry's sectoral Expert Appraisal Committees. Since July 2021, all EACs cleared projects under Violation category; TOR: Terms of Reference issued for impact assessment to projects considered fit for appraisal; EC: Environmental clearance issued; Source: MoEFCC

Projects Rejected vs Approved

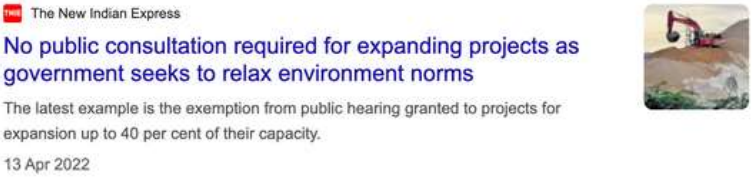


Source: Environment Clearance Web Portal

Projects that undergo environmental impact assessment (EIA) are rarely rejected.

Public Hearing

From 2021 to 2023,there is an increase in projects requiring Public Hearing, however the increase is not being translated into public hearing conducted rather are exempted.


The New Indian Express

No public consultation required for expanding projects as government seeks to relax environment norms

The latest example is the exemption from public hearing granted to projects for expansion up to 40 per cent of their capacity.

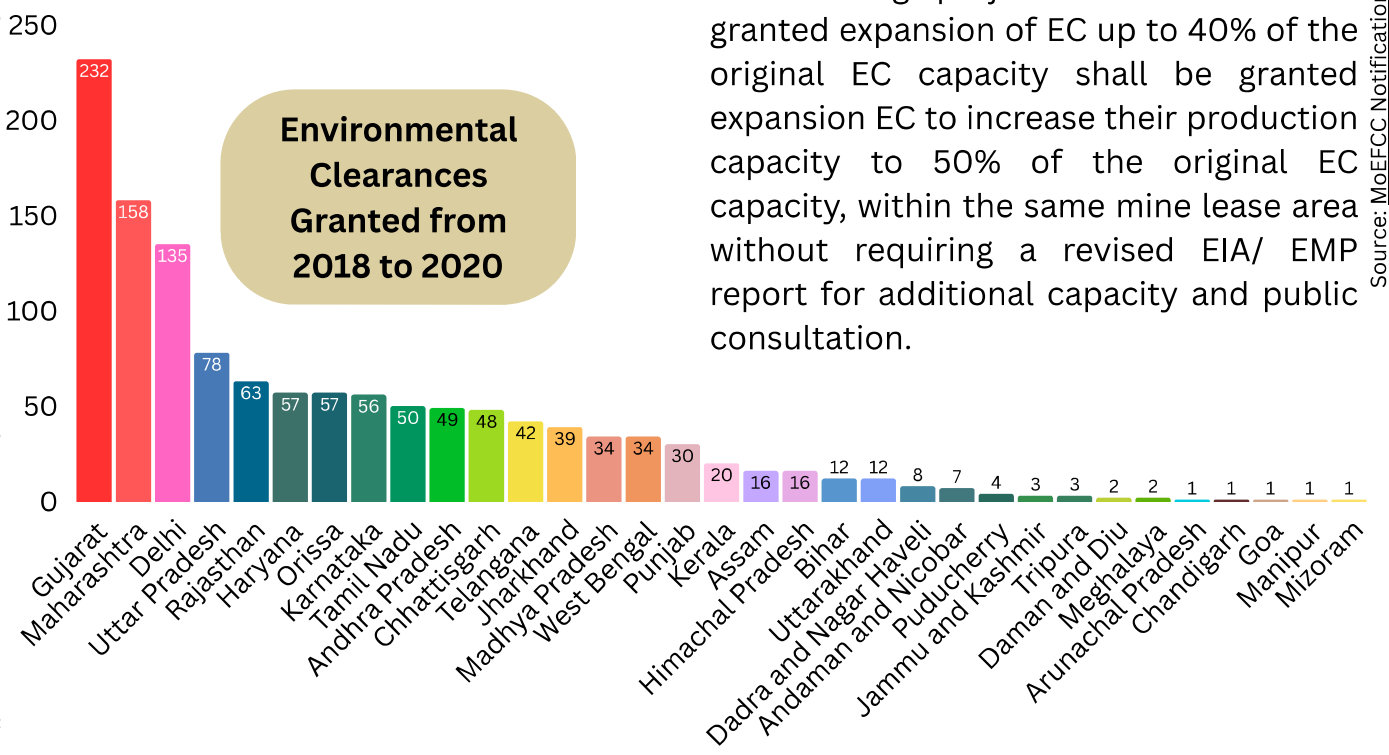
13 Apr 2022

- Several Exemptions are provided to the projects requiring public hearing.
- Coal mining projects that have been granted expansion of EC up to 40% of the original EC capacity shall be granted expansion EC to increase their production capacity to 50% of the original EC capacity, within the same mine lease area without requiring a revised EIA/ EMP report for additional capacity and public consultation.

Source: MoEFCC Notification

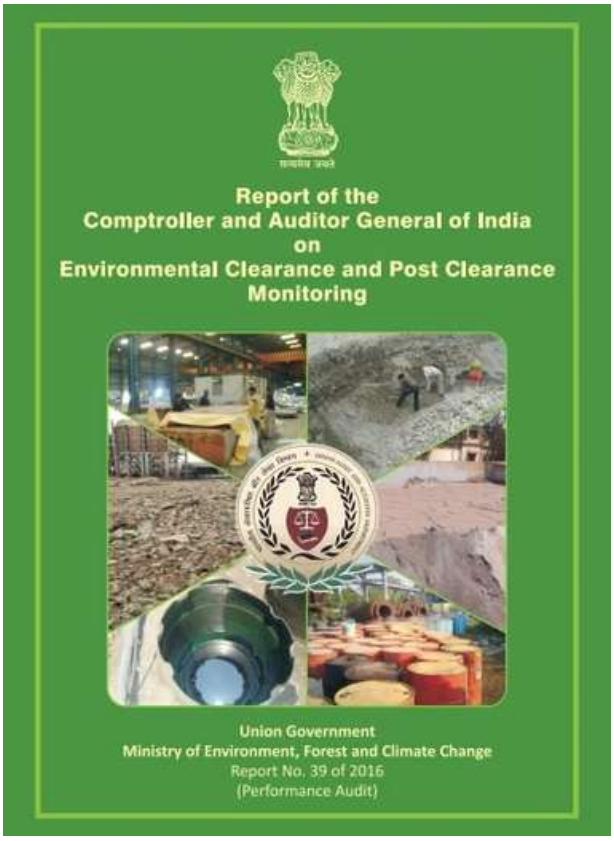
Environmental Clearances Granted from 2018 to 2020

State-wise Number of Environmental Clearances the Ministry has Granted from 2018 to 2020 (Source: Rajya Sabha Session 253; Ministry of Environment, Forest and Climate Change

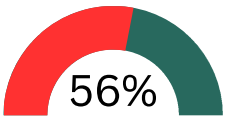


From 2018 to 2020, the *data shows that three* states have received more than 100 ECS, namely Delhi, Gujarat, and Maharashtra.

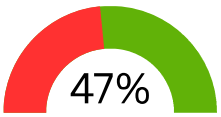
Report on EC (2016) and timeline thereafter



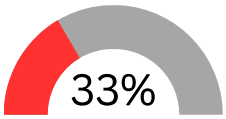
The SAI India was the co-lead in the Environmental Impact Assessment (EIA) Research Project of INTOSAI WGEA. Further, SAI India has conducted PA on ECs & PCM, of which a few takeaways are:



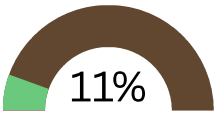
Non-compliance with General EC Norms



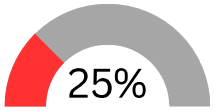
Green Belts Development Missing



Fly Ash Norms Breached



Only 11% of ECs granted within the 105-day timeline.



Non-compliance with ToRs

2016
Last Report tabled

2017
Amnesty Scheme for Post-EC

2020
New Draft EIA Notification Published

2025
Nine years since last audit.

Hindustan Times

Sand ghats without green clearance in Jharkhand asked to shut down

The National Green Tribunal has ordered the immediate closure of 28 sand ghats in East Singhbhum district for not having an environmental clearance certificate...

12 Mar 2016

THE TIMELINE

MARCH 14, 2017: Six-month window offered to violation cases for ex-post facto clearance

MAY 4, 2017: Madras High Court stays the move

OCTOBER 13, 2017: Stay lifted after assurance that the window was a one-time measure

MARCH 14, 2018: Madras HC allows a 30-day extension in lieu of the stay

JAN 29, 2019: March 2017 notification challenged before the SC; still pending

MAY 24, 2021: NGT asks Environment Ministry to prepare SOP for demolishing and/or imposing penalty on violation cases

JULY 7, 2021: Ministry issues SOP for violation cases

JULY 15, 2021: Madras HC stays SOP for violating EIA notification 2006 and going back on the assurance that 2017 window was a one-time measure

DEC 9, 2021: SC ruled stay granted by Madras HC would be limited to its jurisdiction

JAN 28, 2022: Ministry asks all EACs to resume processing violation cases

JAN 2, 2024: SC stayed July 2021, January 2022 orders

Image Source: The Indian Express

In January 2025, the Supreme Court invalidated a 2017 Ministry of Environment notification and a 2021 office memorandum (OM) that allowed "ex-post facto" environmental clearances for projects that began without prior mandatory environmental clearances.

Central Empowered Committee

In April 2025, the CEC appointed by the Supreme Court came down heavily on the Telangana government's actions in the Kancha Gachibowli forest,

- Widespread and indiscriminate destruction of trees, shrubs, and other natural vegetation using heavy machinery.
- Land was cleared without clearly identifying the nature of the proposed development
- Gaps in planning and issues of legal compliance

Permissible Preliminary Activities (Pre-EC)

- Land acquisition or fencing
- Prepare project feasibility reports
- Baseline environmental data collection
- Survey and investigation work
- Environmental Impact Assessment preparation

The Tribune

NGT notice to Centre, firm for starting work on bulk drug park without environment clearance

The National Green Tribunal (NGT) has issued a notice to the Union Ministry of Environment, Forests and Climate Change and Himachal Pradesh...

The Indian Express

SOP on Environmental non-compliance: In most cases, violations were recorded only to be condoned

Between March 2017 and January 2024, till the July 2021 notification was stayed by the

News / Explained / Explained Law / Before doors closed, 55 projects benefited from 2017-2021 environmental amnesty

Premium

Before doors closed, 55 projects benefited from 2017-2021 environmental amnesty

On Friday, the Supreme Court struck down the original 2017 notification and the 2021 OM — along with all circulars, orders, and notifications issued to give effect to these two — as "illegal".

Down To Earth

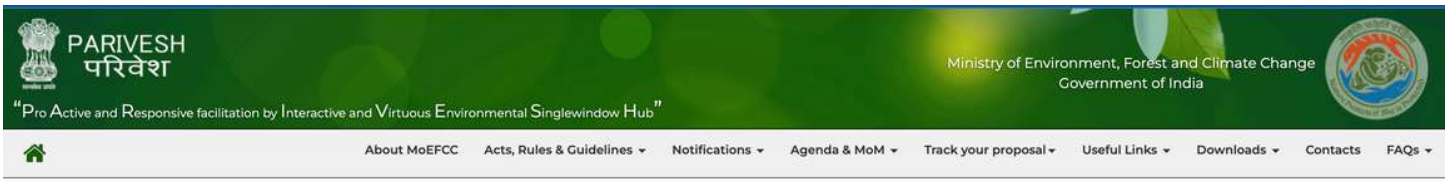
AIIMS Kalyani, to be inaugurated by PM Modi today, lacks environmental clearance: West Bengal Pollution Control Board

The All India Institute of Medical Sciences (AIIMS) in Kalyani, West Bengal, set to be inaugurated by Prime Minister Narendra Modi on February 25, 2024, is...

25 Feb 2024

Non-Availability of data on the portal

On the portal, designated for environmental clearance, there is no data available for desk review.



Notable NGT & Supreme Court Orders on EIA

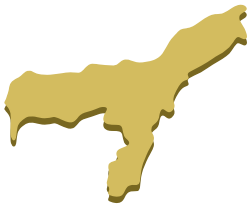
Case Name / Citation	Issue/Observation	Year
T.N. Godavarman v. Union of India	Forest clearance procedures and CAMPA violations	2011
Vellore Citizens Welfare Forum v. Union of India	Recognized precautionary principle and polluter pays	1996
Sterlite Industries case (Vedanta)	Illegalities in EC grant, health hazards	2013
Sachet Tiwari v. MoEFCC	Criticized EIA 2020 Draft for weakening environment safeguards	2020
Him Jagriti Uttaranchal v. MoEF	Faulty EIA for hydropower project in Uttarakhand	2012
Samata v. MoEFCC & Others	Skipped public hearing and forest dwellers' rights	2021
Save Mon Region v. Union of India	Hydropower project approved without proper biodiversity impact analysis	2017

EIA Notification 2006 & 2020: A Comparison

Few revisions in the EIA 2020 Draft raised significant environmental concerns, therefore approving it could be bad for the environment and biodiversity while being advantageous to commercial organizations.

Aspect	EIA Notification 2006	Draft EIA Notification 2020
Process Stages	4 stages: Screening, Scoping, Public Consultation, Appraisal	6 stages: Scoping, Draft EIA Preparation, Public Consultation, Final EIA, Appraisal, Grant/Rejection of EC/EP. Notably, the 'Screening' stage is omitted.
Project Categorization	Categories A and B (with B further divided into B1 and B2 based on screening)	Explicit categorization into A, B1 (with/without General Conditions), and B2 (with/without Appraisal Committee review).
Public Consultation	30 days for public to submit responses	Reduced to 20 days
Public Consultation	Limited exemptions	Expanded list of exemptions, including projects in border areas and certain construction projects
Monitoring Frequency	Compliance reports every 6 months	Compliance reports annually
Post-facto Clearance	Not permitted	Introduces provision for post-facto environmental clearance
Violation Reporting	Public could report violations	Only project proponents or government authorities can report violations
Validity of ECs	30 years for mining projects	Extended to 50 years for mining projects
Definition Clarity	Limited definitions	Expanded definitions with 60 terms defined
Online Submission	Not specified	Introduces online submission and processing of applications

Case of Illegal Clearance of Forest Land in Assam



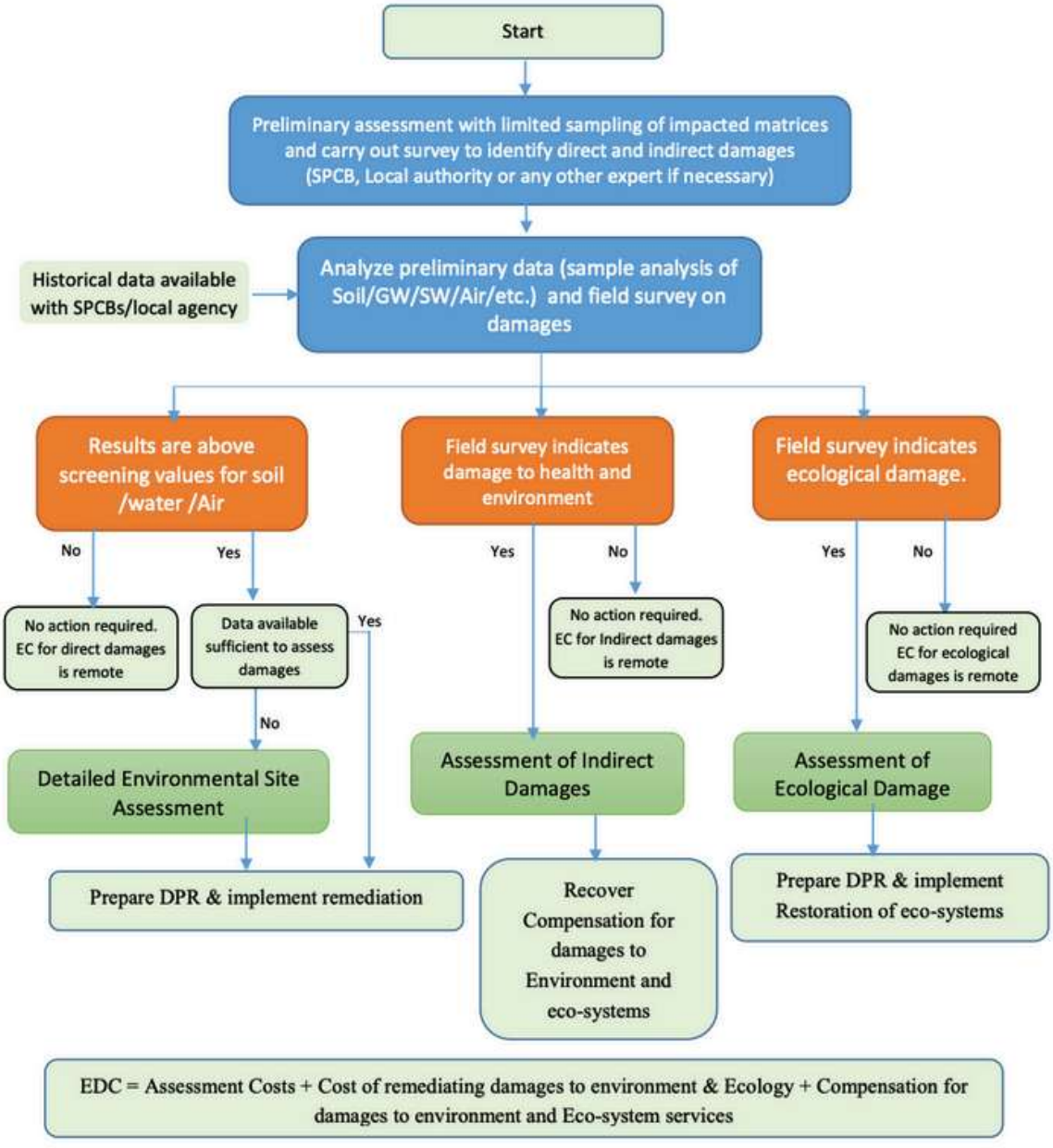
The NGT (suo moto) challenged the legality of clearing 44 ha of protected forest in Hailakandi for the 224th Assam Commando Battalion HQ.

In response, the State of Assam submitted:

- Construction limited to 19,668 sq. mtr (below 20,000 sq. mtr threshold);
- No further construction without prior Environmental Clearance (EC);
- Will apply afresh for EC for the remaining 8,233 sq. mtr, if required;
- Will dismantle any construction beyond the threshold;

The harm to the environment caused is irreversible, even though the government submits to reverse its acts, the trees that were struck down cannot be regrown immediately.

Process : Environmental Damage Compensation



Source: Performance Audit Report No. 39 of 2016: Environmental Clearance and Post Clearance Monitoring

Audit Assessment Checklist

A. Pre-Project Planning and Screening

1. Project Categorisation

- Was the project correctly categorized as Category A or B in accordance with the EIA Notification, 2006 or the prevailing legal framework?

2. Screening and Scoping

- Were proper screening and scoping procedures followed, and was a Terms of Reference (ToR) issued by the competent authority before initiating the EIA study?

3. Baseline Environmental Data

- Was baseline environmental data (air, water, noise, soil, biodiversity, etc.) collected over at least one full season as required?
- Did the EIA study evaluate environmentally sound alternatives, including a 'no project' scenario?

B. Quality of the EIA Report

1. Mandatory Inclusions

- Does the EIA report include all essential chapters such as project description, baseline data, environmental impact prediction, mitigation measures, and Environmental Management Plan (EMP)?

2. Cumulative Impact and Risk Assessment

- Does the EIA report include cumulative impact assessments and risk mitigation strategies, particularly for projects in ecologically sensitive areas?

3. Feasibility of EMP

- Is the Environmental Management Plan (EMP) time-bound, financially supported, and practical with clearly assigned responsibilities?

C. Public Consultation and Disclosure

1. Public Hearing

- Was a public hearing conducted as per legal requirement, and were concerns raised by the affected community adequately addressed?

2. Information Dissemination

- Was prior notice given, and was the EIA report made accessible in the local language and at appropriate public venues?

3. Integration of Feedback

- Was the final EIA report and EMP revised in response to feedback from the public consultation and expert appraisal committee?

D. Project Approval and Regulatory Compliance

1. Environmental Clearance (EC)

- Did the project receive Environmental Clearance before commencement of construction or site development?

2. Condition Compliance

- Is the project complying with all EC conditions, including submission of six-monthly compliance reports?

3. Other Clearances

- Has the project obtained necessary forest, wildlife, and pollution control board clearances (e.g., Consent to Establish or Operate)?

4. Construction Timing

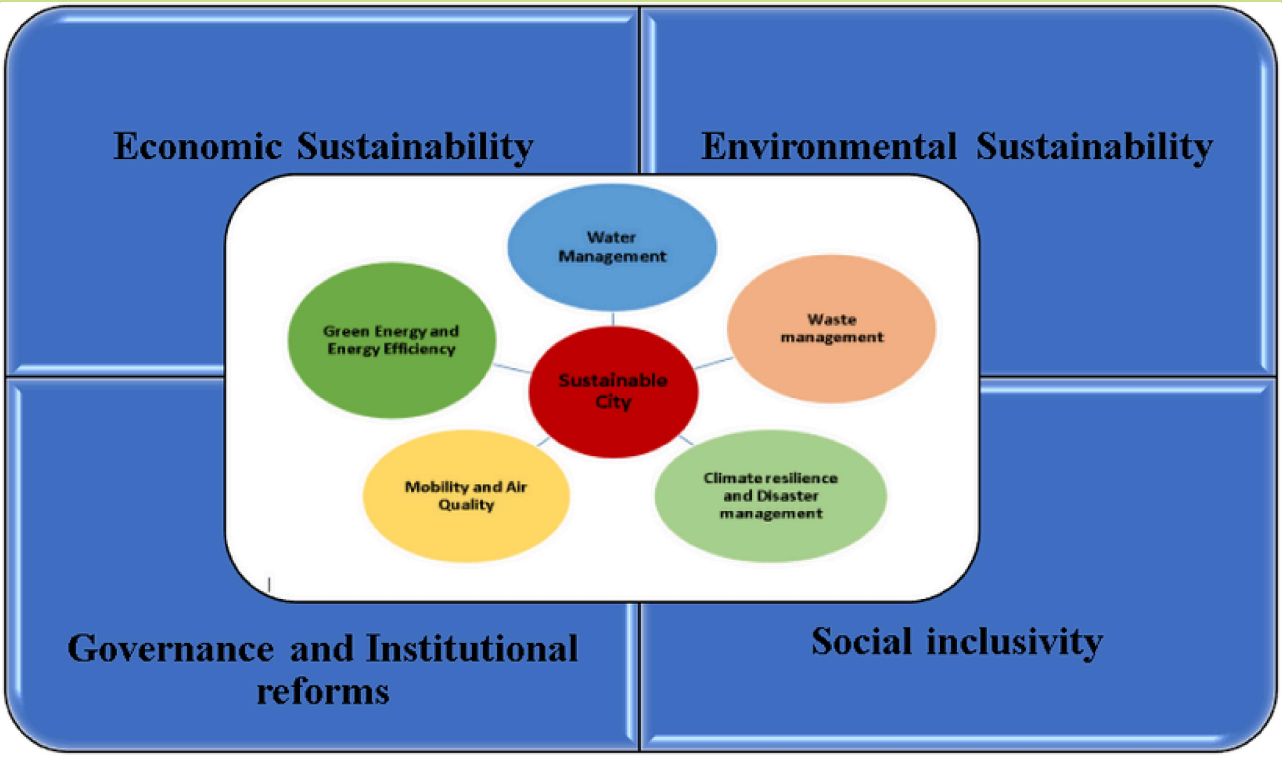
- Was any construction initiated only after obtaining all required approvals and valid EC?

SUSTAINABLE CITIES

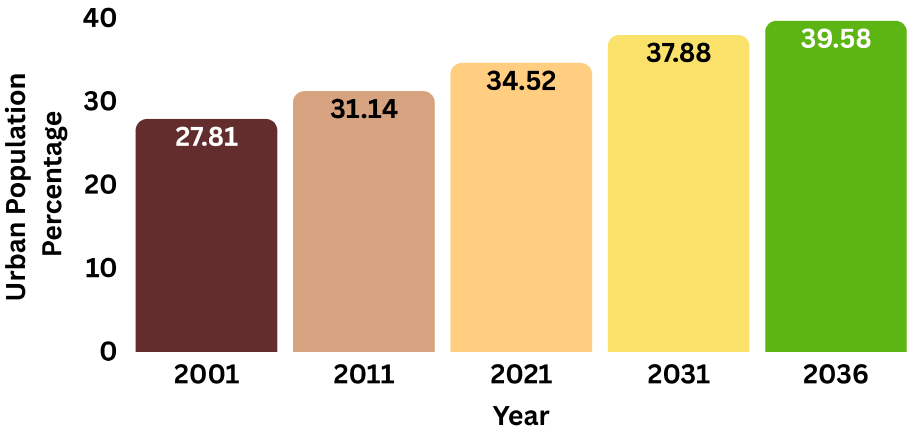
International Centre for Environmental Audit and Sustainable Development

Why to Audit, Sustainable Cities?

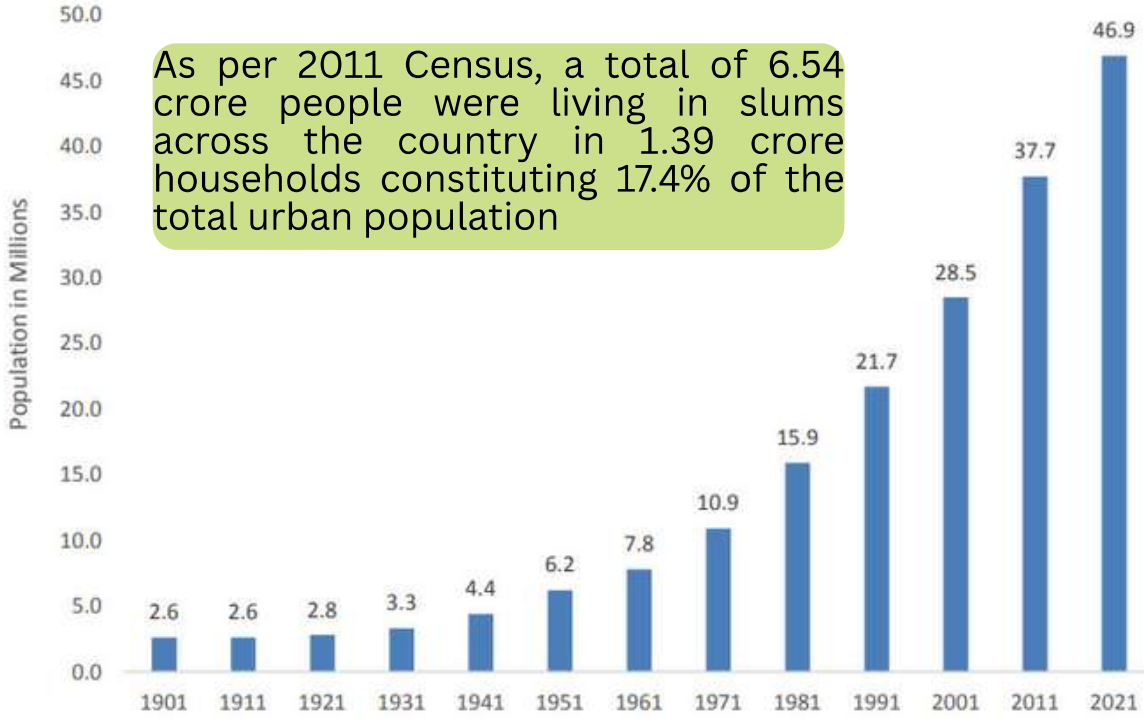
- There has been steady increase in the urban population as proportion of the total population of India. The trend is expected to continue in future as well.
- A very high population density in urban areas compared to rural areas shows enormous pressure on resources and significant contribution of residuals in the urban environment.
- Further, as per 2011 census, a total of 6.54 crore people were living in slums across the country in 1.39 crore households constituting 17.4% of the total urban population living without basic facilities.
- Broadly, sustainability of a city depends on water management, waste management, green energy and energy efficiency, mobility and air quality, climate resilience and disaster management. Here, water management, solid waste management, urban mobility are being focused as fecal and liquid waste, green energy, disaster management and air pollution are covered separately in detail.
- India is a water stressed country with availability of 1513 M^3 water per capita per annum (2024) which is expected to fall to 1140 M^3 per capita per annum in 2050 slightly above the water scarcity benchmark of 1000 M^3 per person per annum.
- Average quantity of water supplied by ULB_s in India is 69.25 litres per person per day against requirement of 135 litres per person per day.
- Solid waste management involves source segregation, proper collection, transportation, treatment and disposal of waste through sanitary landfills, however in urban areas still gaps exists and around 20% of the generated solid waste is dumped in open landfill sites leading to mountains of garbage near cities.
- The problem of solid waste management in urban areas is further aggravated with per capita per day solid waste generation increasing from 98.79 grams in 1917-18 to 123.45 Grams in 2021-22.
- Inadequacy of public transport in Indian cities leads to dependence on private vehicles. The enormous growth in private vehicles indicates huge potential for the growth of greener public transport systems. Inspite of promotion of electric vehicles as cleaner and greener mode of transportation, the ratio of electric vehicles remains a meagre 2% of the total registered vehicles.
- Key challenges faced by smart cities include frequent transfer of CEO's, timely release of matching share contribution from State/ UT Governments, new and diverse areas of work, cities had no experience in building Integrated Command and Control Centres (ICCC), incubation centers, bicycle sharing schemes, solar power projects, riverfront development etc.



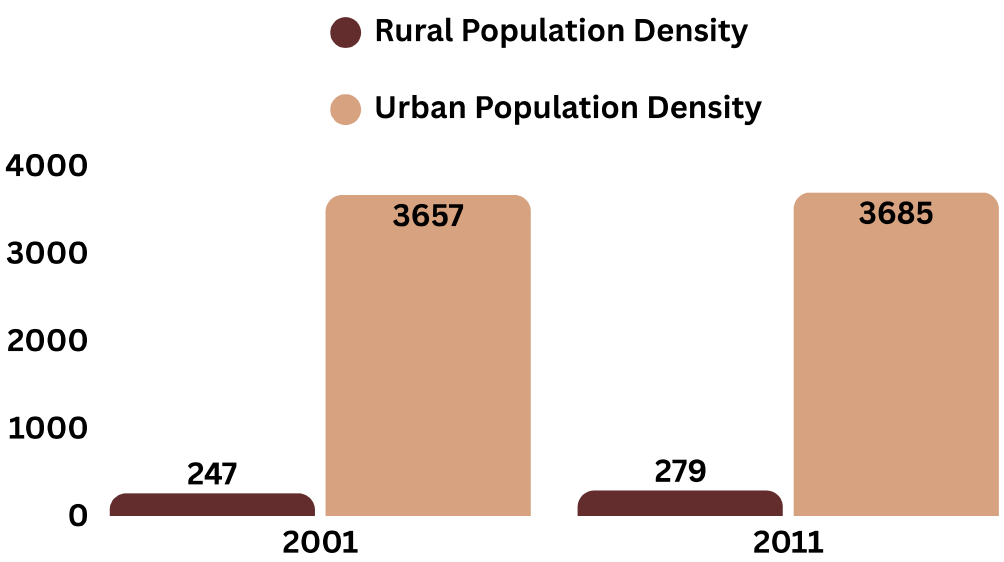
Estimated/ Projected Urban Population Percentage



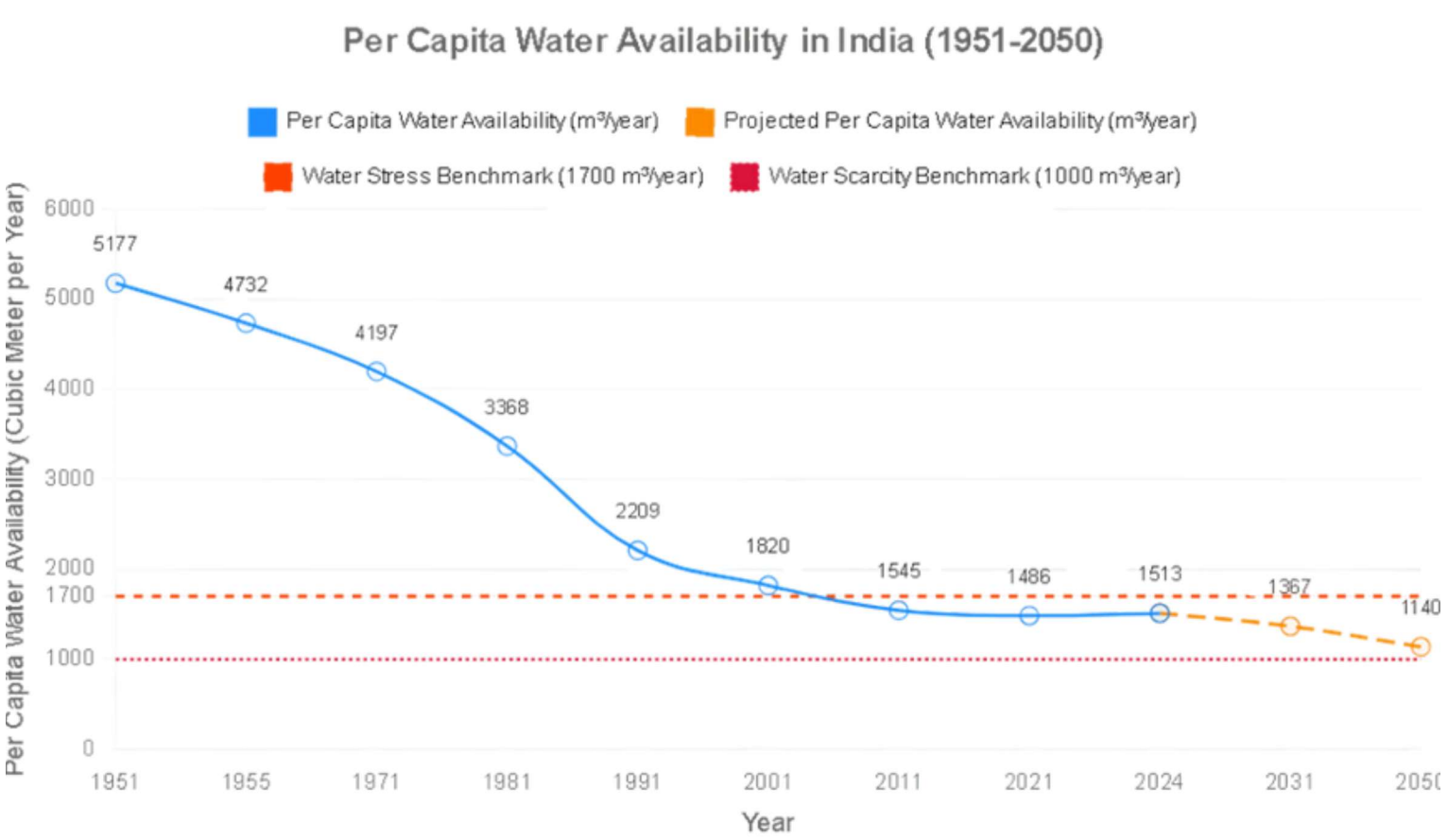
Source: Census – 2001 & 2011 and Min. of Health and Family Welfare (2019) Population projection for India and states, 2011-36



Comparative Rural and Urban Population Density



Source: Census – 2001 & 2011



Source: Central Water Commission (CWC), Ministry of Jal Shakti; NITI Aayog

METRO CRISIS

India's urban population is set to grow massively over the next three decades–a major problem, since existing supplies of water are already insufficient to meet demand

40%
of India's population is projected to live in urban areas by 2030, up from 34 per cent in 2011

31%
of urban households lack access to piped water or public tap water

67.3%
of urban Indian households are not connected to a piped sewage discharge system

48%
of the urban water supply in India comes from groundwater, according to the Centre for Science and Environment

Sources: United Nations Department of Economic and Social Affairs; National Family Health Survey, 2015-16; Census 2011; Central Public Health and Environmental Engineering Organisation; Centre for Science and Environment

THE SUPPLY GAP

Average quantity of water supplied by urban local bodies in India

69.25
litres per person per day

Required quantity of water to be made available in the cities

135
litres per person per day

KEEPING IT FLOWING

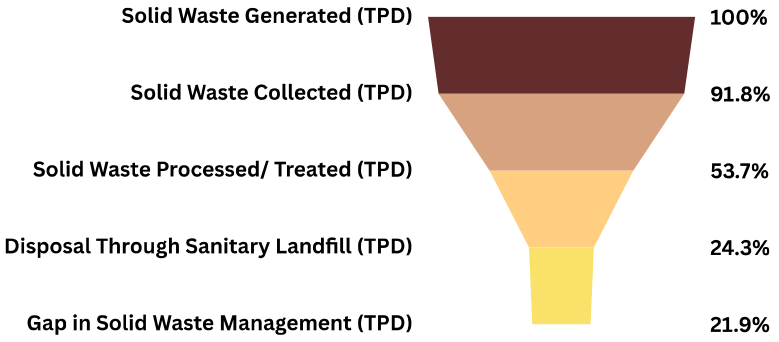
While 80 per cent of households in India's cities have water sources within their premises, the challenge is to keep them recharged

THE 30 CITIES MOST AT RISK

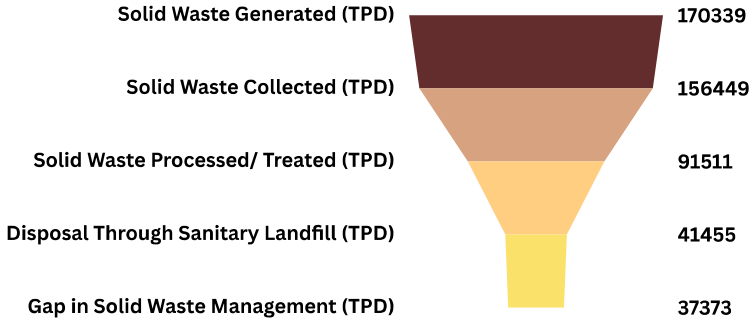
A WWF-India report projects that the following cities will face a 'grave water risk' by 2050 due to sharp increases in population

1. Jaipur
2. Indore
3. Thane
4. Vadodara
5. Srinagar
6. Rajkot
7. Kota
8. Nashik
9. Visakhapatnam
10. Bengaluru
11. Kolkata
12. Ahmedabad
13. Jabalpur
14. Mumbai
15. Lucknow
16. Hubli-Dharwad

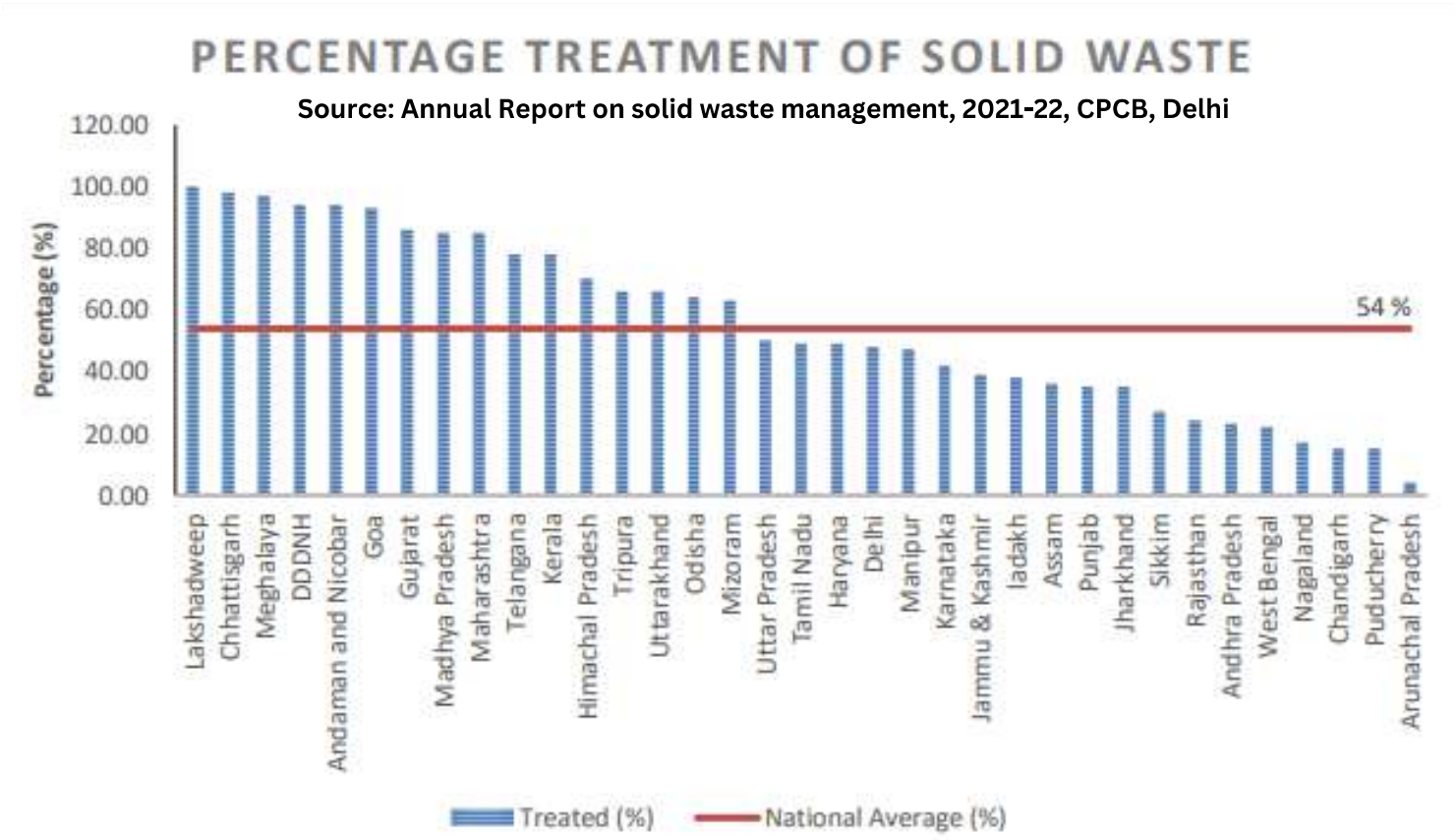
17. Nagpur
18. Chandigarh
19. Amritsar
20. Ludhiana
21. Jalandhar
22. Pune
23. Dhanbad
24. Bhopal
25. Gwalior
26. Surat
27. Delhi
28. Aligarh
29. Kozhikode
30. Kannur

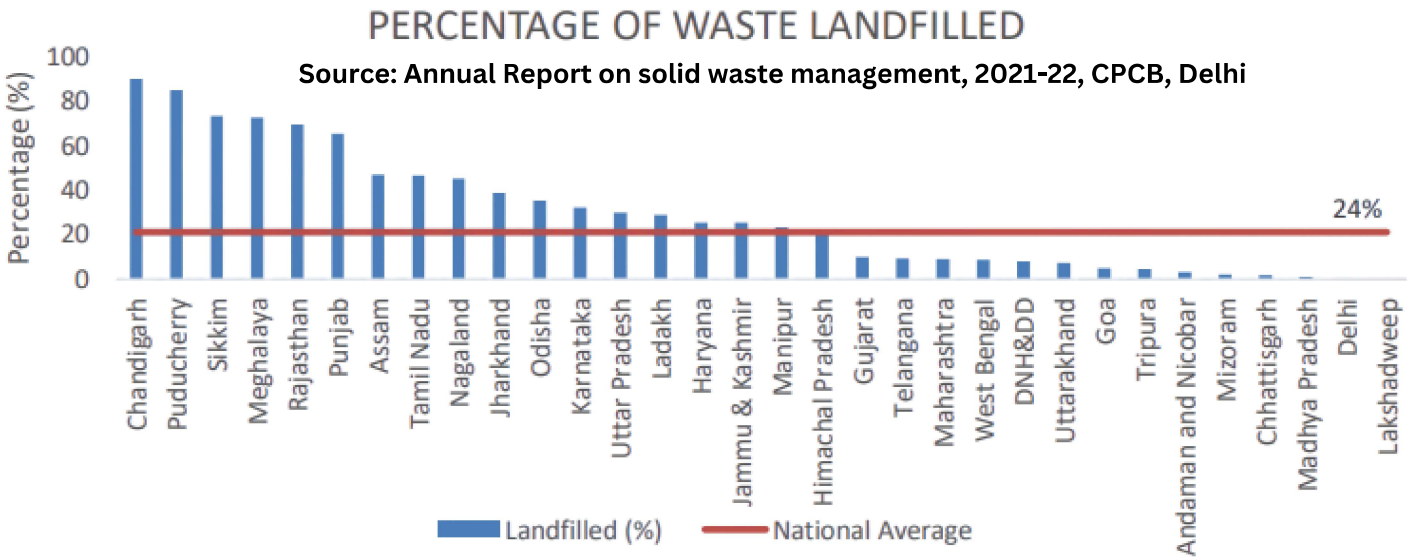


Source: Annual Report on Solid Waste Management, 2021-2022, CPCB, Delhi



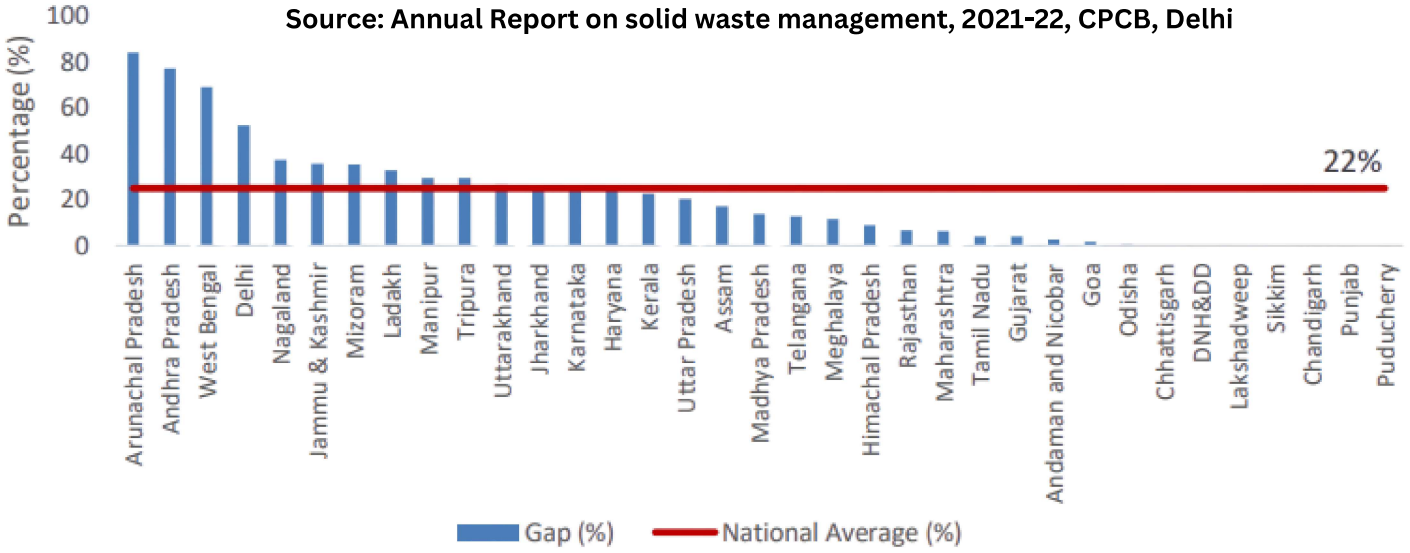
Source: Annual Report on Solid Waste Management, 2021-2022, CPCB, Delhi





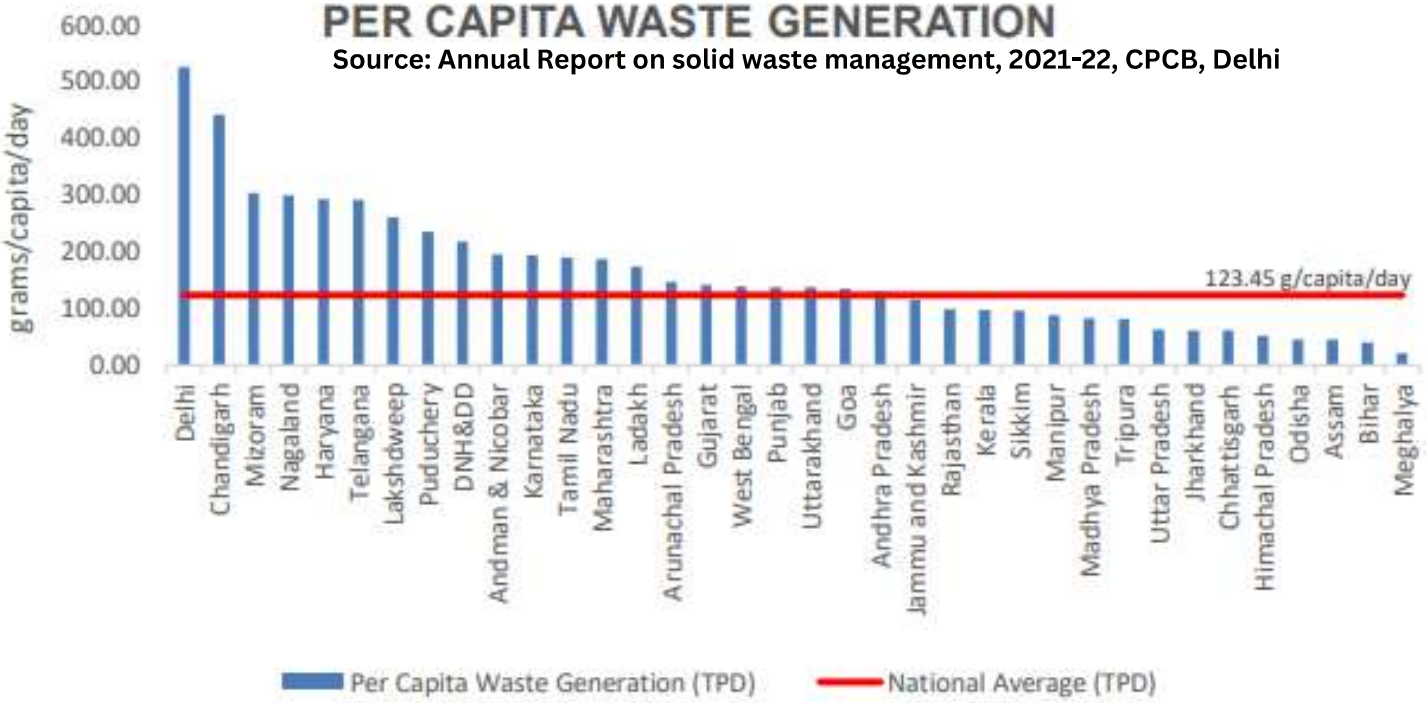
GAPS IN SOLID WASTE MANAGEMENT

Source: Annual Report on solid waste management, 2021-22, CPCB, Delhi

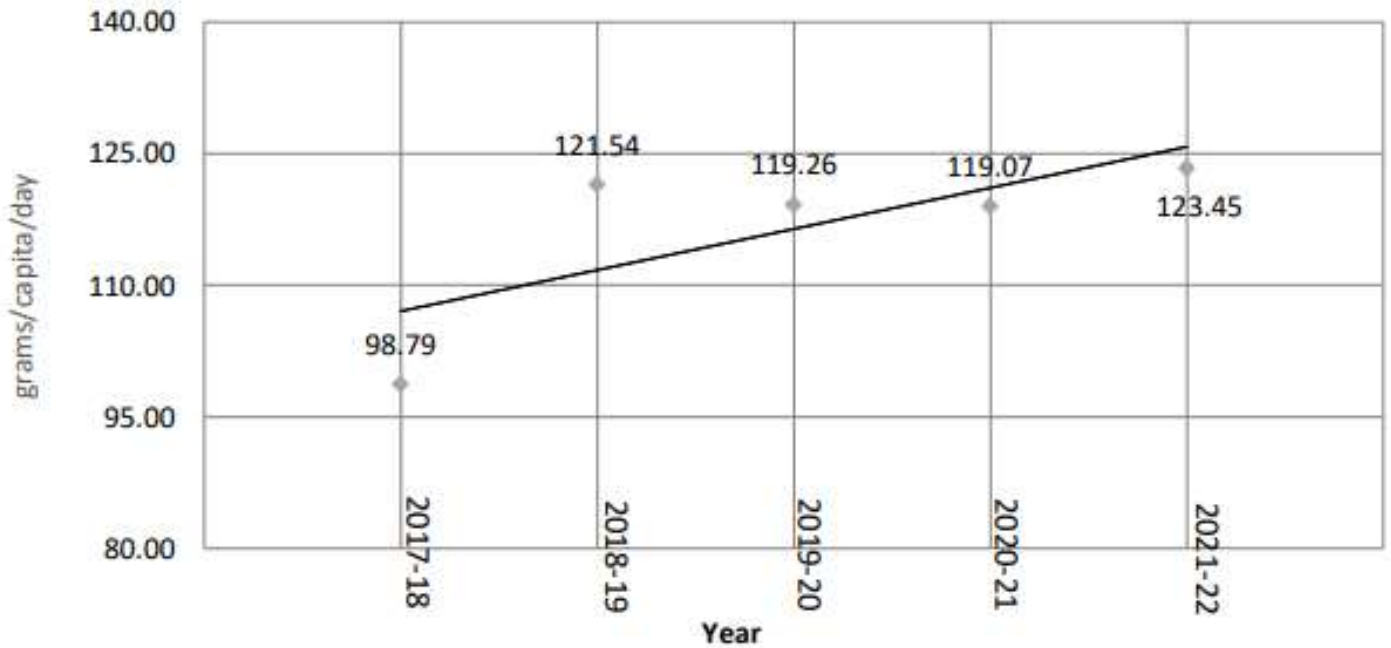


PER CAPITA WASTE GENERATION

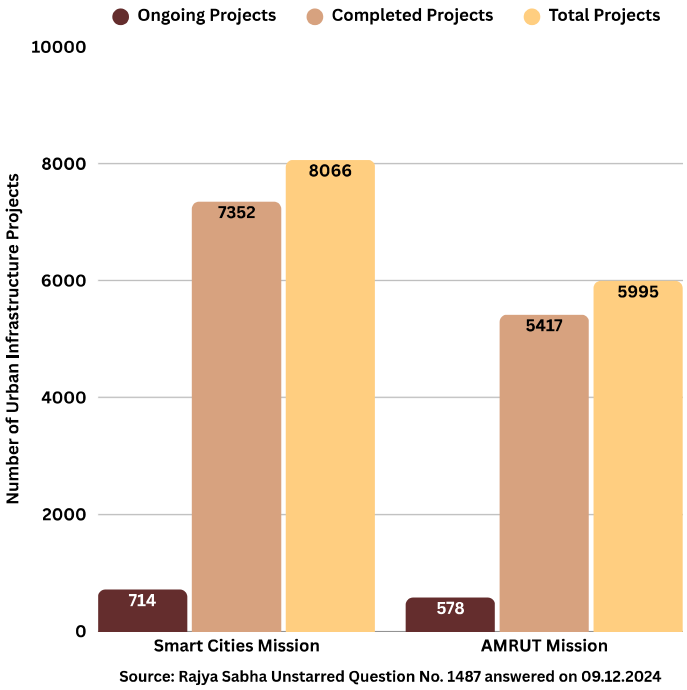
Source: Annual Report on solid waste management, 2021-22, CPCB, Delhi



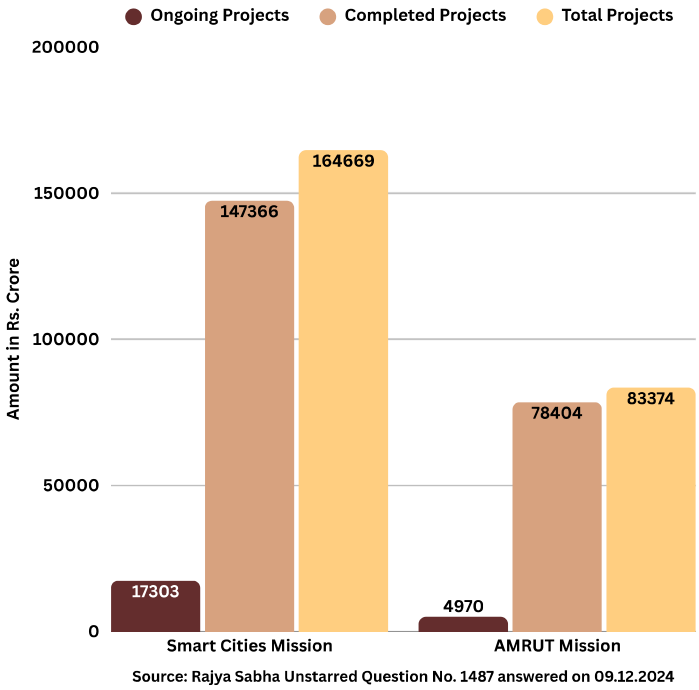
TREND OF PER CAPITA WASTE GENERATION



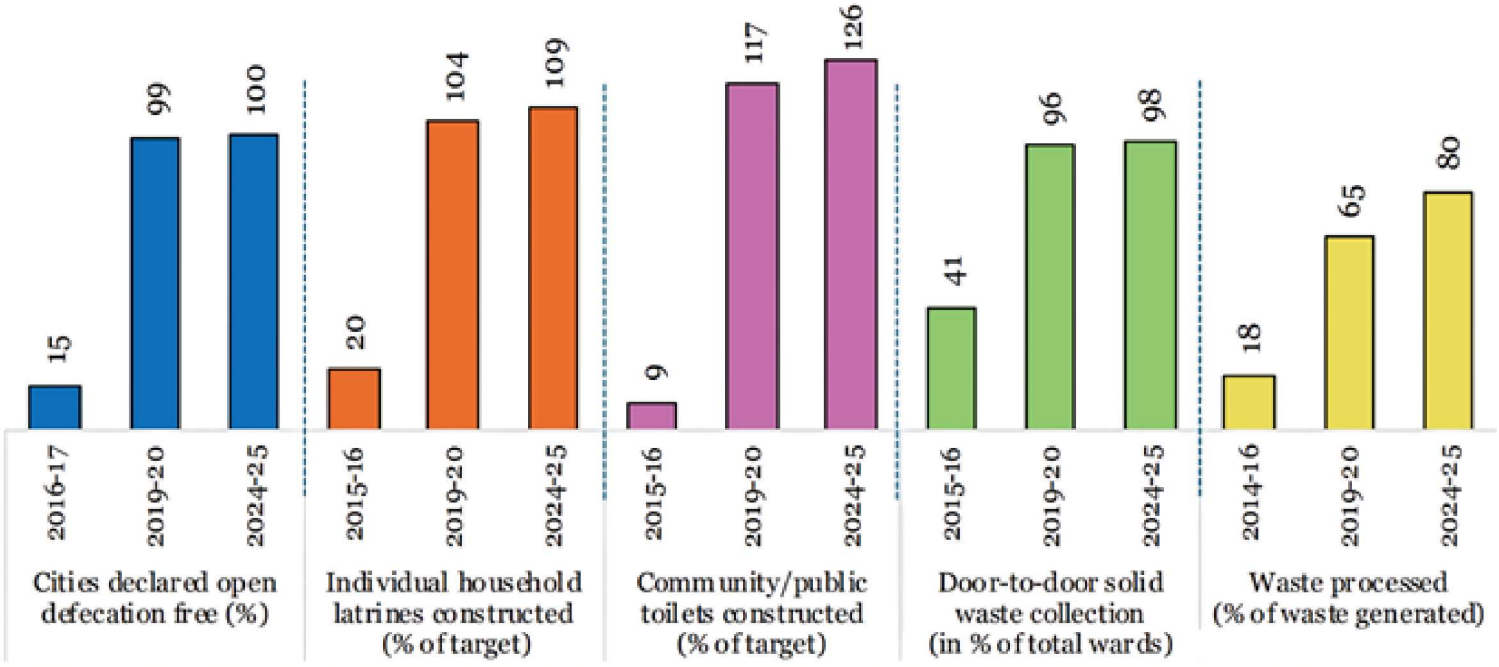
Source: Annual Report on solid waste management, 2021-22, CPCB, Delhi



Source: Rajya Sabha Unstarred Question No. 1487 answered on 09.12.2024



Source: Rajya Sabha Unstarred Question No. 1487 answered on 09.12.2024



Progress Under SBM-U

Source: M/o H&UA

* Note: As on 31st December 2024

Achievements of Smart cities Mission

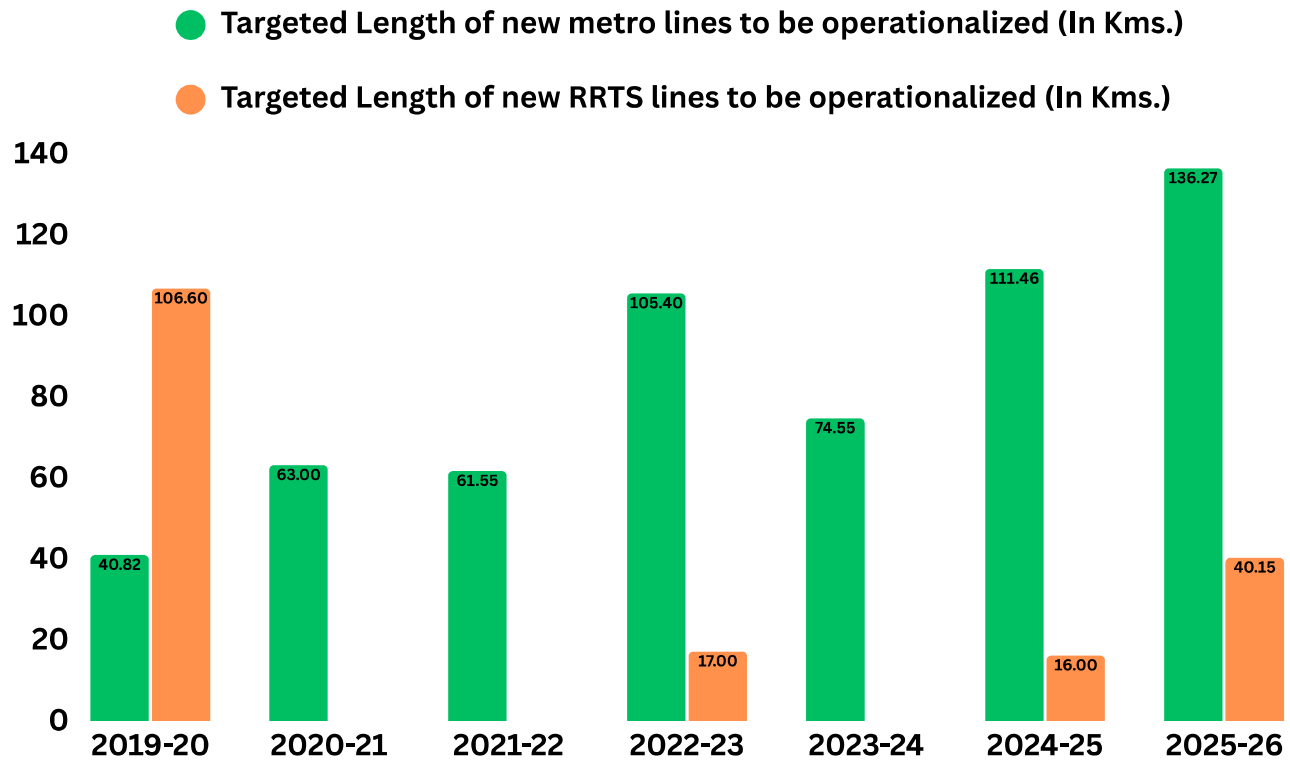
Integrated Command and Control Centres	•Operational in 100 cities. Used for urban management in crime tracking, safety, transport, disaster management, etc.
Public Safety	•83,000+ CCTV cameras, 1,884 emergency call boxes, public address systems, and traffic enforcement tools installed
Public Safety	•1,200+ projects completed, 318 km of waterfronts developed, •484 heritage sites conserved
Water Supply	•17,000 km of water supply monitored via SCADA in 31 cities, reducing water loss and leaks.
Solid Waste Management	•ICCCs and 9,000 RFID-enabled vehicles in 48 cities optimized waste collection.
Streetlights	•16 lakh solar/LED streetlights installed across 79 cities.
Mobility	•1700 km of smart roads, shared bicycles (23,000), buses (1,500+), bus stops (2,000+), ITMS in 35 cities.
Affordable Housing	•35,000+ affordable housing units built in 23 cities.
Smart Solutions	•9,400 Wi-Fi hotspots and 83,000 CCTV cameras created.
Health	•3,100+ hospital beds, 172 e-health centers, 155 health ATMs, and 300 sports facilities added.
Education	•9,400 smart classrooms in 2,300 schools, digital libraries, and Anganwadis developed.
PPP Projects	•199 projects worth ₹9,200 crores implemented in 50+ cities.
Economic Hubs	•Incubation projects and skill centers developed, supporting 1,400+ startups and 20,000+ vendors.

Source: Ministry of Housing and Urban Affairs
Note: * As of 18 Nov 2024

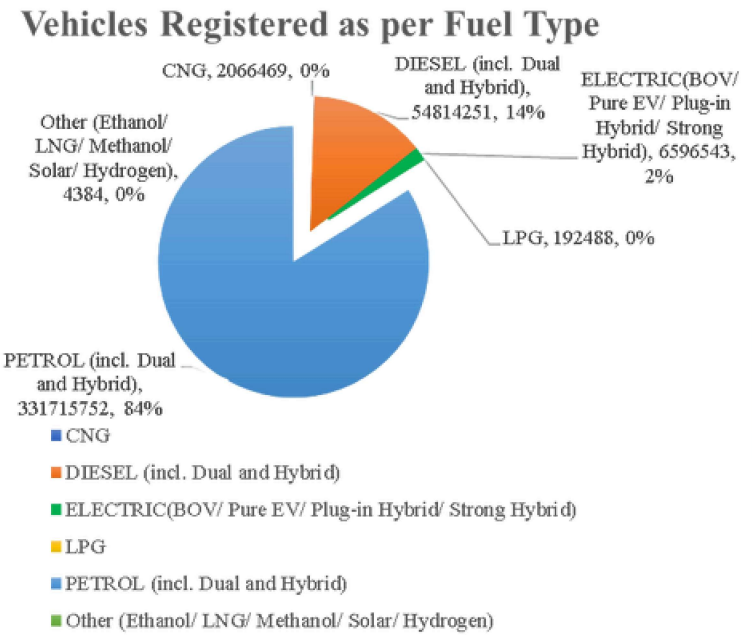
Progress in SBM (U) (as of December 2024)

- Individual household latrines constructed (no.) : 63.7 lakh
- Community and public toilets (no. of seats) constructed: 6.4 lakh
- No. of wards with 100% door-to-door collection of municipal solid waste (MSW): 93,756

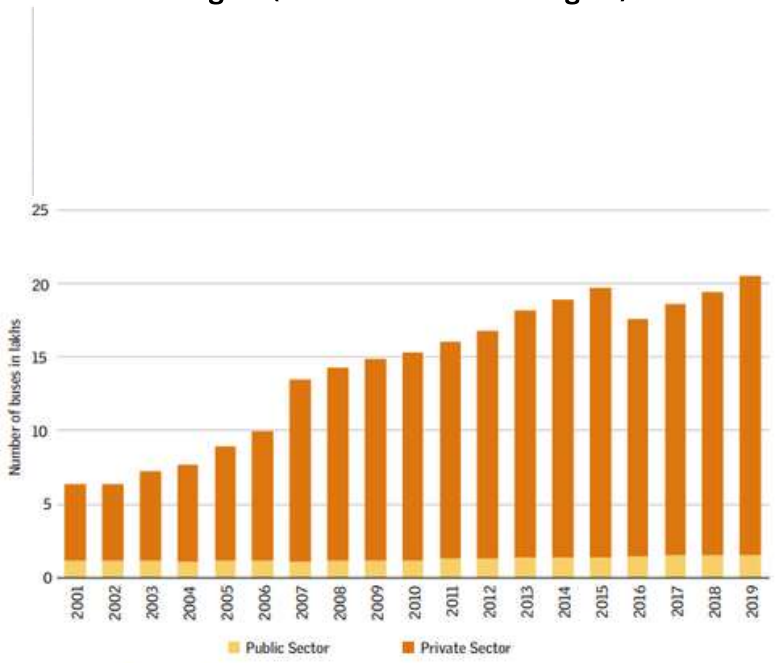
Protocol	Description	Progress
ODF certified	Complete access to toilets by citizens and ensuring that nobody goes out for open defecation at any time of day or night.	4,576 ULBs
ODF+	ODF and all community and public toilets are clean, hygienic and functional while following basic cleanliness criteria.	3,913 ULBs
ODF++	ODF+ and complete faecal sludge from toilets is safely contained, transported, and treated while ensuring that no untreated sludge is discharged in the open.	1,429 ULBs
Water+	ODF++ and ensuring that no untreated liquid waste (including wastewater) is discharged without proper treatment and ensuring maximum reuse of treated wastewater.	64 ULBs



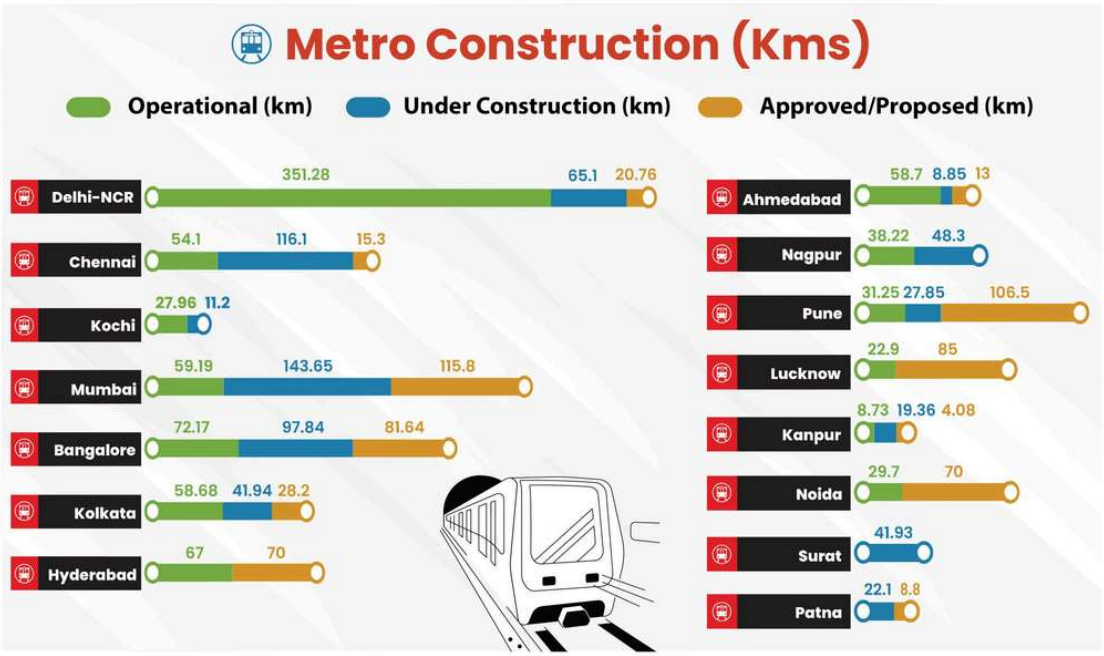
MMRTS and Metro Central Sector Scheme Annual Targets (Source: Outcome Budgets)



SOURCE: VAHAN DATA (AS ON 29.06.2025



Source: Open Government Data Platform



Budget allocation trends under important schemes for urban India

Schemes	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25 (RE)	2025-26 (BE)
Metro Projects	18161.99	8572.59	23262.00	18878.18	19506.20	24758.49	31889
MRTS Projects*	1789.43	654.08	2712.31	7511.59	5532.84	5395.12	5286
AMRUT (Atal Mission for Rejuvenation and Urban Transformation)	6391.52	6448.35	7280.38	6499.87	5590.84	6000	10000
Smart Cities Mission	3207.16	3305.26	6587.64	8652.92	7982.36	2225	250
Swachh Bharat Mission (SBM) - Urban	1255.73	994.90	1951.66	1926.35	2392.28	2159.42	5000
Faster Adoption and Manufacturing of (Hybrid and) Electric Vehicle in India - (FAME - India	500	318.35	800	2402.51	3921.10	2058	0
PM Electric Drive Revolution in Innovative Vehicle Enhancement (PM E-DRIVE) Scheme	0	0	0	0	0	1870.76	4000
PM-eBus Sewa Scheme	0	0	0	0	1.00	500.00	1310
PM-eBus Sewa-Payment Security Mechanism (PSM) for procurement and operation of e-Buses by Public Transport Authorities (PTAs)	0	0	0	0	0	16.52	510
Pradhan Mantri Awas Yojna (PMAY)-Urban	6847.63	20990.70	59963.04	28652.74	21684.33	13670.00	19794
Pradhan Mantri Awas Yojana - Urban 2.0 (PMAY-U 2.0)	0.00	0.00	0.00	0.00	0.00	1500.00	3500
Deendayal Antyodaya Yojana-National Urban Livelihood Mission (DAY-NULM)	732.07	816.61	794.20	547.02	501.39	30.00	0

*Includes National Capital Region Transport Corporation and Metropolitan Transportation Projects
Source: Union Budgets

Recent Court / NGT Directives:

- NGT (Nov 2024) – Directed Madhya Pradesh officials to fully implement solid waste management rules in Balaghat; ordered legacy waste to be cleared and action taken reports to be filed within two months.
- Supreme Court (June 2024) – Ordered Himachal Pradesh to release 137 cusecs of surplus water to Delhi via the Wazirabad barrage and asked Haryana to facilitate the transfer, to address Delhi's acute drinking-water shortage.
- NGT (Dec 2024) – In a suo-motu case, instructed the Kolkata Municipal Corporation to extend piped drinking water to all slum households (rejecting a proposed five-year delay) and to file a complete compliance affidavit within four weeks.
- Karnataka High Court (Dec 2024) – Directed state-run bus agencies to operate loudspeaker audio-announcement systems for visually impaired and differently-abled commuters, earmarking budget funds and mandating that audio systems cover all major bus stops within two years.
- Supreme Court (Apr 2025) – Asked the Union government to submit detailed EV adoption and infrastructure plans, noting the absence of widespread charging stations and slow rollout of electric-vehicle measures.
- NGT (Apr 2024) – Questioned Chhattisgarh's claim of "100%" urban waste segregation as "difficult to believe" and ordered an independent joint committee to verify the state's solid-waste and sewage-management figures.

Audit Assessment Checklist

- **Environmental Sustainability**

· **Air Quality:** Whether cities comply with Ambient Air Quality Standards and/ or able to achieve NCAP targets within the set timelines?
Whether Source Apportionment studies were conducted before development of City Action Plans to ensure targeted approach for Air Pollution control under NCAP?
Whether City Action Plans have been executed as per the timelines?
Whether efforts for the promotion of e-vehicle and green mobility have been able to achieve desired results?
· **Water Supply & Quality:** Whether piped water supply has been ensured for the households as per the targets set under AMRUT?
Whether supplied water meets quality standards as per IS 10500?
· **Sewerage & Sanitation:** Whether waste water from the households and industries is effectively managed through Sewage system?
Whether all the collected sewage is treated through Sewage Treatment Plants?
Whether reuse/ recycling of water is done as per the set targets to reduce water demand?
Whether water audits are conducted to ensure water use efficiency especially in commercial and industrial premises?
· **Solid Waste Management:** Whether city has achieved 100% door-to-door collection of solid waste?
Whether all the collected solid waste is scientifically processed in compliance with SWM Rules?
Whether significant efforts have been made to scientifically process legacy waste to get rid of waste dumps?
· **Green Spaces:** Whether parks and open spaces have been planned and developed in proportion to serve the city population as per the norms for urban heat mitigation and recreation?
Whether urban afforestation projects have been taken up as per the plan?
Whether efforts for the conservation and protection of lakes and wetlands against encroachment have been effective?
· **Energy Efficiency:** Whether efforts to ensure energy efficiency have been made in an effective manner through green building norms including promotion of energy efficient home appliances?
Whether LED streetlights have been installed across the city?
· **Green Energy:** Whether green energy in the form of solar rooftops, solar water heaters, etc. are effectively promoted?
Whether use of Electric Public Transport vehicles has been promoted through significant increase in Electric Buses, Rickshaws, etc.?
Whether significant increase in personal electric vehicles/ two-wheelers has been achieved through policies and improvement in EV charging infrastructure?
· **Climate Resilience:** Whether infrastructure is climate resilient by considering the hazard and vulnerability assessment against disasters such as urban flooding, earthquakes, cyclone, etc.?
Whether flood forecasting and flood protection, storm-water drainage systems, etc. have been installed and working in an effective manner?

- **Social Inclusivity**

· **Affordable Housing:** Whether targets for housing as per PMAY(U) have been met?
Whether slum re-development programme has been effective by providing basic facilities to poor segments of the society?
· **Public Transport:** Whether coverage of public buses/ metros has effectively met the demand?
Whether public transport has been planned and developed increasing the convenience of the travelers and reducing the travel time?
· **Inclusive Public Spaces:** Whether public places have been designed to incorporate disabled-friendly features as well as security features for all especially women and children?
· **Citizen Participation:** Whether effective platforms exist in the form of ward committees, public consultations, online grievance redress platforms, Community Liaison Groups, etc. to ensure citizen participation in urban governance?

- **Economic Sustainability**

· **Livelihood:** Whether effective measures have been taken to improve urban livelihoods, by promotion of MSME zones, SEZ, urban infrastructure, etc.?
· **Municipal Finances:** Whether ULBs have been able to achieve economic sustainability by generating sufficient revenue through property tax, user charges, etc.?
Whether ULBs are able to meet the revenue gaps through issuance of bonds?

- **Governance & Institutional Reform**

· **Efficiency & Innovation:** Whether technology driven smart solutions such as IoT, GIS, AI, e-governance, etc. have been adopted in an effective manner for smooth delivery of urban services?
Whether Command & Control Centres under Smart cities mission have been operational in an effective manner?
· **Policy Compliance:** Whether cities are complying with the policies such as building codes, environmental laws, Swachh Bharat Mission targets, smart cities targets, etc.?
· **Monitoring Systems:** Whether monitoring of urban service delivery through Ease of Living, Swachh Survekshan; service delivery audits real-time dashboards is conducted to improve the processes?
· **Institutional Capacity:** Whether capacity building efforts for the public servants involved in public service delivery through regular training have been made?
· **Transparency & Feedback:** Whether public accountability and transparency has been ensured through Budget disclosures, citizen charters, public audit reports, feedback apps, etc.?

DISASTER MANAGEMENT

International Centre for Environmental Audit and Sustainable Development

Why to Audit, Disaster Management?

- Disaster means a catastrophe, mishap, calamity or grave occurrence in any area, arising from natural or man-made causes, or by accident or negligence which results in substantial loss of life or human suffering or damage to, and destruction of, property, or damage to, or degradation of, environment, and is of such a nature or magnitude as to be beyond the coping capacity of the community of the affected area.
- India, owing to its diverse geography and dense population, has witnessed numerous major disasters over the past two decades:
  ·Gujarat earthquake (2001)
  ·Indian Ocean tsunami (2004)
  ·Kashmir earthquake (2005)
  ·Uttarakhand flash floods and landslides (2013)
  ·Kerala floods (2018) — described as a "once-in-a-century" event
  ·Cyclone Phailin (2013, Odisha) and Cyclone Amphan (2020, West Bengal)
  ·Severe heatwaves and droughts (2015, 2019)
  ·Urban flooding in cities like Mumbai (2005), Chennai (2015, 2023, 2024), Bengaluru (2015), Hyderabad (2000, 2020), Delhi (2002, 2003, 2009, 2010)
- Out of 36 States and Union Territories (UTs) in the country, 27 are disaster prone. 58.6% landmass is prone to earthquakes of moderate to very high intensity; 12% land is prone to flood and river erosion; out of 7,516 km coastline, 5,700 km is prone to cyclones and tsunamis; 68% of the cultivable land is vulnerable to drought, hilly areas are at risk from landslides and avalanches, and 15% of landmass is prone to landslides. A total of 5,161 Urban Local Bodies (ULBs) are prone to urban flooding.
- A total of 3,94,014 human lives were lost during the period 2000 – 2022 due to natural causes.
- Climate Change is leading to increase in extreme weather events in the form of Heat wave days, torrential rainfall, cyclones, urban flooding. Climate Change along with rapid urbanization, socio-economic conditions, environmental degradation, increasing population pressure, demographic transition and migration are increasing vulnerability to disaster related risks.
- **Disasters have been categorized into five major sub-groups as below:**

Water and climate related disasters

- Floods
- Cyclones
- Tornadoes and hurricane
- Hailstorm
- Cloud burst
- Heat wave and cold wave
- Snow avalanches
- Droughts
- Sea erosion
- Thunder and lightening
- Tsunami

Geological related disasters

- Landslides and mudflows
- Earthquakes
- Dam failures/ Dam bursts
- Minor fires

Chemical, industrial and nuclear related disasters

- Chemical and industrial disasters
- Nuclear disasters

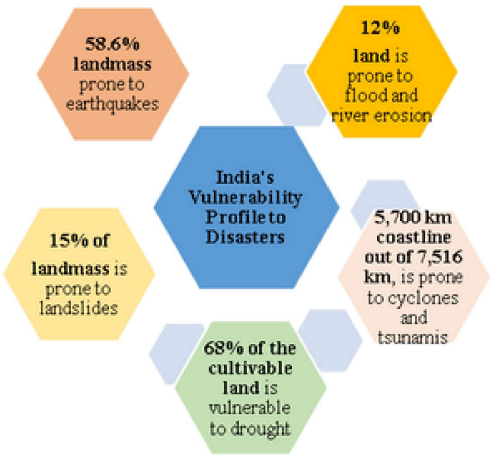
Accident related disasters

- Forest fires
- Urban fires
- Mine flooding
- Oil spills
- Major building collapse
- Serial bomb blasts
- Festival related disasters
- Electrical disasters and fires
- Air, road and rail accidents
- Boat capsizing
- Village fire

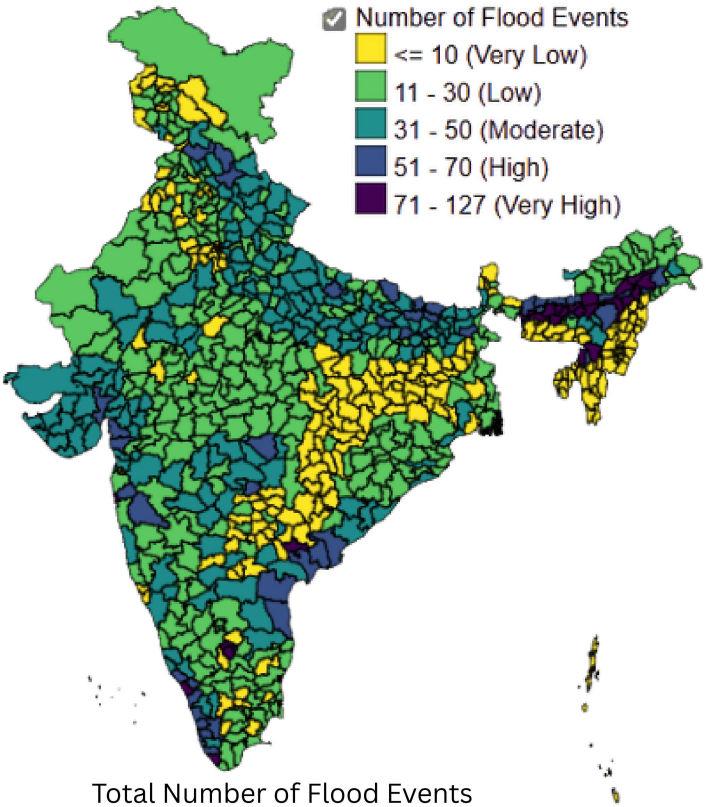
Biological related disasters

- Biological disasters and epidemics
- Pest attacks
- Cattle epidemics
- Food poisoning

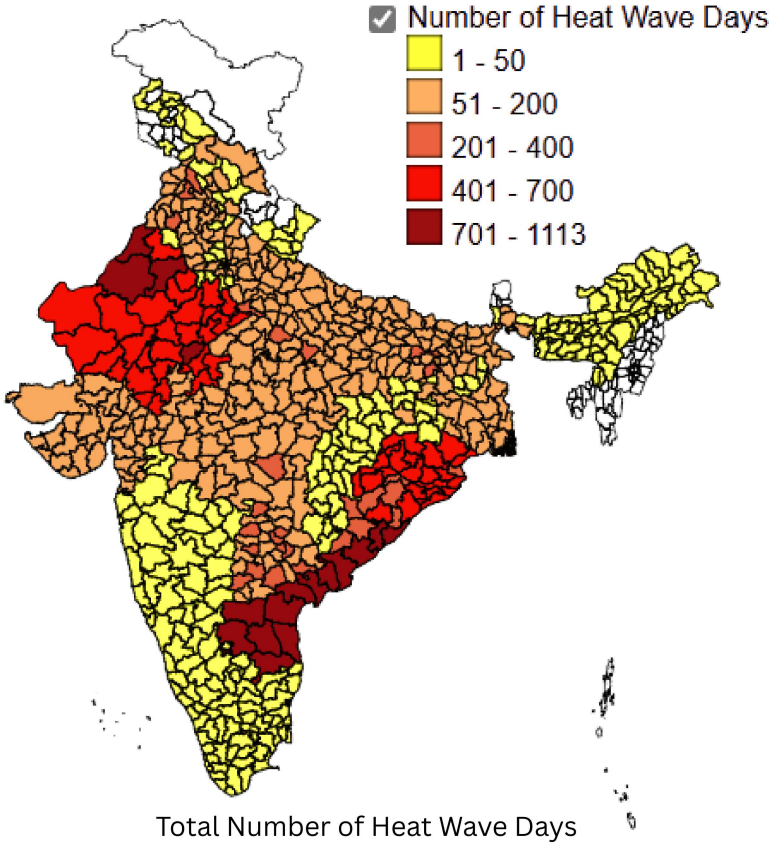
India Disaster Risk Profile



Source: National Disaster Management Authority Annual Report 2023-24

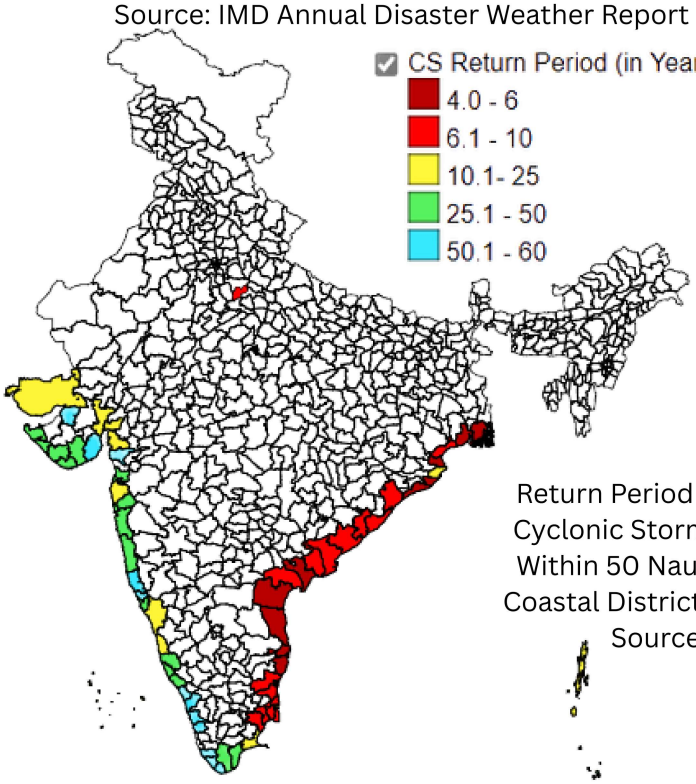


Total Number of Flood Events
During the Period from 1969 to 2019
Source: IMD Annual Disaster Weather Report



Total Number of Heat Wave Days
During the Period from 1969 to 2019
Source: IMD Annual Disaster Weather Report

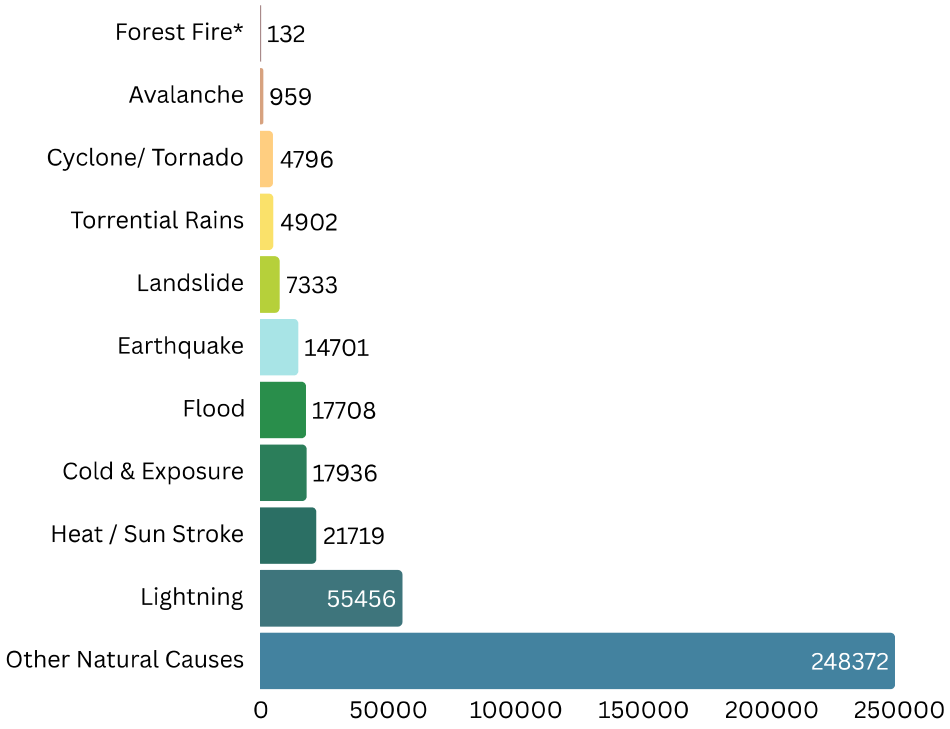
Seismic Zone Map of India



Return Period (in years) for Cyclonic Storm(CS) Passing Within 50 Nautical Miles of Coastal Districts (1961-2020)
Source: IMD

Loss of Human life due to disasters (2000 – 2022)

A total of 3,94,014 human lives were lost during the period 2000 – 2022 due to natural causes as detailed below:



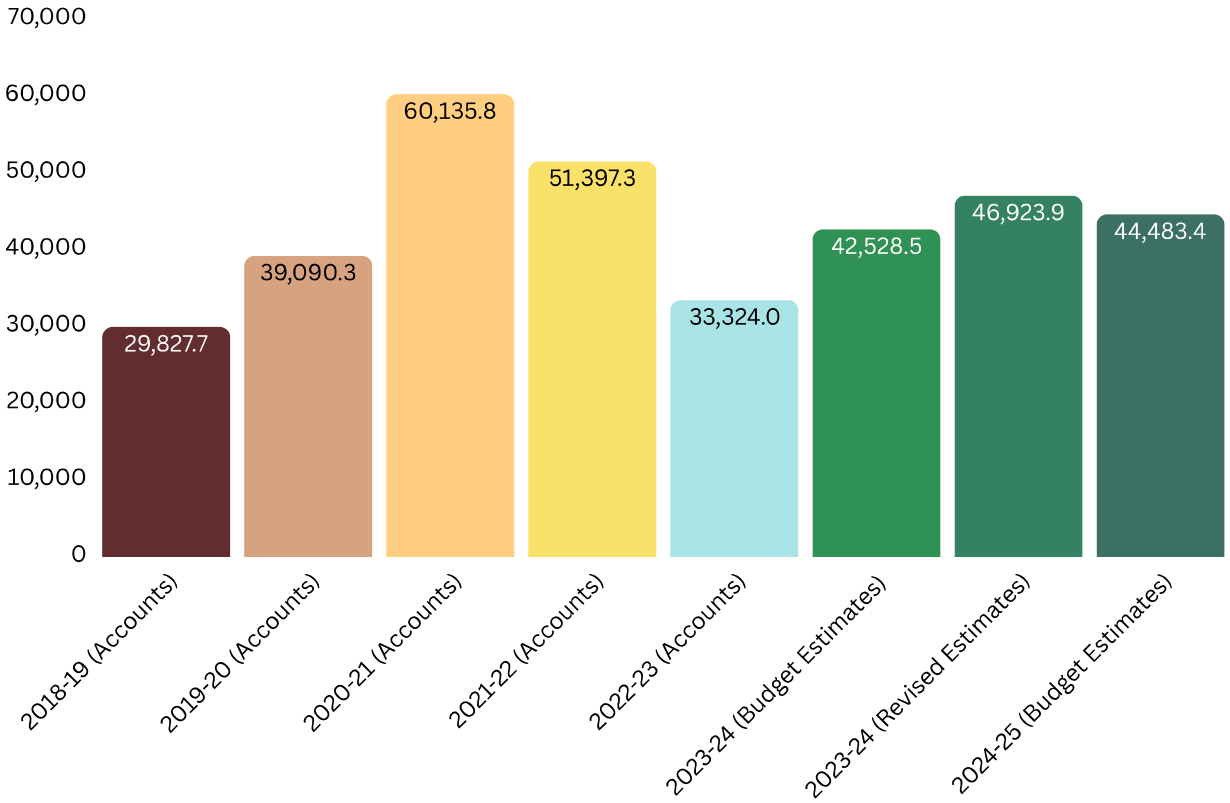
Source: National Crime Records Bureau – Yearly Accidental Deaths and Suicides in India *Separate data available since 2014 only

Economic Loss due to disasters (2001 – 2023)

Cattle Lost (In No.)	Houses Damaged (In No.)	Cropped Areas Affected (in Lakh hectares)
• 1609483	• 25250781	• 827.42

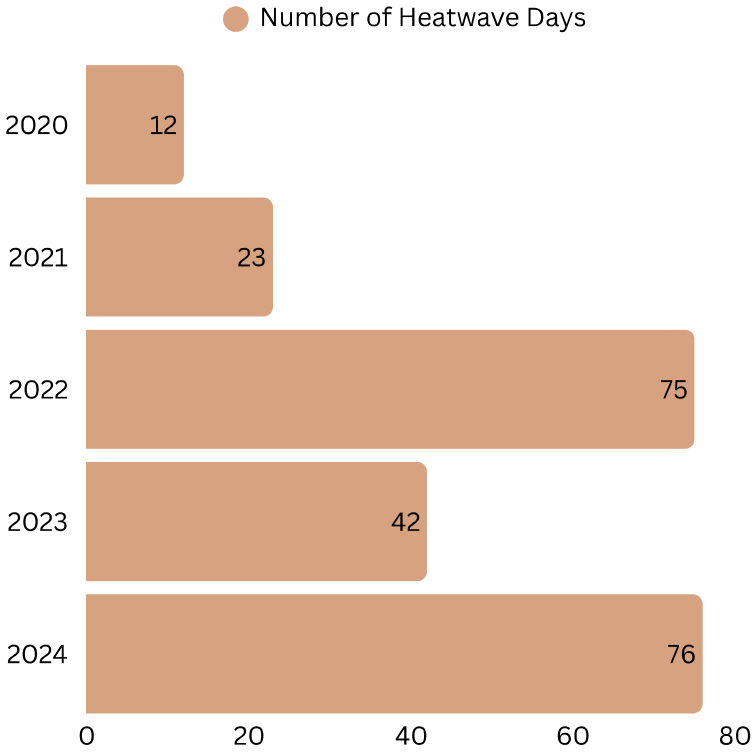
Source: Disaster Management Division, Ministry of Home Affairs

Revenue Expenditure of States and Union Territories with Legislature - Relief on account of Natural Calamities (2018-19 – 2024-25) – In Rs. Crore

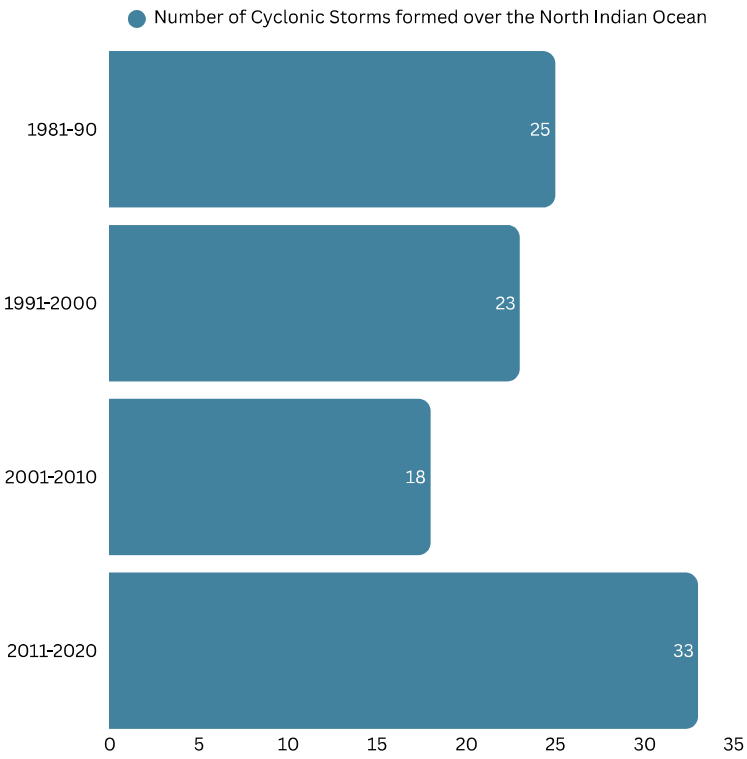


Source: Reserve Bank of India Publication on State Finances – A study of Budget of 2024-25

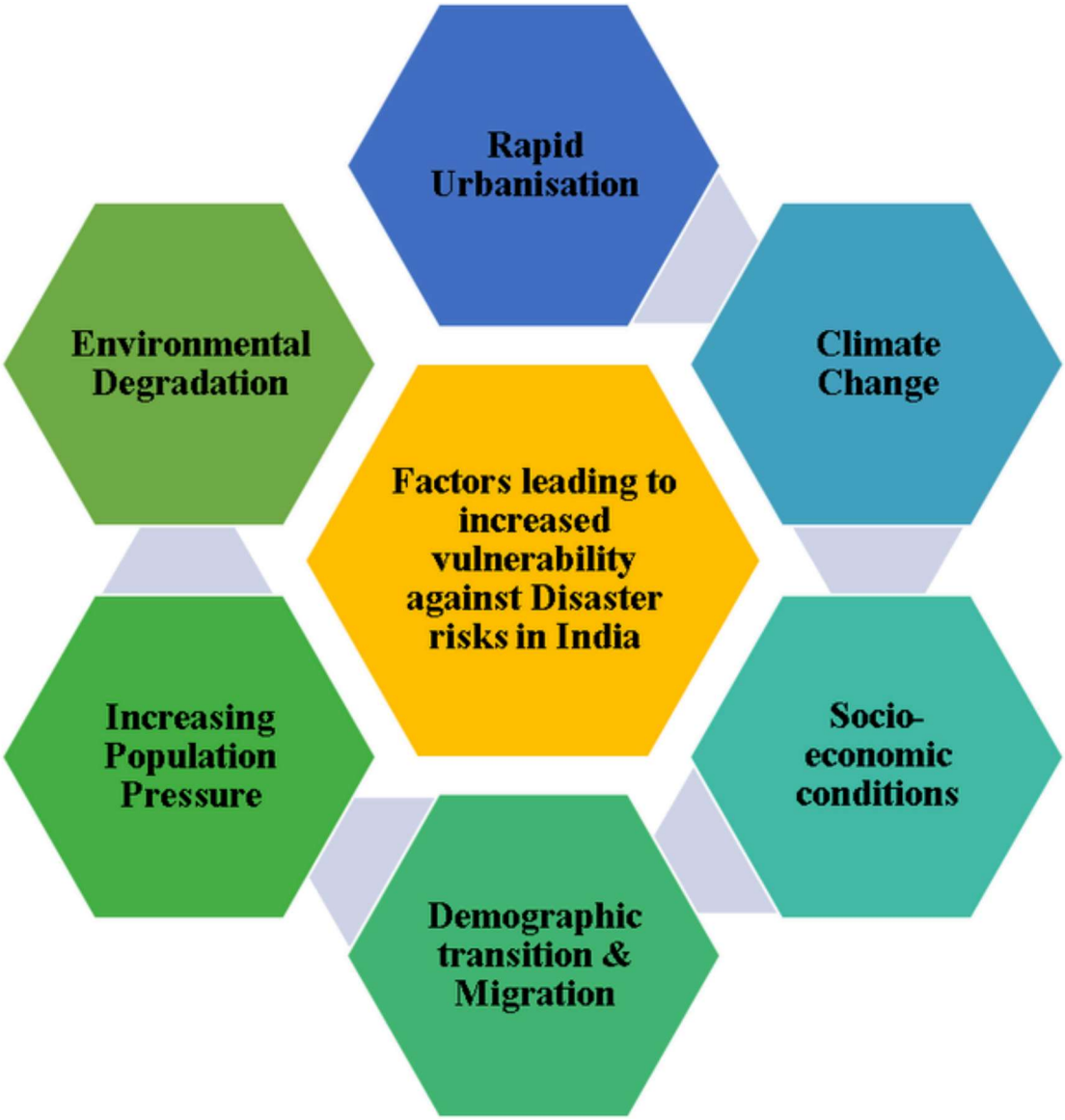
Climate Change and increase in Extreme Weather events



Source: Indian Meteorological Department, Ministry of Earth Sciences



Source: Indian Meteorological Department, Ministry of Earth Sciences



Disaster Management in India

Legislative and Legal Framework	Institutional Framework	Resources	Government Schemes and Projects
• National Disaster Management Act, 2005 • National Policy on Disaster Management, 2009 • National Disaster Management Plan • State Disaster Management Plan • District/ City Disaster Management Plan • Disaster Management Guidelines • Sendai Framework 2015-30	• Union Government • Ministry of Home Affairs • National Disaster Mangement Authority • Line Ministeries • State Governments • State Disaster Management Authorities • District Administration/ Local Self Governments • District/ City Disaster Management Authorities • Advisory and Executive Committees at Union, State and District Levels	• National Disaster Response Force • State Disaster Response Force • Aapda Mitra • Civil Defence Volunteers • Emergency Essential Resource Reserve (EERR) • India Disaster Resource Network (IDRN) • National Disaster Risk Management Fund (NDRMF) • State Disaster Risk Management Fund (SDRMF)	• National Cyclone Risk Mitigation Project • Landslide Risk Mitigation Scheme • Common Alerting Protocol (CAP) based Integrated Alert System (SACHET) • Earthquake Disaster Risk Index • Implementation of SENDAI Framework for Disaster Risk Reduction • Upscaling of Aapda Mitra Scheme • Strengthening of District Disaster Management Authorities • Extension of Emergency Response Support System (Dial 112) for Disaster Emergencies

Disaster Management - Finance

National Disaster Risk Management Fund (NDRMF) and State Disaster Risk Management Fund (SDRMF)

The coverage of the funds recommended by 15th Finance Commission goes beyond the disaster response funds that already exist at the national (NDRF) and state (SDRF) levels. Hence, 15th Finance Commission has recommended the creation of funds for disaster mitigation along with disaster response, which will now together be called National Disaster Risk Management Fund (NDRMF) and State Disaster Risk Management Funds (SDRMF). The Commission has recommended allocation of funds under NDRMF and SDRMF for the period 2021-26 as follows:

State Disaster Risk Management Funds (SDRMF)
Rs. 1,60,153 crores
2021-26

- **State Disaster Response Fund (SDRF) – 80% SDRMF**
  Rs. 1,28,122 crore
- **State Disaster Mitigation Fund (SDMF) – 20% of SDRMF**
  Rs. 32,031 crore

National Disaster Risk Management Fund (NDRMF)

Rs. 68,463 crore

2021-26

National Disaster Response Fund (NDRF) – 80% of NDRMF

Rs. 54,770 crore

Earmarked Allocation for two activities:-

- Expansion and Modernization of Fire Services (Rs. 5000 crore)
- Resettlement of displaced people affected by erosion (Rs. 1000 crore)

National Disaster Mitigation Fund (NDMF) –20% of NDRMF

Rs. 13,693 crore

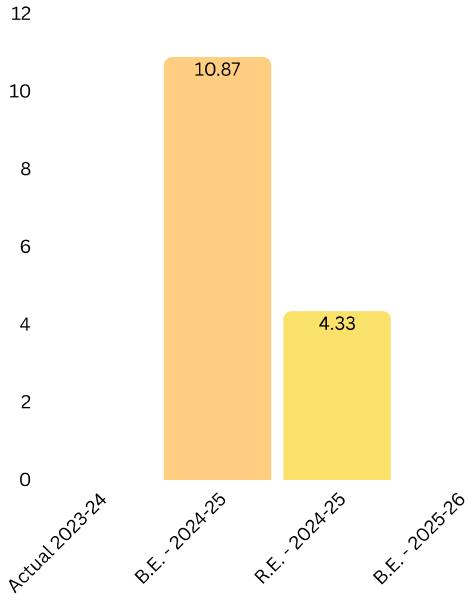
Earmarked allocation for four activities:-

- catalytic assistance to twelve most drought-prone States ((Rs. 1200 crore);
- managing seismic and landslide risks in ten hill States (Rs. 750 crore);
- reducing the risk of urban flooding in seven most populous cities (Rs. 2500 crore); and
- mitigation measures to prevent erosion (Rs. 1500 crores).

No fund released from National Disaster Mitigation Fund during 2020-21 to 2023-24

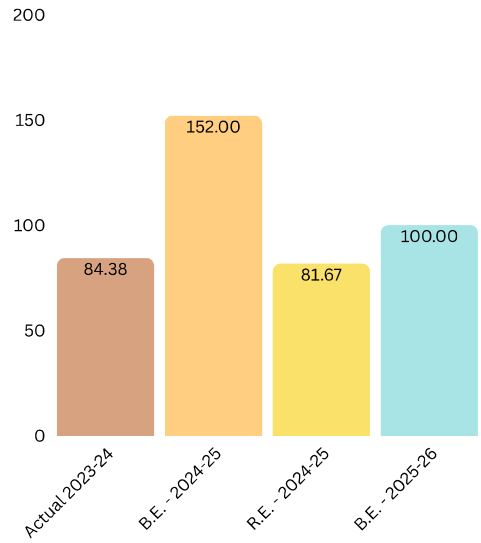
Government Schemes – Budget Trends (In Rs. Crores)

Centrally Sponsored Scheme

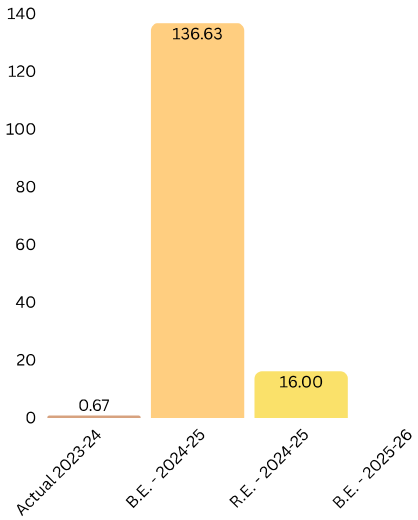


National Cyclone Risk Mitigation Project - Budget allotment
Source: Union Budget 2025-26

Central Sector Schemes



Infrastructure for Disaster Management - Budget allotment
Source: Union Budget 2025-26



Other Disaster Management Schemes - Budget allotment
Source: Union Budget 2025-26

Courts / National Green Tribunal Focus on Disaster Management

Flood Plain Encroachment	• NGT ordered demolition of 29 bungalows built within the Indrayani flood-zone and imposed environmental compensation (EDC) of ₹5 crore. Supreme Court upheld the NGT Decision. • NGT issued notices to Haryana authorities including Gurugram Municipal Corporation, Haryana Shehri Vikas Pradhikaran over encroachments affecting storm-water ponds vital for flood control.
Urban Drainage & Flood Safety Planning	• Delhi High Court directed the GNCTD to consolidate management of 22 open drains into a single authority by April 30 2025 • Gauhati High Court directed the Assam government to present both existing and future anti-flood action plans, following severe monsoon flooding in August 2024
Disaster Planning for Landslides	• Kerala High Court registered suo moto proceedings to assess legal measures for preventive disaster management in response to recurring landslide

Audit Assessment Checklist

- Whether systematic HVCA is conducted at macro and micro levels?
- Whether inputs from HVCA have been integrated into DDMPs/CDMPs?
- Whether DDMPs/ CDMPs are updated regularly and meet the framework requirements?

- **Climate-Resilient Infrastructure**
  - Whether climate risk factors have been included in disaster management plans?
  - Whether infrastructure created complies with building codes and land-use norms?
- **Hiring of Disaster Management Professionals by State Disaster Management Authorities and District Disaster Management Authorities**
  - Whether the hiring, role, and impact of disaster management professionals is supporting the implementation of the Sendai Framework for Disaster Risk Reduction at the State and District level in an effective manner?
- **Commissioning and operationalization of Early Warning Systems**
  - Whether Early Warning Systems for cyclones, tsunamis, urban flooding, etc. are functioning in a proper manner and their reach is at the desired level making the system effective?
- E**ffectiveness of Community based Disaster Response scheme**
  - Whether capacity building efforts have been effective in preparedness of the human resource engaged in disaster management activities?
  - Whether schemes like Aapda Mitra and Civil Defence volunteers especially efforts for capacity building of volunteers and resource availability is functioning in an effective and desired manner?
- **Disaster Risk Mitigation Infrastructure**
  - Whether disaster risk mitigation structures are available and are adequate to handle disasters in future as per the norms?
- **Measures for the implementation/ execution of NDMA Disaster Management Guidelines**
  - Whether sufficient efforts have been made by various agencies for the execution/ implementation of the actions mandated in around 33 Disaster Management Guidelines issued by NDMA so far?
- Further, All India Performance Audit of Disaster Preparedness in India was last conducted in 2012-13 covering period from 2007-08 to 2011-12, prior to the preparation of National Disaster Management Plan, State Disaster Management Plans and Disaster Management Plans. It has been more than 13 years since the last pan India audit covering different disasters. Therefore, audit to assess disaster preparedness may be taken up.