# The water security agenda in the age of climate change

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# Climate and Water

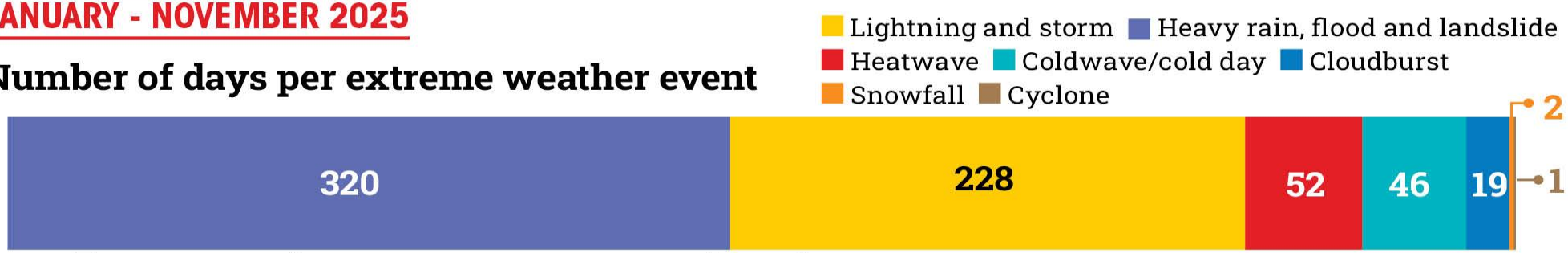
## Need action; At scale; with a difference


- Climate change is adding to water stress in our world; we will get more rain in fewer number of rainy days; this is leading to floods and then droughts
- Climate change is also adding to heat stress, which in turn adds to the demand for water
- But we must remember that climate change is an exacerbating factor; our water crisis is about our inability to build an affordable system of water management to supply clean water to all; take back and recycle the used water of all
- **Resilience is about reworking current practices for a water wise and water secure future**

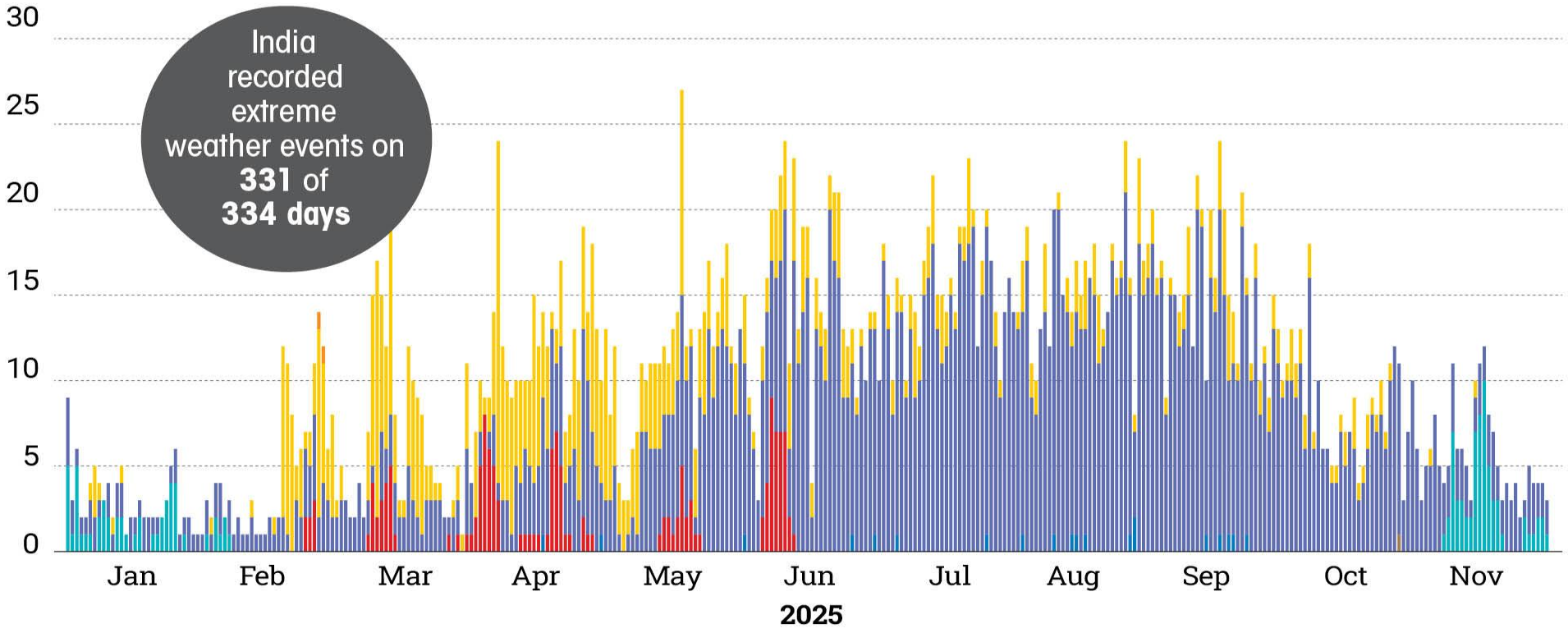
# India has seen one extreme event a day in 2025

**JANUARY - NOVEMBER 2025**

## Number of days per extreme weather event




Extreme weather events across country, day-wise



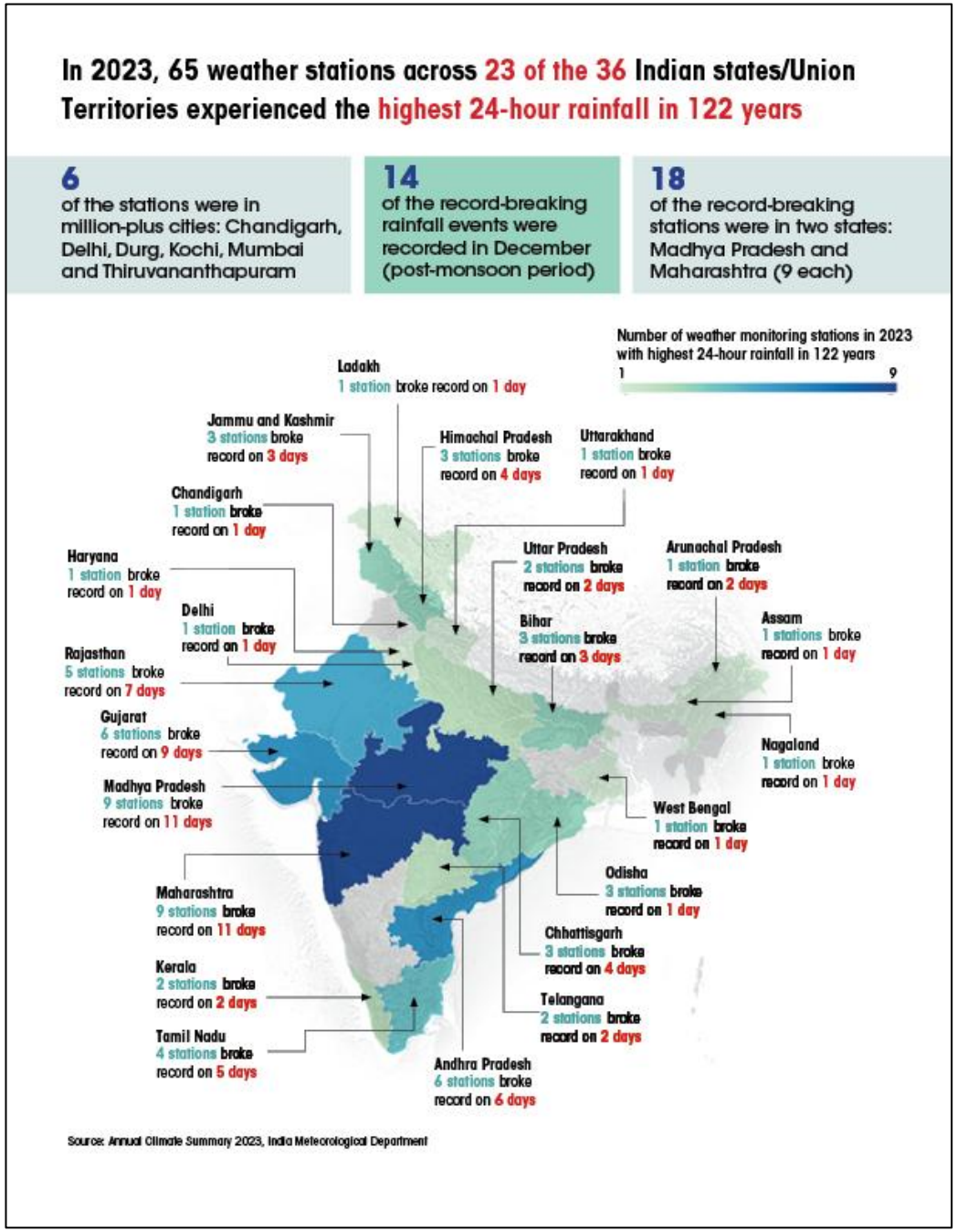

Source: Based on India's database of weather disasters dashboard by CSE-DTE Data Centre. Data sourced from the Disaster Management Division Union Ministry of Home Affairs, India Meteorological Department and media reports

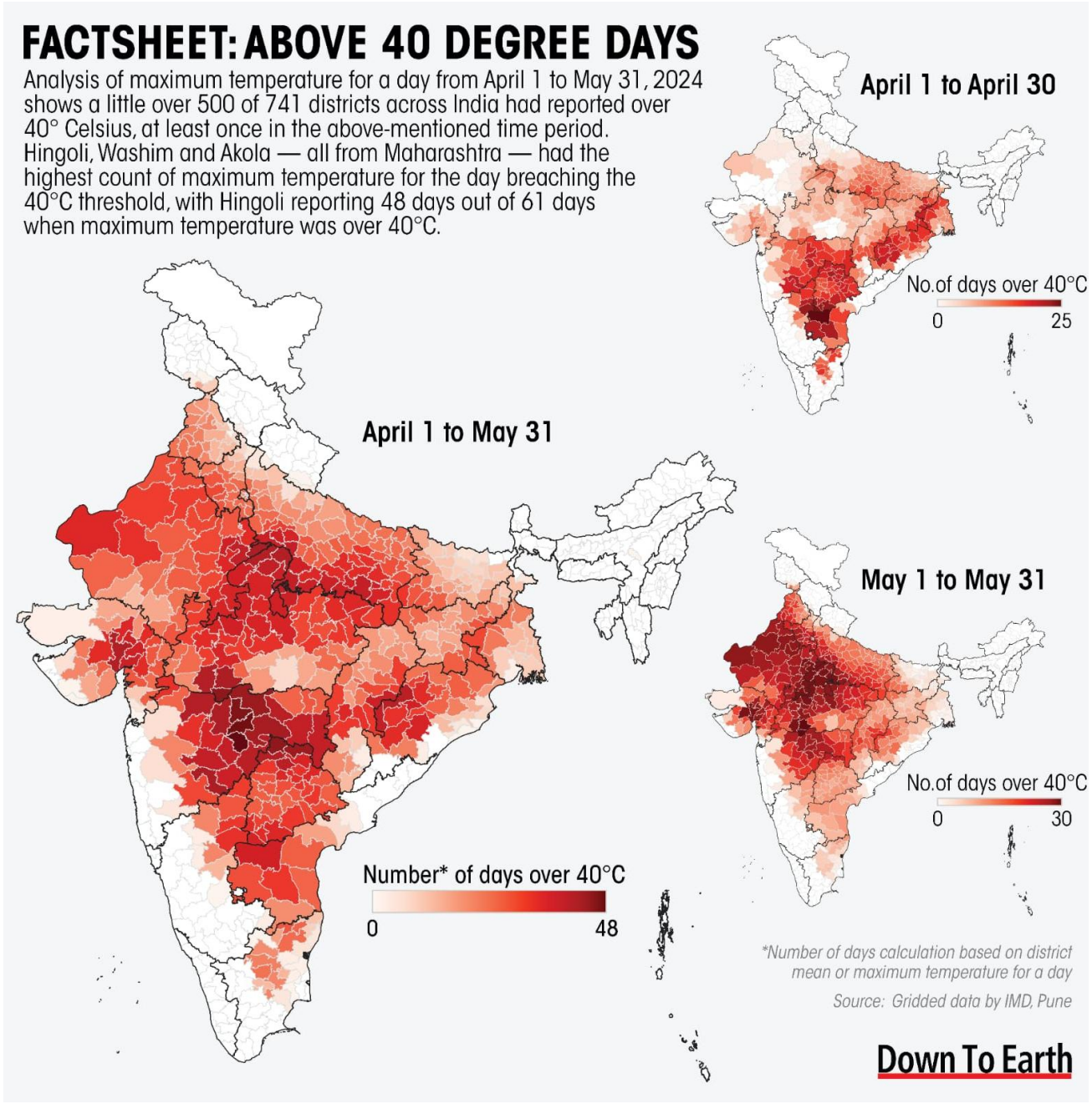
Climate change will lead to more rain in fewer number of rainy days

Already, extreme rain events across India and across the world are growing

Regions are getting an entire year's rain in a matter of hours/day

This means that we must enhance our ability to hold the water; to recharge it; to minimize its use and to recycle and reuse every drop






# Rising heat adds to water demand

Dry moisture in soils – increase the need for irrigation; add to land degradation and dust formation

Increased evaporation rate – water stored in surface structures will be depleted

Drive up the use of water – from drinking to irrigation to fighting fires in forests and building

**Water management will be crucially important in the age of climate change**

# New (old) agenda for water security


- It is about clean water to all
- It is about water for livelihood; economy and for health
- **This is the old and new agenda**
- We have also learnt a lot/water policy and practice has evolved in the past 3-4 decades
- The task now is to take this new practice forward
- **At scale and speed** – the climate imperative means we are running out of time

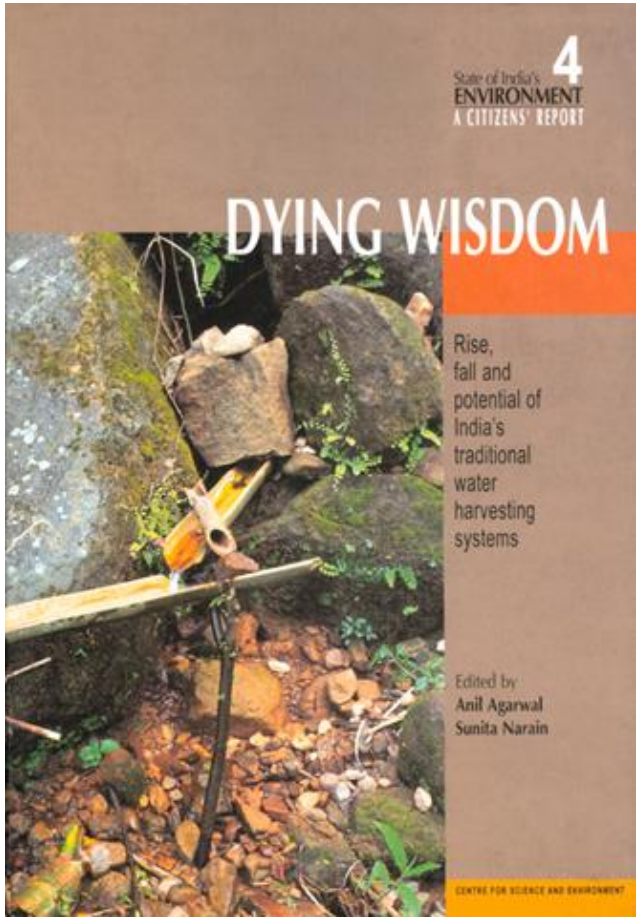
# Let's re-cap: history of water practice Till decade of 2000

- Predominant water management was about central systems; canals that brought water from large reservoirs
- They were managed by large water bureaucracies
- Groundwater was regarded as conjunctive use; minor irrigation
- Drinking water supply was about reaching villages and then an equal number was 'un-reached' as sources dried up; got polluted; infrastructure broken
- Sanitation was about building toilets that did not have water; were never used or just never built
- There was a never-ending cycle of drought and floods

# New idea took shape: water is decentralized and so is rain

A new practice was imagined; from the old

- Augmenting water supply was about capturing every drop of rain in millions of water bodies
- It was about recharging groundwater
- It was about building water security that would provide local livelihood security
- It was about learning from the past to make it part of our present and future
- This changed policy; it changed practice (but not enough – this is the unfinished agenda)



# Policy changed: Practice magnified
# Scale of intervention must be recognised

**Millions of structures/huge investment made in water-sanitation**

- **MGNREGA**: Since inception roughly **100 million assets** built; of which 60-70% are water structures
- This means there 148 assets per village/**roughly 100 water structures** per village – incredible investment in ecological security
- **Amrit Sarovar**: 69,000 water structures rejuvenated
- **Jal Jeevan Mission**: 158 million household tap connections given (80 per cent households reached)
- **ODF Mission**: 120 million rural toilets built

# Policy evolved/was dynamic
# Learnt from the development lab

- MGNREGA: is now focused on quality and not just counting numbers; it is measuring source sustainability; using convergence model; even satellite data

- JJM: focus on ‘functional’ tap; guidelines stress need for quality, O&M; push for source sustainability; grey-water management, community ownership; local participatory institutions

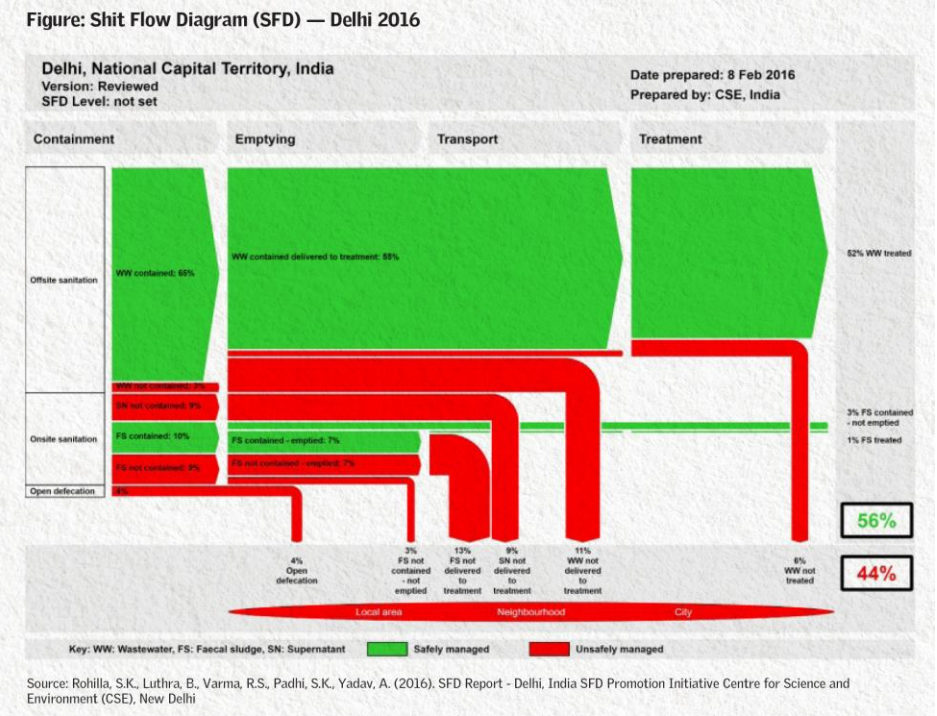
- ODF+: emphasis on behaviour change, quality of toilets; excreta treatment; grey-water for reuse and recharge

- Cities do not ‘consume’ water; they use and discharge
- But cities, industries take clean water and discharge effluents
- When rivers, lakes, groundwater is polluted; it is degraded; it adds to scarcity and health costs
- We have learnt that we cannot clean rivers with the conventional hardware: build STP and connect to underground sewage approach
- Our reality; millions remain unconnected to sewage networks
- Our reality: millions of tonnes of sewage is untreated
- Catch up game of pipes not working

# Urban water policy: also evolved
# Water to waste to water

Our reality

1. Majority cities are **unsewered**;
2. Shit Flow Diagrams found majority use **on-site systems**; connected to septic tanks: drains or/and informal collection systems
3. This reality was then reimagined for the future
4. Faecal sludge brought from the existing on-site systems by overground methods like tankers; taken to treatment plants designed for reuse
5. Opportunity is to intercept waste of all; treat faecal sludge of all; reuse water and reuse the biosolid



Source: Rohilla, S.K., Luthra, B., Varma, R.S., Padhi, S.K., Yadav, A. (2016). SFD Report - Delhi, India SFD Promotion Initiative Centre for Science and Environment (CSE), New Delhi

# Indian government has evolved policy

Policy has learnt from reality:

**Affordable sanitation is critical for sustainability**. If we cannot intercept the excreta of all, we cannot clean our rivers

**GOI SBM 2.0 guidelines (2021)**: Focus on sewage interception and reuse of treated water, not on STPs and underground sewage

Many states are now moving towards non-sewered sanitation

Scalable and affordable

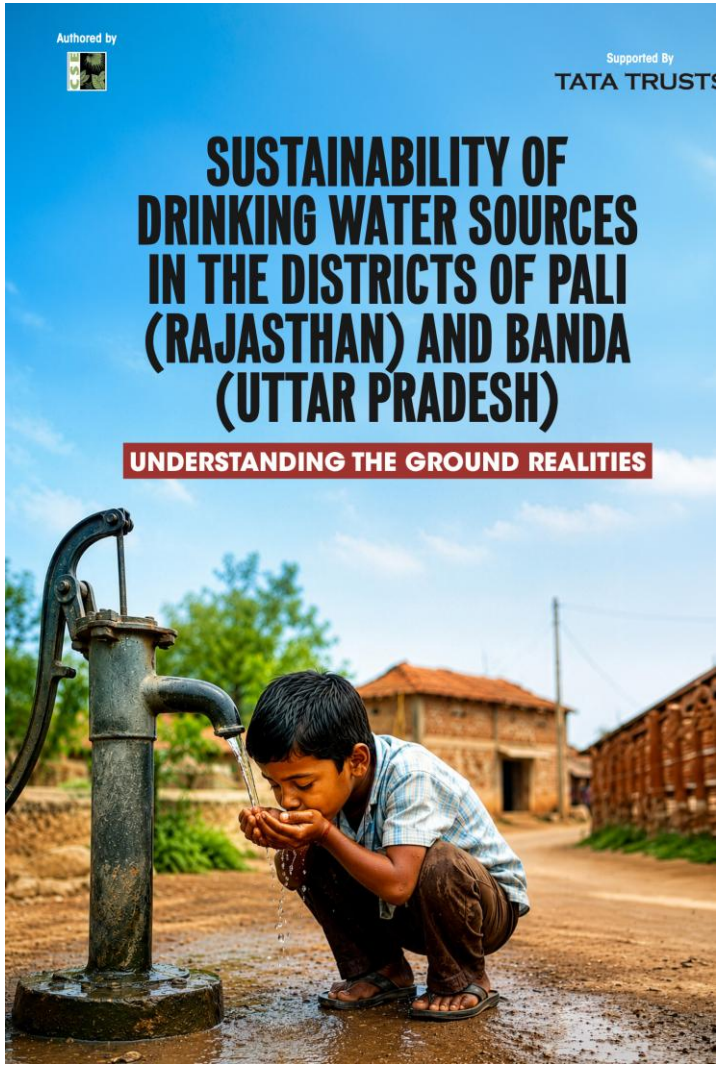
It is the mobile-revolution again – moving away from costly landlines or surface irrigation systems; to solutions that are inclusive and so sustainable

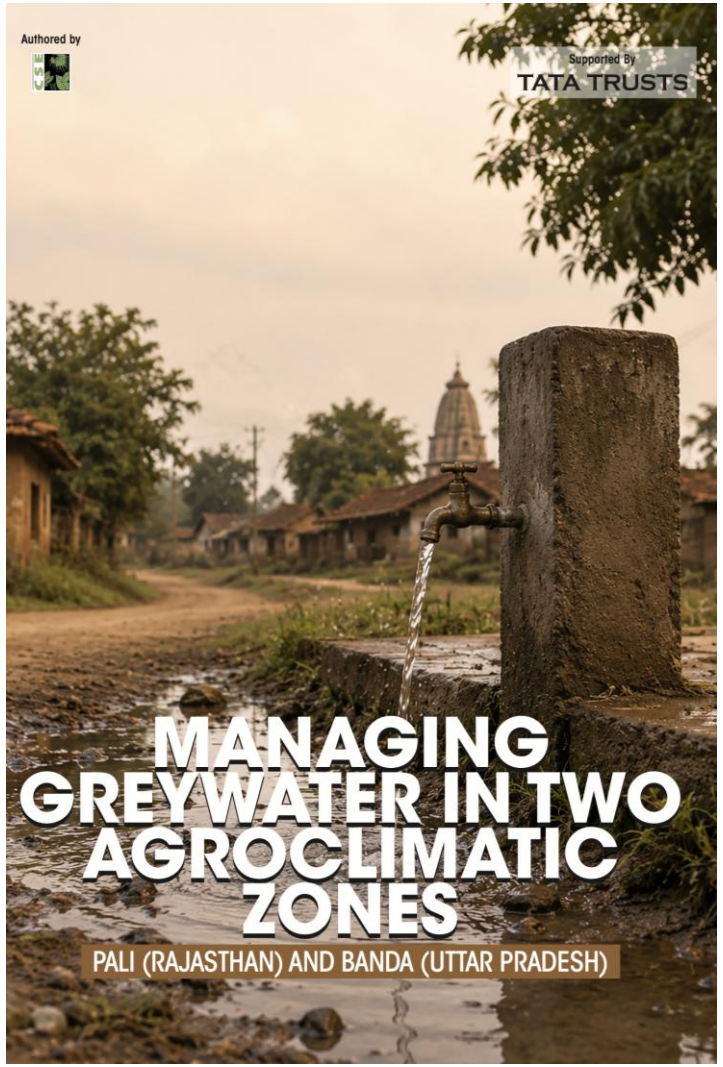
# Agenda: 2026
# Critical decade: must not negate gains

- We are in danger of slipping back; **old and new challenges**

- **Non-functional taps**/Operation and Maintenance not fixed
- **Sources drying up**; recharge is not sufficient; governments moving away from single-to-multi-village and this means more unsustainability in the future
- **More pollution**/poor quality of water is impacting health

- And this in an era of climate change means more water-insecurity as extreme rain is destroying infrastructure; adding to loss of investment




# Agenda 2026: Review, reset and scale

# Agenda 2026
# 1. Source sustainability

- Achilles heel of water projects is source sustainability
- Bulk of water systems depend on groundwater. We know we need to invest in local recharge
- Reports show that there is inadequate attention of recharge of local water sources; dependence on external water sources is adding to this; makes system unreliable, unsustainable
- Greywater management is not linked to recharge structures
- Recharge structures are poorly constructed
- Land for recharge – catchment is not connected to water
- Groundwater monitoring network is weak; spread over and not real-time

# Agenda 2: Convergence in schemes; in departments; between land and land


- Bureaucracies remain fractured; revenue-panchayat-forest-irrigation
- Water needs convergence to flow; from watersheds in channels (nallas, drains) to ponds or to wells; this land is in different departments and different schemes
- We need convergence to map water structures and recharge
- We need convergence between schemes for efficient utilization of funds; can add value

## Sources of funds and convergence to manage rural sanitation

| Activity | Primary fund | Convergent funds | GP role | Key outputs |
|---|---|---|---|---|
| Household/community toilets (gap filling) | SBMG | 15th FC Untied, SFC grants | Beneficiary identification, site facilitation | Toilet coverage, ODF+ |
| Faecal sludge management | SBMG | 15th FC Tied (Sanitation), State PR grants | Land provision, O&M oversight | FSM treatment units/ plants |
| Greywater drains and soak pits | 15th FC Tied (Water & Sanitation) | MGNREGS (labour), SFC | Planning and supervision | Reduced water logging |
| Doortodoor collection system | SBMG | GP own revenue | Procurement and user charges | Regular waste collection |
| Waste segregation sheds | SBMG | 15th FC Untied | Construction and monitoring | Source segregation |
| Compost/biogas units | SBMG | MGNREGS, CSR | Community mobilization | Organic waste treatment |
| Plastic waste collection and disposal | SBMG | District/CSR | Tieups with recyclers | Reduced plastic dumping |
| Pond/talab desilting | MGNREGS | 15th FC Tied (Water), SFC | Work identification | Increased storage |
| Pond embankment strengthening | MGNREGS | State water schemes | Supervision | Flood resilience |
| Recharge pits and check dams | Jal Jeevan Mission/Atal Bhujal | MGNREGS | Community planning | Groundwater recharge |
| River/stream rejuvenation (local) | Namami Gange (where applicable) | MGNREGS, state funds | Local stewardship | Improved water quality |
| Asset maintenance | GP own revenue, SFC grants | | Annual maintenance plans | |
| User charges collection | Local revenue | | Fee setting and enforcement | |
| Behaviour change communication | SBMG | | Community engagement | |

Source: Compiled by CSE

# Agenda 3:
# Quality and pollution

- Water pollution degrades sources; lost investment; health cost
- Concern: arsenic, fluoride and bacteria contamination
- Monitoring being done; test labs set up; (are mostly non-functional); all local testing systems data is either unreliable or unavailable
- Central Groundwater Board/CAG reports point to this
- To fix quality, we need data and more reliable, timely data
- Solutions are there:
- Water-sewage connection
- Groundwater-surface water connection

# Agenda 4: Institutions for management


- Focus on **institutions** for management of decentralized planning and resources and to control decision making and funds
- JJM has been clear on this from the inception: panchayat, gram sabha, pani-samiti, nal-jal mitra, jal doot, social audit
- As yet, this first-tier governance is weak
- **This is now the most important agenda:** invest to strengthen this first-tier of governance
- Need to invest in technical and management capacities; including use of digital public infrastructure at the village/hamlet level

# JJM 2.0: Focus on long-term water quality and source sustainability


- 1. Mandate for terrain-specific recharge structures
- 2. Mandatory rainwater harvesting structures
- 3. Greywater management for improved recharge
- 4. Source protection from pollution
- 5. Mandatory convergence between schemes: G-RAM-G, Atal Bhujal..
- 6. Use of digital data to track source sustainability and groundwater monitoring; water quality
- 7. Sujalam Bharat platform to map each village from catchment to source

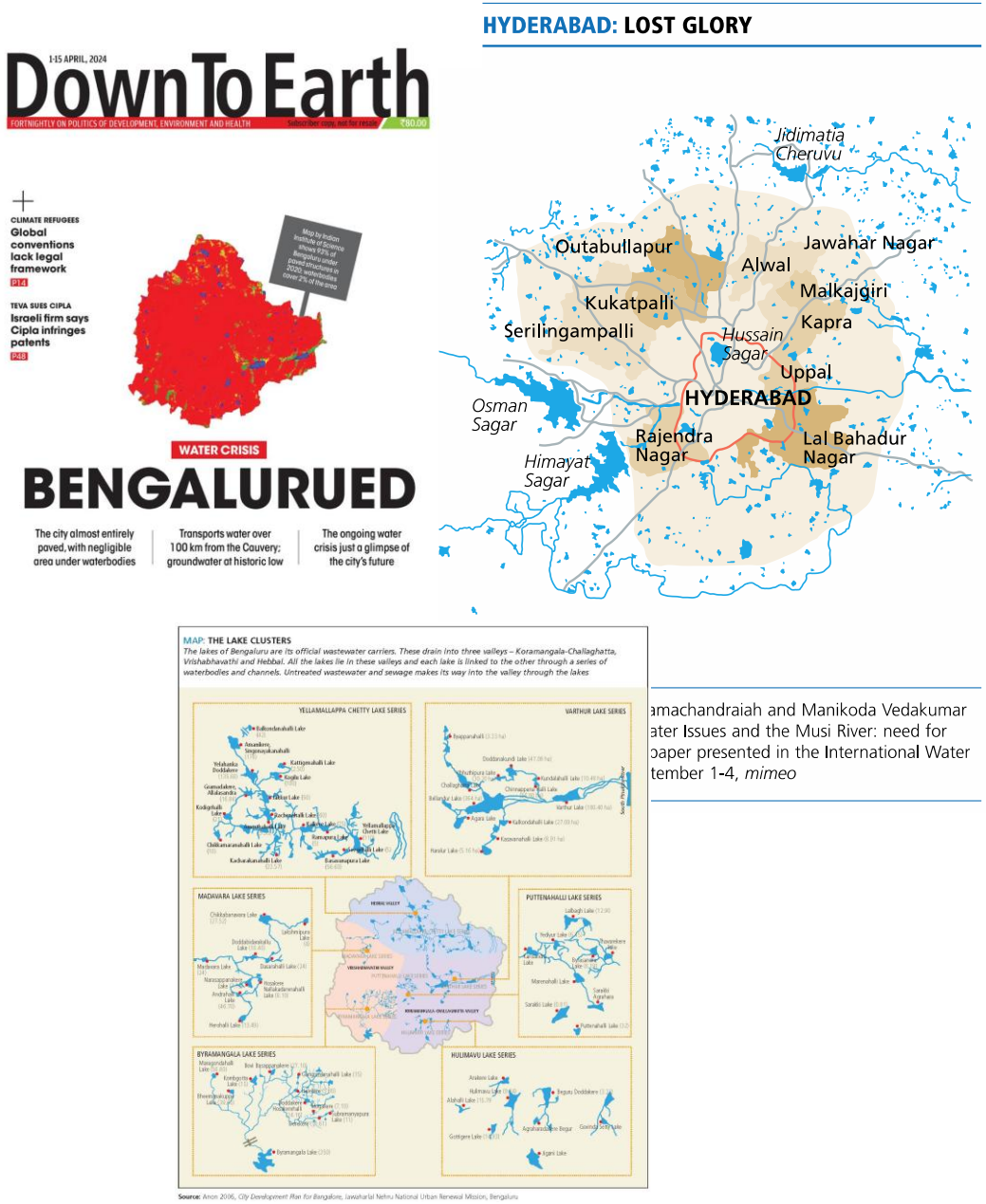
# JJM 2.0: from contractor to community

- Proposes formal hand-over process based on agreement on long-term mechanism for source sustainability and O&M
- Proposes more devolution of roles, control and responsibility
- This is great
- But this is where things can go right or terribly wrong
- Reports show that VWSC are mostly non-functional
- How can this next-gen water security programme improve the governance from this first-tier
- What are the missing links? What needs to be strengthened?

# Urban agenda: Cities need to do more to relearn the art of local water and waste management

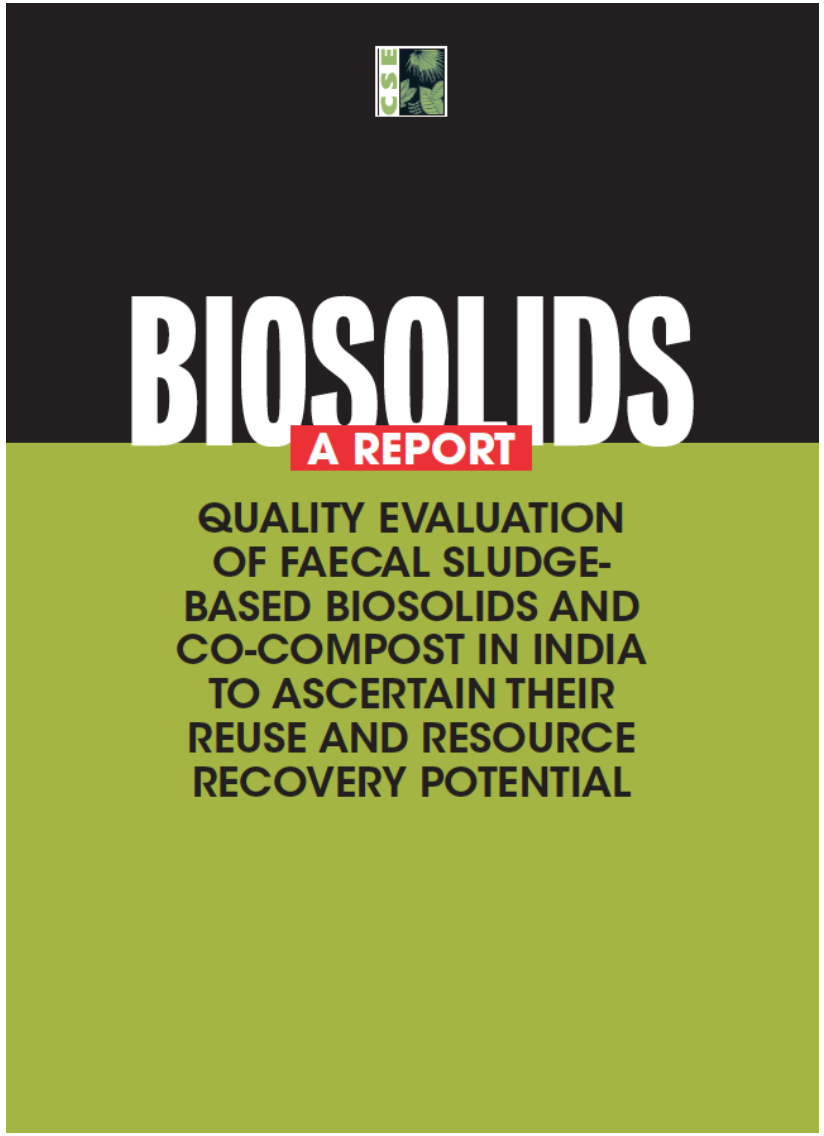
## Sewage-First approach

- Current paradigm of bringing water long distances adds to cost of supply; distribution losses; adds to inequity in supply; unaffordable sewage paradigm adds to pollution
- Climate change will lead to more rain/more flood. Cities need sponges; which are also places for recharge of groundwater
- Solutions need to be practiced at scale for water security of cities and so villages
- **Join the water-dot between urban and rural**
- **Opportunity to reinvent is now an imperative**




amachandraiah and Manikoda Vedakumar
ater Issues and the Musi River: need for
paper presented in the International Water
tember 1-4, *mimeo*

Next-Gen work
In most STPs and FSTPs
Biosolid after drying are being stored;
Analysis of sludge from 47 FSTP + 14 co-treatment STP found
Nitrogen rich sludge; needs reutilization
But current compost standards may need to be reviewed for reuse
Need better operations for pathogen management
Nutrients-food-excreta-land connection



**Water to water**

Question is about

Treatment

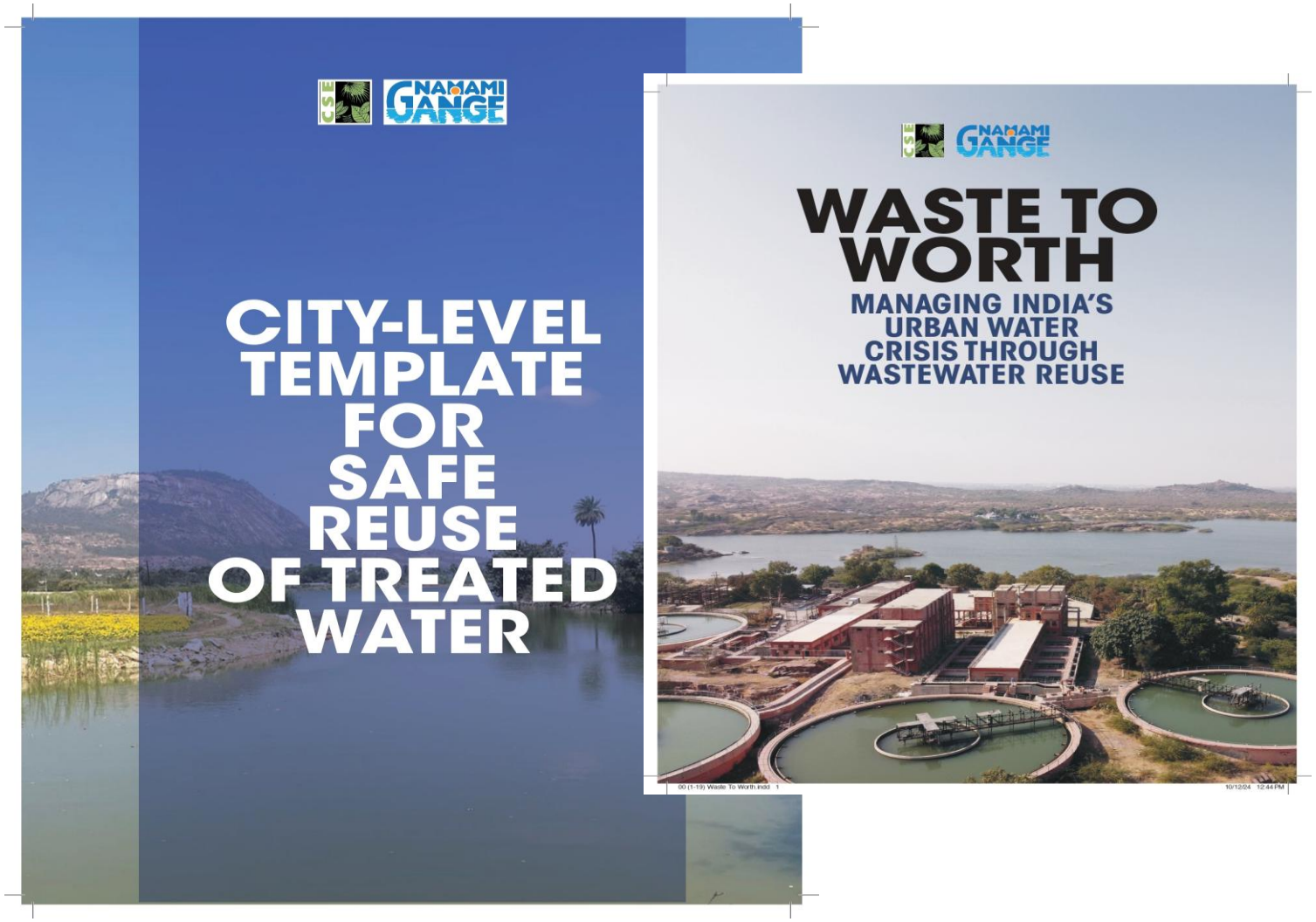
Cost

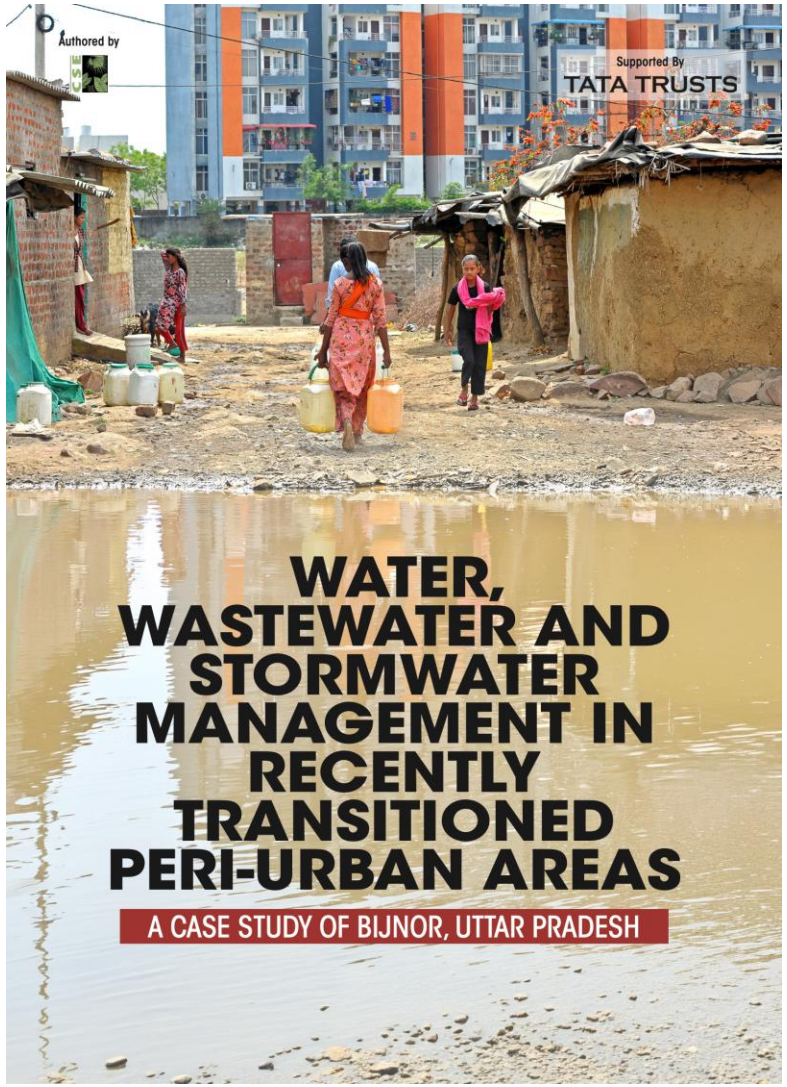
Standards

But huge opportunity as cities take water and discharge water

Add to water scarcity

Add to water pollution






# Agenda: Peri-Urban

Opportunity to rework the paradigm as nothing exists on ground

Can build differently

Must build affordable, nimble and scaled up solutions for providing water supply

Cut the pipeline; invest in local sources

Build affordable, nimble and scaled up solutions for treating wastewater so that water supply is not compromised

# Change needs scale and scale needs state intervention But effectiveness needs all our attention


- There is gap between programme and delivery
- Question is how can civil society/philanthropy work with these programmes to ensure effectiveness; how to make this work?
- The way ahead:
- **Build confidence and capacity**: Understand gaps/build capacity to do differently; amplify the best practice; inspire others to learn what can work and how; how to scale practice
- **Strengthen narrative on outcomes**: Use credible data on to show how investment in water-sanitation has improved health-livelihood indicators

# Because we all live downstream