From Service Monitoring to Climate-Responsive WASH Systems at Scale: Lessons from PAS

Dhwani Shah (Senior Research Associates, CWAS, CRDF, CEPT University)

PAS team: Jay Shah(program lead),Omkar Kane (Senior research associate), Gaurav Kushwaha(research Associate), Jayashree Bhiwange (Research associate), Devanshi Shah(Research Associate)

Global South Academic Conclave on WASH and Climate 2026

6th – 7th February 2026, Ahmedabad

CWAS CENTER FOR WATER AND SANITATION CRDF CEPT UNIVERSITY

CEPT UNIVERSITY FACULTY OF PLANNING

Gates Foundation

viega foundation

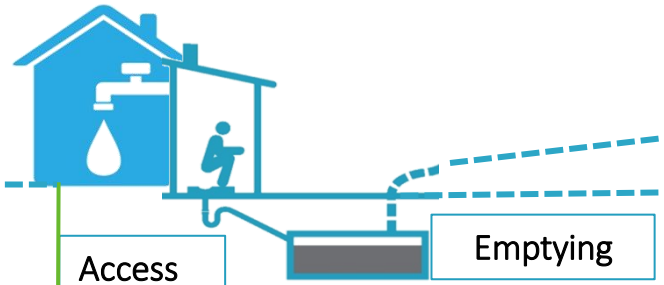
Goal 6: Clean Water and Sanitation

FROM MDG 7 TO SDG 6 TO ??

Resources

By 2020, protect and **restore water-related ecosystems,** including mountains, forests, wetlands, rivers, aquifers and lakes

By 2030, implement **integrated water resources management** at all levels, including through transboundary cooperation as appropriate



Access

Emptying

To halve the proportion of population without sustainable **access** to clean and safe drinking water and basic sanitation.

By 2030, achieve **universal and equitable access** to safe and affordable drinking water for all

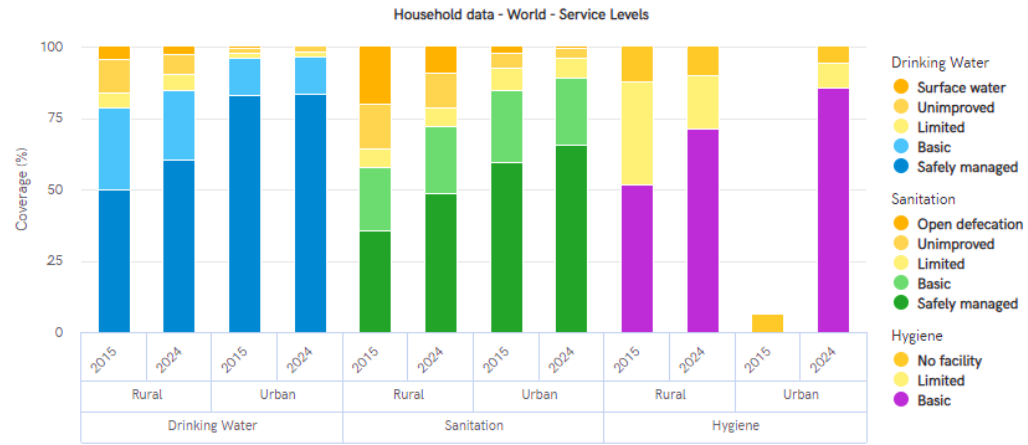
By 2030, achieve access to **adequate and equitable sanitation and hygiene** for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations

Treatment

Reuse/safe disposal

By 2030, substantially **increase water-use efficiency** across all sectors and ensure sustainable withdrawals and supply of freshwater to **address water scarcity** and substantially reduce the number of people suffering from water scarcity

By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of **untreated wastewater** and substantially increasing **recycling and safe reuse globally**



Many developing countries, including India, are unlikely to fully achieve SDG 6 by 2030

In 2024, 160 countries had estimates for safely managed drinking water services

Figure 3 Proportion of population using safely managed drinking water services, 2024 (%)

In 2024, 145 countries had estimates for safely managed sanitation services

Figure 5 Proportion of population using safely managed sanitation services, 2024 (%)

In 2024, three out of four people had safely managed drinking water, but people in least developed countries were more than twice as likely to lack access

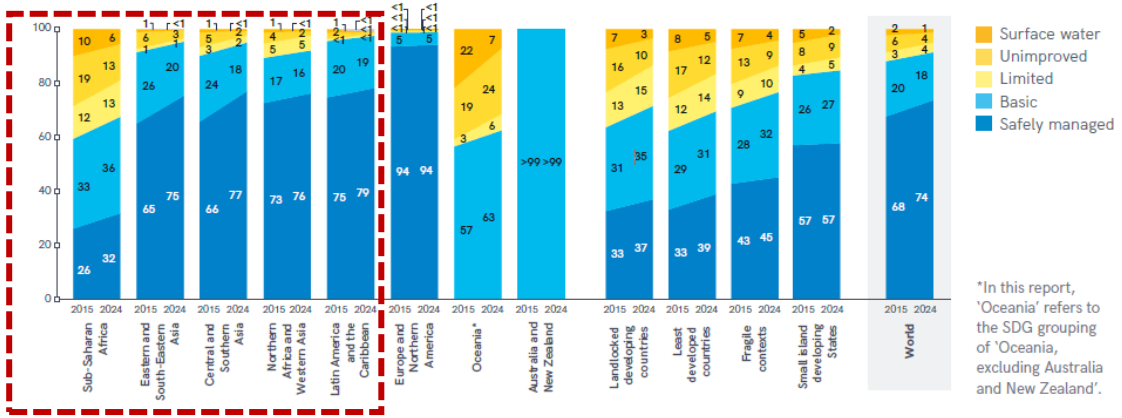


Figure 2 Global and regional drinking water coverage, 2015–2024 (%)

In 2024, three out of five people had safely managed sanitation services, but people living in least developed countries were nearly twice as likely to lack access

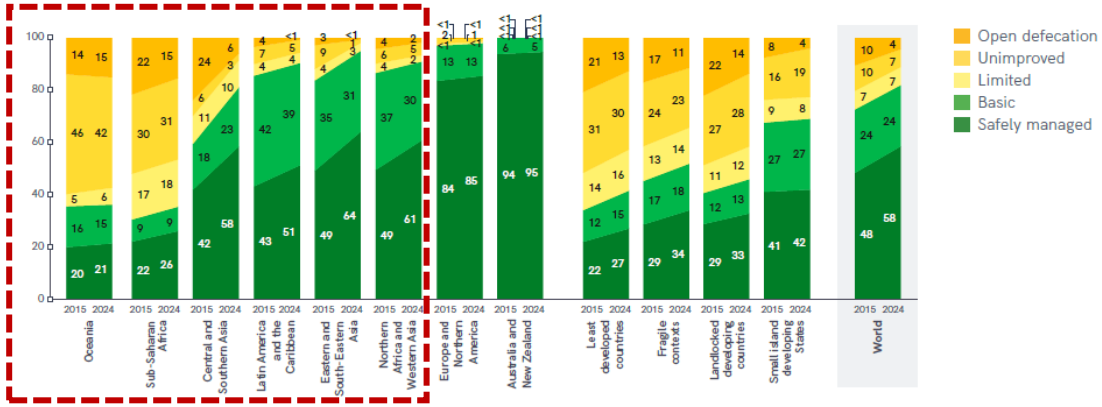
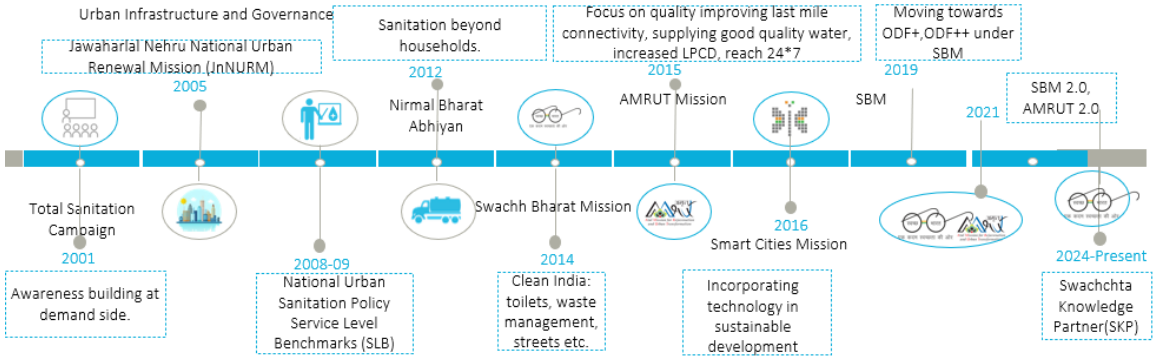


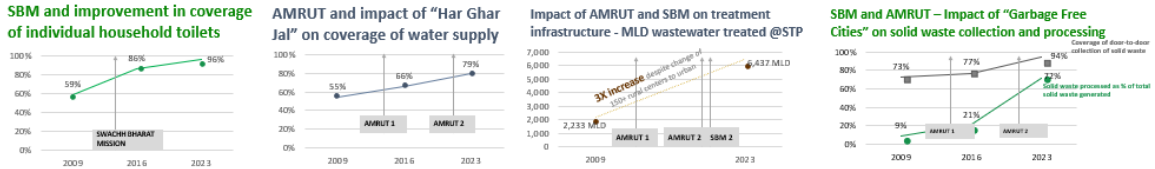
Figure 4 Global and regional sanitation coverage, 2015–2024 (%)

- SDG 6 ends in 2030, but urban WASH challenges will intensify
- SDG 6 focuses largely on **access and infrastructure targets (2015–2030)**

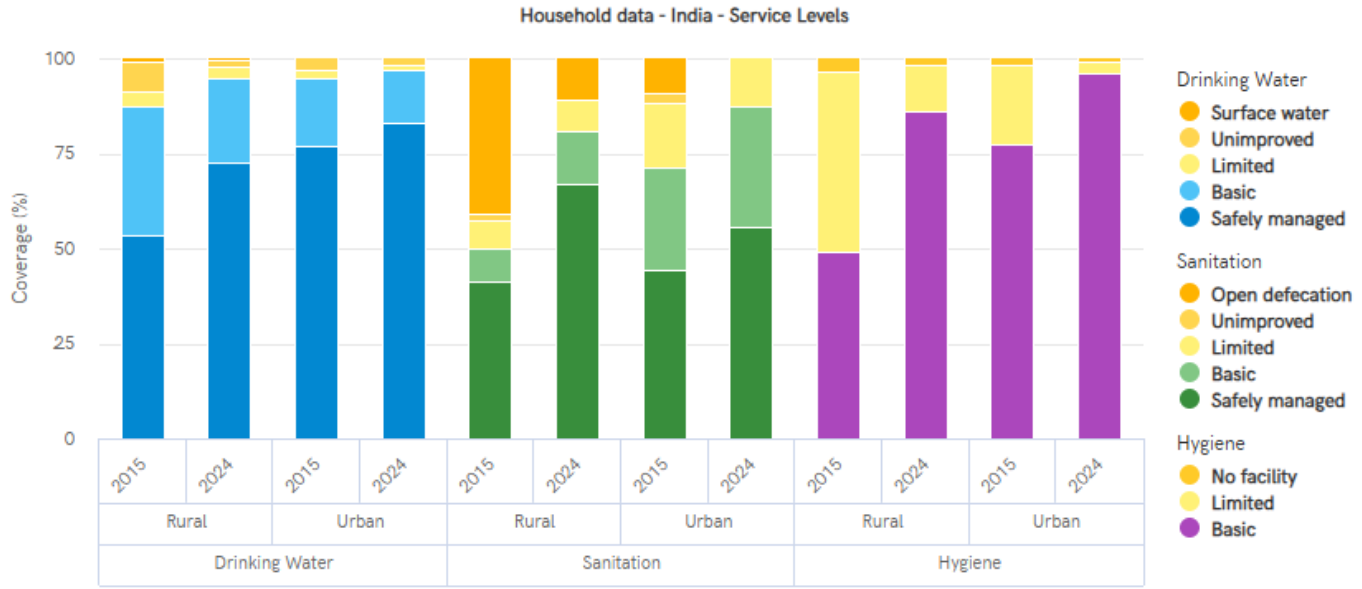
Source: UN-Water Global Analysis and Assessment of Sanitation and Drinking-Water (GLAAS)World Bank (2022): From Scarcity to Security – Water in a Changing Climate access from https://www.unwater.org/sites/default/files/2022-12/GLAAS_2022_REPORT.pdf , https://washdata.org/reports/jmp-2025-wash-households

India's experience: strong progress through flagship missions





- India's experience demonstrates what sustained political commitment can achieve.
- Programs like **Swachh Bharat Mission and AMRUT** significantly expanded access to water and sanitation.



Urban WASH in the age of climate uncertainty

Achieving the 2030 targets for ending open defecation and universal access to basic WASH services will require acceleration, and universal coverage of safely managed services is increasingly out of reach

Figure 1 Global coverage of WASH services, 2015-2024 (%), and acceleration required to reach universal coverage (>99%) by 2030

Need for improvements in urban WASH services!

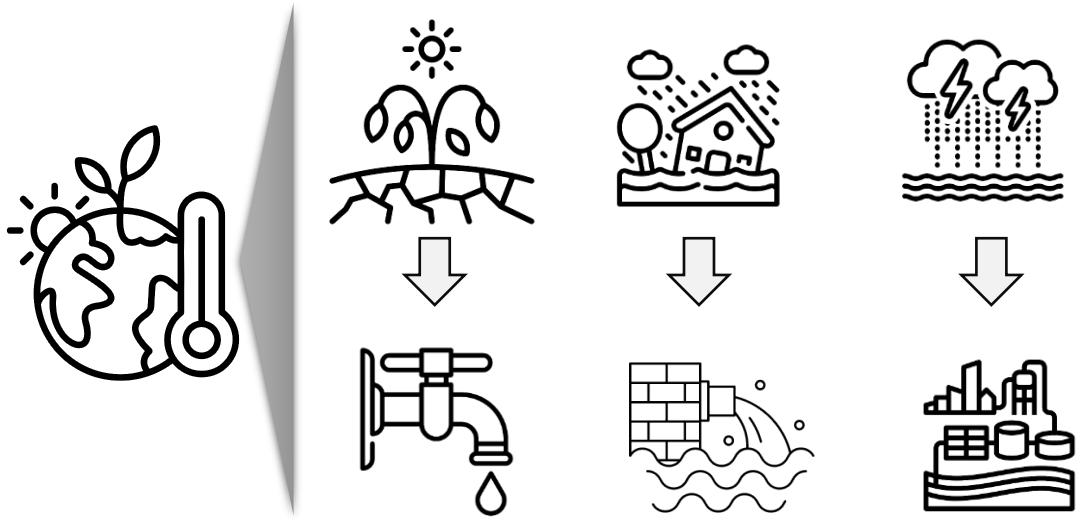
By 2050, 55% of India will become Urban
Need to focus on Urban WASH service

- Global agendas like SDGs helped mobilize investments and political attention.
- **However, it largely measured access, not service performance, resilience, or sustainability especially in cities facing climate stress**

It is a multi hazard situation in terms of external, natural shocks and internal urban stresses. How are the cities coping?

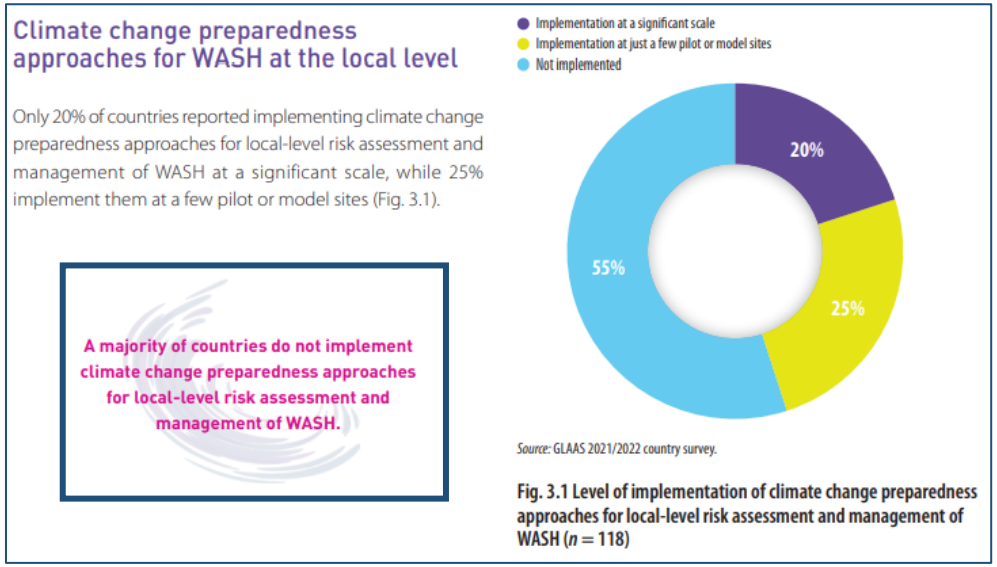
Source: UN-Water Global Analysis and Assessment of Sanitation and Drinking-Water (GLAAS)World Bank (2022): From Scarcity to Security – Water in a Changing Climate access from https://www.unwater.org/sites/default/files/2022-12/GLAAS_2022_REPORT.pdf , https://washdata.org/reports/jmp-2025-wash-households

Rethinking Urban WASH in a Climate-Constrained Global South



Climate change and WASH are deeply interconnected:

Climate shocks directly disrupt WASH services



"Most countries do not address risks of climate change to WASH services." (Glass Report ,2022)

"Global targets without adaptive monitoring systems, becoming symbolic rather than transformative" (UN-Water, 2023)

Monitoring gaps in climate-vulnerable WASH populations

Table 3.2 Measures to improve and extend drinking-water services to populations disproportionally affected by climate change by SDG region

0–39% 40–59% 60–79% 80–100%

SDG region	*n*	Governance Policies and plans have specific measures to reach populations disproportionally affected by climate change	Monitoring Progress to extend service provision to populations disproportionally affected by climate change is tracked and reported	Finance Specific measures to direct resources to populations disproportionally affected by climate change are consistently applied
Global	**76**	**67%**	**36%**	**29%**
Central and Southern Asia	7	86%	14%	14%
East Asia and South-Eastern Asia	8	75%	50%	38%
Latin America and the Caribbean	18	50%	28%	22%
Northern Africa and Western Asia	4	75%	25%	75%
Oceania (excluding Australia and New Zealand)	4	75%	25%	25%
Sub-Saharan Africa	29	76%	48%	34%

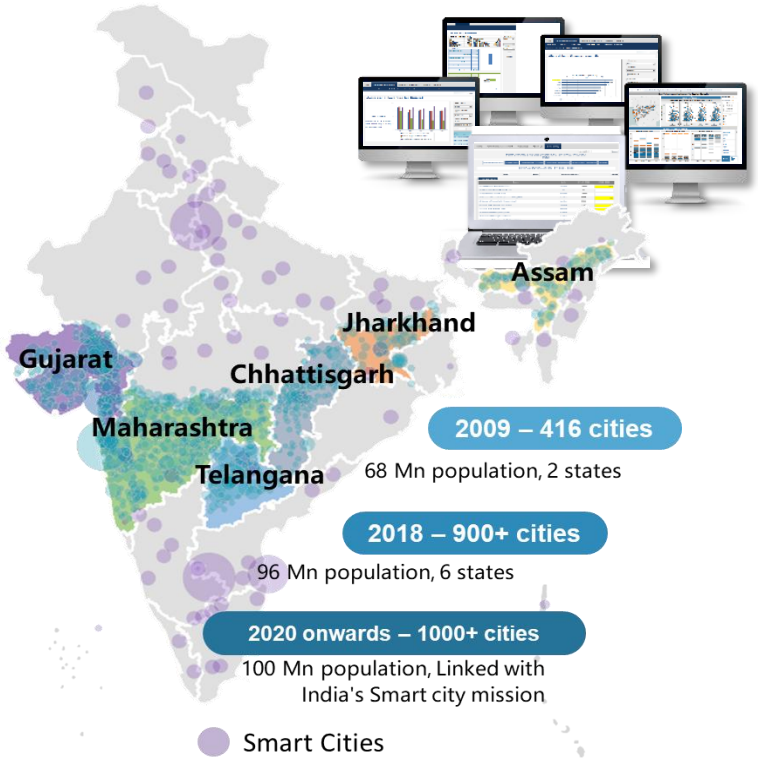
Note: The table shows only those SDG regions for which data cover at least 50% of countries or at least 50% of the population. Based on these criteria, two SDG regions were excluded: Australia and New Zealand, and Europe and Northern America.
Source: GLAAS 2021/2022 country survey.

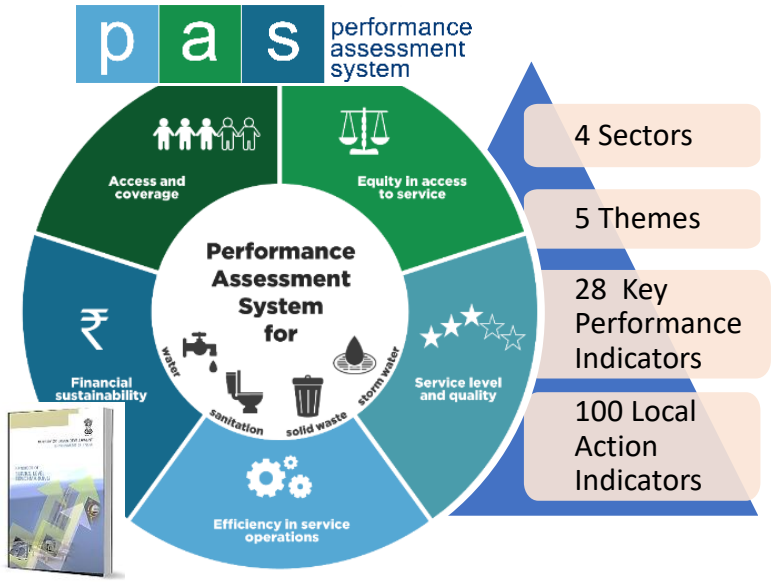
- Predominantly annual, self-reported, compliance-driven
- Weak linkage between:
  - Service quality
  - Climate risks
  - Financial sustainability
- **Limited usability for day-to-day decision-making by cities**

"Although policy measures are in place in many WASH policies and plans to reach populations disproportionally affected by climate change, very few are taking action to monitor progress or allocate resources." (GLASS, 2022)

Source: https://www.unwater.org/sites/default/files/2022-12/GLAAS_2022_REPORT.pdf?utm_source=chatgpt.com

PAS already monitors WASH services with focus on Service quality, Equity, and Sustainability since 15+ years.





Nationally aligned
With national SLB initiative

Technically sound
Review of International and Indian efforts, Stakeholder consultations, Pilot studies

Framework suited to local context
Added lens of equity, slums and on-site sanitation

Annual city level monitoring
Online module – self reporting by city governments

- **PAS represents a contextual innovation—built within Global South realities rather than imported from high-income country models.**
- No Pilots…**operate at Scale**
- **City-level, not project-level**
- **Designed for data-poor, capacity-constrained environments**
- **One of the largest time series databases** for urban water and sanitation
- **Wide range of users** – from Governments to researchers and industry
- Implemented **across 1000+ Indian cities**- scalable for Global South
- **Tracks access, equity, quality, efficiency & financial sustainability**
- Embedded within government systems & aligned with India’s ongoing WASH urban missions

PAS helps cities to move from project-based approach to a performance based, from output to outcome

Conventional Approach

'PROJECT'
based approach

Oriented towards **OUTPUTS**

SUPPLY DRIVEN

Focus on **INDIVIDUAL PROJECTS**

PAS-SLB Approach

'SERVICE'
based approach

Oriented towards **OUTCOMES**

Starting point is current performance – **NEED DRIVEN**

Focus on **SECTORAL SOLUTIONS**

PAS aligns with governance literature that emphasizes learning systems over static indicators (Mehta et al., 2019).

- Rethinking investment approach:
- *From **infrastructure creation** to **improving service levels** in water and sanitation*

PAS offers a realistic pathway for climate monitoring in resource-constrained cities.

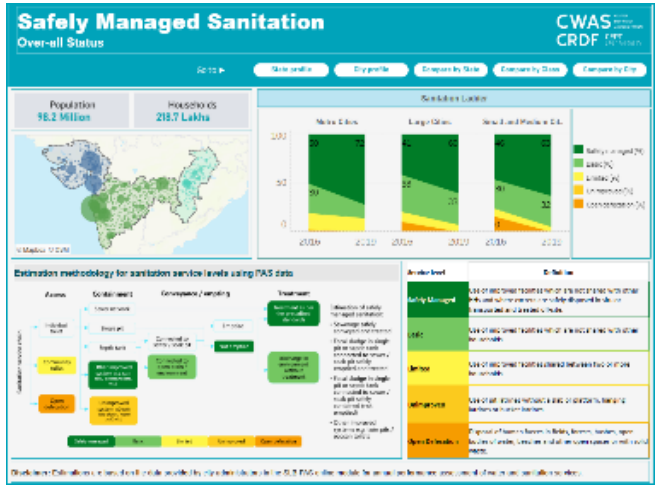
For Global South cities:

- Low-cost
- Institutionally embedded
- Works even where sensors & tech are limited

Performance Assessment Systems (PAS) can shape climate responsive WASH monitoring system suitable and easy to implement in Global south cities.

PAS as a common data backbone for multiple frameworks

Monitoring safely managed services (SDG 6.2)

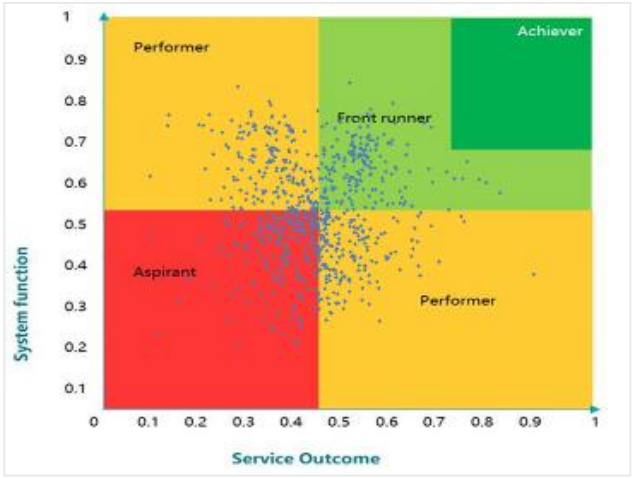


ESG assessment for cities

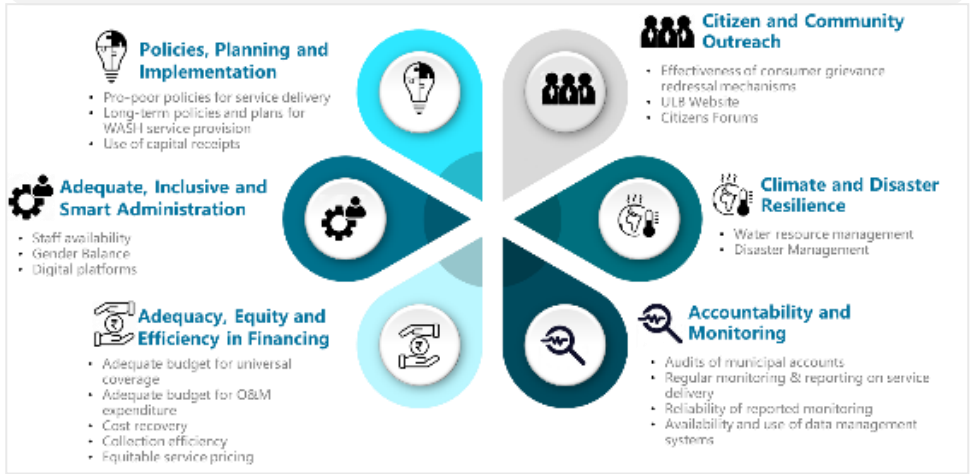
Credit worthiness of cities

- **PAS acts as a common data backbone, rather than a standalone tool**

PAS-CWIS performance ladder



Assessment of water governance



Assessment tool of climate adaptation, mitigation status

CWAS tools and CWIS

PAS themes and information

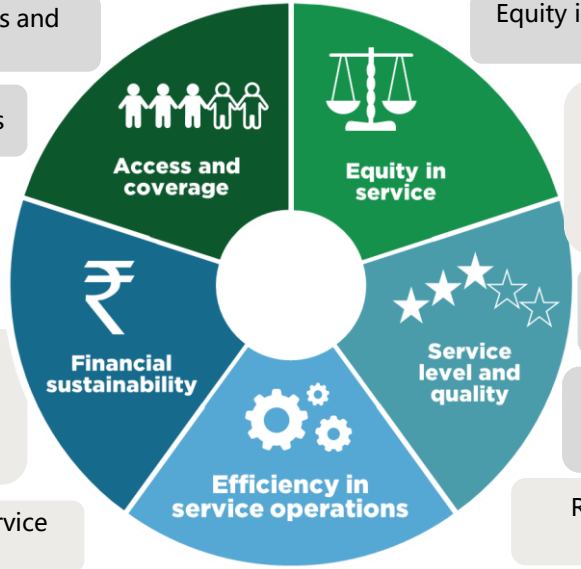
Citywide access and coverage

San-benchmarks

Financial sustainability Cost recovery for services

Use of PAS information for city level plans (CSAP, CWBP, SaniPlan)

Efficiency in service operations



Equity in access to services in slums

Mandate for equitable access to services and achieving quality service delivery for all

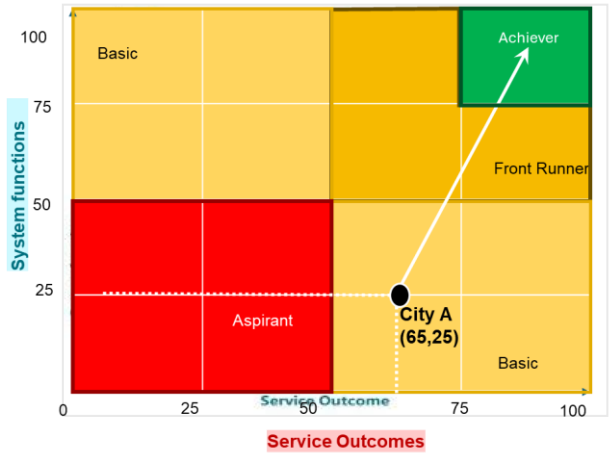
Safely managed sanitation services across service chain

Sustaining service levels and meeting quality norms

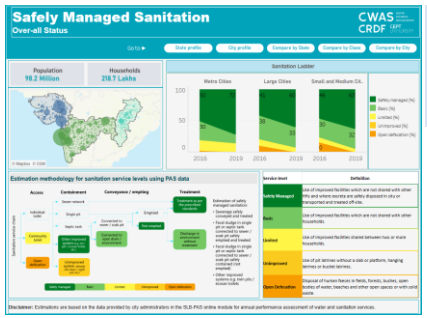
Reliable and quality service delivery

Sanitation monitoring tools

PAS-CWIS ladder

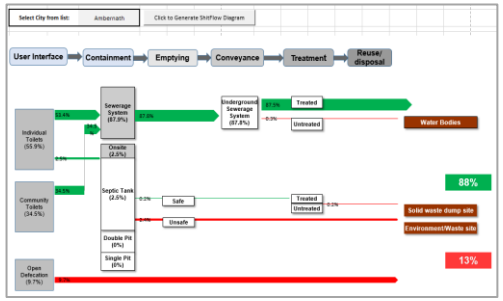


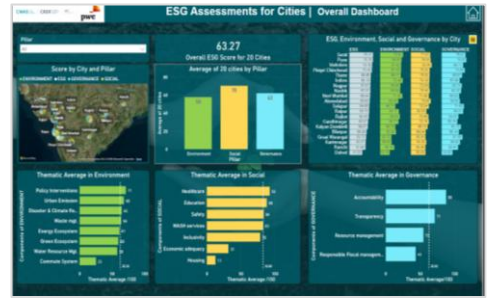
Frameworks derived from PAS



Localising SDG 6.2 using PAS

Shit Flow Diagram





ESG assessments
Creditworthiness assessments

CWAS tools and CWIS

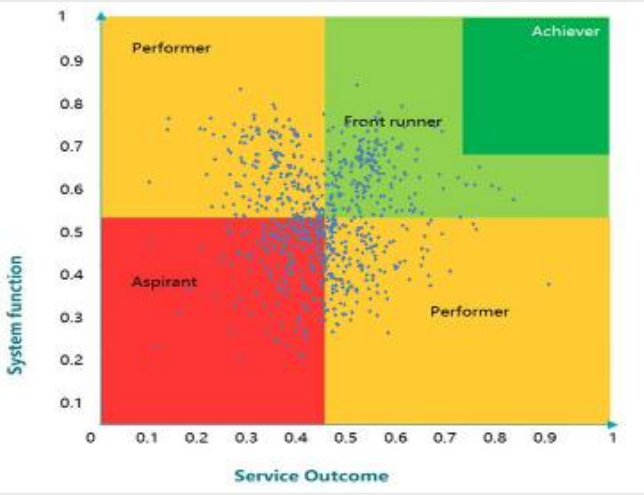
CORE CWIS OUTCOMES

EQUITY	SAFETY	SUSTAINABILITY
Citywide access and coverage Equity in access to services in slums	San-benchmarks Safely managed sanitation services across service chain Sanitation monitoring tools	Financial sustainability Cost recovery for services Sustaining service levels and meeting quality norms

CORE CWIS FUNCTIONS

RESPONSIBILITY	ACCOUNTABILITY	RESOURCE PLANNING & MANAGEMENT
Mandate for equitable access to services and achieving quality service delivery for all Sanitation monitoring tools	Reliable and quality service delivery Efficiency in service operations Sanitation monitoring tools	Use of PAS information for city level plans (CSAP, CWBP, SaniPlan)

PAS-CWIS ladder



WASH agenda must move from “access targets” to “Resilient service delivery under climate stress” NOW.

- Current WASH monitoring systems are- Annual
- Infrastructure-focused
- Weak on service reliability, climate risk, and resilience

- The next phase of WASH is not about building more assets, but about keeping services functional under climate shocks.
- WASH NOW- how services perform under climate stress, not just whether infrastructure exists.

Business as usual scenario

- Project outputs
- Access & coverage
- Infrastructure creation
- Sector silos
- Annual reporting

Climate responsive monitoring

- Service performance outcomes
- Reliability & continuity
- Service performance
- Climate-integrated urban governance
- Real-time/Continuous monitoring

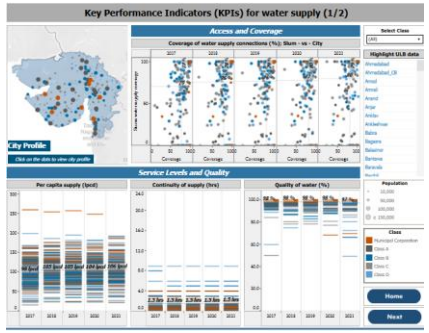
NOW agenda of WASH Service monitoring must shift…

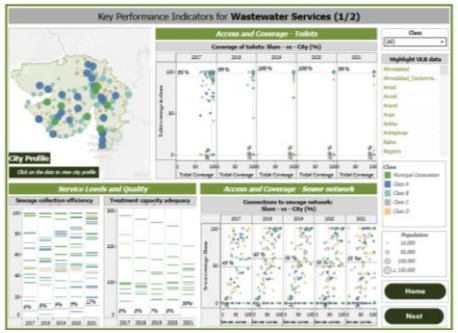
From “Did we provide infrastructure?” To “Can cities sustain services under climate, financial, and social stress?”

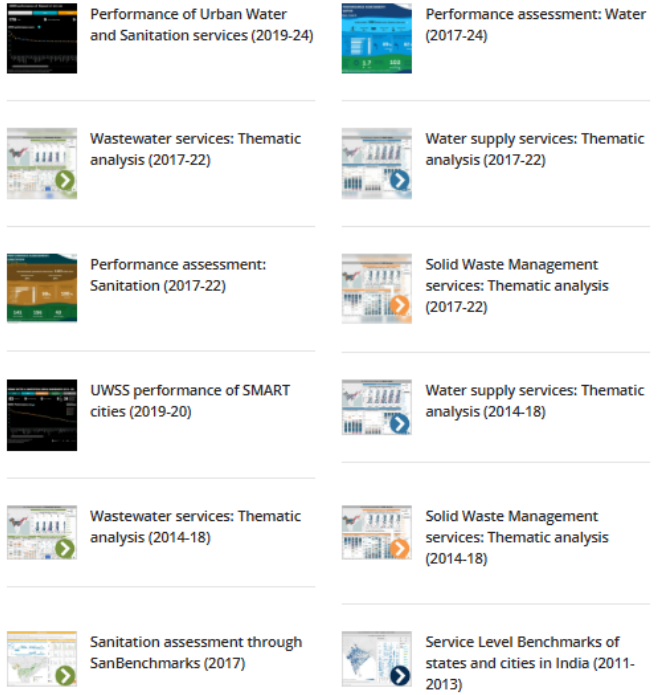
Moving from annual to climate-responsive monitoring

Climate resilience requires governance systems that detect stress early and enable adaptive responses (IPCC, 2022).

- PAS answers what happened annually in past 15+ years
- But…Annual monitoring is no longer adequate
- As.. Climate risk operates in months and seasons







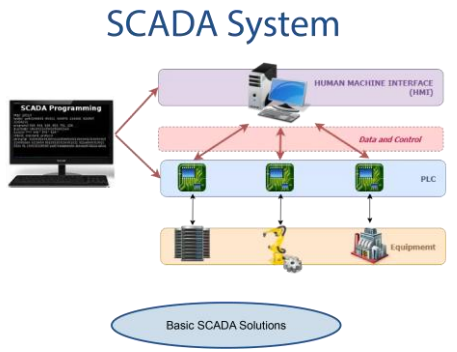
Cities now need..

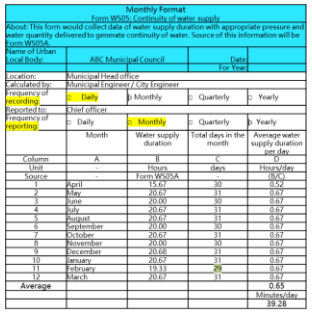
Early warning signals

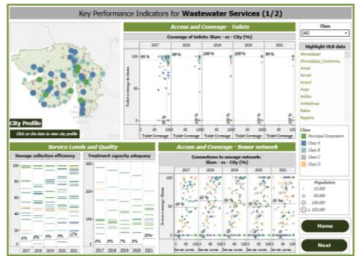
Seasonal stress indicators

Real-time operational insights

The Next Evolution: PAS as a Climate-Responsive Monitoring System







Tool to formulate Drinking Water Quality Surveillence Regime

Urban Water Supply and Sanitation

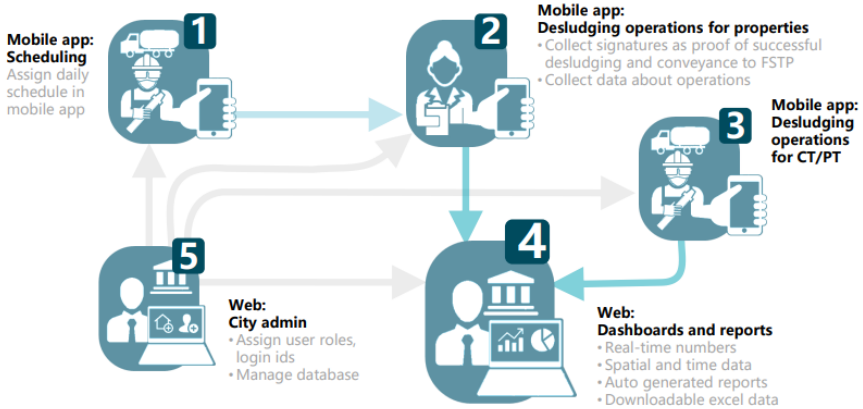
Shift from: Once-a-year SLB reporting To quarterly / monthly dashboards

- Integrate PAS with:
  - Utility billing systems
  - Water quality sensors
  - SCADA / flow meters (where available)
  - FSM scheduling systems
  - City finance & asset management portals

Real-time does not mean complex technology—it means more frequent, decision-relevant data.

From Annual Indicators to Dynamic Monitoring

- LPCD → seasonal variability
- NRW → pressure + leakage stress
- Treatment → uptime during extreme events
- Coverage → reliability index



PAS will become a living system - not a compliance exercise.

Using PAS to Anticipate and Respond to Climate Risks

- **PAS can help cities:** Identify climate-vulnerable services & populations
- **Monitor:**
  - Continuity during heatwaves
  - FSM disruption during floods
  - Financial stress under climate shocks
  - Prioritize adaptive investments

From Data to Decisions to Climate Resilience

Call for Action NOW

Key Takeaways:

1. Now WASH must shift from access to resilient service delivery
2. India has made strong progress under SDG 6 through national missions. But climate uncertainty now threatens these gains.
3. Current monitoring systems are not designed to capture this risk.
4. PAS offers a scalable Global South model that strengthens multiple frameworks and supports climate resilience.

WASH agenda must be about sustaining services under climate stress—and monitoring is the starting point.

Strengthening monitoring systems like PAS is essential to move from data to decisions to climate resilience in India and across the Global South.

By transforming PAS from an annual reporting mechanism into a climate-responsive monitoring platform, India—and other Global South countries—can bridge the gap between global ambitions and local realities.

Thank You

Global South Academic Conclave on WASH and Climate 2026

CWAS CENTER FOR WATER AND SANITATION
CRDF CEPT UNIVERSITY
CEPT UNIVERSITY FACULTY OF PLANNING
Gates Foundation
viega foundation

Resources

Ministry of Urban Development. 2009. Handbook of Service Level Benchmarking. Government of India.

Ministry of Urban Development. 2010. Improving Urban Services Through Service Level Benchmarking. Government of India. https://mohua.gov.in/upload/uploadfiles/files/Flyer.pdf

Mehta, M., and D. Mehta. 2010. Accountability and Incentives for Improving Performance in Urban Water Supply and Sanitation in India. Center for Water and Sanitation, CRDF, CEPT University.

Mehta, M., D. Mehta, and A. Immanuel. 2011.Benchmarking in Emerging Economies: The Performance Assessment System (PAS) Project in India. Center for Water and Sanitation, CEPT University.

Mehta, Meera, and Dinesh Mehta. 2014. "Monitoring Systems for Municipal Finance and Service Delivery in Urban Local Bodies - Suggestions for the Fourteenth Central Finance Commission".

Mehta, Meera, Dinesh Mehta, Jaladhi Vavaliya, and Upasana Yadav. 2015. "SAN benchmarks: citywide assessment of sanitation service delivery – including on-site sanitation",

Vavaliya, J., D. Bhavsar, U. Kavadi, and M. Mahroof. 2016. Online Performance Assessment System for Urban Water Supply and Sanitation Services in India. Aquatic Procedia 6: 51–63.

Mehta, M., D. Mehta et al. 2018. Performance Assessment System for Urban Water Supply and Sanitation

Mehta, M., D. Mehta, and J. Vavaliya. 2021. Urban Drinking Water Security in Gujarat. Journal of Social and Economic Development 23: 166–181. https://doi.org/10.1007/s40847-020-00122-0

Vavaliya, J., and D. Bhavsar. 2021. Performance Assessment System for Evidence Based Decision Making in Water and Sanitation Services. Stanford Woods Institute for the Environment.

Ministry of Urban Development. 2009. Handbook of Service Level Benchmarking. Government of India.

Ministry of Urban Development. 2010. Improving Urban Services Through Service Level Benchmarking. Government of India. https://mohua.gov.in/upload/uploadfiles/files/Flyer.pdf

Mehta, M., and D. Mehta. 2010. Accountability and Incentives for Improving Performance in Urban Water Supply and Sanitation in India. Center for Water and Sanitation, CRDF, CEPT University.

Mehta, M., D. Mehta, and A. Immanuel. 2011.Benchmarking in Emerging Economies: The Performance Assessment System (PAS) Project in India. Center for Water and Sanitation, CEPT University.

Mehta, Meera, and Dinesh Mehta. 2014. "Monitoring Systems for Municipal Finance and Service Delivery in Urban Local Bodies - Suggestions for the Fourteenth Central Finance Commission".

Mehta, Meera, Dinesh Mehta, Jaladhi Vavaliya, and Upasana Yadav. 2015. "SAN benchmarks: citywide assessment of sanitation service delivery – including on-site sanitation",

Vavaliya, J., D. Bhavsar, U. Kavadi, and M. Mahroof. 2016. Online Performance Assessment System for Urban Water Supply and Sanitation Services in India. Aquatic Procedia 6: 51–63.

Mehta, M., D. Mehta et al. 2018. Performance Assessment System for Urban Water Supply and Sanitation

Mehta, M., D. Mehta, and J. Vavaliya. 2021. Urban Drinking Water Security in Gujarat. Journal of Social and Economic Development 23: 166–181. https://doi.org/10.1007/s40847-020-00122-0

Vavaliya, J., and D. Bhavsar. 2021. Performance Assessment System for Evidence Based Decision Making in Water and Sanitation Services. Stanford Woods Institute for the Environment.

UN-Water (2023). SDG 6 Synthesis Report

WHO & UNICEF (2025). Joint Monitoring Programme (JMP) Report

UN-Water (2022). Global Analysis and Assessment of Sanitation and Drinking-Water (GLAAS)World Bank (2022). From Scarcity to Security: Water in a Changing Climate

IPCC (2022). AR6: Impacts, Adaptation and Vulnerability

Mehta et al. (2019). Performance Assessment System for Urban Water and Sanitation in India