Monitoring Climate Adaptation and Mitigation in WASH: Integrating with PAS

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Performance assessment system is a digital systems necessary for monitoring and assessing WASH

Most data exists with cities…

…but paper based and fragmented – not collated, analyzed or reported

Developed PAS as an online platform

www.pas.org.in

Industry-academic partnership with

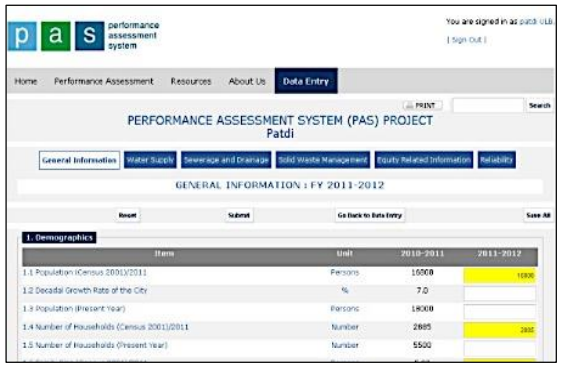
TATA CONSULTANCY SERVICES

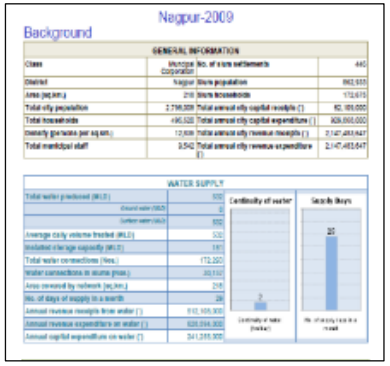
Features of Digital platform

- Online module for self reporting
- Inbuilt validation checks
- Scientific system for calculating indicators
- Comparative dashboards
- Local language supported

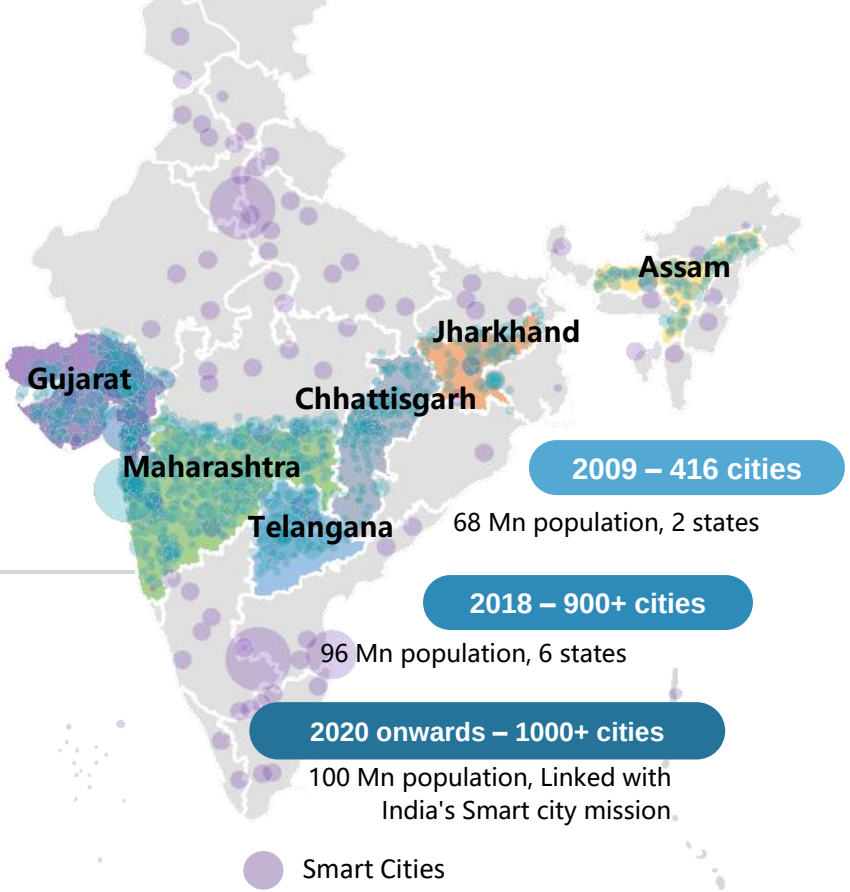
Made PAS an e-platform that enabled analysis

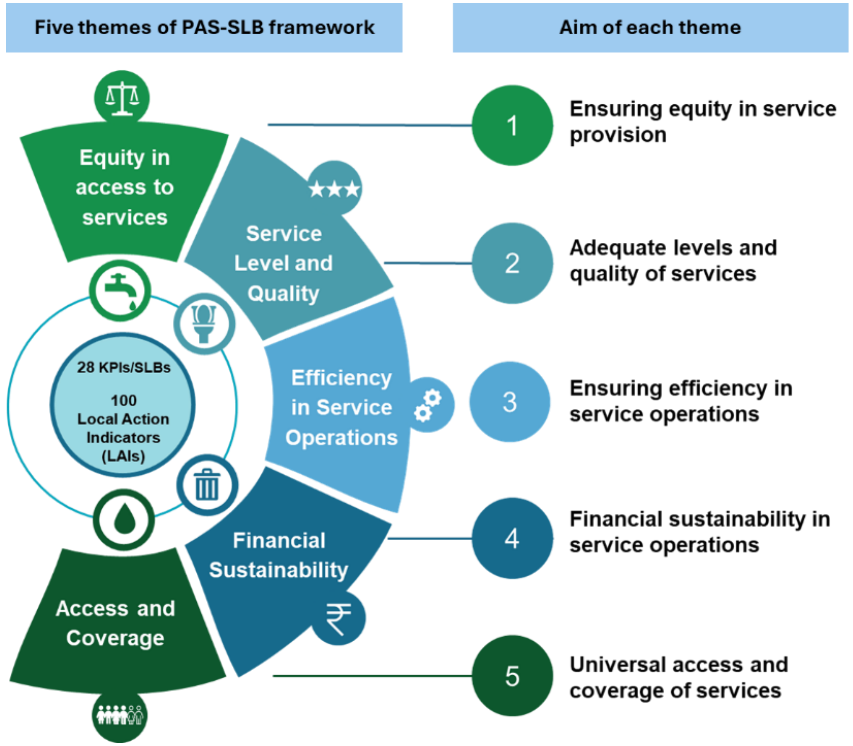
Raw Data → Information: Performance Measurement with indicators on PAS portal → Knowledge: City and State UWSS profiles, peer comparison





PAS achieving scale in India – Since 2009, sustained and growing





No Pilots…operate at Scale

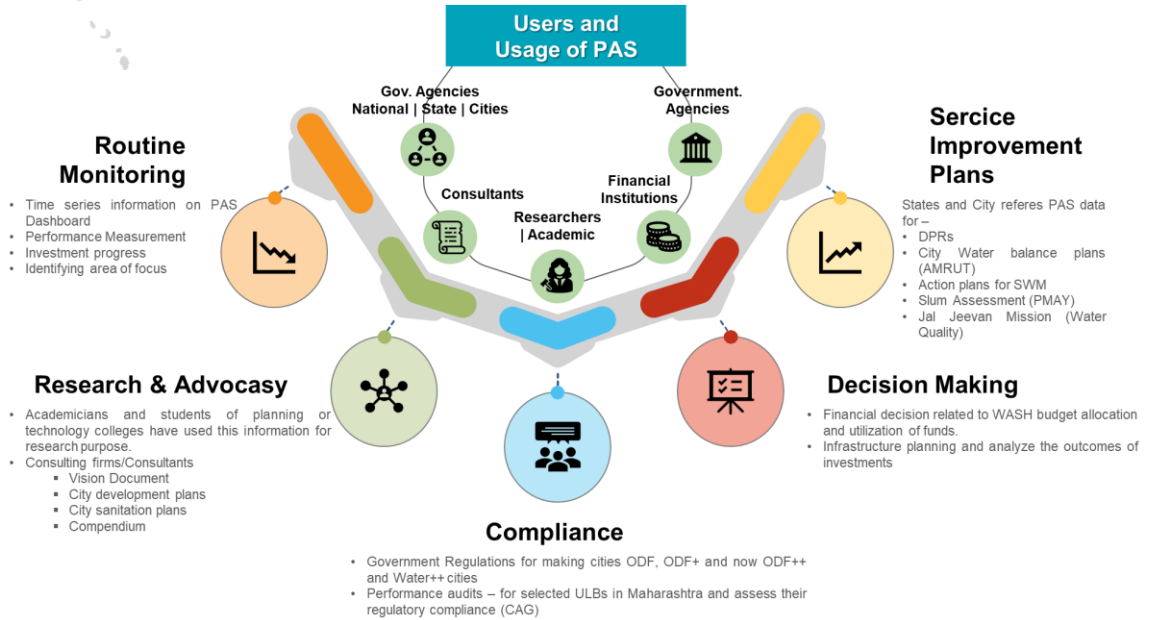
MoUs with states governments for support in assembling and publishing their data in Gazette

One of the largest time series databases for urban water and sanitation

Wide range of users – from Governments to researchers and industry

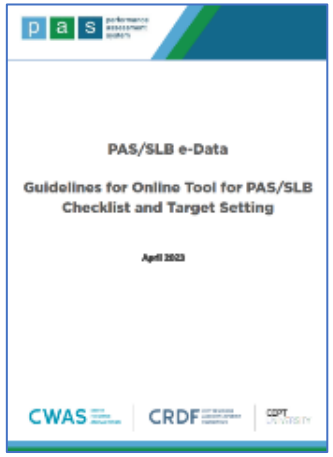
Kicked off further WASH assessments and improvement plans

Sectors	Water supply	Waste water	Solid waste	Storm water
SLBs/KPIs	9	9	8	2
LAIs	35	32	12	
SAN Benchmarks		6		
Slum indicator	1	2	1	

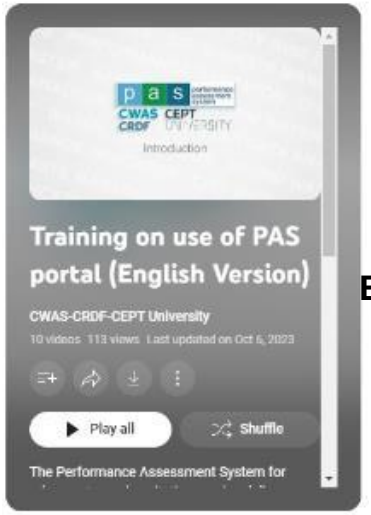


Government officials at both state and city levels are made conversant with PAS and are effectively using PAS since past 15 years- 800+ ULB officials trained every year

Reduction in the time for tracking SLBs from 15 months to two months within five years.



Guidelines for online tool for PAS portal



Hindi Video

English Video

Training videos on portal

- Self learning tutorial videos both in Hindi and English

Capacity building workshops

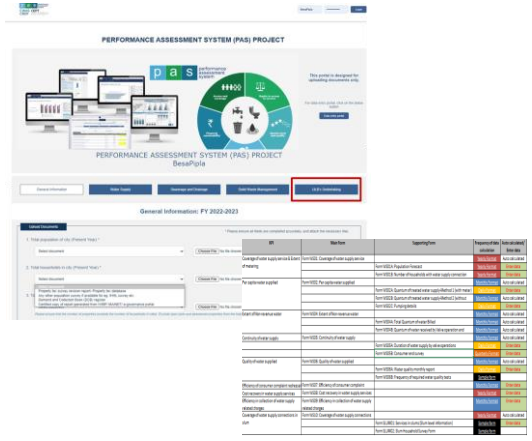
1000+ ULB Officials trained every year

Data collection, validation and Data verification

- Online Data validation Field Verification in selected cities

Data System Strengthening

- Prepared and shared Formats to capture reliable data on a suggested frequency

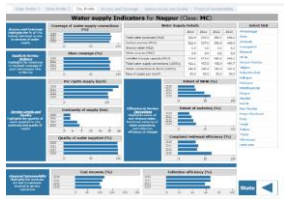


Handholding support

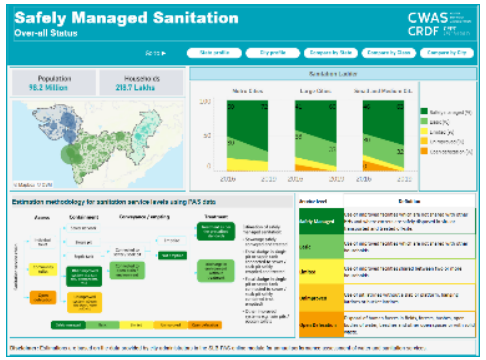
- Gazette publication
- Sectoral Improvement planning
- Performance Improvement Plans(PIP)

Interactive dashboards

- Training cities to use the dashboards
- To know their areas of improvement
- For better routine decision making

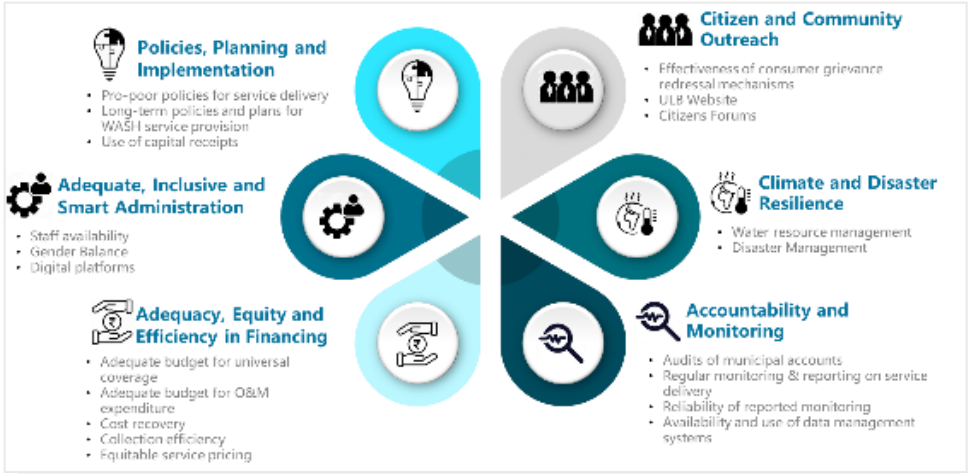


PAS adapted for versatile approach and for varied uses



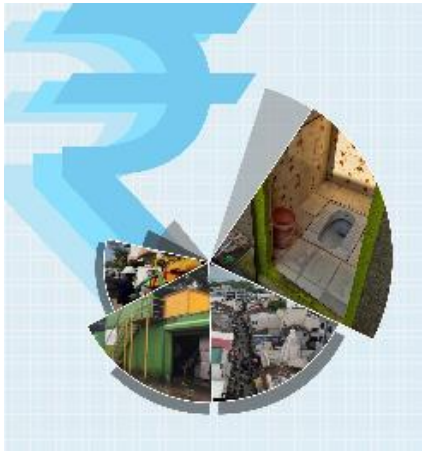
Monitoring safely managed services (SDG 6.2)

ESG assessment for cities



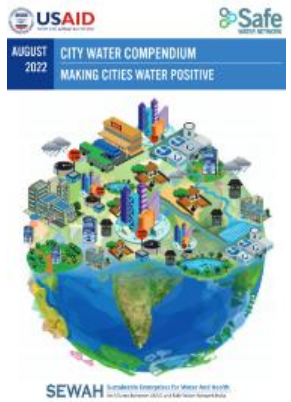
Assessment of water governance

PAS-CWIS performance ladder

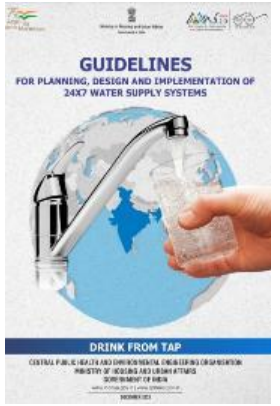


Credit worthiness of cities

International reports



Government reports

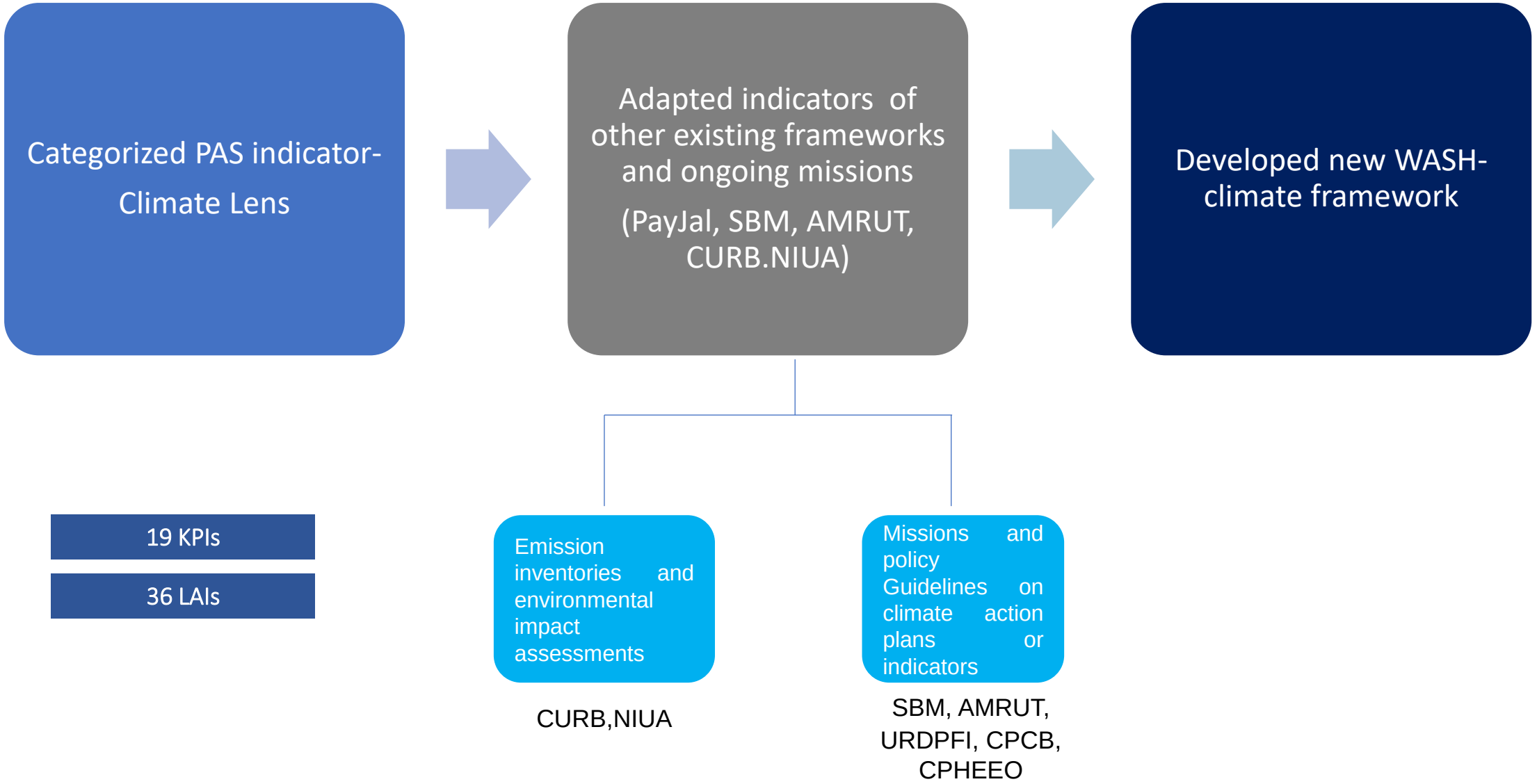


Guidelines for planning, design and implementation of 24x7 water supply systems

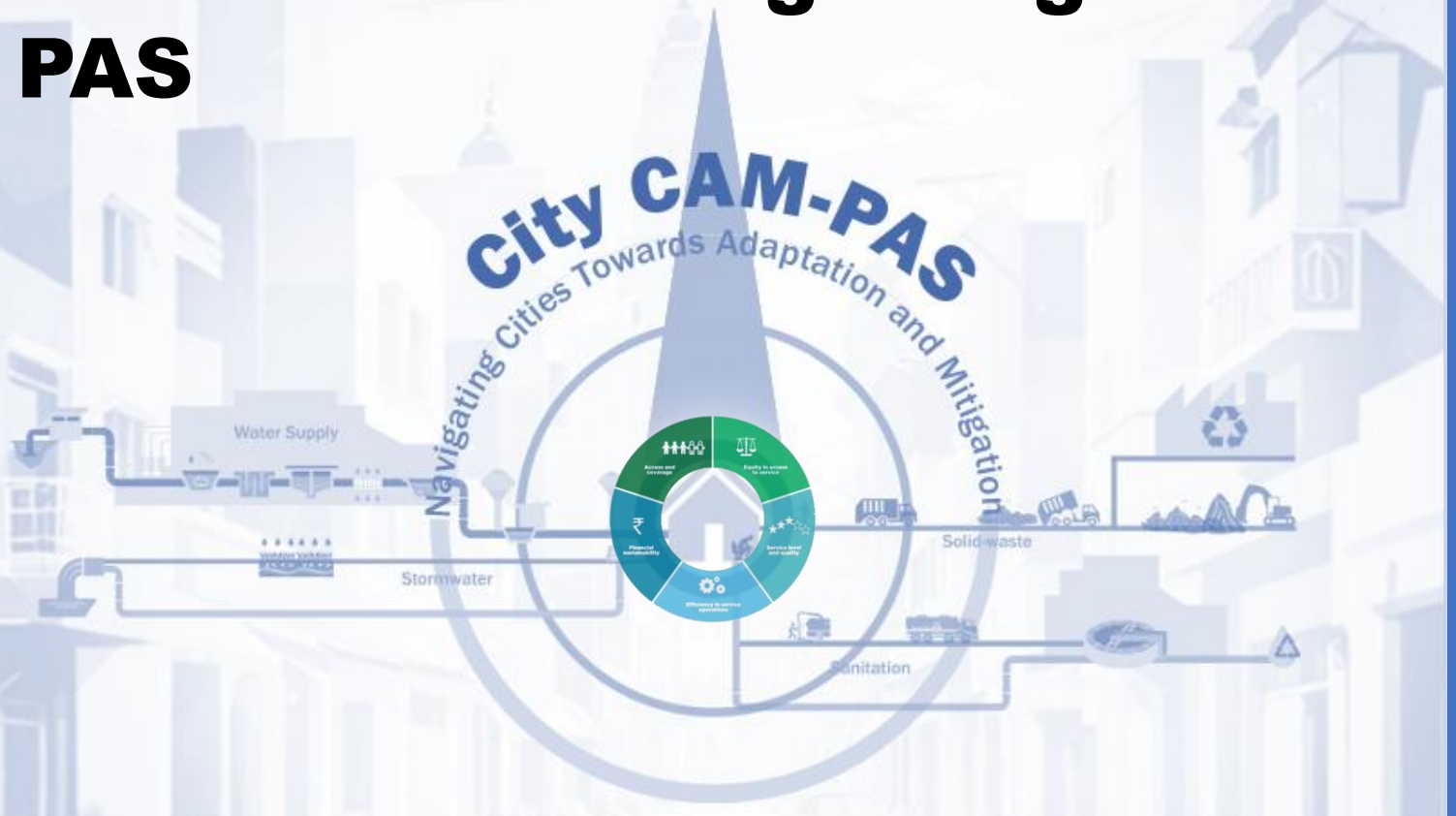
Research Papers journals

Varions publications on Journey of PAS

Adding climate element in PAS framework



Developing Assessment Framework- Integrating with PAS



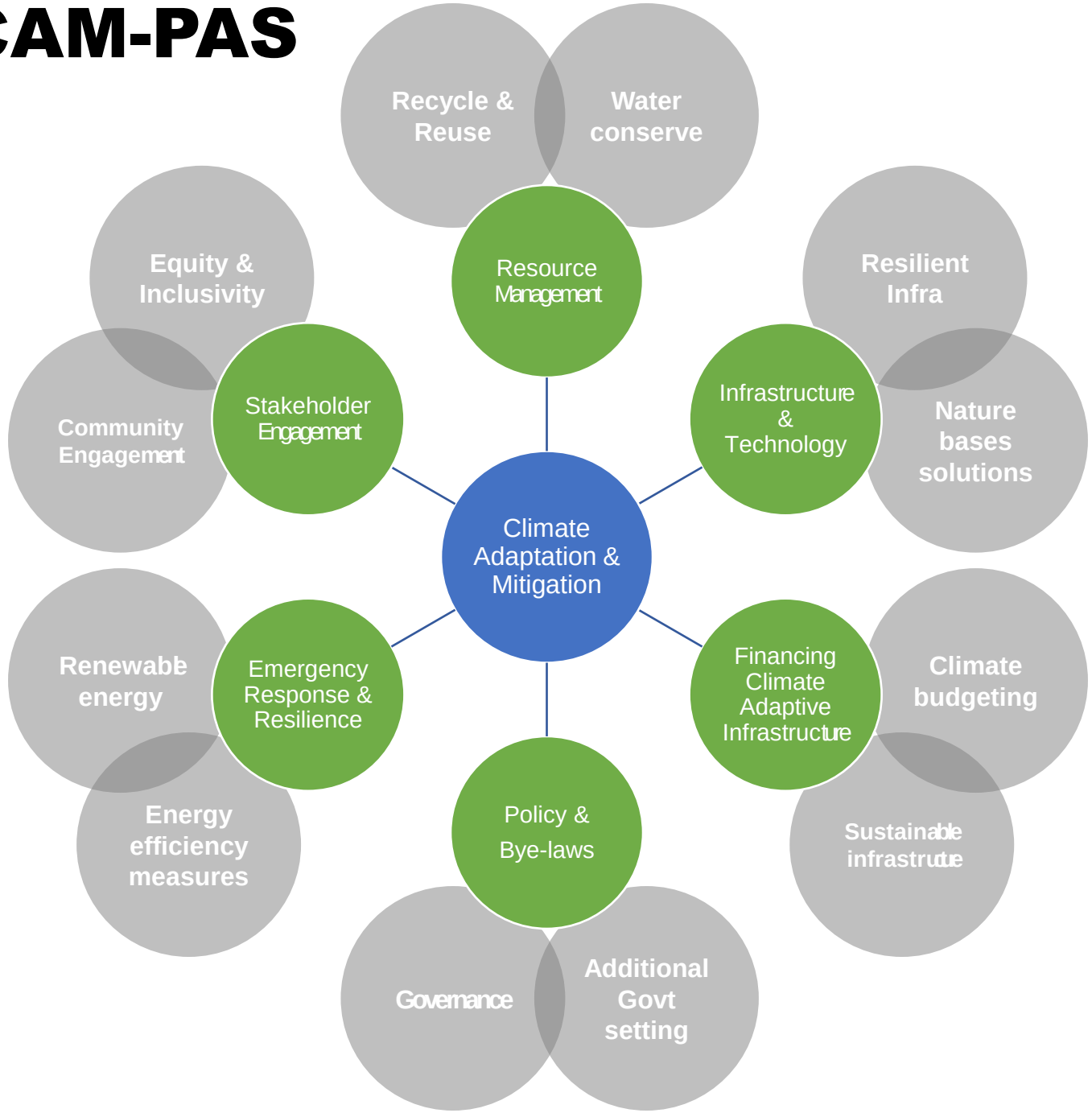
City CAM-PAS Framework

Urban Climate Adaptation & Mitigation Assessment Framework

Navigating Cities Towards Climate Adaptation & Mitigation

Service Delivery + Climate Measures

Concept of CAM-PAS



Water Supply

Solid waste

Sanitation

Stormwater

Framework: 17 Indicators

Resource Management

- Rainwater harvesting at city level
- Green infrastructure
- Reduction in urban heat island intensity
- Blue Infrastructure management
- Stormwater network present in the city

Infrastructure & Technology

- Stormwater network present in the city
- Stormwater network coverage
- Real-time monitoring

Emergency Response & Resilience

- Resilient infrastructure to withstand disasters
- Complaint redressal (water logging)
- Flood-risk mapping
- Disease due to water logging

Policy & Bye-laws

- Flood risk reduction policies & programs currently in place
- Incorporation of climate data in stormwater management planning

Financing Climate Adaptive Infrastructure

- Proportion of budget for climate-oriented projects
- Provision of funds for Vulnerable population

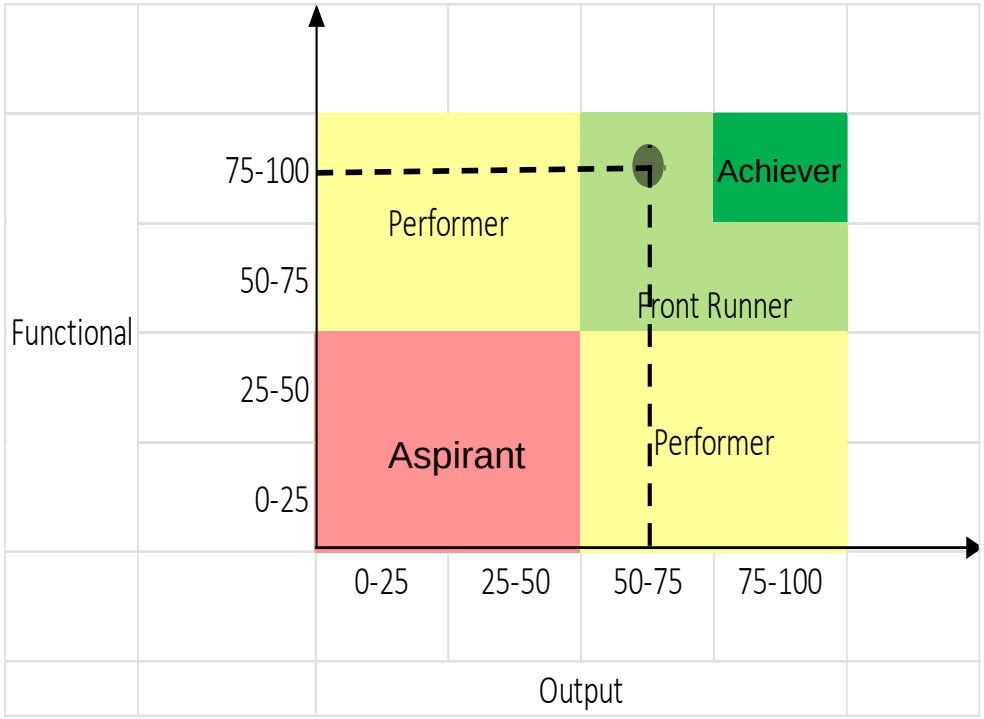
Stakeholder Engagement

- Public awareness and engagement for stormwater management

PAS

CAM-PAS framework helps the cities to identify the areas of improvement

Themes	Resource Management	Infrastructure & Technology	Emergency Response & Resilience	Policy & Bye-laws	Financing Climate Adaptative Infrastructure	Stakeholder Engagement	Sector Total (out of 100)
Water Supply							
Sanitation							
Solid waste Management							
Stormwater Management							
Theme Total (out of 100)							
PAS sectors	Output			Functional			



Each indicator is awarded 100 marks, and by totaling the score for each theme and sector, the city's overall performance can be identified. This helps in assessing the areas where the city is performing well and where it needs to focus.
Each theme is given equal 100% weightage

- If a city has low performance in both output and functional sectors, it is considered an aspirant city.
- If a city performs well in functional areas but poorly in output areas, or vice versa, it might be classified as a performer city.
- If a city does well in both output and functional areas, it is classified as an Achiever city.

CAM-PAS Framework Application

Case of Surat and Anjar

Present scenario and issues: *Surat*

Good Practices

- Tertiary wastewater treatment plant
- C&D Waste Management Plant
- Centralized Plastic Waste management plant
- 24X7 Water supply & Metering
- Grid supply network for emergency response
- Surat Stormwater Action Plan 2019
- ICCC Flood Management & Monitoring System
- SBM Rank 1
- ODF++ City

24X7 Water supply and Metering

Tertiary Wastewater treatment plant

Plastic Waste Recycle Facility

Issues

- Despite of being no 1 in SBM, city still faces issues of littering in the city, around the water bodies, creeks etc.
- Initiatives of rainwater harvesting need to be implemented.

Littering and Open Burning of Waste

Present scenario and issues: Anjar

Good Practices

- 100% Wastewater recycle and reuse.
- Good emergency response to the services, with in 24 hours.
- Rainwater harvesting and groundwater recharge projects implementation at pilot level.
- IEC and public awareness campaign held frequently for all the sectors.

Issues

- Infrastructure services not fully developed
- Energy efficiency and renewable energy are not there
- No proper monitoring mechanisms (GHG, water metering, GW monitoring)
- No recycling and reuse of solid waste
- Littering of solid waste in the city
- Stormwater infra coverage only 3%
- No proper mandate regarding RWH.
- No stakeholder engagement and incentives to citizens to motivate them towards climate actions

Rainwater harvesting

Groundwater Recharge

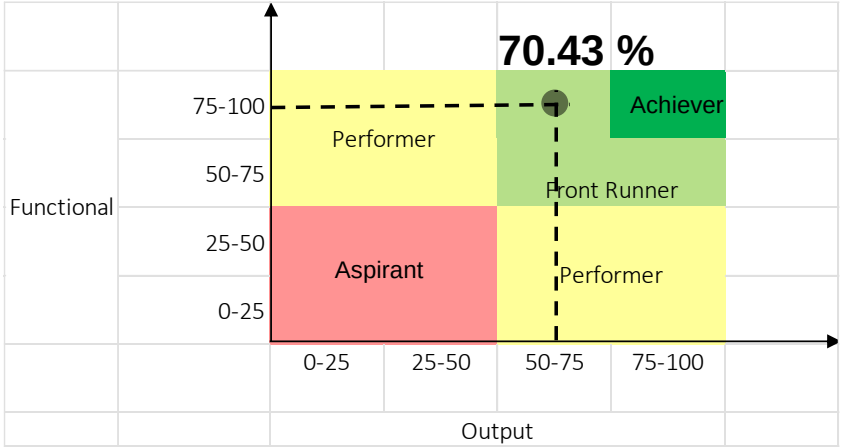
Littering and water logging

Poor infrastructure

Applying the framework to Big and Small case cities

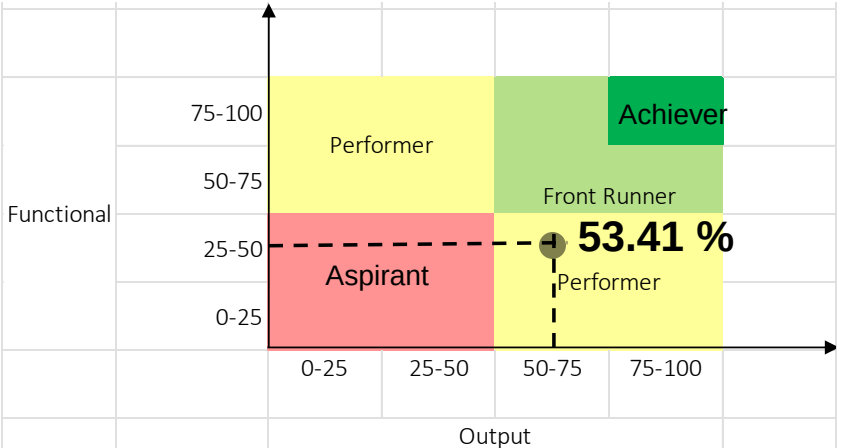
Surat

	Resource Management	Infrastructure & Technology	Emergency Response & Resilience	Policy & Bye-laws	Financing Climate Adaptative Infrastructure	Stakeholder Engagement	Sectorial score (out of 100)
	Outcome			Function			
Water Supply	66.16	58.56	53.90	100.00	72.31	66.67	69.6
Sanitation	66.67	56.08	99.69	100.00	62.63	66.67	72.3
Solid waste Management	57.14	34.84	66.67	100.00	59.93	66.67	64.2
Stormwater Management	41.67	90.07	87.50	100.00	50.00	66.67	72.6
Theme Total (out of 100)	57.91	59.89	76.94	100.00	61.22	66.67	
	64.91			75.96			



Anjar

	Resource Management	Infrastructure & Technology	Emergency Response & Resilience	Policy & Bye-laws	Financing Climate Adaptative Infrastructure	Stakeholder Engagement
	Outcome			Function		
Water Supply	49.29	20.01	84.14	37.50	52.97	66.67
Sanitation	100.00	31.79	95.13	37.50	45.89	66.67
Solid waste Management	33.33	53.33	100.00	37.50	30.23	66.67
Stormwater Management	41.67	34.33	75.00	50.00	50.00	33.33
Theme Total (out of 100)	56.07	34.87	88.57	40.63	44.77	58.33
	58.91			47.91		



Key Findings and Takeaways

Surat	Anjar
Ground water monitoring and management – **Lack Technical staff capacity**	Enhancing energy efficiency and exploring renewable energy solutions, particularly in sectors such as water and sanitation.- **Land Availability**
Waterbody rejuvenation and cleaning initiatives- **Inter sectoral dispute**	Measuring and monitoring greenhouse gas emissions across all sectors- **Lack of Awareness**
Liter free city- **Citizen awareness**	Initiating recycling and the reuse of solid waste-**Lack of technical expertise and capacity**
Implementing rainwater harvesting initiatives at city and residential level-**Lack of awareness among ULB and other stakeholders.**	Implementing residential rainwater harvesting initiatives- **No proper mandate and regulation, hindering the initiation**
Seeking alternative water sources to alleviate pressure on groundwater resources	Seeking alternative water sources to alleviate pressure on groundwater resources. **Financial and regulatory constraints.**

Infrastructure Development Divide	• Large cities like Surat benefit from established infrastructure, enabling easier focus on climate measures, while small cities such as Anjar struggle with basic infrastructure needs, hindering climate action prioritization.
Opportunities for Sustainable Development	• Despite challenges, small cities have opportunities to leapfrog traditional development pathways and prioritize sustainable infrastructure.
Capacity and Awareness Gap	• Small cities face limitations in capacity and awareness regarding climate change impacts and mitigation strategies, causing challenges in implementation.
Need for Integrated Planning	• To be climate-adaptive, small cities must integrate climate considerations into infrastructure development and planning,

CAM-PAS is different than other frameworks

Data from city officials

No/less periodic study requirement

Thematic indicators- Software and Hardware aspects

From situation assessment of infra to climate assessment

Easy to integrate with PAS
Followed the checklist format

Cities are already using PAS- so CAM-PAS is easy to adapt and scale

Helps in assessing readiness of the city to cope up with climate change

Helps in identifying quick wins and coping with challenges

Way forward

- Need to apply this on other case cities.
- Need to simplify the framework

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.

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Thank You

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

Framework: 23 Indicators

Resource Management

- Demand Water Management (Demand Vs Supply)
- Capacity addition/augmentation to present supply
- Degree of surface water dependency (on single source)
- Ratio of storage capacity to water supply
- Gravity led water supply
- Per capita water supplied at consumer end
- Ground water management

Infrastructure & Technology

- Water supply coverage
- Non-revenue water
- Water metering
- Renewable energy options
- Energy efficiency
- Emission Reduction

Emergency Response & Resilience

- Resilient infrastructure to withstand disasters
- Complaints Response in Water Supply
- Water Quality

Policy & Bye-laws

- Water conservation policies, Implementation & Monitoring at city level.
- Incorporation of climate data in water management planning

Financing Climate Adaptive Infrastructure

- Proportion of budget for climate-oriented projects
- Provision of funds for Vulnerable population
- Cost recovery in water supply services
- Collection efficiency in water supply-related charges

Stakeholder Engagement

- Public awareness and engagement for water conservation

Water Supply

PAS

Framework : 18 Indicators

Resource Management

- Extent of sewage recycle and reuse
- Sewage quality check before discharging into nature

Infrastructure & Technology

- Sewer Network Coverage
- Real-time monitoring
- Nature-based treatment technology
- Renewable energy options
- Energy efficiency
- Emission Reduction

Emergency Response & Resilience

- Resilient infrastructure to withstand disasters
- Complaint redressal (open spillage)
- Disease due to sewage spillage

Policy & Bye-laws

- Sanitation policies & programs currently in place, implementation and monitoring
- Incorporation of climate data in sanitation management planning

Financing Climate Adaptive Infrastructure

- Proportion of budget for climate-oriented projects
- Provision of funds for Vulnerable population
- Cost recovery in sanitation services
- Collection efficiency in sanitation related charges

Stakeholder Engagement

- Public awareness and engagement for sanitation & wastewater reuse

Sanitation

PAS

Framework: 18 Indicators

Resource Management

- Waste recycled and reused
- Waste to energy initiative
- Open Burning of waste

Infrastructure & Technology

- Coverage of solid waste management services
- Waste treatment efficiency
- Waste management of littering in the city
- Percentage of E-Vehicles
- Landfill distance from the city

Emergency Response & Resilience

- Complaint redressal (littering)
- Disease due to waste accumulation around
- Time to restore waste management services after a disaster

Policy & Bye-laws

- SWM policies & programs currently in place, implementation and monitoring
- Incorporation of climate data in waste management planning

Financing Climate Adaptive Infrastructure

- Proportion of budget for climate-oriented projects
- Provision of funds for Vulnerable population
- Cost recovery in SWM
- Collection efficiency in SWM related charges

Stakeholder Engagement

- Public awareness and engagement for SWM

PAS

Framework: 17 Indicators

Resource Management

- Rainwater harvesting at city level
- Green infrastructure
- Reduction in urban heat island intensity
- Blue Infrastructure management
- Stormwater network present in the city

Infrastructure & Technology

- Stormwater network present in the city
- Stormwater network coverage
- Real-time monitoring

Emergency Response & Resilience

- Resilient infrastructure to withstand disasters
- Complaint redressal (water logging)
- Flood-risk mapping
- Disease due to water logging

Policy & Bye-laws

- Flood risk reduction policies & programs currently in place
- Incorporation of climate data in stormwater management planning

Financing Climate Adaptive Infrastructure

- Proportion of budget for climate-oriented projects
- Provision of funds for Vulnerable population

Stakeholder Engagement

- Public awareness and engagement for stormwater management

PAS

	Water	Sanitation	Solidwaste	Stormwater
Resource Management	Demand Water Management (Demand Vs Supply)	Extent of sewage recycle and reuse	Waste recycled and reused	Rainwater harvesting at city level
	Capacity addition/augmentation to present supply of water commissioned over next 3 years from projects/schemes/bulk purchase	Sewage quality check before discharging into nature	Waste to energy initiative	Green infrastructure
	Degree of surface water dependency (on single source)		Open Burning of waste	Reduction in urban heat island intensity
	Ratio of storage capacity to water supply			Blue Infrastructure management
	Gravity led water supply			Stormwater network present in the city
	Per capita water supplied at consumer end			Real-time monitoring
	Ground water management			
Infrastructure & Technology	Water supply coverage	Sewer Network Coverage	Coverage of solid waste management services	Stormwater network present in the city
	Non-revenue water	Real-time monitoring	Waste treatment efficiency	Stormwater network coverage
	Water metering	Nature-based treatment technology	Waste management of littering in the city	Real-time monitoring
	Renewable energy options	Renewable energy options	Percentage of E-Vehicles	
	Energy efficiency	Energy efficiency	Landfill distance from the city	
	Emission Reduction	Emission Reduction		
Emergency Response & Resilience	Resilient infrastructure to withstand disasters	Resilient infrastructure to withstand disasters	Complaint redressal (littering)	Resilient infrastructure to withstand disasters
	Complaints Responce in Water Supply	Complaint redressal (open spillage)	Disease due to waste accumulation around	Complaint redressal (water logging)
	Water Quality	Disease due to sewage spillage	Time to restore waste management services after a disaster	Flood-risk mapping
				Disease due to water logging
Policy & Bye-laws	Water conservation policies, Implementation & Monitoring at city level.	Sanitation policies & programs currently in place, implementation and monitoring	SWM policies & programs currently in place, implementation and monitoring	Flood risk reduction policies & programs currently in place
	Incorporation of climate data in water management planning	Incorporation of climate data in sanitation management planning	Incorporation of climate data in waste management planning	Incorporation of climate data in stormwater management planning
Financing Climate Adaptative Infrastructure	Proportion of budget for climate-oriented projects	Proportion of budget for climate-oriented projects	Proportion of budget for climate-oriented projects	Proportion of budget for climate-oriented projects
	Provision of funds for Vulnerable population	Provision of funds for Vulnerable population	Provision of funds for Vulnerable population	Provision of funds for Vulnerable population
	Cost recovery in water supply services	Cost recovery in sanitation services	Cost recovery in SWM	
	Collection efficiency in water supply related charges	Collection efficiency in sanitation related charges	Collection efficiency in SWM related charges	

Scoring summary

WATER	PAS	Other Frameworks	New	Total	Total
Indicators	8	4	11	23	79
Sub-Indicators	15	5	36	56	

SANITATION	PAS	Other Frameworks	New	Total	Total
Indicators	5	3	9	17	54
Sub-Indicators	19	4	14	37	

SOLID WASTE	PAS	Other Frameworks	New	Total	Total
Indicators	5	4	8	17	50
Sub-Indicators	12	7	14	33	

STORMWATER	PAS	Other Frameworks	New	Total	Total
Indicators	3	1	12	16	36
Sub-Indicators	4	2	14	20	

Water	Percentage	Binary	Benchmarking	Aggregate
Resource Management	2	2	1	2
Infrastructure & Technology	0	0	0	6
Emergency Response & Resilience	0	0	0	3
Policy & Bye-laws	0	1	0	1
Financing Climate Adaptative Infrastructure	3	1	0	0
Stakeholder Engagement	0	0	0	1

Sanitation	Percentage	Binary	Benchmarking	Aggregate
Resource Management	1	1	0	0
Infrastructure & Technology	1	2	0	3
Emergency Response & Resilience	0	2	0	1
Policy & Bye-laws	0	1	0	1
Financing Climate Adaptative Infrastructure	3	1	0	0
Stakeholder Engagement	0	0	0	1

SWM	Percentage	Binary	Benchmarking	Aggregate
Resource Management	0	2	0	1
Infrastructure & Technology	1	0	1	3
Emergency Response & Resilience	0	1	1	1
Policy & Bye-laws	0	1	0	1
Financing Climate Adaptative Infrastructure	3	1	0	0
Stakeholder Engagement	0	0	0	1

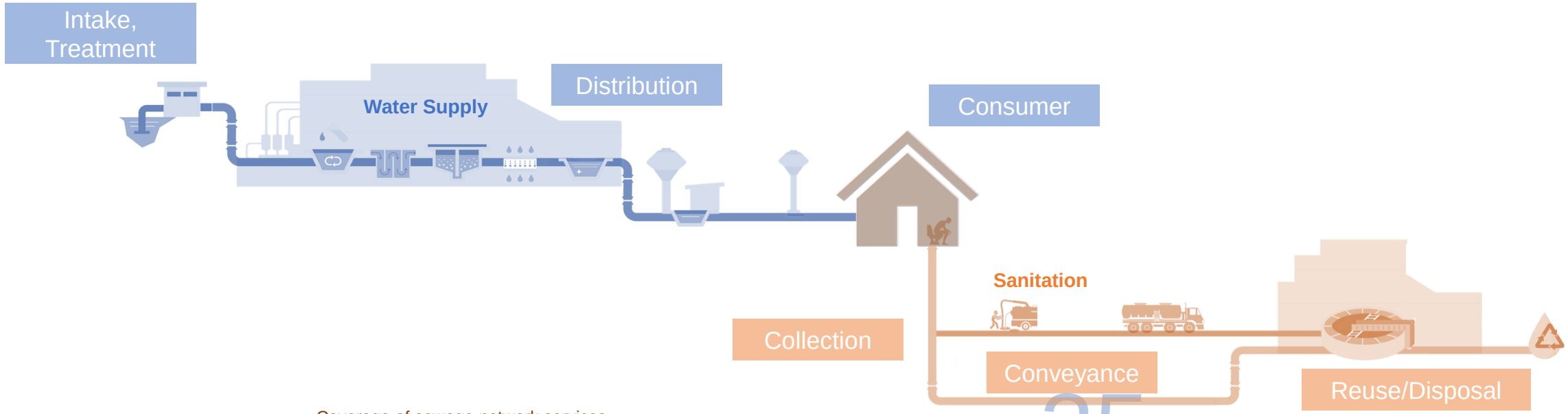
Stormwater	Percentage	Binary	Benchmarking	Aggregate
Resource Management	0	2	0	2
Infrastructure & Technology	1	2	0	0
Emergency Response & Resilience	0	1	0	3
Policy & Bye-laws	0	2	0	0
Financing Climate Adaptative Infrastructure	1	1	0	0
Stakeholder Engagement	0	0	0	1

Existing PAS indicators related to climate change

- Quality of water supplied
- Regular annual assessment of available sources(ERI68)
- Studies/ actions on detailed energy audits(ERI73)
- Studies and actions for preliminary water audit
- Number of pumps replaced/repaired in the current year(ERI75)
- Studies and actions for preliminary water audit(E208)

- Coverage of water supply connections
- Extent of Non-Revenue Water
- Spatial coverage of distribution network
- % water losses from source to water treatment plant (WTP)
- % water losses from WTP to water distribution station (WDS)
- % water losses from WDS to final consumption (includes both leakage on service connections and unauthorized consumption)
- Number of pipe breaks per km length of network
- % of network refurbished

- Per capita supply of water (At consumer end)
- Extent of metering of water connections
- Efficiency in redressal of customer complaints
- Cost recovery in water supply services
- Efficiency in collection of water supply related charges
- % of connections that are metered
- % of meters that are functional
- Periodic monitoring and analysis of complaints
- Total complaints in water supply per 1000 connections per year



KPIs

LAIs

- Coverage of sewage network services
- Coverage of sewerage network (% of area covered with sewer network)
- Coverage of sullage/greywater network (open + covered)
- % of HHs connected to sewer network
- % of HHs connected to septic tank*
- % of septic tanks as per design standards
- % of HHs connected to twin pit / other safe system
- % of septic tanks connected to settled sewer/ drains for effluent disposal*
- % of septic tanks connected to soak pit for effluent disposal*
- % of septic tanks cleaned annually
- Efficiency in redressal of customer complaints
- Total complaints in wastewater per 1000 connections

- Collection efficiency of sewerage networks
- Frequency of sewer overflows
- Quality of septage treatment*
- Quality of effluent and grey water treatment*
- Extent of cost recovery in sewage management
- Efficiency in collection of sewage charges

- Extent of reuse and recycling of sewage
- Extent of reuse and recycling in sanitation system (weighted average)
- Extent of reuse and recycling of treated septage*
- Extent of reuse and recycling of treated effluent (from septic tank and grey water) *

Source: PAS (2023)

Performance Assessment Systems (PAS)

- % treatment capacity to solid waste generated
- Adequacy of solid waste treatment facilities

Recycle/Disposal

- Extent of segregation of municipal solid waste
- Efficiency in redressal of customer complaints

Collection

- Household level coverage of solid waste management services

Conveyance

- Extent of water bodies rejuvenation

- Coverage of Storm Water Drainage Network
- Incidence of water logging/flooding
- Coverage of rainwater harvesting structure

26

KPIs	28 KPIs	19 KPIs
LAIs	100+ LAIs	36 LAIs

Source: PAS (2023)