



# **Data System Strengthening of Water and Sanitation Services**

***- Evaluation based on the  
Performance Assessment System  
(PAS) Program***

April 2023

# Acknowledgements

Performance Assessment System (PAS) has created one of the largest databases of urban water and sanitation services in India. The effectiveness of performance assessment for meaningful management decisions depends on the systems that generate the data to compute the performance. To address the data reliability challenges, the online PAS module includes questions related to data systems and data management for each key performance indicators. The reliability grade is generated automatically based on results of standard questions. Over the years, various studies and support has been provided for data system improvement in pilot cities of Gujarat and Maharashtra states.

This slide deck covers the PAS approach to data system strengthening, overview of various data system improvement initiatives, analysis of improvements in data reliability and recommendations for strengthening water and sanitation data systems. Analysis of reliability improvements is based on the data in the online PAS module, and insights provided by 550+ cities of Gujarat and Maharashtra states of India.

The study was carried out under the project “Performance Assessment System for Urban Water Supply and Sanitation in India” funded by the Bill and Melinda Gates Foundation. The work on this study was carried out by a team led by Meera Mehta and Dinesh Mehta and included Jaladhi Vavaliya and Apoorva Bhate.

Water and sanitation data system in Indian cities is evolving as cities strive to overcome various challenges in delivering safe and reliable water and sanitation services. We believe, by improving data systems, cities can gain a deeper understanding of improvement areas. The true potential of data will be unleashed when it is used for predictive and prescriptive analytics, empowering cities to achieve services that are equitable, efficient, sufficient, and sustainable.

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Executive Directors, Centre for water and Sanitation  
CRDF, CEPT University  
Ahmedabad, India



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## Summary

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Overview of Water and Sanitation  
Data Management Practices – At the  
Beginning of PAS Program

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PAS Approach to Data System  
Strengthening

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Overview of Data Reliability  
Improvements in a Decade

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Recommendations for Data System  
Strengthening

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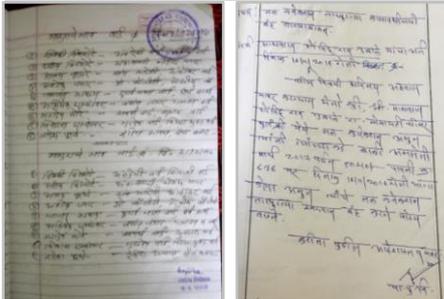
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# What is Water and Sanitation Data System?

- Reliable and updated data from water and sanitation information systems are the necessitate for providing equitable, efficient, adequate and sustainable services.
- However, too often data sit in reports, on shelves or in databases and are not sufficiently utilised in policy and program development, improvement, strategic planning and advocacy.
- Data system means a system of interacting data elements that function together to achieve an objective.
- It includes data recording, analysis, usage and reporting mechanism of city for provision of various services like water supply, wastewater management and solid waste management.
- Record keeping processes in cities varies from handwritten manual records, computerised records, e-governance modules and online software in India.

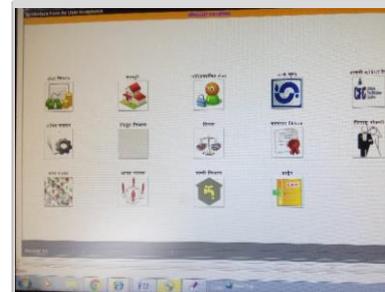
Manual records



Computerised records

Year	Area																			
2013-2014	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

E-governance module



Online software

Consumer No.: 10011 10011 Name: MR. SHYAM V. NERALKAR  
 Meter No.: 1001111111 Price: Receipt No.: Zone No.: BE No.:  
 Total Amount: 33 Total Paid Amt: Advance Amt  
 Penalty: 0 Paid Penalty: Payment Mode:  
 Previous Balance: 0 Paid Balance: 0  
 Current Bill: 33 Bill Status: 22/03/2018  
 Balance Amount: Bill No. Code

# Overview of Water and Sanitation Data Management Practices in Indian Cities – At the Beginning of PAS Program

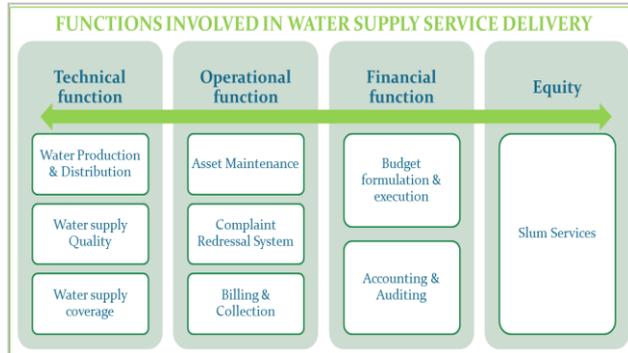


Absence of data recording system at ground level

If recorded, then it was not collated to be analyzed / reported to higher level



Most of the records are paper based and fragmented.

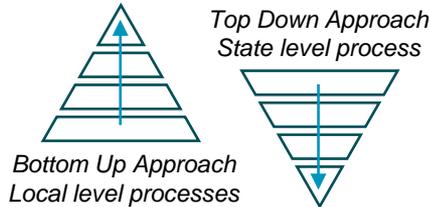


Maintained in isolation and were not usually shared with each other

- There were serious gaps in water supply and sanitation data recording and management in cities of India.
- Based on the pilot study of PAS performance measurement framework, critical data gaps are related to assets condition, relationship between households and connections, household level sanitation facilities, water production and supply, wastewater collection and treatment, and services in urban poor or slum settlements.
- In some aspects such as for monitoring of water quality and consumer grievance redressal, while some data is available, possible problems with reporting system.
- These **gaps in information processing practices** point to the need to develop a **systematic assessment of data reliability** so that data system strengthening can be **planned and measured** along with the service level improvements.

# Data System Strengthening Activities in the Performance Assessment System Program

Review of Key Processes for performance measurement, performance monitoring and use of performance information in decision making



Standardised Reliability Assessment for key performance indicators using an online SLB-PAS module

Question	Options	YN
What is the basis of estimation of HHs served with individual water supply connections?	1. Through household surveys (1-5 yrs)	Y
	2. Number of residential connections	
	3. Area covered by distribution network	
	4. Road covered by network length	
How are records of HHs served by water supply maintained?	1. Computerized	Y
	2. Only Manual	

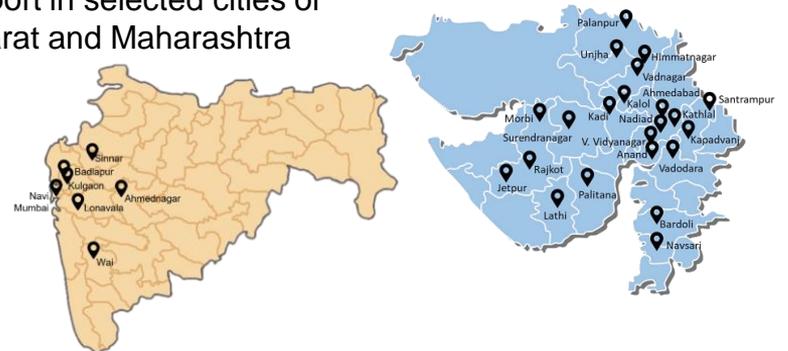
Identified Data Gaps in collection, analysis and reporting of key performance indicators

Theme	Water Supply	Wastewater	Solid waste
Access and coverage including equity	<ul style="list-style-type: none"> <li>HHs level coverage of WS connections</li> <li>Coverage of WS connections in slum settlement</li> </ul>	<ul style="list-style-type: none"> <li>Coverage of toilets</li> <li>Coverage of sewer network</li> <li>Coverage of onsite system</li> <li>Coverage of toilets in slum settlement</li> <li>Coverage of sewer in slum</li> </ul>	<ul style="list-style-type: none"> <li>HHs level coverage of SWM services</li> <li>HHs level coverage of SWM services in slum settlement</li> </ul>
Service level and quality	<ul style="list-style-type: none"> <li>The capita supply of water at consumer end</li> <li>Continuity of water supply</li> <li>Quality of water supplied</li> </ul>	<ul style="list-style-type: none"> <li>Collection efficiency of sewerage network</li> <li>Collection efficiency of septage</li> <li>Adequacy of sewage treatment capacity</li> </ul>	<ul style="list-style-type: none"> <li>Efficiency of MSW collection</li> <li>Extent of segregation</li> <li>Extent of MSW processed and recycled</li> </ul>
Efficiency in service operations	<ul style="list-style-type: none"> <li>Extent of non-revenue water</li> <li>Efficiency in resolution of customer complaints</li> <li>Extent of metering of water connections</li> <li>Efficiency in collection of WS related charges</li> </ul>	<ul style="list-style-type: none"> <li>Quality of sewage treatment</li> <li>Extent of reuse and recycling of sewage</li> <li>Efficiency in resolution of customer complaints</li> <li>Efficiency in collection of sewerage related charges</li> </ul>	<ul style="list-style-type: none"> <li>Extent of scientific disposal of municipal solid waste</li> <li>Efficiency in redressal of customer complaints</li> <li>Efficiency in collection of SWM related user charges</li> </ul>
Financial sustainability	<ul style="list-style-type: none"> <li>Extent of cost recovery (O&amp;M) in WS services</li> </ul>	<ul style="list-style-type: none"> <li>Extent of cost recovery (O&amp;M) in wastewater</li> </ul>	<ul style="list-style-type: none"> <li>Extent of cost recovery (O&amp;M) in SWM services</li> </ul>

Developed Methods and Tools to improve reliability of key performance indicators



Data System Strengthening support in selected cities of Gujarat and Maharashtra



## Data System Strengthening Approach

Based on the initial years' performance assessment results, adopted two approaches for water and sanitation data system strengthening in selected pilot cities.

### Linear approach

- The linear approach involves a step-by-step process that is designed to improve the quality and availability of data in a systematic way.
- It is a more structured and linear process that involves developing data collection tools / methods, collecting data, and analyzing data.
- Focuses only on improving the quality and availability of data related to specific group / individual indicators like Non-revenue water, water quality surveillance, adequate sanitation, etc.

### System approach

- The systems approach takes a holistic view of the entire data system, including the people, processes, and technology involved in collecting, analyzing, and disseminating data.
- It recognizes that a data system is more than just the data itself, but also includes the organizational structures, policies, and process that support data collection and use.
- Focuses on understanding and improving the entire data system as a whole.

# Data System Strengthening Initiatives in Pilot Cities

Various information system improvement initiatives were carried out in more than 25 pilot cities of Gujarat and Maharashtra

## Linear approach



**Strengthened city's e-governance system for SLB integration**

PAS Project, Cept University (2016-2017)

Dashboard Water Supply Waste Water PERFORMANCE ASSESSMENT SYSTEM

PAS Project, Cept University  
Quantity - Water Production (Value in lakh lt) From 01/05/2017 to 07/05/2017

Sr No	Date	Source-Ground Water	Source-Surface Water	Source-Bulk Raw	Source-Bulk treated	Quantity
1	01/05/2017	238.3	0.0	0.0	0.0	238.00
2	02/05/2017	242.6	0.0	0.0	0.0	243.00
3	03/05/2017	238.3	0.0	0.0	0.0	238.00
4	04/05/2017	238.3	0.0	0.0	0.0	238.00
5	05/05/2017	242.5	0.0	0.0	0.0	243.00
6	06/05/2017	238.4	0.0	0.0	0.0	238.00
7	07/05/2017	238.3	0.0	0.0	0.0	238.00

**Developed e-governance module to cover regular operation and maintenance of water supply and sanitation services**



**Preliminary water audit study**



Standard Operating Procedure (SOP) for Routine Water Quality Surveillance in ULBs in Gujarat

Prepared by  
Urban Management Centre  
Under  
PAS program

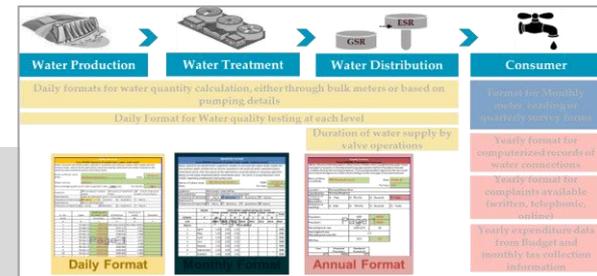
**Improvement in drinking water quality surveillance**

## System approach



**Information System Improvement Plan of water supply, wastewater and solid waste management services**

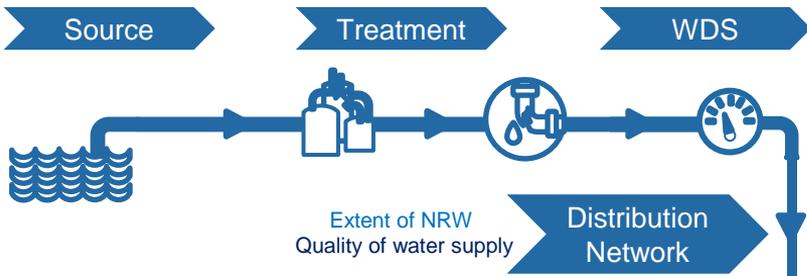
**Developed standard information system improvement formats for small and medium cities**



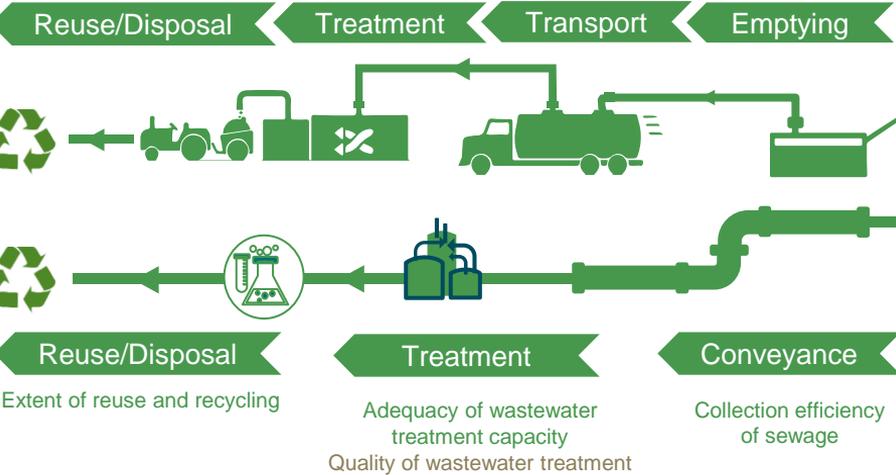
# Water and Sanitation Data System Analysis using Reliability of Service Level Indicators

Access to water supply, toilet, sewerage, adequate sanitation and SWM  
 Per capita water supply  
 Continuity of water supply  
 Extent of metering  
 Complaint redressal  
 Collection of water supply, wastewater and SWM services related charges

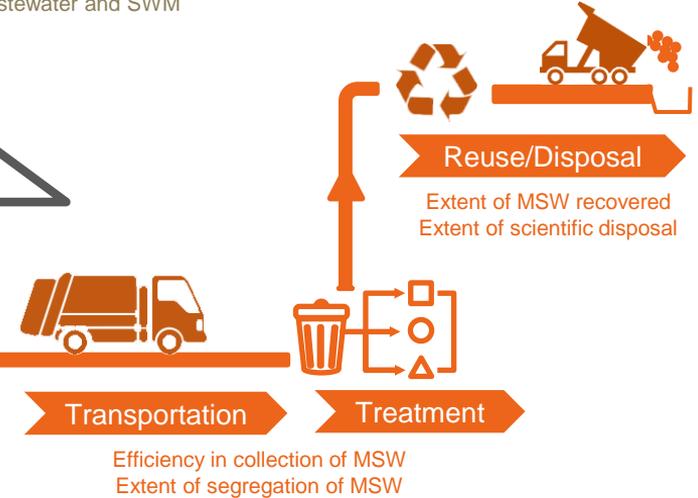
## Water supply service chain



## Wastewater management service chain



## Solid waste management service chain



## Water and sanitation data systems

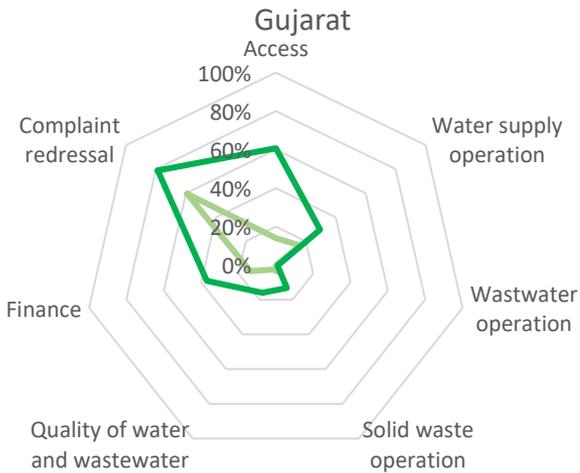
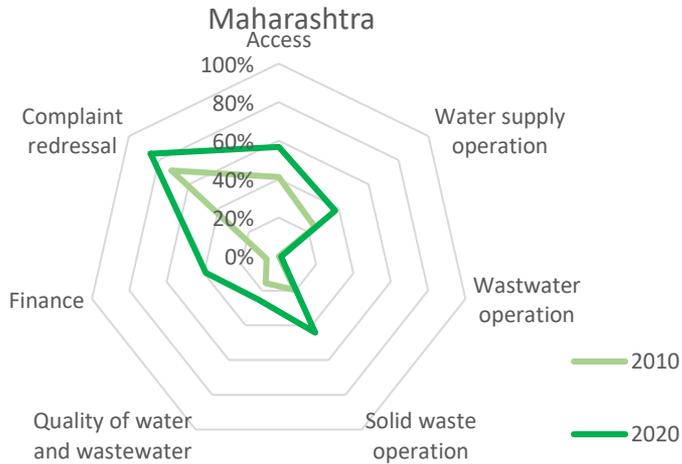
- Consumer information system
- Financial system
- Water supply operation system
- Wastewater operation system
- Solid waste operation system
- Complaint redressal system
- Water quality monitoring system
- Wastewater quality monitoring system

## Urban Local Government

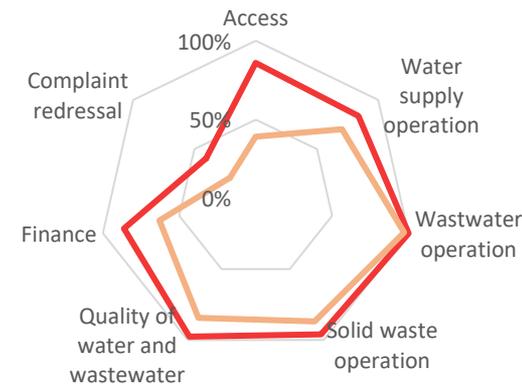
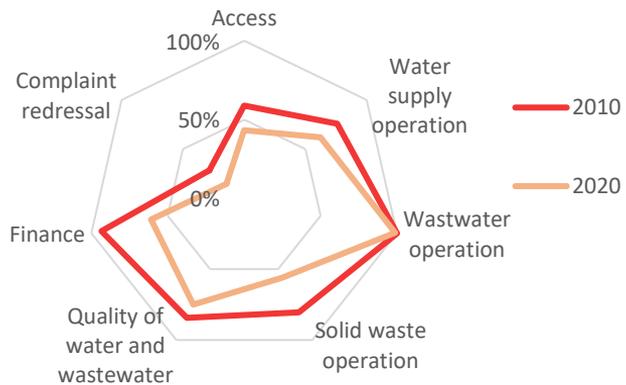
Cost recovery of water supply, wastewater and SWM services

# Overview of State-wise Data Reliability Assessment

Data system wise analysis of reliability grades A / B



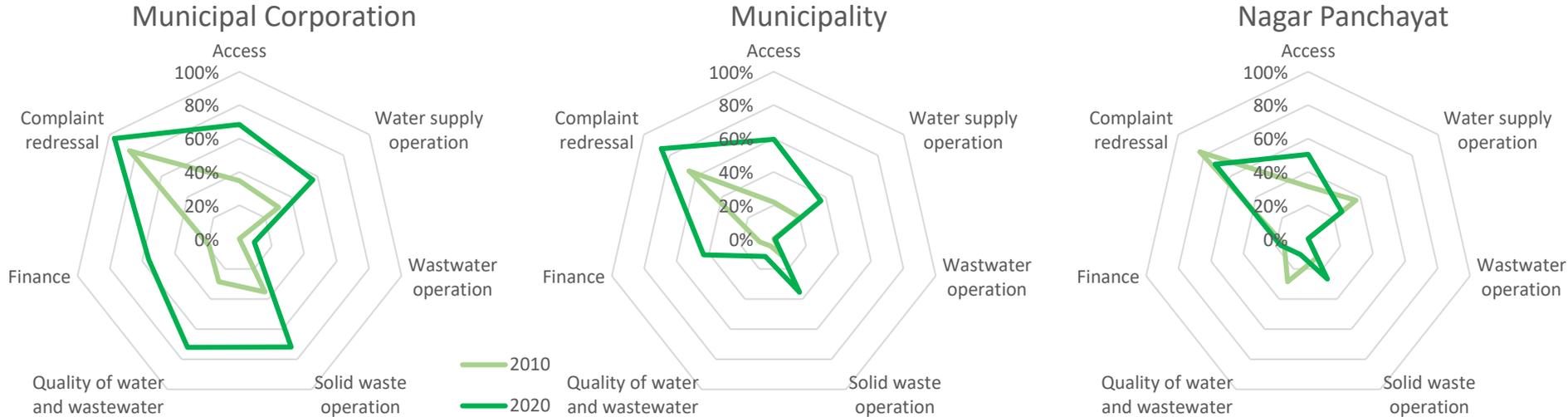
Data system wise analysis of reliability grades C / D



- The reliability of **access to services, complaint redressal** are higher as compared with other data systems.
- Reliability grades are visibly improved in most of the data systems except for wastewater operations.
- In Gujarat, highest improvement is visible in access services related data whereas in Maharashtra highest improvement is visible in finance related data.
- Still, more than 50% cities have **lower data reliability in water supply operations, wastewater operations, solid waste operations, quality of water and wastewater treatment and finance**. These are mainly **Municipalities or Nagar panchayats**.

# Overview of Class-wise Data Reliability Assessment

Data system wise analysis of reliability grades A / B



- **Municipal Corporation** has **higher data reliability** as compared with Municipalities and Nagar panchayats.
- **Complaint redressal** has a **highest reliability** whereas **wastewater operation** has **lowest data reliability** in all class of cities.
- Over a decade, the reliability of data related to water supply operations, water quality and complaint redressal in nagar panchayats has reduced because of significant increase in newly formed nagar panchayat (from 6 cities in 2010 to 138 in 2020).

## Key Learnings of Data System Strengthening from Pilot Cities

Water and sanitation data management practices in Indian cities are evolving as cities work to address the many challenges they face in ensuring access to safe and reliable water and sanitation services. By improving data systems, cities can better understand and address these challenges.

Some key learnings from water and sanitation data system strengthening efforts include:

- Implementation of data system strengthening activities are gradual but consistent in pilot cities. Patience and adequate time is required to improve government systems.
- Awareness and capacity enhancement of city officials (at all levels - from field staffs to management staffs) are crucial for improvements in data system at city level.
- Availability of skilled human resources and equipment's for measurement and monitoring are key drivers to keep data systems updated regularly.
- Technology solutions, such as mobile apps and sensors are valuable tools for improving water and sanitation data system strengthening efforts. However, technology should be used in such a way that complements existing data system, rather than as a standalone solution.
- Water and sanitation service level data generation, collation and analysis should be integrated with the city officials day to day work and part of their job responsibility.
- For scaling-up data system strengthening approach, state government's direction and monitoring is essential.

# Summary of Measures to Strengthen Water and Sanitation Data Systems in Pilot Cities

- Over the years, CWAS in partnership with various institutions has conducted many studies and supported selected cities for data system improvement in Gujarat and Maharashtra states.
- Data system improvement measures span a wide range, ranging from basic paper-based forms to advanced online automatic monitoring systems equipped with app-based control.
  - Standard data formats for water, wastewater and municipal solid waste management services
  - Household and property survey for water and sanitation using SaniTab app
  - Online module for municipal finance
  - Budget software with standardize budget head and dashboards
  - Preliminary water audit study
  - SaniTrack: Online system for monitoring scheduled de-sludging
  - Standard operating procedures excel based tool for routine water quality surveillance
  - Excel based tool for citizens complaints monitoring
  - San Q: Real time monitoring of FSTP operations with dashboard
- Capacity building for data recording, analysis and management is required to ensure that data is effectively used to inform decision-making and drive resource allocation and policy development in the water and sanitation sector.
- Implementation of various measures to improve data systems is just a starting point towards strengthening them. As the quality of data improves, it becomes necessary to assess the advancements in data-driven decision-making or assessing the impact of the data system strengthening approach on the overall water and sanitation service provision.

# Interrelated Building Blocks in Water and Sanitation Data Systems

## Measures to strengthen the interrelated key building blocks in WASH data system

### Data management

Centralize and standardised data collection, storage, and sharing function.

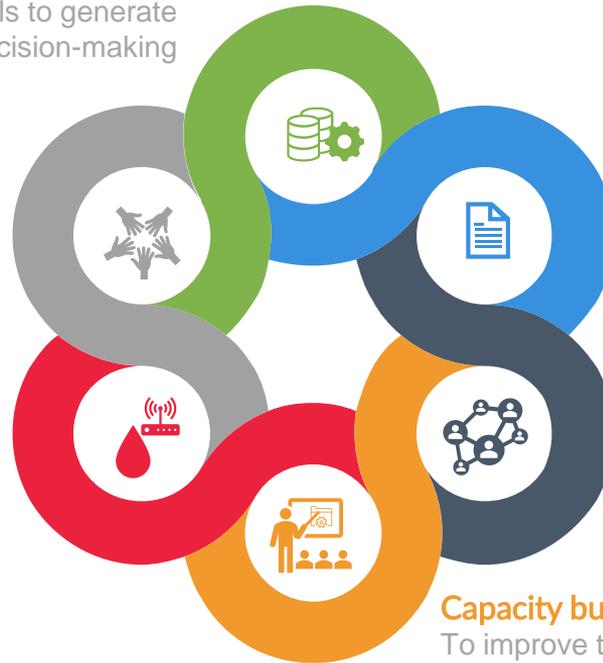
Use data analytics tools to generate insights and use in decision-making

### Stakeholder engagement

With the help of data, engage with citizens, financial institutions and other stakeholders more meaningfully and in transparent ways

### Technology adoption

Use of mobile application, sensors, web based systems to generate, store, transmit, analyse and use data and information



### Enabling policies

Issue guidelines, policies and standard operating procedures to improve data systems like water metering policy

### Governance structure

Establish state level performance monitoring cell to review the service levels and its reliability grade

### Capacity building

To improve the data literacy in government officials, review the staff strength in terms of numbers and staff capacity

# Emerging Measures for National, State and Local Governments (1/2)

Data system strengthening is the cyclic process that involves adjusting the approach based on monitoring results in order to continually enhance the quality and accessibility of data for decision-making.

## National Government

- Governance structure: Include data system strengthening activities like generation of water and sanitation consumer information, establishing monitoring system for measurement of water quantity and wastewater collection and treatment, etc. in Swachh Survekshan or PayJal Survekshan.
- Enabling policies: Link data system improvement measures with performance grant.

## State Government

- Enabling policies: Issue guidelines, policies and standard operating procedures to improve data systems like standardization of property tax assessment forms, water metering policy, water and wastewater treatment, distribution / conveyance / transportation monitoring systems.
- Governance structure: Establish state level performance monitoring cell to review the service levels and its reliability grade. Allocate financial resources for setting up monitoring systems in water, wastewater and municipal solid waste operations.
- Governance structure: Water and sanitation service level data generation, collation and analysis should be integrated with the city officials day to day work and regular updating should be a part of their job responsibility.
- Stakeholder engagement: Share water and sanitation data across different stakeholders, including government agencies, non-governmental organizations, and the private sector. Stakeholders engagement through data sharing improves the coordination, promote transparency and accountability in the water and sanitation sector.
- Capacity building: Review the staff strength in local governments in terms of numbers and staff capacity.
- Data management: Include water and sanitation service coverage and operations details in state level E-governance system. Develop various dashboards to generate insights of water and sanitation services and use in decision-making.

## Emerging Measures for National, State and Local Governments (2/2)

### Urban Local Government

- **Enabling policies:** Implement an open data policy that promotes the release of water and sanitation data to the public in a timely and accessible manner while also protecting the sensitive / personal data. Share water and sanitation service level data in easily understandable formats for citizens.
- **Data management:** Measure service delivery performance at the smallest geographical jurisdiction. When laid out spatially on the city map, offer interesting insights that can be used to enable equality in service provision. Leveraging data for predictive and prescriptive analytics and use to achieve services that are equitable, efficient, sufficient, and sustainable.
- **Technology adoption:** Setting up monitoring systems by installing and using sensors, IoT devices and artificial intelligence in water and wastewater services. Its' costs are often marginal compared to the large investments that are typical for the sector.
- **Capacity building:** Awareness and capacity enhancement of city officials (at all levels - from field staffs to management staffs) to capture, collate and analyse the water and sanitation performance data. Training for data analysis and management to ensure that data is effectively used to inform decision-making and drive policy development in the water and sanitation sector.
- **Stakeholders engagement:** Engage citizens in data collection, such as through reporting water leaks or septic tank / sewer overflow issues. Community generated data can be used to supplement existing data sources, as well as to identify areas where additional data collection is needed. Discuss with citizens about service performance and improvement plans. Establish channels for citizens to provide feedback and ensure that their perspectives and concerns are considered in decision-making processes.



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## Summary

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### Overview of Water and Sanitation Data Management Practices – At the Beginning of PAS Program

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### PAS Approach to Data System Strengthening

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### Overview of Data Reliability Improvements in a Decade

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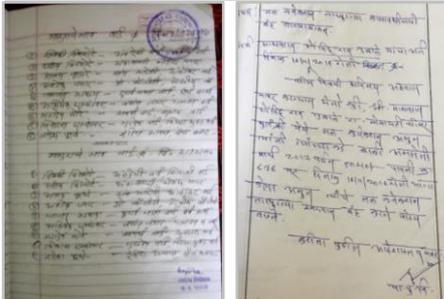
### Recommendations for Data System Strengthening

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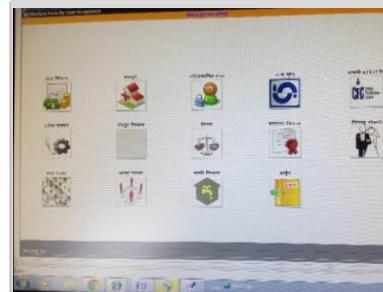
Manual records



Computerised records

Sl. No.	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	Unit
1	2010-2011	571.00	571.00	571.00	571.00	571.00	571.00	571.00	571.00	571.00	571.00	571.00	571.00	571.00	571.00
2	2010-2011	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00
3	2010-2011	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00
4	2010-2011	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00
5	2010-2011	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

E-governance module



Online software

Consumer No.: 10011 10011 Name: MR. SHYAM V. NERALKAR  
 Meter No.: 1001111111 Price: Receipt No.: Zone No.: BE No.:  
 Total Amount: 50 Total Paid Amt: Advance Amt  
 Penalty: 0 Paid Penalty: Payment Mode:  
 Previous Balance: 0 Paid Balance: 0  
 Current Bill: 50 Bill Status: 22/02/2010  
 Balance Amount: Bill No. Code

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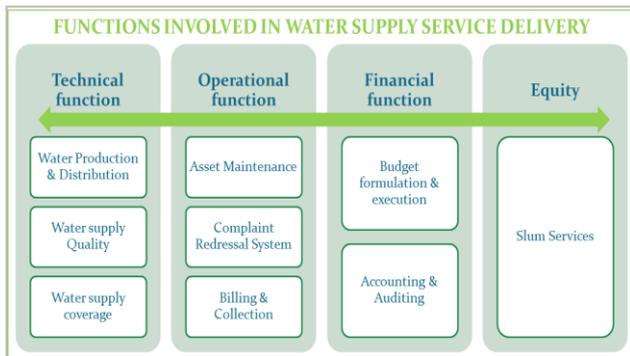


Absence of data recording system at ground level

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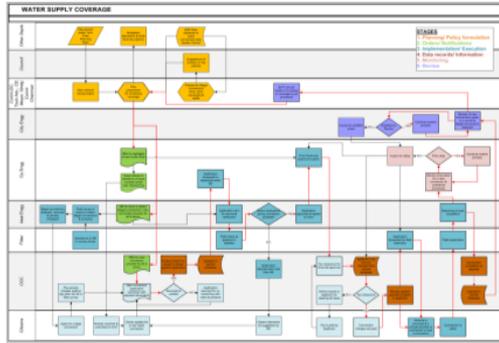


Maintained in isolation and were not usually shared with each other

- There were serious gaps in water supply and sanitation data recording and management in cities of India.
- Based on the pilot study of PAS performance measurement framework, critical data gaps are related to assets condition, relationship between households and connections, household level sanitation facilities, water production and supply, wastewater collection and treatment, and services in urban poor or slum settlements.
- In some aspects such as for monitoring of water quality and consumer grievance redressal, while some data is available, possible problems with reporting system.
- These **gaps in information processing practices** point to the need to develop a **systematic assessment of data reliability** so that data system strengthening can be **planned and measured** along with the service level improvements.

# Data System Strengthening Activities in the Performance Assessment System Program

The performance measurement is only as reliable for meaningful management decisions as the systems that generate the data to compute the performance.



	Existing forms	Proposed forms	GE01	WS01	SE01	WS02	GE02	WS03	SE02	SE0
<b>Water Supply</b>										
Coverage of Water Supply Connections										
Per capita supply of water										
Extent of metering										
Continuity of Water Supply										
Efficiency in redressal of consumer complaints										
Quality of Water Supplied										
Cost Recovery in Water Supply Services										
Efficiency in Water Supply-related Charges										
<b>Sewerage</b>										
Coverage of toilets										
Coverage of sewerage network services										
Collection efficiency of the sewerage network										
Adequacy of sewerage treatment capacity										
Quality of sewage treatment										
Extent of recycling and reuse of sewage										
Efficiency in redressal of customer complaints										
Extent of cost recovery in sewerage management										
Efficiency in collection of sewerage charges										
<b>Solid Waste Management</b>										
Household level coverage of Solid Waste Management services										
Efficiency of collection of municipal solid waste										
Extent of segregation of municipal solid waste										
Extent of municipal solid waste recovered										
Extent of scientific disposal of municipal solid waste										
Efficiency in redressal of customer complaints										
Extent of cost recovery in Solid Waste Management services										
Efficiency in collection of SWM related user charges										

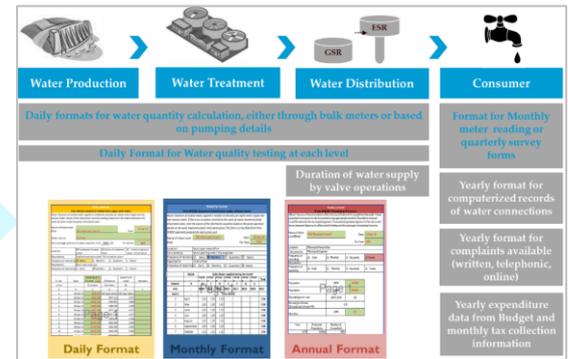
Standardised reliability assessment for key performance indicators in online SLB-PAS module

Review of key process in water and sanitation performance assessment in sample cities

Support to selected cities for preparation of information system improvement plans

Develop methods and tools to improve reliability of key performance indicators

4. Coverage		2020-2021	2021-2022
Reliability parameters for water supply, wastewater, SWM and SWD			
1.1 What is the basis of estimation of			
Hse served with individual water supply connections	1. Through household surveys (1-5 yrs)	YES	YES
	2. Through property tax/billing records	YES	YES
	3. Number of residential connections	YES	YES
	4. Past trends/surveys	YES	YES
	5. Area covered by distribution network	NO	NO
	6. Road covered by network length	NO	NO
Properties served with toilets (individual + community)	1. Through household surveys (1-5 yrs)	NO	NO
	2. Through property tax records	NO	NO
	3. Area covered by toilet facilities	YES	YES
	4. Past trends/surveys	NO	NO
Properties served with sewerage connections	1. Through household surveys (1-5 yrs)	NO	NO
	3. Through property tax records	YES	YES
	1. Number of sewer connections	YES	YES
	4. Past trends/surveys	NO	NO
	5. Area covered by sewer network	YES	YES
	6. Road length covered by sewerage	NO	NO
Households served with septic tank connections / twin pit system	1. Through household surveys (1-5 yrs)	YES	YES
	2. Through property tax records or BU permission records	NO	NO
	3. Past trends/surveys	NO	NO
	4. Area covered by septic tank	YES	YES



# Systematic Approach for Assessment of Data Reliability

*“Reliability of measurement highlights a hitherto ignored aspect in performance management of urban services—the need to design, implement and institutionalise robust systems and processes that will provide data of high reliability, on a repeat basis, and in a consistent manner.” – SLB Handbook, MoUD, GoI*

## Reliability Band for Key Performance Indicators

### Reliability A

Data records are updated regularly based on best available procedure

### Reliability B

Data records maintained as appropriate with at least periodic updating

### Reliability C

Data is extrapolated from a limited sample

### Reliability D

Data is estimated without measurement or documented evidence

- In the PAS program, reliability of each indicator is calculated automatically with a set of questions that address the conditions in each reliability band as listed in the SLB Handbook of Ministry of Urban Development (Now called as Ministry of Housing and Urban Affairs).
- Standardised reliability assessment ensures a transparent and consistent comparison across all cities.
- It also informs cities about the quality of their existing data systems, and encourages them to keep making sequential improvements in their data management systems.

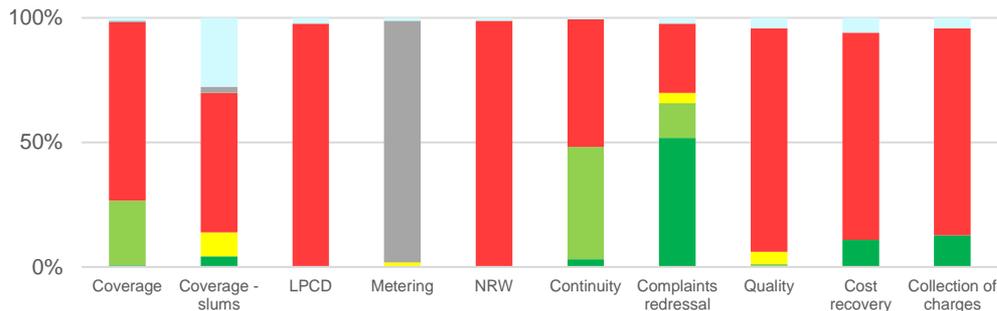
Illustration of reliability assessment for Coverage of Water supply connections

Reliability A

Question	Options	Y/N
What is the basis of estimation of HHs served with individual water supply connections?	1. Through household surveys (1-5 yrs)	Y
	2. Number of residential connections	
	3. Area covered by distribution network	
	4. Road covered by network length	
How are records of HHs served by water supply maintained?	1. Computerized	Y
	2. Only Manual	

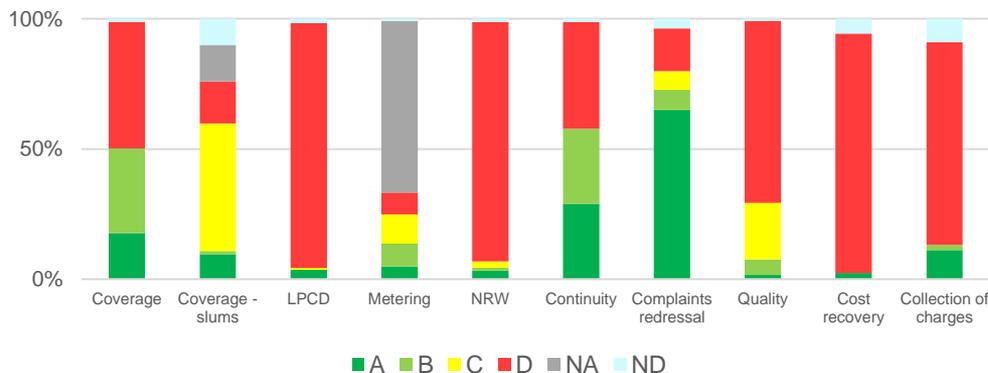
## Analysis of Water Supply Indicators' Reliability – Initial Years of Assessment

Water supply indicators reliability of Gujarat, 2010



- The reliability of water supply key performance indicators was **comparatively higher** only for three indicators, **coverage of water supply connections, continuity of water supply and efficiency in redressal of customer complaints.**
- All cities of Gujarat and 69% cities of Maharashtra did not have flow meters in water system and water meters at consumer ends. Hence volume of water produced, treated and billed cannot be estimated accurately which resulted in **reliability “D”** for **per capita water supply (LPCD), extent of metering and non-revenue water.**
- **Municipal corporations** have a somewhat **established procedure for drinking water quality surveillance.** Whereas **municipalities** conducted water testing from time to time but **did not have a set regime for routine surveillance** and proper documentation.
- Municipalities **finance practice operated on a cash-based system**, where the unpaid bills especially electricity and bulk water charges were not considered.

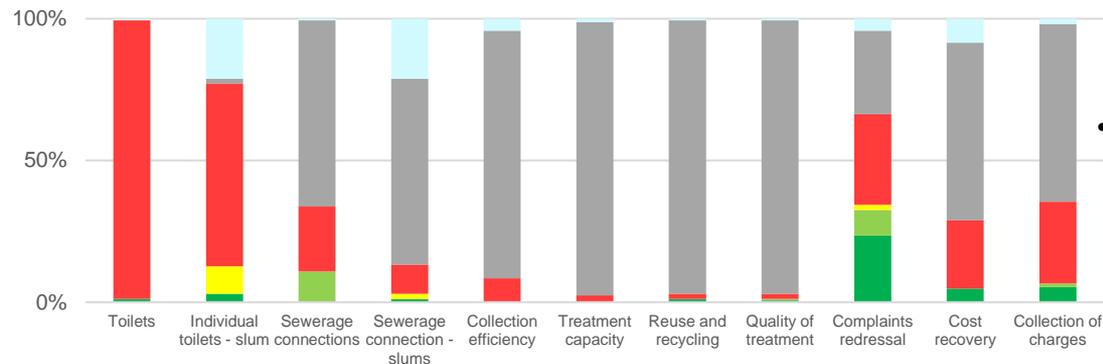
Water supply indicators reliability of Maharashtra, 2010



■ A ■ B ■ C ■ D ■ NA ■ ND

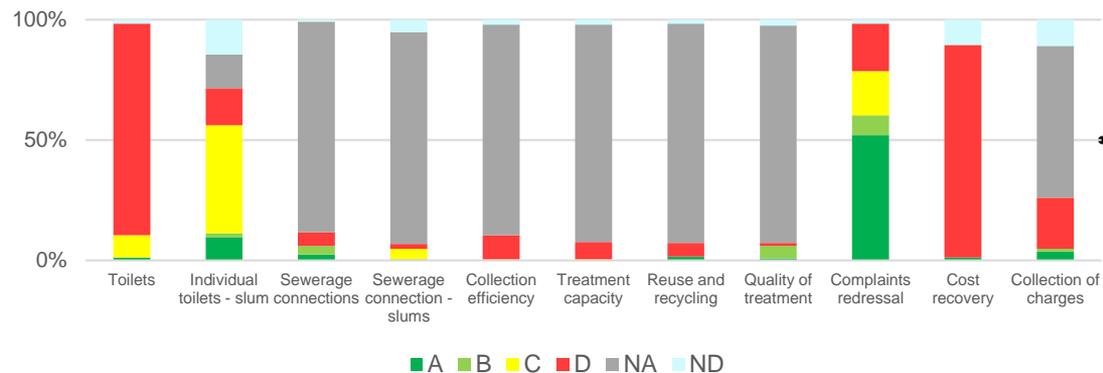
# Analysis of Wastewater Management Indicators' Reliability – Initial Years of Assessment

Wastewater management indicators reliability of Gujarat, 2010



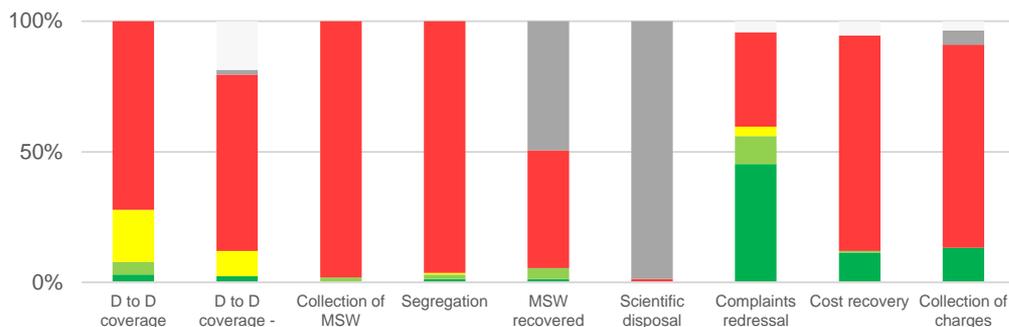
- The reliability of wastewater management key performance indicators was **comparatively higher** only for **sewerage connections** and **efficiency in redressal of customer complaints**.
- In case of onsite sanitation system, mostly citizens are responsible for construction and maintenance of various types of onsite facilities such as septic tanks / single pit / twin pits etc. Hence **coverage of toilets** and **coverage of adequate sanitation** indicators values were of **low reliability**.
- Partial sewerage system was present in 33% of total cities of Gujarat and 11% of total cities of Maharashtra. Therefore **sewerage system related indicators were Not Applicable (NA)** in many cities.
- Where sewerage system was present, still collection efficiency of sewerage system and adequacy of treatment capacity reliability was low because of the wastewater generated. **Wastewater generation** is **depends on the water supply** and data was not accurately measured due to lack of metering at consumer end.

Wastewater management indicators reliability of Maharashtra, 2010



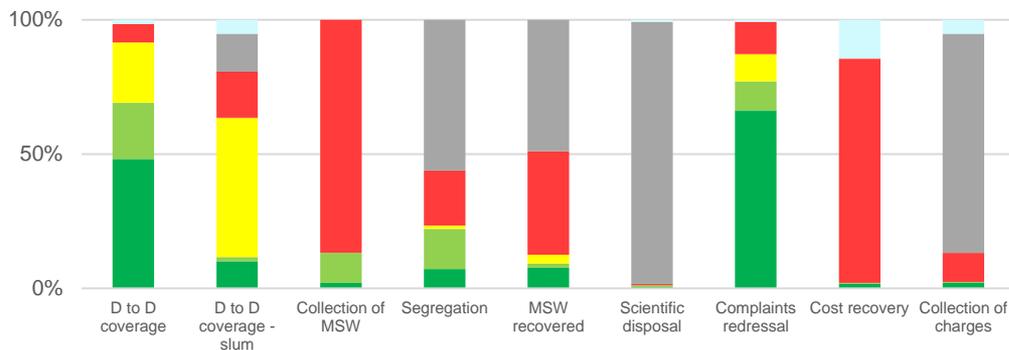
# Analysis of Solid Waste Management Indicators' Reliability – Initial Years of Assessment

Solid waste management indicators reliability of Gujarat, 2010



- The reliability of solid waste management key performance indicators was **comparatively higher** only for **door to door coverage of municipal solid waste collection and efficiency in redressal of customer complaints**.
- Cities did not have appropriate records and systems to estimate waste generation, waste collection and waste recovery. Hence, collection efficiency of municipal solid waste, segregation of municipal solid waste and extent of municipal solid waste recovered indicators value were low reliability grade.

Solid waste management indicators reliability of Maharashtra, 2010



- Cities of Maharashtra states had better reliability grades as compared with cities of Gujarat.
- In Gujarat, only two cities and in Maharashtra, only 3 cities reported values for extent of scientific disposal. So reliability grade was not applicable to most of the cities where there is no scientific disposal facilities.
- Municipalities **finance practice operates on a cash-based system**, where the unpaid bills especially electricity and bulk water charges are not considered.

■ A ■ B ■ C ■ D ■ NA ■ ND

# Sector-wise Availability of Data for Key Performance Indicators

Theme	Water Supply	Wastewater	Solid waste
 <p>Access and coverage including equity</p>	<ul style="list-style-type: none"> <li>HHs level coverage of WS connections</li> <li>Coverage of WS connections in slum settlement</li> </ul>	<ul style="list-style-type: none"> <li>Coverage of toilets</li> <li>Coverage of sewer network</li> <li>Coverage of onsite system</li> <li>Coverage of toilets in slum</li> <li>Coverage of sewer in slum</li> </ul>	<ul style="list-style-type: none"> <li>HHs level coverage of SWM services</li> <li>HHs level coverage of SWM services in slum settlement</li> </ul>
 <p>Service level and quality</p>	<ul style="list-style-type: none"> <li>Per capita supply of water at consumer end</li> <li>Continuity of water supply</li> <li>Quality of water supplied</li> </ul>	<ul style="list-style-type: none"> <li>Collection efficiency of sewerage network</li> <li>Collection efficiency of septage</li> <li>Adequacy of sewage treatment capacity</li> </ul>	<ul style="list-style-type: none"> <li>Efficiency of MSW collection</li> <li>Extent of segregation</li> <li>Extent of MSW processed and recycled</li> </ul>
 <p>Efficiency in service operations</p>	<ul style="list-style-type: none"> <li>Extent of non-revenue water</li> <li>Efficiency in redressal of customer complaints</li> <li>Extent of metering of water connections</li> <li>Efficiency in collection of WS related charges</li> </ul>	<ul style="list-style-type: none"> <li>Quality of sewage treatment</li> <li>Extent of reuse and recycling of sewage</li> <li>Efficiency in redressal of customer complaints</li> <li>Efficiency in collection of sewerage related charges</li> </ul>	<ul style="list-style-type: none"> <li>Extent of scientific disposal of municipal solid waste</li> <li>Efficiency in redressal of customer complaints</li> <li>Efficiency in collection of SWM related user charges</li> </ul>
 <p>Financial sustainability</p>	<ul style="list-style-type: none"> <li>Extent of cost recovery (O&amp;M) in WS services</li> </ul>	<ul style="list-style-type: none"> <li>Extent of cost recovery (O&amp;M) in wastewater</li> </ul>	<ul style="list-style-type: none"> <li>Extent of cost recovery (O&amp;M) in SWM services</li> </ul>

Readily available  
 Limited data available  
 Estimated



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## Summary

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Overview of Water and Sanitation  
Data Management Practices – At the  
Beginning of PAS Program

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PAS Approach to Data System  
Strengthening

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Overview of Data Reliability  
Improvements in a Decade

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Recommendations for Data System  
Strengthening

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# Data System Strengthening Approach

Based on the initial years' performance assessment results, adopted two approaches for water and sanitation data system strengthening in selected pilot cities.

## Linear approach

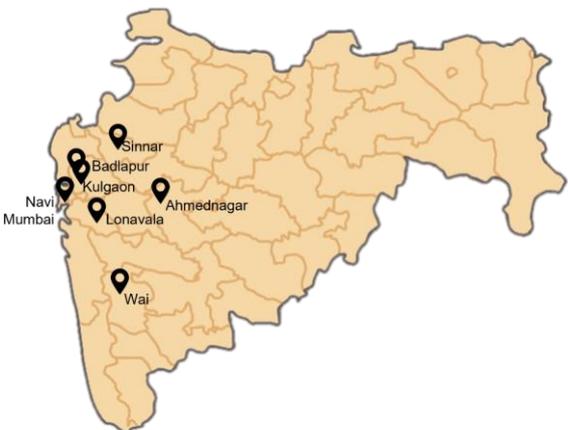
- The linear approach involves a step-by-step process that is designed to improve the quality and availability of data in a systematic way.
- It is a more structured and linear process that involves developing data collection tools / methods, collecting data, and analysing data.
- Focuses only on improving the quality and availability of data related to specific group / individual indicators like Non-revenue water, water quality surveillance, adequate sanitation, etc.

## System approach

- The systems approach takes a holistic view of the entire data system, including the people, processes, and technology involved in collecting, analysing, and disseminating data.
- It recognises that a data system is more than just the data itself, but also includes the organisational structures, policies, and process that support data collection and use.
- Focuses on understanding and improving the entire data system as a whole.

# Data System Strengthening in Pilot Cities

Various information system improvement initiatives were carried out in pilot cities of Gujarat and Maharashtra states:



## Linear approach

**Processes mapping** of water supply and wastewater management services and suggestions for improvement areas in the processes

Gujarat: Rajkot, Nadiad, Kalol, Surendranagar, Unjha, Vadnagar, Kapadvanj and Vallabh Vidyanagar

**Mapping of city's e-governance** system for SLB integration

Maharashtra: Navi Mumbai, Ahmednagar, Wai and Sinnar

**Incorporated SLB indicators** of solid waste management in city's e-governance system

Gujarat: Ahmedabad

**Developed e-governance module** to cover regular operation and maintenance of water supply and wastewater management

Gujarat: Nadiad

**Preliminary water audit** study

Gujarat: Rajkot, Navsari, Morbi, Kalol Anand, Himmatnagar, Kadi, Bardoli, Santrampur, Palanpur and Palitana

Improvement in **drinking water quality surveillance**

Gujarat: Jetpur, Kathlal and Lathi

## System approach

**Information System Improvement Plan** of water supply, wastewater and solid waste management services

Gujarat: Vadodara

**Information system improvement plan** of water supply

Gujarat: Navasari

Developed **standard information system improvement formats** for small and medium cities

Tested in various cities of Gujarat and Maharashtra

# Process Mapping of Water Supply and Sanitation at Local Level

## Methodology for Process Mapping



Identifying key critical processes in water and sanitation service chain



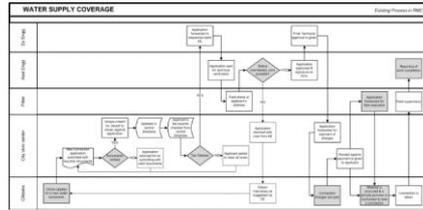
Review and comparative analysis of processes across sample cities



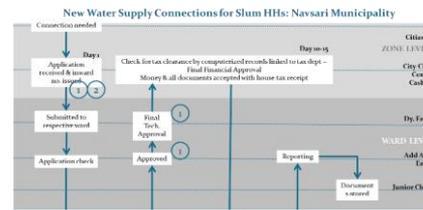
Establish key critical stages / activity for each process



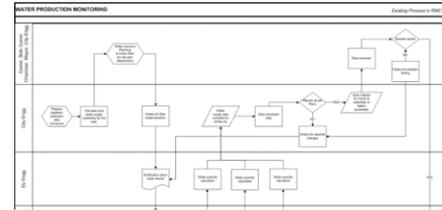
Suggestions for improvement areas in the processes



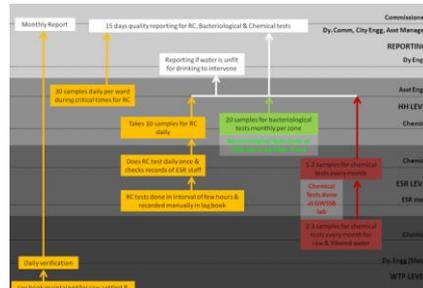
Connection process and regularisation of illegal connections



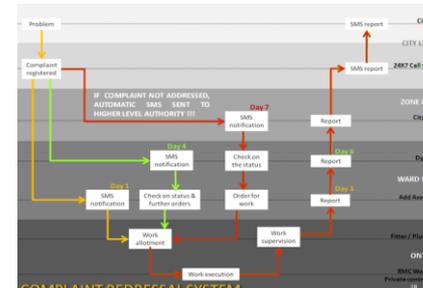
Connection process for new consumers from slum HHs/ BPL families



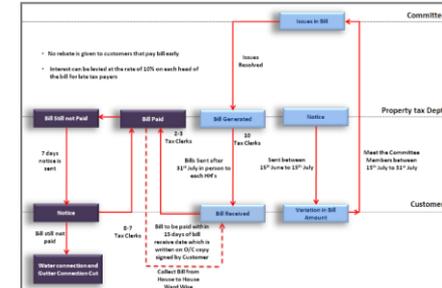
Process for regular updates of water quantity at source, distribution and consumer



Regular water quality surveillance at distribution and consumer end



Process for complaints handling, resolving and reporting back to consumer



Process for production of bills and customer friendly collection systems

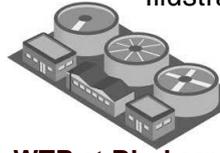
For more information, refer [Process Mapping of Urban Water Supply At Local Level - Center for Water and Sanitation | CRDF | CEPT \(cwas.org.in\)](https://www.cwas.org.in/)

# Mapping of City's E-governance System for SLB Integration

Illustration of E-governance system for water supply services in Navi Mumbai



**Morbe Dam**  
**Water Production**



**WTP at Bhokarpada**  
**Water Treatment**



**Water Distribution**



**Water Consumption**

**Bulk flow meters** installed at all points to measure water production and distribution.

Water produced and distributed monitored through **SCADA system**. (Hourly reports generated)

Water quality tests conducted at **own laboratory** daily

**Monthly meter readings** through  
- Automatic meter reader  
- Manual recording

**Computerized records** for water connections, consumption and billing maintained

**Multiple mechanism** to register complaints available (written, telephonic, online)

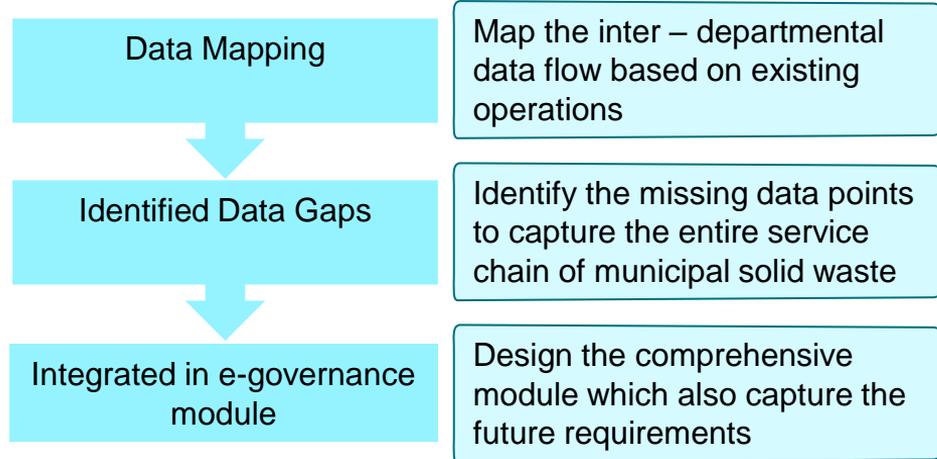
- Documented the existing **data recording and monitoring process** for water supply, wastewater management and solid waste management for Navi Mumbai municipal corporation and ABM MAINet™ (KDMC) module used in municipalities of Maharashtra.

- Assessed the **reliability grades and data availability for service level indicators** of water supply and wastewater management



# Incorporated SLB Indicators of Solid Waste Management in City's E-governance System

## Process of SLB indicators integration in e-governance system

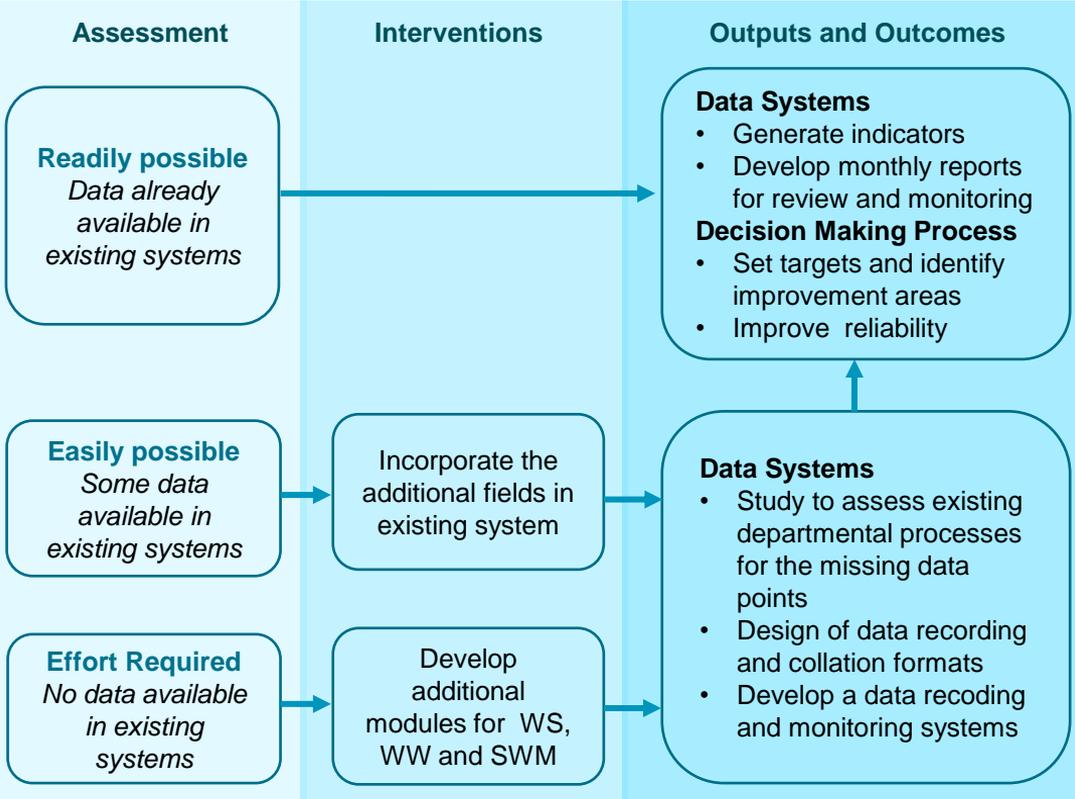


Indicators for Solid Waste Management services	Status of data set covered in e-governance
Household level coverage of solid waste management services	Partially
Efficiency of collection of municipal solid waste	Partially
Extent of segregation of municipal solid waste	In year 2014, there was no segregation at household level
Extent of municipal solid waste recovered	Yes
Extent of scientific disposal of municipal solid waste	Yes
Efficiency in redressal of customer complains	Yes
Extent of cost recovery in SWM services	Covered in Account and property tax dept.
Efficiency in collection of SWM charges	Covered in Property tax dept.
Household level coverage of SWM services in slum	No



# Developed E-governance Module for Regular Operation and Maintenance of Water Supply and Wastewater Management Services

Process diagram for e-governance module for regular operation and maintenance of water supply and wastewater management services



- Collaborated with private service provider for integration of already covered SLB related data in existing e-governance systems and development of new module for regular operation and maintenance of water supply and wastewater management services.
- Three main components of e-governance module:
  - Assets entry:** One time entry of the assets and provisions for the modification, addition, removal of the assets.
  - Operation details:** Entries of the each operations every day
  - Report generation:** Generating reports daily / weekly / monthly.

PAS Project, Cept University (2016-2017) Cept

Dashboard Water Supply Waste Water PERFORMANCE ASSESSMENT SYSTEM ▲

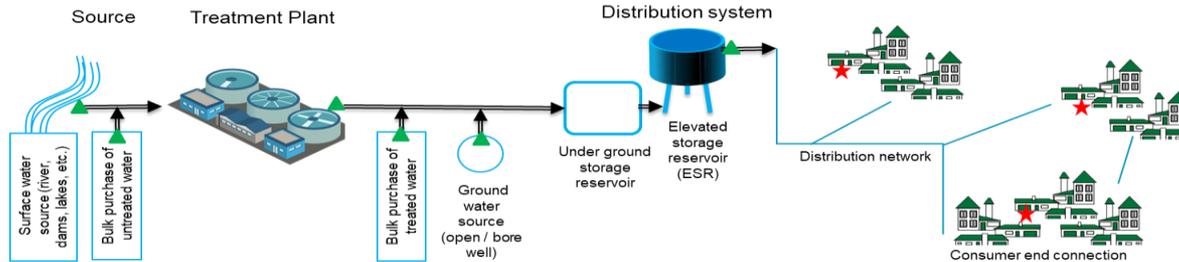
PAS Project, Cept University  
Quantity - Water Production (Value in lakh ltr) From 01/05/2017 to 07/05/2017

Sr No	Date	Source-Ground Water	Source-Surface Water	Source-Bulk Raw	Source-Bulk treated	Quantity
1	01/05/2017	238.3	0.0	0.0	0.0	238.00
2	02/05/2017	242.6	0.0	0.0	0.0	243.00
3	03/05/2017	238.3	0.0	0.0	0.0	238.00
4	04/05/2017	238.3	0.0	0.0	0.0	238.00
5	05/05/2017	242.5	0.0	0.0	0.0	243.00
6	06/05/2017	238.4	0.0	0.0	0.0	238.00
7	07/05/2017	238.3	0.0	0.0	0.0	238.00

# Preliminary Water Audit Study

- Detailed water audit and leak detection are time and resource intensive exercises. Without metering in most cities of Gujarat, it was relatively difficult to estimate quantity of water delivered to the consumers.
- The PAS program has developed a methodology for preliminary water audit that estimated water delivered at consumer level based on a sample survey. Such an exercise can be done very quickly and with limited resources.
- Preliminary water audit methodology is suitable for non-metered water supply system.

## Schematic diagram of water supply indicating water quantity measurement points in preliminary water audit study



▲ Water quantity measurement using portable ultrasonic flow meter (UFM) at source, treatment plant and water distribution station

★ Water quantity measurement using water meters / bucket and stop watch method at consumer end connection

For more information, refer [City Water Audit Methodology - Center for Water and Sanitation | CRDF | CEPT \(cwas.org.in\)](#) and [Preliminary Water Audit Studies in Gujarat - Center for Water and Sanitation | CRDF | CEPT \(cwas.org.in\)](#)

## Preliminary water audit methodology



### Step 1: Preliminary Visits

Preliminary visits included discussions with city officials, documenting existing water supply system, documenting current system of water quantity estimation, site visits for identifying bulk flow measurement points, etc.



### Step 2: Field measurement - At various sources, WTPs and WDSs

Field measurement included bulk flow measurement at various sources, WTPs, WDSs using portable ultrasonic flow meter.



### Step 3: Field measurement - At consumer end

Representative sample survey is carried out at consumer end using water meters, water quantity reached at consumer end is measured for the full supply hours in a day



### Step 4: Preparation of draft report

Based on the field measurement, amount of losses from sources to WTPs, WTPs to WDSs and WDSs to consumers, free water use and illegal consumption were calculated and strategies were prepared to reduce these losses.



### Step 5: Preparation of final report

Results were shared with the elected representatives and councils and their inputs were incorporated in the final report

# Improvement in Drinking Water Quality Surveillance

## Methodology for improvement of water quality surveillance data system



Standard Operating Procedure (SOP) for Routine Water Quality Surveillance in ULBs in Gujarat

UMC

pas performance assessment system

Prepared by  
Urban Management Centre

Under  
PAS program

- Most cities in Gujarat perform some level of quality testing of their drinking water system. City officials conduct Residual Chlorine (RC) testing on site and send water samples to government or accredited laboratories for chemical and bacteriological testing.
- Initial years of PAS data suggest municipal corporations have a somewhat established procedure for drinking water quality surveillance. Municipalities although conduct water testing from time to time but do not have a set regime for routine surveillance and documentation and sharing procedures.
- Therefore, detailed assessment of water quality surveillance process was done in pilot cities.
- To guide cities for establishment of uniform drinking water quality testing and recording process as per the CPHEEO standards, a Standard Operating Procedure (SOP) and excel based quality monitoring tool has been prepared.

For more information, refer [Improvement in Drinking Water Quality Surveillance in Gujarat - Center for Water and Sanitation | CRDF | CEPT \(cwas.org.in\)](#)

# Information System Improvement Plan of Water Supply, Wastewater and Solid Waste Management Services – Vadodara Municipal Corporation

Information system improvement plan covers the improved data recording, transfer, analysis and reporting mechanism of Vadodara for water supply, sewerage and solid waste management sectors

## Methodology for information improvement plan

**Assessment of existing situation**  
of data recording, processing, usage and reporting

**Identification of gaps**  
in the information, use of data gathering/ measuring devices at various installations of water-sanitation, availability of trained staff in basic computer application

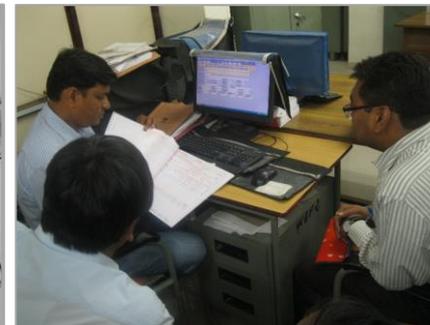
**Recommendations**  
interventions in three categories:  
a) Modification in existing formats and design new forms for gathering data including surveys wherever required  
b) Installation of measuring equipment at various locations  
c) Training and capacity building of staff for implementation of information system improvement plan

Department/officer contributing to water supply indicators	Water supply indicators	Availability of staff	Availability of equipment	Availability of data	Availability of reports	Availability of analysis	Availability of monitoring	Availability of maintenance
Town Planning Chief Town Planner	✓	✓						
Dy. Municipal Commissioner (Admin.) Director (PI) EDPU	✓							
Dy. Municipal Commissioner (General) Chief Accountant SCD Department Asst. MC Revenue								
City Engineer Exec. Engineer (Water Supply)								
Additional City Engineer Exec. Engineer (Drainage) Exec. Engineer (Mech. & SWM)								

Illustration of mapping of various city officers contributing water supply performance data



Illustration of information flow diagram to assess water supply related performance indicators



For more information, refer: [Information System Improvement Plan For Water Supply, Sewerage and Solid Waste Management Sectors in Vadodara - Center for Water and Sanitation | CRDF | CEPT \(cwas.org.in\)](#)

# Information System Improvement Plan of Water Supply Service – Navsari Municipality

## Methodology for information improvement plan

**Assessment of existing situation**  
of data recording, processing, usage and reporting



**Quantification of water at various levels**  
computation of water volume from the tank-level data maintained in the log book



**Consumer end survey**  
for assessment of water quantity, quality and pressure at the consumer end



**Recommendations**  
includes modification / new format, periodic survey, equipment installations, improvements in the water supply process

Rapid assessment of the existing pattern of managing water supply system of Navsari Municipality and identify the immediate improvement areas for better information generation.

water volume computation from different water distribution station of NNP-21/9/2010													Water supply to different zones				
Sr.No	time	period	tank	level at beg	level end	diff	in mt	vol/mt	vol process	pump vol	total vol	total qty	Full press	Middle	Stn sump	Direct	East zone
1	3.45-5.0	1.25	Small tk	10.5	10.5	0	0	82.2	0	217	271		604.398				
2	5.0-7.0	2	Small tk	10.5	12	1.5	0.4542	82.2	37.33524	217	397			2099.721			
3	9.30-11.0	1.5	Small tk	12	8	4	1.2112	82.2	99.56064	217	425					379.75	1893.117
4	11.0-13.50	1.5	Small tk	8	8	0	0	82.2	0	217	326		325.5				
5	18.0-20.0	2	Small tk	8	10	2	0.6056	82.2	49.78032	217	384		750.0837				271.25
6	3.45-5.0	1.25	Big tank	13	16	3	0.9084	280	254.352	470	333	1802.70					
7	5.0-7.0	2	Big tank	16	7	9	2.7252	280	763.056	470	1703						
8	9.5-11.0	1.5	Big tank	16	7	9	2.7252	280	763.056	470	1468						
9	15-16.5	1.5	Big tank	16	7	9	2.7252	280	763.056	470	1468			1468.056			
10	18-19.5	1.5	Big tank	12	16	4	1.2112	280	339.136	470	366						
11	19.50-21.75	2.15	Big tank	8	16	8	2.4224	280	678.272	470	332	5337.26					
12	8.0-10	2	Lunci kui	6.5	0	6.5	6.5	226	1469	522	2513						
13	19.25-21	1.15	Lunci kui	6.5	0	6.5	6.5	226	1469	522	2069	4582.3					2069.3

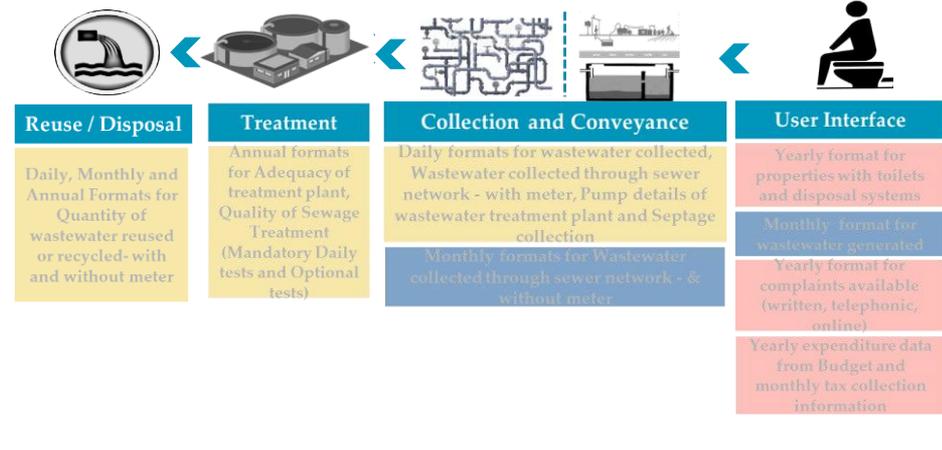
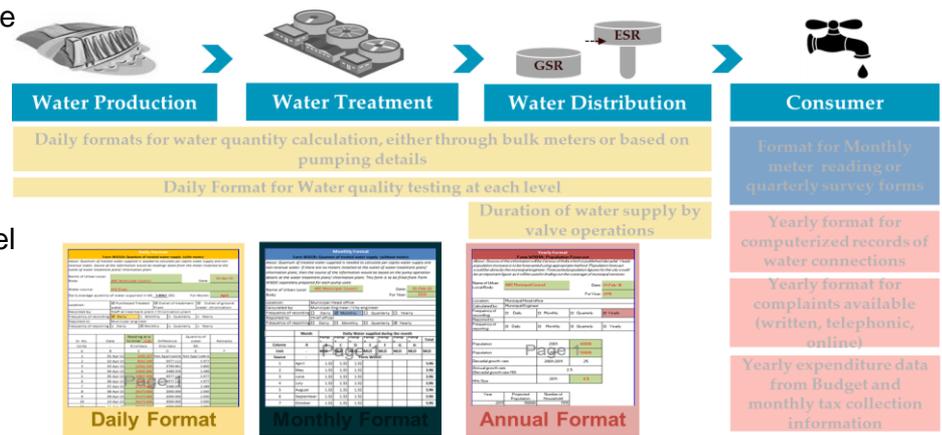
Illustration of water volume computation from different water distribution stations



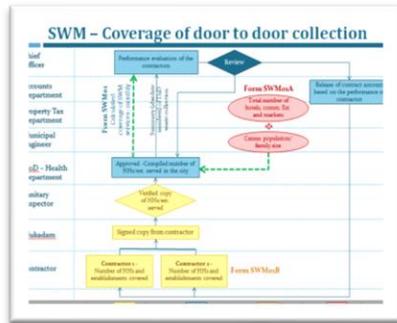
For more information, refer: [Recommendations For Improving Information Documentation For Water Supply in Navsari - Center for Water and Sanitation | CRDF | CEPT \(cwas.org.in\)](#)

# Standard Information System Improvement Formats for Small and Medium Cities

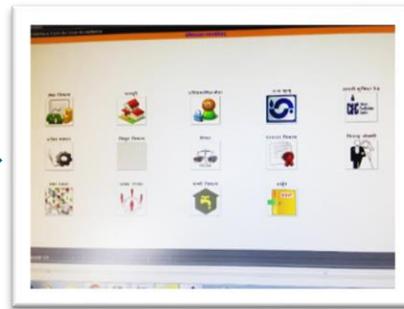
- Developed standard formats for water supply, wastewater (sewerage and onsite sanitation) systems and solid waste management services to improve data recording and processing system.
- These formats are tested in various pilot cities of Gujarat and Maharashtra.
- Three levels of forms: Base level, compilation and survey. Base level form captures lowest level of disintegrated information. Based on information in base level forms, compilation form auto-calculates indicators daily / monthly / quarterly or annually. Survey form provides standard template for consumer survey.



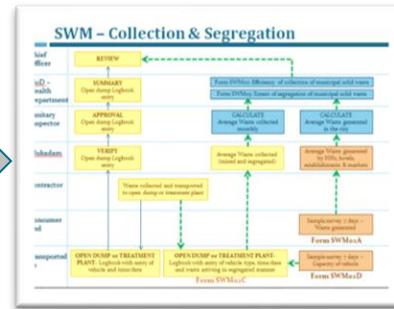
# Strengthening the E-governance System of City – Lonavala Municipality



Study and mapping of all the processes of various departments



Study of the existing e-governance module and complaints app



Gap assessment of computerized and manual processes

KPIs	LMC existing system		PAS
	Manual	Computerized	Proposed System
Household level coverage of solid waste management services	Based on field experience and terms sheet/contract	Based on field experience and terms sheet/contract	Need to understand technology of GIS primary collection from GIS, mobile/phones, basic, meters, meters, etc. I-APP
Efficiency of collection of municipal solid waste	Based on field experience, no records	Based on field experience, no records	Need to assess system performance in the city through operationally ready, have to collect in the APPs/online and transparent to open during maintenance, time taken to issue delivery work/notice and details are submitted by contractor
Extent of segregation of municipal solid waste	Based on field experience, no records	Based on field experience, no records	Need to measure and record the segregated waste collected and transported to report data and to have an online system for monitoring implementation I-APP
Extent of municipal solid waste recovered	Based on field experience, no records	Based on field experience, no records	Need to measure and record the waste transported to these treatment plant (online implementation I-APP)

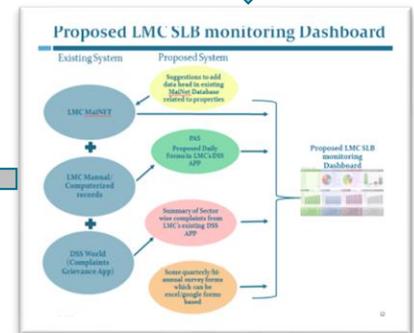
Identification of indicator wise gaps in the PAS-SLB database

Supported Lonavala city to develop required documents for information system improvement in the existing e-governance system and shared standard formats for water and sanitation data recording.



Prepare requirement document for software development

Designing MIS – Forms and format/ software



Standardization of processes

## Key Learnings of Data System Strengthening from Pilot Cities

Water and sanitation data management practices in Indian cities are evolving as cities work to address the many challenges they face in ensuring access to safe and reliable water and sanitation services. By improving data systems, cities can better understand and address these challenges.

Some key learnings from water and sanitation data system strengthening efforts include:

- Implementation of data system strengthening activities are gradual but consistent in pilot cities. Patience and adequate time is required to improve government systems.
- Awareness and capacity enhancement of city officials (at all levels - from field staffs to management staffs) are crucial for improvements in data system at city level.
- Availability of skilled human resources and equipment's for measurement and monitoring are key drivers to keep data systems updated regularly.
- Technology solutions, such as mobile apps and sensors are valuable tools for improving water and sanitation data system strengthening efforts. However, technology should be used in such a way that complements existing data system, rather than as a standalone solution.
- Water and sanitation service level data generation, collation and analysis should be integrated with the city officials day to day work and part of their job responsibility.
- For scaling-up data system strengthening approach, state government's direction and monitoring is essential.



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## Summary

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Overview of Water and Sanitation  
Data Management Practices – At the  
Beginning of PAS Program

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PAS Approach to Data System  
Strengthening

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Overview of Data Reliability  
Improvements in a Decade

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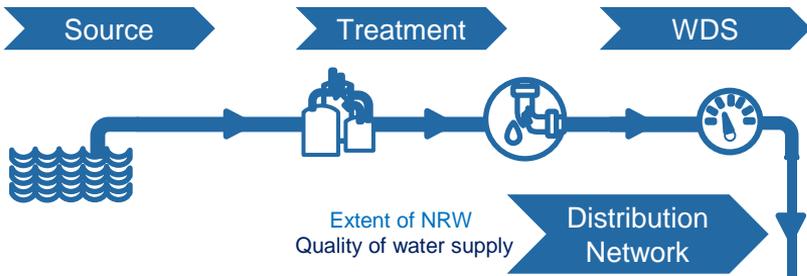
Recommendations for Data System  
Strengthening

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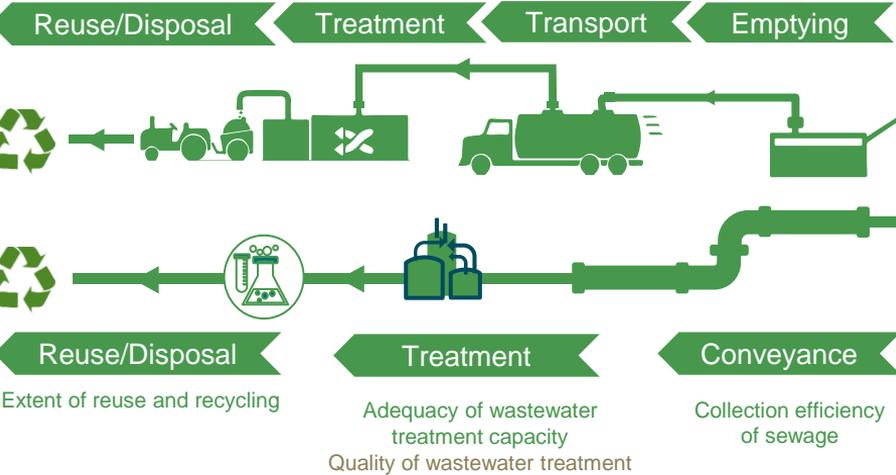
# Water and Sanitation Data System Analysis using Reliability of Service Level Indicators

Access to water supply, toilet, sewerage, adequate sanitation and SWM  
 Per capita water supply  
 Continuity of water supply  
 Extent of metering  
 Complaint redressal  
 Collection of water supply, wastewater and SWM services related charges

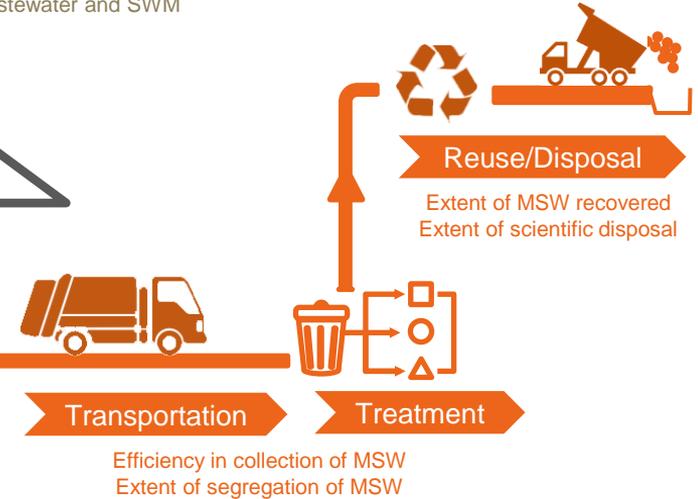
## Water supply service chain



## Wastewater management service chain



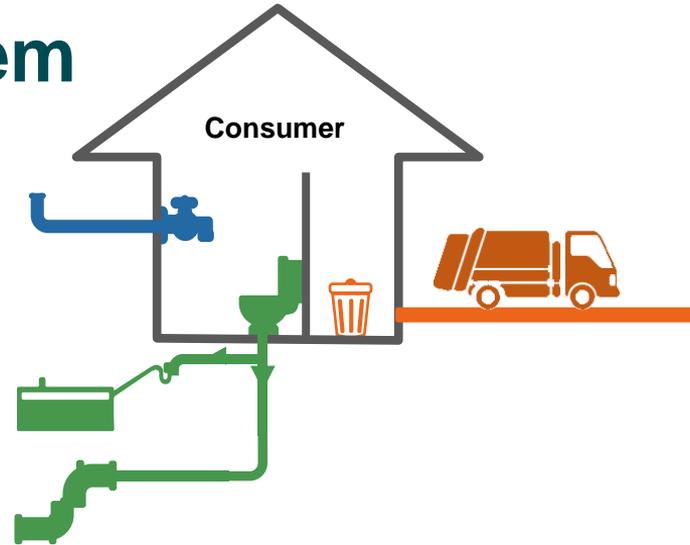
## Solid waste management service chain



## Water and sanitation data systems

- Consumer information system
- Financial system
- Water supply operation system
- Wastewater operation system
- Solid waste operation system
- Complaint redressal system
- Water quality monitoring system
- Wastewater quality monitoring system

# Consumer Information System



Coverage of water supply connections,  
Access to Toilet,  
Coverage of Sewerage,  
Coverage of adequate sanitation, and  
Door to door coverage of municipal solid waste services

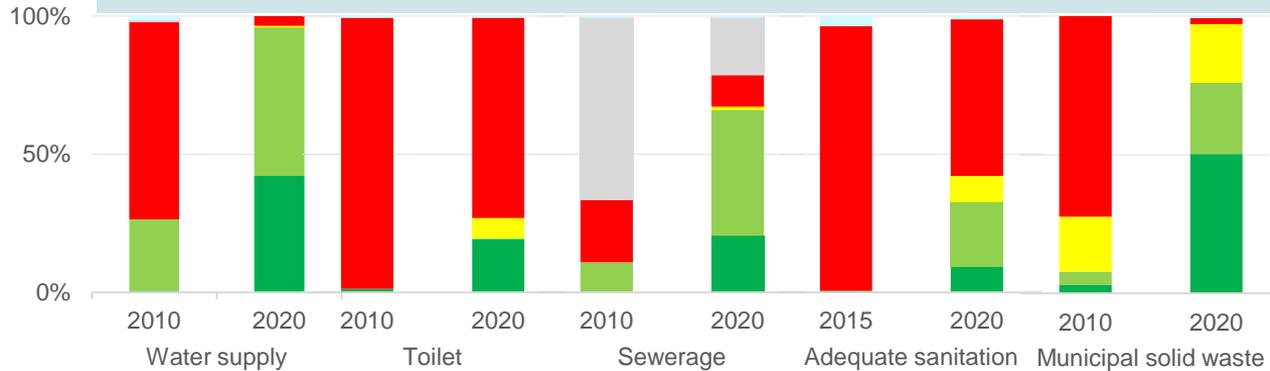
# Information System for Consumer of Water and Sanitation Services

- To provide the municipal services satisfactory, city has to maintain the customer / user information system.
- User information related to water and sanitation services are:
  - Number of households connected with municipal water connections
  - Households depends on community water taps / stand posts
  - Properties with own toilets
  - Households depend on community toilets
  - Properties connected with sewer network
  - Households with own toilets connected with adequate onsite sanitation system (septic tank + soak pit / lined drain, twin pits, eco-san toilets, etc.)
  - Households covered by door to door collection of municipal solid waste services
  - Establishments (commercial property / institutional property / etc.) covered by door to door collection of municipal solid waste services
- Many a times, cities have an isolated or partial data base. For example, water connection information is recorded but users (households) connected with water connections are not recorded; isolated data is kept for households depend on community toilets.
- One of the ways to assess the consumer information systems performance of water and sanitation services is to review the reliability grades of access and coverage indicators.

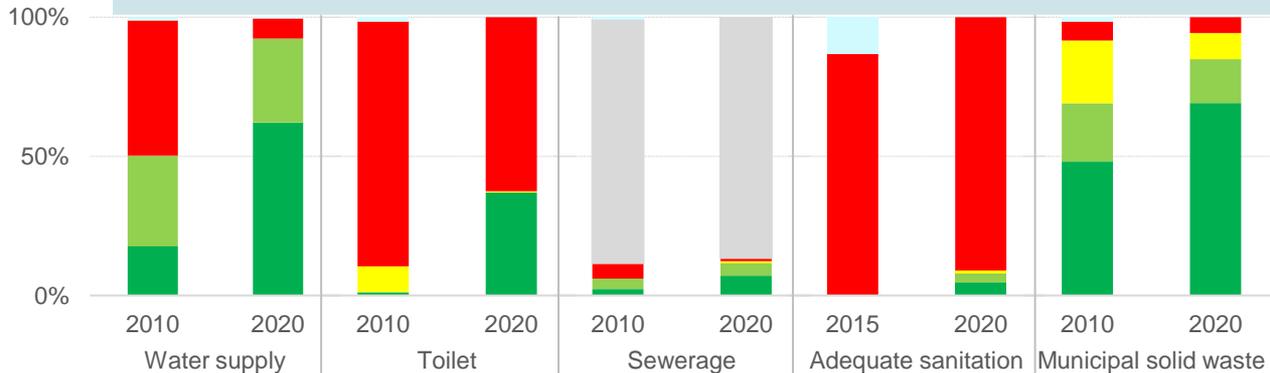
# Assessment of Reliability Improvements - Access and Coverage Indicators

Access and coverage indicators reliability assessment

Gujarat



Maharashtra



■ Reliability A 
 ■ Reliability B 
 ■ Reliability C 
 ■ Reliability D 
 ■ NA – Not applicable 
 ■ ND – No Data

- Reliability of **coverage of water supply connections, sewerage connections and solid waste management services data is improved** in a decade.
- Highest number of cities have reported improvement in coverage of water supply connections data reliability as compared to other services.
- Least reliability improvement is observed in coverage of toilets and access to adequate sanitation data.**

# Assessment of Reliability Improvements – Coverage of Water Supply Connections

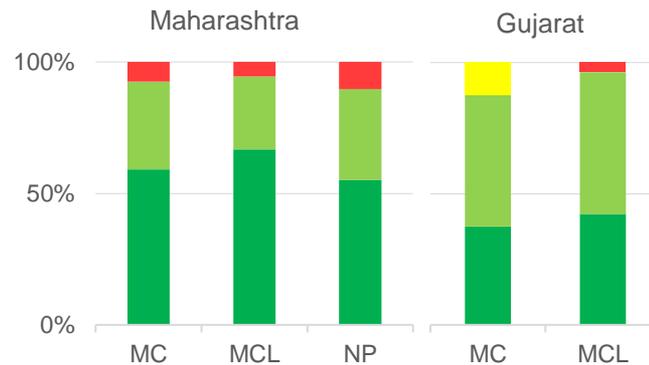
- In the year 2010, only 11% of cities have reported highest level of data reliability (reliability A grade) and 59% of cities have reported lowest level of data reliability (reliability D grade).
- Out of total 572 cities of Gujarat and Maharashtra states for the year 2020, 56% of cities have reported reliability A grade and only 6% of cities have reported reliability D grade.
- Most of the cities levied water taxes (flat rate or volumetric based on usage type, connection size and water usage). Therefore, when cities have started implementation of e-governance system or digitisation of records, water supply connections or water tax billing records were digitised and updated in most of the cities.

Example of summary of water connections, size – wise, monthly and yearly

Question	Options	A	B	C	D
HHs served with individual water supply connections	1.Through household surveys (1-5 yrs)	Y			
	2.Through property tax/billing records				
	3. Number of residential connections		Y		
	4. Road covered by network length			Y	
	5. Area covered by distribution network				Y
How are records of HHs served by water supply maintained?	1. Computerised	Y			
	2. Only Manual				

If none is "Yes", it will calculate D.

Coverage of water supply connections reliability, class-wise, 2020



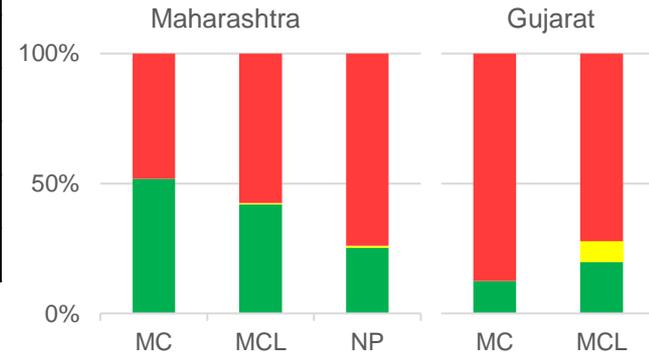
# Assessment of Reliability Improvements – Access to Toilets

- Access to toilets indicator reliability is improved in a decade (from 1% of cities reported reliability A grade in the year 2010 to 32% cities in the year 2020).
- In the year 2020, 37% cities of Maharashtra and 19% cities of Gujarat have reported reliability grade A.
- But still many cities, 63% cities of Maharashtra and 73% cities of Gujarat, have reliability grade D in the year 2020.
- Many cities have done partial or pilot surveys for toilet coverage under Swachha Bharat Abhiyan, but the data one time study-not updated regularly and have manual records.

Sanitation	Underground Drainage Length	How Much Population Will Be Served By Underground Drainage	Sewage Treatment	Septic tank no.		HH No.	No. Of Individual Toilets	No. Of Community Toilets	Septic Tank Cleaning Management	Drainage Tanker Requirement
				Individual	Community					
महाराष्ट्र	अवधी	अवधी	अवधी	अवधी	अवधी	अवधी	अवधी	अवधी	अवधी	अवधी
गुजरात	अवधी	अवधी	अवधी	अवधी	अवधी	अवधी	अवधी	अवधी	अवधी	अवधी

Example of access to sanitation services - manual record

Access to toilets reliability, class-wise, 2020



Question	Options	A	B*	C	D
Properties served with toilets (individual + community)	1. Through household surveys (1-5 yrs)	Y			
	2. Through property tax records			Y	
	3. Area covered by toilet facilities				Y
How are records of properties served maintained for (Toilets)	1. Computerised#	Y		N	
	2. Only Manual#	Y		N	

Notes – \* SLB doesn't define reliability B; # Records are maintained either Computerised or Manual  
If none is "Yes", it will calculate D.

# Assessment of Reliability Improvements – Coverage of Sewerage Connections

- In the year 2010, only 7% of cities have reported highest level of data reliability (reliability A grade) and 61% of cities have reported lowest level of data reliability (reliability D grade).
- Out of total 187 cities with sewerage connection of Gujarat and Maharashtra states for the year 2020, 85% of cities have reported reliability A or B grade and only 13% of cities have reported reliability D grade.
- Sewerage connections are provided by the cities. Therefore in most of the cities, they maintain a sewerage connection register. In cities with sewerage system, around 55% cities levied a sewerage tax and therefore in those cities, sewerage connections record is also linked with the property tax record.

ગટર વિભાગ હેઠળ :-

- સોલ્યુક બિન સોલ્યુક ગટર કનેક્શનની સંખ્યા ( ૩૧ માર્ચ, ૨૦૨૦ ના રોજ સુધી )

(૧) સોલ્યુક ગટર કનેક્શનની સંખ્યા : ૭૬૯૬

(૨) બિન સોલ્યુક ગટર કનેક્શનની સંખ્યા : ૩૮૩૭

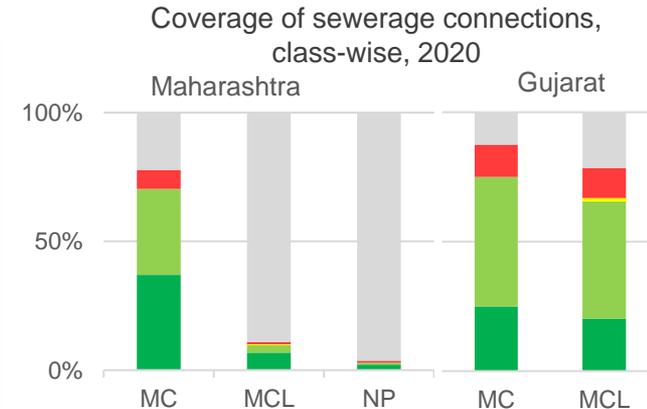
ગટર વિભાગ હેઠળ

રહેણાંક ગટર કનેક્શન	બીન રહેણાંક ગટર કનેક્શન	રીમાકસ
૩૫૭૬	૩૬૭	સુગર્ભ ગટરવેરી કામ બાકી રોવાથી નાખવામા આવેલ નથી

Example of summary of sewerage connections number – residential and non-residential

Question	Options	A	B	C	D
Properties served with sewerage connections	1. Through household surveys (1-5 yrs)	Y			
	2. Through property tax records*		Y		
	3. Number of sewer connections*		Y		
	4. Past trends/surveys*			Y	
	5. Area covered by sewer network				Y
	6. Road length covered by sewerage*			Y	
How are records of properties served maintained for (Sewerage)	1. Computerised#	Y			
	2. Only Manual#	Y			

If none is "Yes", it will calculate D. \*Reliability B / C if data is based on either or options # Records are maintained either Computerised or Manual



## Assessment of Reliability Improvements – Coverage of Adequate Sanitation System

- Coverage of adequate sanitation (sewerage and onsite system) indicator reliability is not improved much in the last 5 years (from 3% of cities reported reliability A grade in the year 2016 to 6% cities in the year 2020).
- In the year 2020, 5% cities of Maharashtra and 9% cities of Gujarat have reported reliability grade A. Whereas many cities, 91% cities of Maharashtra and 57% cities of Gujarat, have reliability grade D in the year 2020.
- Few cities (e.g. Hinganghat, Satara, Lonavala, Jamkhed) have included onsite sanitation related information in the household surveys or in the property tax records. And shown improvements in the toilet and adequate sanitation data reliability. 71% cities have reported manual records for onsite sanitation system.

Question	Options	A	B	C	D
Properties served with sewerage connections	1. Through household surveys (1-5 yrs)	Y			
	2. Through property tax records*		Y		
	3. Number of sewer connections*		Y		
	4. Past trends/surveys*			Y	
	5. Area covered by sewer network*				Y
	6. Road length covered by sewerage			Y	
Households served with septic tank connections / twin pit system	1. Through household surveys (1-5 yrs)	Y			
	2. Through property tax records or BU permission records		Y		
	3. Past trends/surveys			Y	
	4. Area covered by septic tank				
How are records of properties served maintained for (Sewerage)	1. Computerised#	Y			
	2. Only Manual#	Y			

If none is "Yes", it will calculate D. \*Reliability B / C if data is based on either or options # Records are maintained either

Computerised or Manual



Coverage of adequate sanitation system, class-wise, 2020



# Assessment of Reliability Improvements – Door to Door Collection of Municipal Solid Waste

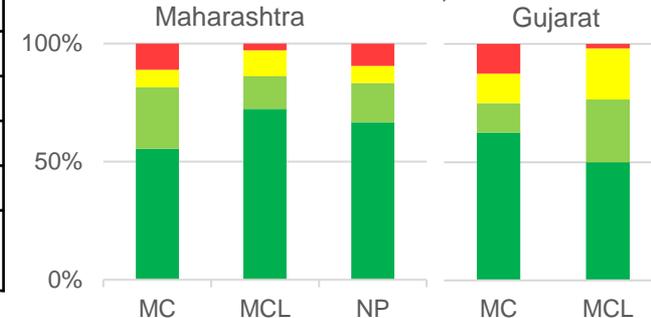
- In the year 2010, 30% of cities have reported highest level of data reliability (reliability A grade) and 33% of cities have reported lowest level of data reliability (reliability D grade).
- Out of total 572 cities of Gujarat and Maharashtra states for the year 2020, 64% of cities have reported reliability A grade and only 5% of cities have reported reliability D grade.
- City is providing services related to door to door collection of municipal solid waste. Most of the cities have contract and payment linked with the area / establishments covered by door to door collection of MSW. Therefore, reliability grade of this indicator was higher even in the year 2010 in many cities.
- But 84% cities of Gujarat and Maharashtra have manual records for door to door collection of municipal solid waste.

Example of door to door collection of MSW – daily record

Question	Options	A	B	C	D
HHs and establishments served by door to door collection	1. Through household surveys (1-5 yrs)	Y			
	2. Quantity of waste collected		Y		
	3. No. of wards served			Y	
How are records of properties served maintained for (Solid waste management)	1. Computerised#	Y			
	2. Only Manual#	Y			

If none is "Yes", it will calculate D. # Records are maintained either Computerised or Manual

Door to door collection of MSW, class-wise, 2020



## Measures to Strengthen Water and Sanitation Consumer Information System (1/4)

- In most cities, data related to water and sewerage connections are linked with property tax database and records are maintained for regular door to door collection of municipal solid waste services. Therefore reliability of this data is higher.
- Under the Swachh Bharat Mission, cities have done partial or pilot surveys related to toilet coverage and access to adequate sanitation indicators. And few cities have incorporated onsite sanitation related information in the household surveys or in the property tax records. Hence, 32% cities of Gujarat and Maharashtra has reliability A in coverage of toilet indicator.
- CWAS tested a few ways to improve data systems related to access to water and sanitation services:
  - Modification in existing property tax re-assessment survey forms
  - Household and property survey for water and sanitation using SaniTab app followed by linkages with property data systems at city level for standard updates
  - Link with the e-governance system at state / city level

# Measures to Strengthen Water and Sanitation Consumer Information System (2/4)

Household and property survey for water and sanitation using SaniTab app

- In Vita city of Maharashtra, water and sanitation survey was carried out to create a database specifically for toilets and onsite sanitation system in city. Survey was done through SaniTab app.
- Survey results were further used in identifying additional infrastructure requirement for implementing scheduled desludging and to prepare Water+ strategy in the city.



**~50,000**  
Population



**11,428**  
Households



**14,720**

Total properties

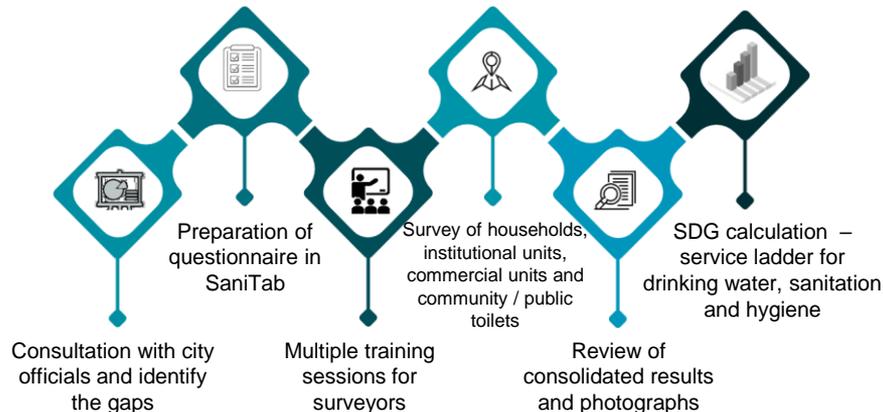


**12**  
Wards

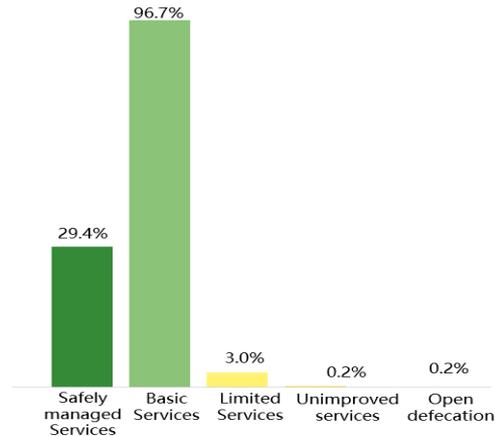


**57** Sq.Km  
Area

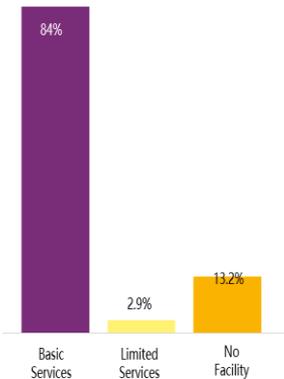
## Survey Methodology



## Sanitation ladder



## Handwashing ladder





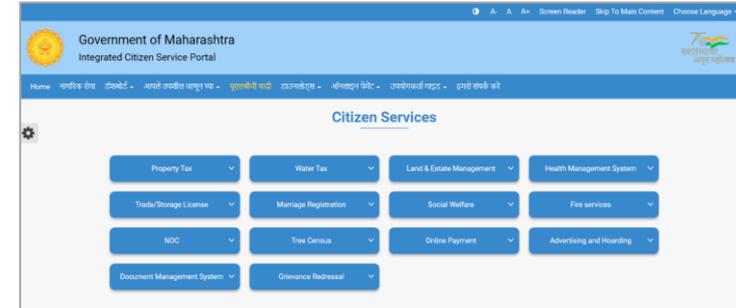
# Measures to Strengthen Water and Sanitation Consumer Information System (4/4)

Link with the e-governance system at state / city level

- Most municipal corporations have their own e-governance system.
- Urban development and housing department of Gujarat has implemented an e-Nagar project for online citizen centric services to cities.
- Directorate of municipal administration (DMA) Maharashtra has initiated an integrated web based solution for various municipal services.
- Various e-governance system captures information related to properties connected with municipal water supply and sewer networks.
- Consumer information system can be improved by adding data fields related to households within residential properties and onsite sanitation systems in e-governance portals.
- Holistic and integrated consumer information system can also be useful to communicate with citizens, for example, inform citizen in case of disruption in water supply timings or issue drinking water advisory in case of contamination.



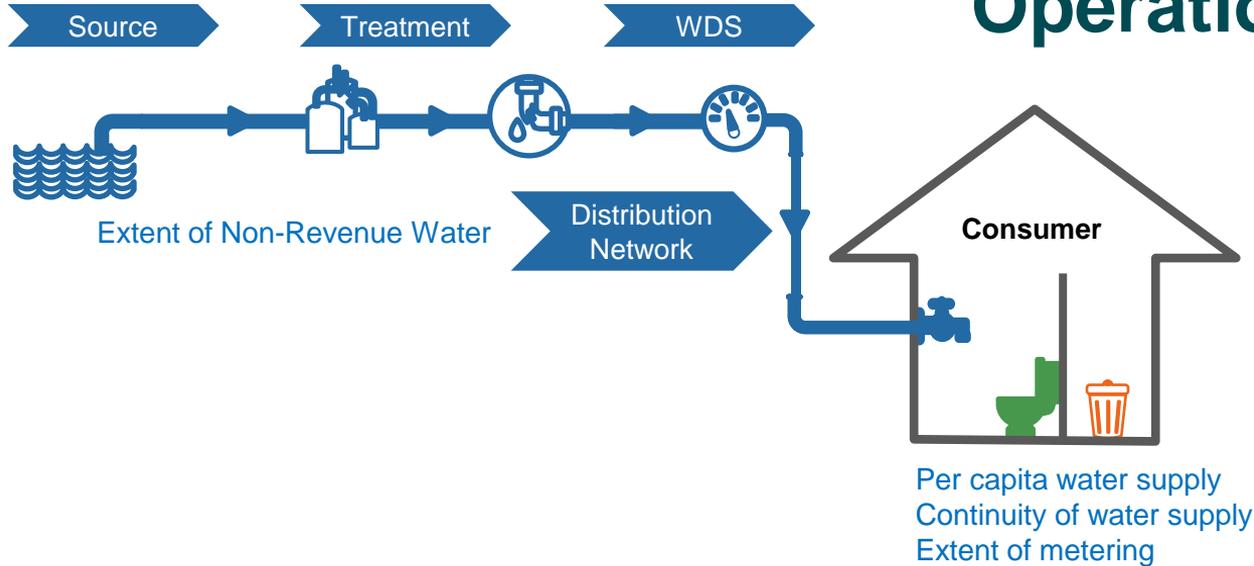
E-Nagar portal, Gujarat



Integrated citizen service portal, Maharashtra

# Water Supply Operation Data System

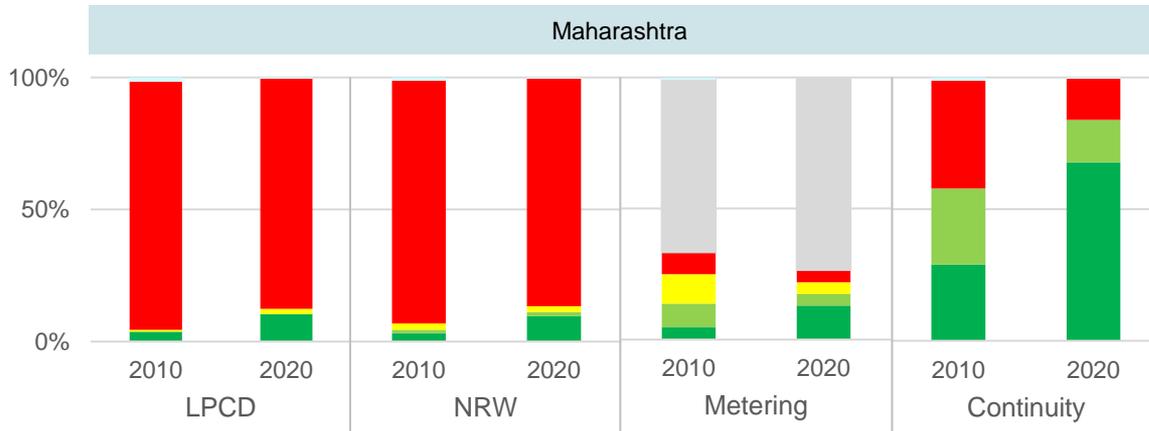
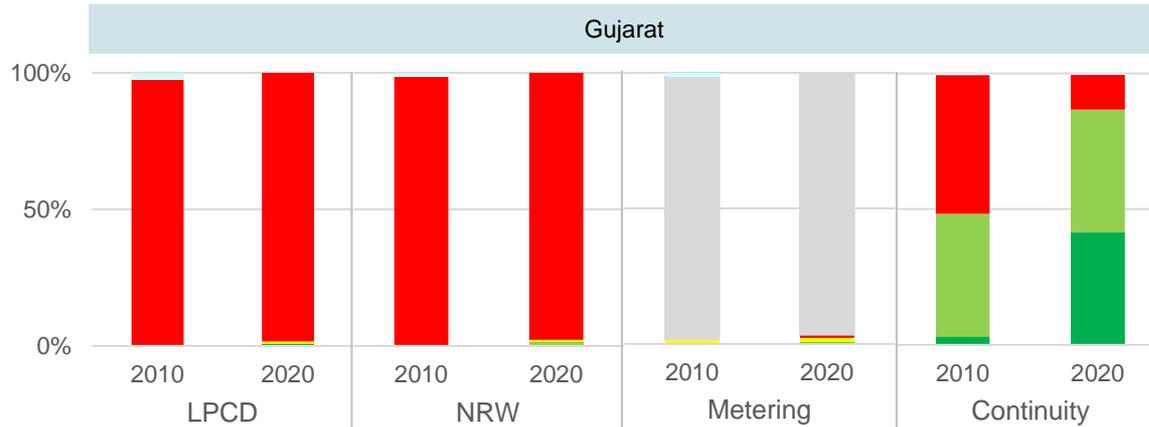
## Water supply service chain



## Water Supply Operation Data System

- In water supply operation data system, metering is very important component. Due to lack of bulk flow meters at various locations in the water supply system, quantity of water extracted from sources, treated at treatment plant and distributed from various distribution stations are not readily available. It will lead to an unequal distribution of water.
- At consumer end, if water meters are not present then water quantity used by various consumers are unknown. This will lead to an careless behaviors in consumers and act as a barrier in water conservation.
- One third cities of Maharashtra and Gujarat have reported bulk flow meters at treatment plants.
- Consumer end metering is present in 26% cities of Maharashtra. Only 4 municipal corporations (Bhavnagar, Jamnagar, Surat and Vadodara) of Gujarat have reported partial water metering.

# Assessment of Reliability Improvements – Water Supply Operation Indicators



■ Reliability A 
 ■ Reliability B 
 ■ Reliability C 
 ■ Reliability D 
 ■ NA – Not applicable 
 ■ ND – No Data

- Highest number of cities have reported **improvement in continuity of water supply indicators** as compared to other water supply operational indicators.
- **Due to lack of metering** (consumer end and even at sources / treatment plants / distribution stations), **least cities** have reported improvements in **LPCD and NRW related indicators**.
- Higher number of cities in Maharashtra has extent of water meters in water supply network. Whereas only countable cities (of only municipal corporations) in Gujarat have partial metering in water supply network.

# Assessment of Reliability Improvements – Litres Per Capita per Day (LPCD)

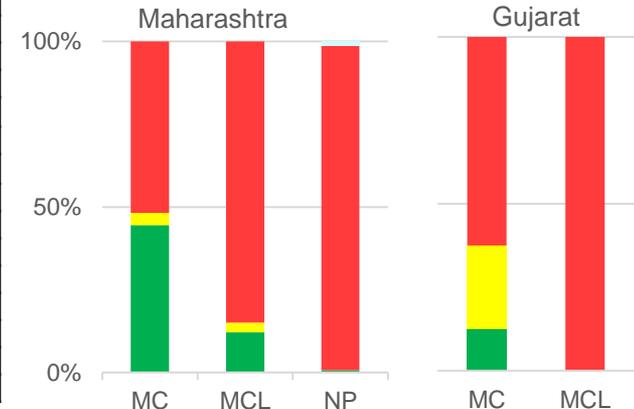
- In the year 2010, only 2% of cities have reported highest level of data reliability (reliability A grade) and 95% of cities have reported lowest level of data reliability (reliability D grade).
- Out of total 572 cities of Gujarat and Maharashtra states for the year 2020, only 7% of cities have reported reliability A grade. Whereas 90% of cities have reported reliability D grade and 2% cities have reported reliability C.
- In Maharashtra, Municipal Corporation has higher data reliability as compared with Municipalities and Nagar panchayats. All municipalities in Gujarat have reliability D grade.

Example of log book maintained at WTP and ESR

Question	Options	A	B*	C	D
Basis of measurement of water produced at WTP/tube wells	1. Bulk flow meters	Y			
	2. Pump/level details				
Basis of measurement of water supplied from bulk distribution points	1. Bulk flow meters	Y			
	2. Pump/level details				Y
	3. Periodic sample surveys			Y	
How are records maintained at WTP/tube wells?	1. Computerised	Y			
	2. Only Manual				
How are records maintained at bulk distribution points like ESRs, etc?	1. Computerised	Y			
	2. Only Manual				
Extent of metering of connections	1. At all consumer points				
	2. Only bulk & commercial consumers			Y	
How is household consumption estimated?	1. Meters installed at all consumer points	Y			
	2. Periodic Survey			Y	
	3. Spot Survey				
	4. Ferrule size and hours of supply				
Record Keeping	1. Computerised	Y			
	2. Only Manual				

\* Note – SLB doesn't define reliability B; if none is "Yes", it will calculate D.

Liter per capita per day (LPCD) reliability, class-wise, 2020



# Assessment of Reliability Improvements – Non-Revenue Water (NRW)

- In the year 2010, only 3% of cities have reported higher level of data reliability (reliability A / B grades) and 95% of cities have reported lowest level of data reliability (reliability D grade).
- Out of total 572 cities of Gujarat and Maharashtra states for the year 2020, only 9% of cities have reported higher reliability grades (A or B). Whereas 90% of cities have reported reliability D grade.
- In Maharashtra, Municipal Corporation has higher data reliability as compared with Municipalities and Nagar panchayats. None of the cities in Gujarat have reported higher reliability Grade A and all municipalities have reliability D in NRW indicator.

**MH KRASHIYA JEEVAN PRADEHARAN, DIVISO, "JUVATMAL"**  
Yavatmal Water Supply Scheme.

1 Name of water works: Yavatmal Water Supply Scheme.      2 HRS: February 2019      (No. LABS)

2 Design capacity in MLD: 33.74 MLD      3 Present working hours: 5 Month

3 Present supply in MLD: 21.00 MLD      AVERAGE

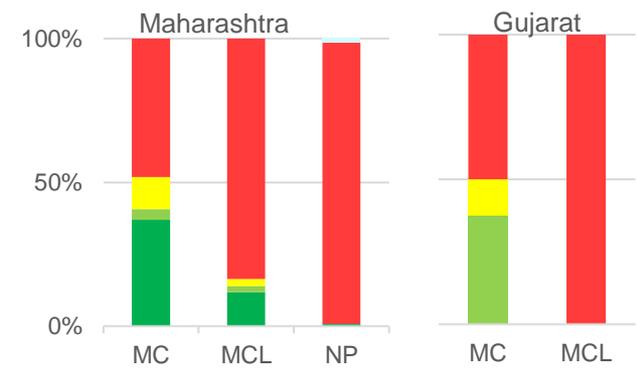
Monthly Information of Water Works

Sl. No.	Head of Accounts	Year	Monthly Information of Water Works												Total	
			April	May	June	July	August	September	October	November	December	January	February	March		
Raw water (MLD)			2013-2014	927.00	917.80	814.10	902.10	1011.16	975.91	1014.20	901.86	1014.31	1011.90	900.15	1005.40	11505.21
Pure Water (MLD)			2013-2014	544.97	566.46	4629.83	866.36	739.89	863.93	966.23	922.74	936.40	891.00	826.69	949.61	11190.62
Billed Water (MLD)			2013-2014	527.00	517.80	414.10	495.84	571.27	542.02	583.49	564.26	565.00	565.00	565.00	565.00	6666.59
Difference			2013-2014	382.03	349.04	349.04	406.26	439.89	421.89	382.74	371.14	326.00	330.60	434.61	4828.92	

Example of compilation of raw, treated and billed water

Question	Options	A	B	C	D
Basis of measurement of water produced at WTP/tube wells	1. Bulk flow meters	Y	Y		
	2. Pump/level details				Y
Basis of measurement of water supplied from bulk distribution points	1. Bulk flow meters	Y	Y		
	2. Pump/level details				
	3. Periodic sample surveys			Y	
Extent of metering of connections	1. At all consumer points	Y			
	2. Only bulk & commercial consumers		Y	Y	
How is household consumption estimated?	1. Meters installed at all consumer points	Y			
	2. Periodic Survey				
	3. Spot Survey				
	4. Ferrule size and hours of supply		Y		
Record Keeping	1. Computerised	Y			
	2. Only Manual				

Non-revenue water (NRW) reliability, class-wise, 2020



if none is "Yes", it will calculate D.

# Assessment of Reliability Improvements – Metering of Water Connections

- In the year 2010, only 8% of cities have reported higher level of data reliability (reliability A / B grades) and 13% of cities have reported lower level of data reliability (reliability C/ D grade). 78% cities reported lack of consumer end metering.
- Only 12% cities have reported higher level of data reliability (reliability A / B grades) and 8% of cities have reported lower level of data reliability (reliability C/ D grade). 80% cities reported lack of consumer end metering for the year 2020.
- In Maharashtra, Municipal Corporation has higher data reliability as compared with Municipalities and Nagar panchayats. None of the municipalities in Gujarat have consumer end metering.

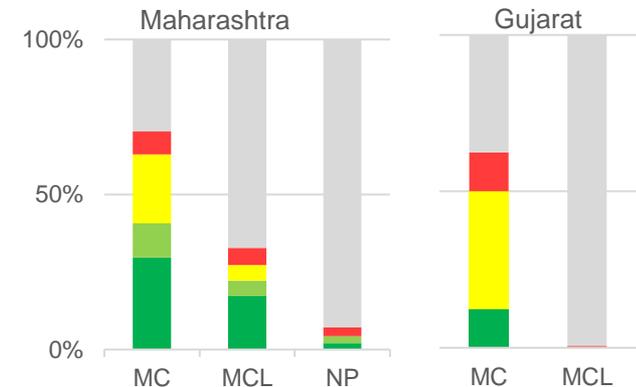
Head of Accounts	Year	April		May		June		July		August		September		October		November		December		January		February		March		Total	
		3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25			
No. of connections	2014-2015	28359	28409	28469	28519	28579	28629	28679	28729	28779	28829	28879	28929	28979	29029	29079	29129	29179	29229	29279	29329	29379	29429	29479	29529	29579	
	2015-2016	29679	29689	29699	29709	29719	29729	29739	29749	29759	29769	29779	29789	29799	29809	29819	29829	29839	29849	29859	29869	29879	29889	29899	29909	29919	
	2016-2017	30989	30999	31009	31019	31029	31039	31049	31059	31069	31079	31089	31099	31109	31119	31129	31139	31149	31159	31169	31179	31189	31199	31209	31219	31229	31239
	2017-2018	32382	32402	32422	32442	32462	32482	32502	32522	32542	32562	32582	32602	32622	32642	32662	32682	32702	32722	32742	32762	32782	32802	32822	32842	32862	
No. of Water meters	2014-2014	27402	27462	27522	27582	27642	27702	27762	27822	27882	27942	28002	28062	28122	28182	28242	28302	28362	28422	28482	28542	28602	28662	28722	28782	28842	
	2014-2015	28236	28296	28356	28416	28476	28536	28596	28656	28716	28776	28836	28896	28956	29016	29076	29136	29196	29256	29316	29376	29436	29496	29556	29616	29676	
	2015-2016	29579	29589	29599	29609	29619	29629	29639	29649	29659	29669	29679	29689	29699	29709	29719	29729	29739	29749	29759	29769	29779	29789	29799	29809	29819	
	2016-2017	30964	30969	30974	30979	30984	30989	30994	30999	31004	31009	31014	31019	31024	31029	31034	31039	31044	31049	31054	31059	31064	31069	31074	31079	31084	
No. of Water meter (working)	2014-2014	25681	25621	25717	25646	25742	25671	25767	25696	25792	25721	25817	25746	25842	25771	25867	25796	25892	25821	25917	25846	25942	25871	25967	25896	26002	
	2014-2015	26355	26390	26426	26462	26498	26534	26570	26606	26642	26678	26714	26750	26786	26822	26858	26894	26930	26966	27002	27038	27074	27110	27146	27182	27218	
	2015-2016	27757	27757	27854	27850	27947	27943	28040	28036	28133	28129	28230	28226	28327	28323	28424	28420	28521	28517	28618	28614	28715	28711	28812	28808	28909	
	2016-2017	27956	28103	28243	28383	28523	28663	28803	28943	29083	29223	29363	29503	29643	29783	29923	30063	30203	30343	30483	30623	30763	30903	31043	31183	31323	
No. of Stand posts	2014-2014	213	213	213	213	213	213	213	213	213	213	213	213	213	213	213	213	213	213	213	213	213	213	213	213		
	2014-2015	213	213	213	213	213	213	213	213	213	213	213	213	213	213	213	213	213	213	213	213	213	213	213	213		
	2014-2016	213	213	213	213	213	213	213	213	213	213	213	213	213	213	213	213	213	213	213	213	213	213	213	213		
	2016-2017	213	213	213	213	213	213	213	213	213	213	213	213	213	213	213	213	213	213	213	213	213	213	213	213		

Example of compiled water connections details showing water meters / meter working

Question	Options	A	B	C	D
Are records maintained for charges collected against the specific bill issued? (WS)		Y			
Are billing and collection records regularly updated?		Y			
Extent of metering of connections	1. At all consumer points	Y	Y		
	2. Only bulk & commercial consumers			Y	
How are functional meters assessed?	1. Regular reading and billing of meters	Y			
	2. Spot checks				
How is household consumption estimated?	1. Meters installed at all consumer points	Y			
	2. Periodic Survey				
	3. Spot Survey				
	4. Ferrule size and hours of supply				
Record Keeping	1. Computerised	Y	Y		
	2. Only Manual				

if none is "Yes", it will calculate D.

Metering of water connections reliability, class-wise, 2020



# Assessment of Reliability Improvements – Continuity of Water Supply

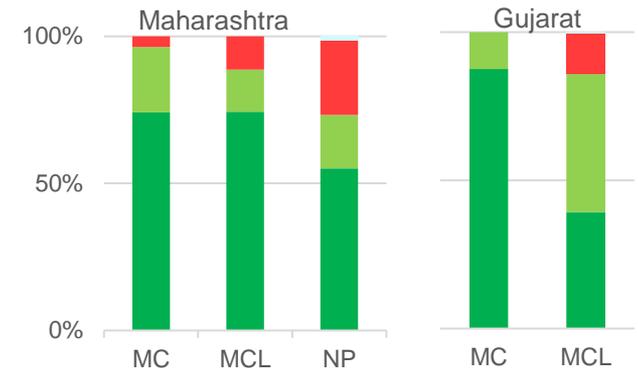
- In the year 2010, only 19% of cities have reported highest level of data reliability (reliability A grade) and 45% of cities have reported lowest level of data reliability (reliability D grade).
- Out of total 572 cities of Gujarat and Maharashtra states for the year 2020, 60% of cities have reported reliability A grade. Whereas only 15% of cities have reported reliability D grade.
- In most of the cities, valve operations are fixed / pre-defined and documented.
- In both the states, lower reliability are mostly reported in municipalities and Nagar panchayats.

Example of continuity related document

Question	Options	A	B	C*	D
How is the duration of water supplied for the city estimated?	1. Valve operating points across zones	Y	Y		
	2. Periodic surveys				
	3. Feedback from city field engineers				Y
Is adequacy of pressure and hours of supply at consumer end assessed?		Y			

\* Note – SLB doesn't define reliability C; if none is "Yes", it will calculate D.

Continuity of water supply reliability, class-wise, 2020



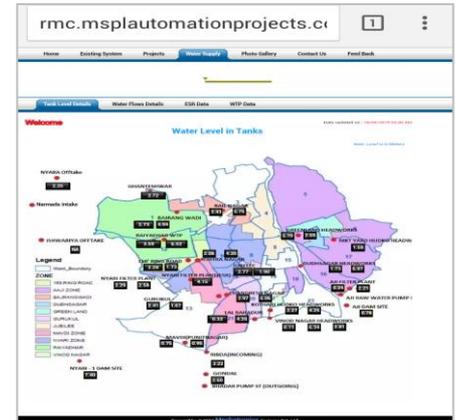
# Measures to Strengthen Water Supply Operation Data System

- Due to lack of metering in most cities of Gujarat, CWAS developed a preliminary water audit methodology. This study has been conducted in 12 cities of Gujarat.
- To strengthen the water supply operations, installation of flow meters, pressure gauge, level sensors and consumer water meters are very crucial. Efficiency of water supply operations will be measured through these instruments.
- Real time online monitoring system for water quantity and calculation of losses.



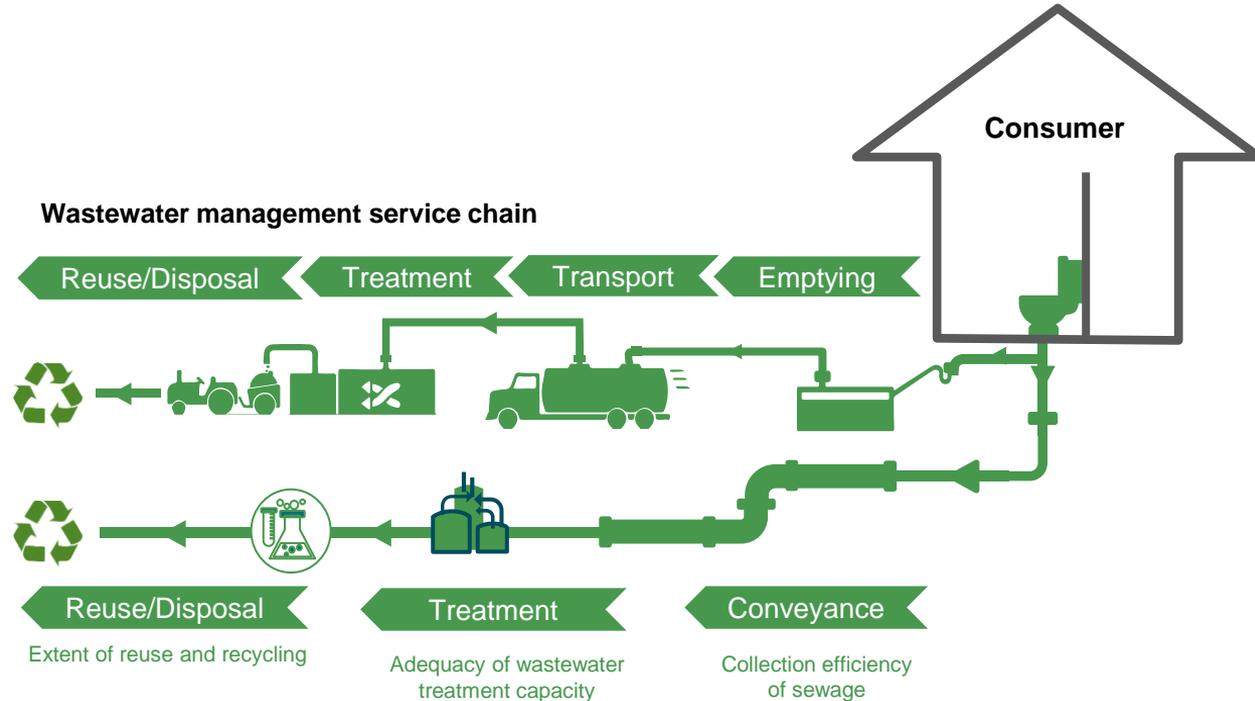
Measurement of water quantity in water supply network – Preliminary water audit city

Online dashboard showing real time water levels in the tanks



# Wastewater Management Operation Data System

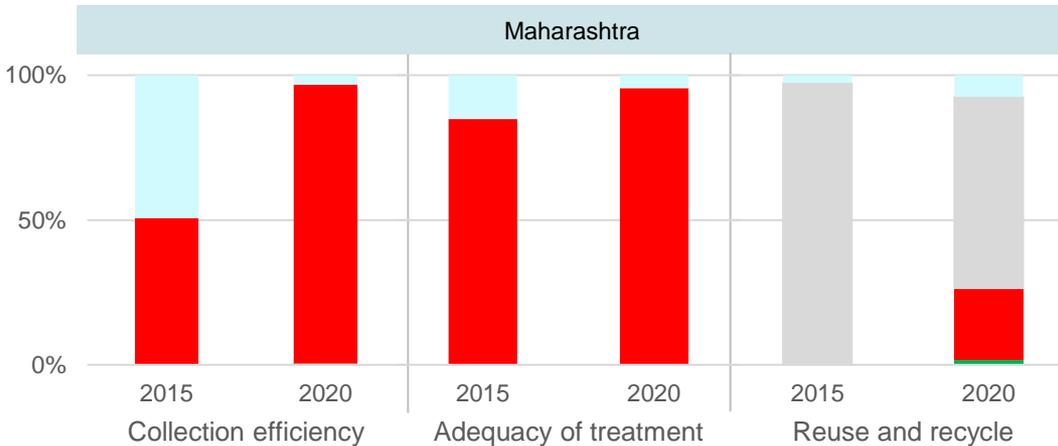
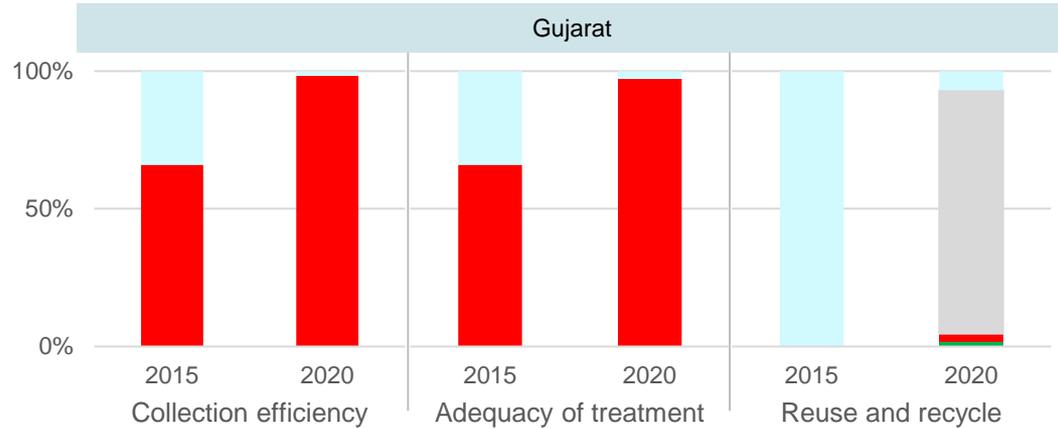
Wastewater management service chain



## Wastewater Management Operation Data System

- In wastewater management, revised indicators capturing performance of onsite sanitation along with sewerage system are added in 2015. Therefore, data system analysis based on PAS data of wastewater operation is from the year 2015.
- Though many cities have started building treatment facilities for sewerage and septage, (from 2015 to 2020, out of 403 cities in Maharashtra, 23 cities with STPs to 40 cities with STPs and 93 cities with FSTPs and out of 170 cities in Gujarat, 6 to 11 cities with STPs) still there are many cities without treatment facilities.
- Availability of treatment plants for sewage, septage and grey water along with installed measurement devices such as meter and weighing scale at treatment plant are very important components in wastewater management operation data system.
- Quantity of wastewater generation is depends on the volume of water consumed (municipal and non-municipal sources). Thus wastewater operation data is also depends on water supply operation data system.

# Assessment of Reliability Improvements – Wastewater Management Operation Indicators

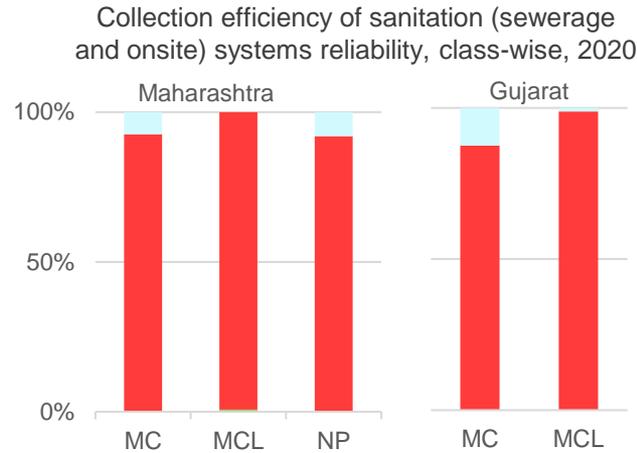


- Though **reliability of wastewater management operation indicators are not improved much**. But **cities have able to estimate the values of these indicators**.
- In 2015, many cities have reported “ND” – No Data, mainly because of non availability of onsite sanitation data. Now, most of the cities have reported values in these indicators.
- **Reliability of wastewater generation** is also depends on the volume of water consumed (municipal and non-municipal sources) that **is not improved mainly due to lack of water metering**.
- As cities have started building treatment facility for septage and grey water in addition to sewerage, reliability will be improved when cities will monitor the operational processes of treatment plants and water metering.

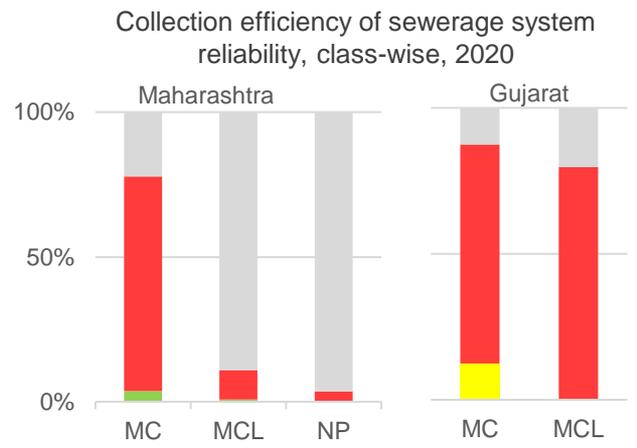
■ Reliability A 
 ■ Reliability B 
 ■ Reliability C 
 ■ Reliability D 
 ■ NA – Not applicable 
 ■ ND – No Data

# Assessment of Reliability Improvements – Collection Efficiency of Sanitation Services

- Though reliability of collection efficiency of sanitation systems is not improved much. But cities have able to estimate the value of this indicator. In 2015, 43% cities have reported “ND” – No Data for collection efficiency of sanitation systems, mainly because of non availability of onsite sanitation data. Now, most of the cities have reported values in this indicator. Kulgaon Badlapur, municipality in Maharashtra is the only city that has reported reliability A for this indicator.
- Quantity of wastewater generation is depends on the volume of water consumed (municipal and non-municipal sources). Hence reliability of wastewater data is also depends on water supply. If we look at the sewerage system data reliability separately, then its not improved much because of the water supply and lack of metering at wastewater treatment plant.



Question	Options	A	B	C	D
How is quantity of wastewater collected by network estimated?	1. Bulk flow meters at inlet of treatment plant	Y			
	2. V-Notch at outlet of channel		Y		
	3. Installed Plant Capacity			Y	Y
Collection efficiency of sewage network	Volume of water consumed from any Non ULB water sources	>0			
Water supply reliability Grades	Extent of Non Revenue Water	A	B	C	D
How is quantity of septage collected estimated?	1. Bulk meters at inlet of treatment plant	Y			
	2. Register maintained for number and volume of trucks emptier at the treatment plant or dump site		Y		
	3. Installed Plant Capacity			Y	
	4. Number of septic tank cleaned annually				Y

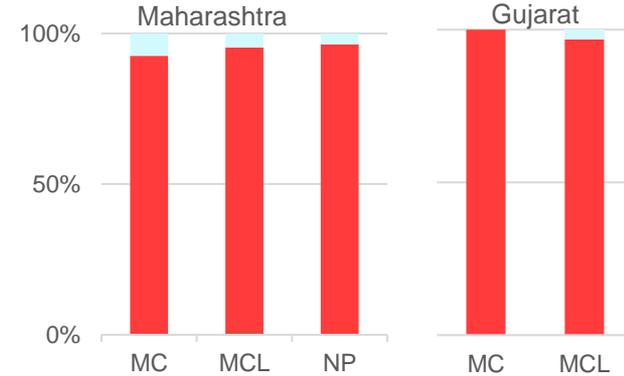


\* Note – SLB doesn't define reliability B; if none is "Yes", it will calculate D.

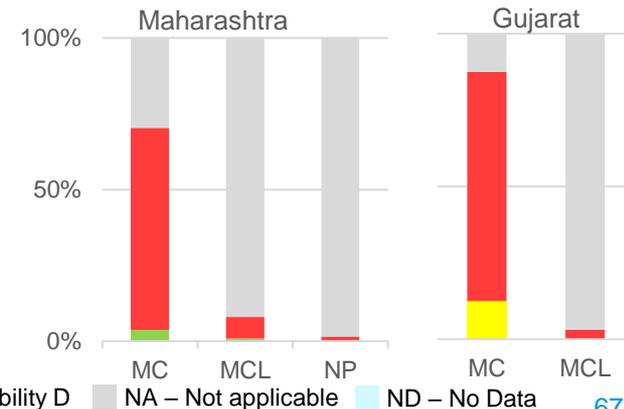
# Assessment of Reliability Improvements – Adequacy of Wastewater Treatment Capacity

- Though reliability of adequacy of treatment capacity is not improved much, but lower reliability is due to lack of infrastructure. Earlier, there is no recording of co-treatment of septage in existing sewerage treatment plant. But now cities have started monitoring and treatment of septage in existing sewerage treatment plants in addition to building faecal sludge treatment plants.
- Reliability of adequacy of treatment capacity is also depends on the reliability of volume of water consumed (municipal and non-municipal sources). If we look at the sewerage system data reliability separately, then its not improved much because of the water supply.
- As cities have started building treatment facility for septage and grey water in addition to sewerage, reliability will be improved when cities will monitor the operational processes of treatment plants and reliability of Non-revenue water indicator.

Adequacy of treatment capacity of sanitation (sewerage and onsite) reliability, class-wise, 2020



Adequacy of sewerage treatment capacity reliability, class-wise, 2020



Question	Options	A	B	C	D
How quantity of wastewater is actually treated estimated?	1. Bulk flow meters at outlet of treatment plant	Y			
	2. V-Notch at outlet of channel				
	3. Installed Plant Capacity				Y
How quantity of septage actually treated estimated?	1. Weighing scale at outlet of treatment plant	Y			
	2. Installed Plant Capacity				Y
How treatment plant system capacity is assessed?	1. Through rigorous testing and commissioning procedures	Y			
	2. On the basis of reliable operational data		Y		
	3. No estimate of treatment capacity that is actually functional and in operation			Y	
Water supply reliability Grades	Extent of Non Revenue Water	A	B	C	D

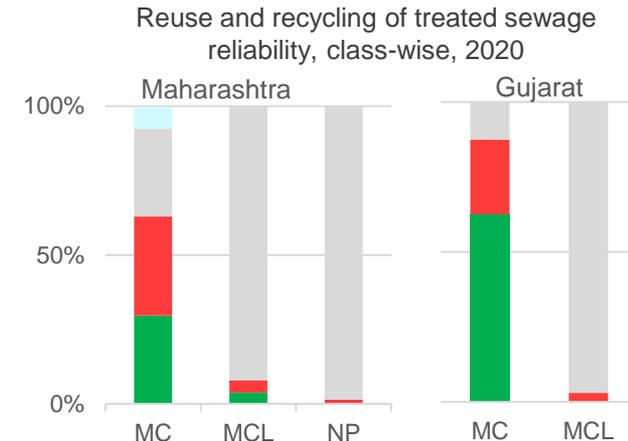
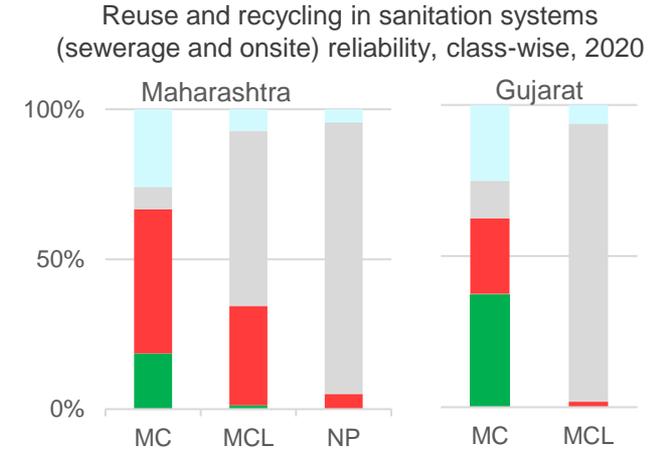
if none is "Yes", it will calculate D.

# Assessment of Reliability Improvements – Reuse and Recycling in Sanitation Systems

- As cities have started treatment and reuse of treated sewage, septage and grey water, values are also generated in reuse and recycling in sanitation systems.
- Reliability of reuse and recycling of treated sewage is higher as compared to treated septage.
- Municipal Corporation has higher data reliability as compared with Municipalities and Nagar panchayats.
- To improve the reliability of reuse and recycling data, city should install a bulk flow meters or weighing scale at outlet of treatment plant.

Question	Options	A	B*	C*	D
How quantity of wastewater is actually treated estimated?	1. Bulk flow meters at outlet of treatment plant	Y			
	2. V-Notch at outlet of channel				
	3. Installed Plant Capacity				Y
How quantity of septage actually treated estimated?	1. Weighing scale at outlet of treatment plant	Y			
	2. Installed Plant Capacity				Y

\* Note – SLB doesn't define reliability B and C, if none is "Yes", it will calculate D.



# Measures to Strengthen Wastewater Management Operation Data System

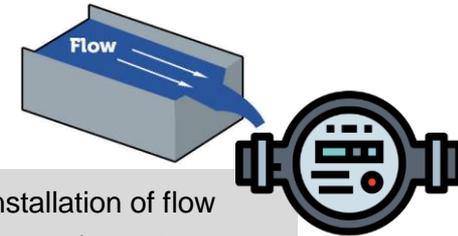
- To strengthen wastewater operation data system, strategies should cover collection, treatment and reuse of sewage, septage and grey water.
- CWAS tested a few ways to improve data systems related to wastewater management operation focusing on sewerage and septage:
  - SaniTrack: Online system for monitoring scheduled de-sludging and FSTP operations in a city
  - Implementation of standard data forms related to sewerage and onsite sanitation

## Examples of Measures to Strengthen Wastewater Operation Data System



SaniTrack: Online system for monitoring scheduled de-sludging and FSTP operations in a city

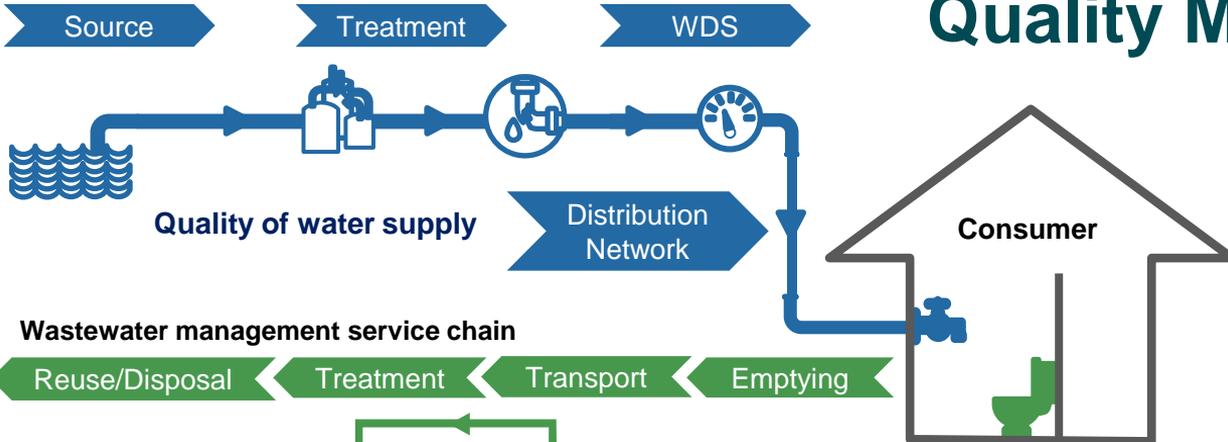
Real time online monitoring systems for conveyance and treatment of wastewater (sewage or grey water)



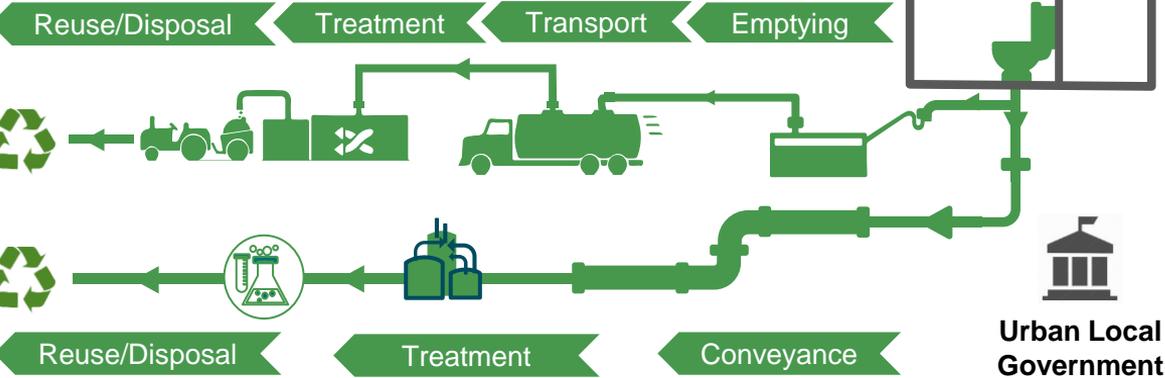
Installation of flow meters in wastewater pipelines or V-Notch at outlet of treatment plant channel

# Water and Wastewater Quality Monitoring System

## Water supply service chain



## Wastewater management service chain

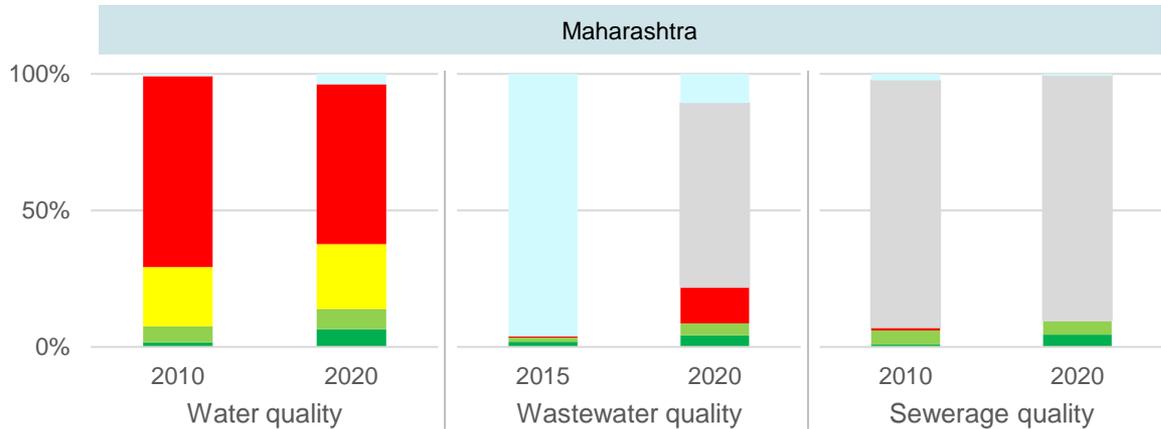
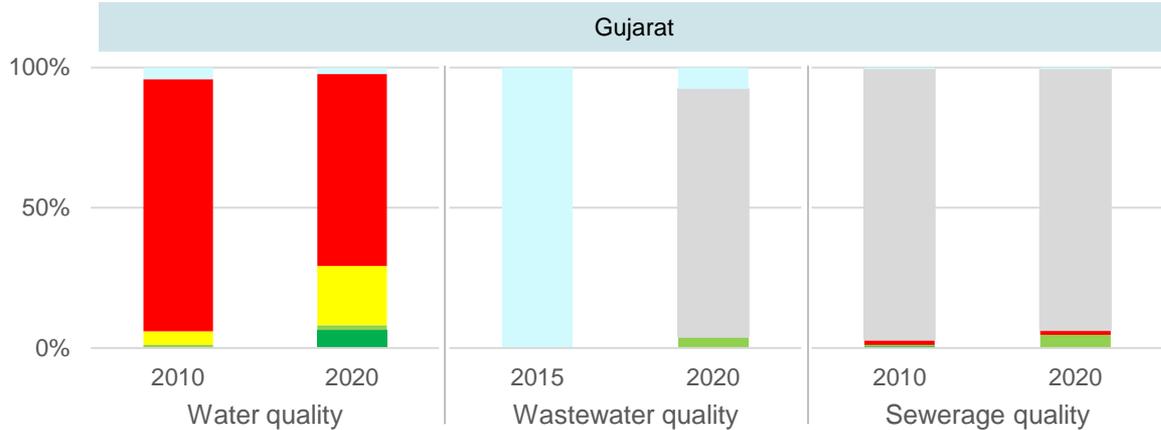


Quality of wastewater treatment

## Water and Wastewater Quality Monitoring Data System

- Most of the municipal corporations have own water quality monitoring laboratories and skilled human resources that monitors water and wastewater quality. Periodic tests are conducted with appropriate sampling at water treatment plants, wastewater treatment plants, water storage tanks and consumer end (for water). Appropriate reporting formats are also maintained at these levels for quality test results.
- Whereas municipalities and nagar panchayats depend on district level government laboratories or private laboratories for quality monitoring. And many cities don't have established regime for water and wastewater quality monitoring system.
- Out of 572 cities of Gujarat and Maharashtra, 30% cities have indicated an audit through independent agencies to monitor water quality procedures. Whereas 13% cities (out of 144 cities with STPs or FSTPs) have indicated an audit through independent agencies to monitor treated wastewater quality.

# Assessment of Reliability Improvements – Water and Wastewater Quality Monitoring Indicators



■ Reliability A   
 ■ Reliability B   
 ■ Reliability C   
 ■ Reliability D   
 ■ NA – Not applicable   
 ■ ND – No Data

- In a decade, **water and wastewater quality monitoring system has been improved in both the states.**
- Highest number of cities have reported **improvement in water quality monitoring** as compared to treated wastewater (sewerage and faecal sludge) and sewerage quality monitoring indicators.
- When new indicators in wastewater are introduced in 2015, **many cities don't have information on onsite sanitation.** Therefore, many cities have reported **no data "ND" in wastewater quality monitoring indicators.**

# Assessment of Reliability Improvements – Quality of Water Supplied

पाणी पुरवठा विभाग

अ.नं.	दिनांक	नळकनेकरन प्राधकाचे नांव व पत्ता	वेळ	O.T. PPM	टेस्ट वेळापत्री मधी	प्राधकाची मधी
	07/2010	अहमद अहमद अहमद अहमद अहमद	6:50	0.2 PPM	MRM	
	6-2-2016	Ashank Jadhav Kalyan Vasudevan Sumer Shinde Malkapur Kalyan		0.2 PPM	MRM	जा अहमद
	012/16	Kalapur Naka Tribhuvan Prasad	07:30	0.2 PPM	MRM	अहमद
	07/16	Kamlesh Parbhakar Kalapur Naka	09:00	0.2 PPM	MRM	अहमद
	012/16	S. N. Gokhale Abhinav Chavhan	09:00	0.2 PPM	MRM	अहमद
	02/16	श्रीमती अ. वि. शिंदे अहमद अहमद	09:00	0.2 PPM	MRM	अहमद

Example of residual chlorine (RC) test record at consumer end

Quality of water supplied reliability, class-wise, 2020



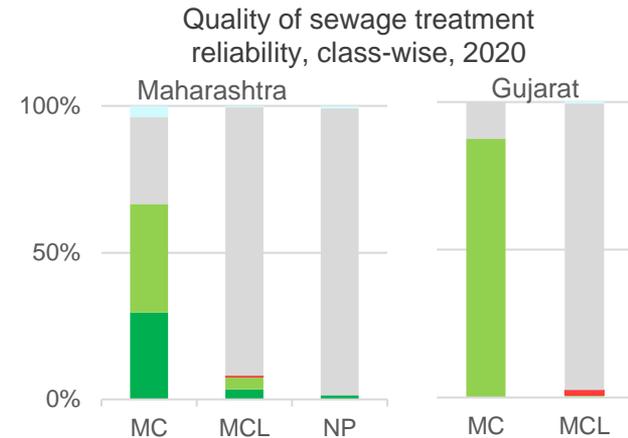
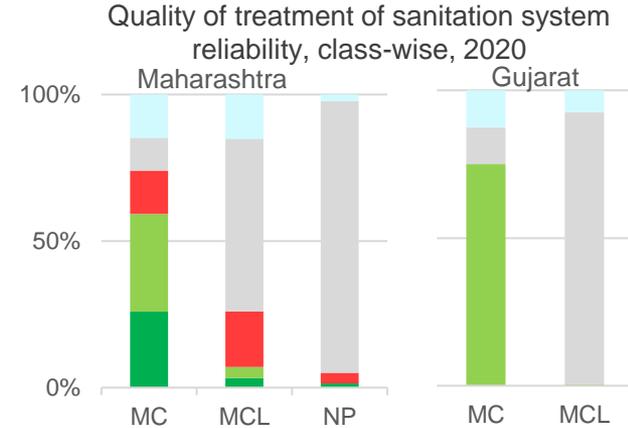
- In the year 2010, only 5% of cities have reported higher level of data reliability (reliability A / B grades) and 78% of cities have reported lower level of data reliability (reliability D grade).
- Out of total 572 cities of Gujarat and Maharashtra states for the year 2020, only 12% of cities have reported higher reliability grades (A or B). Whereas still 61% of cities have reported reliability D grade.
- Municipal Corporation has higher data reliability whereas lower reliability grades are in Municipalities and Nagar panchayats

Question	Options	A	B	C	D
Are proper records of samples conducted and passed/failed at source, WTP/bore wells, bulk distribution points and consumer end maintained?		Y	Y		
Are tests for quality conducted through	1. Own laboratory regularly	Y	Y		
	2. Accredited centers regularly				
	3. Third party agencies intermittently			Y	
How are audits to monitor water quality procedures carried out?	1. by independent agencies periodically	Y			
	2. ULB itself occasionally				
Record Keeping	1. Computerised	Y			
	2. Only Manual				
Total Samples taken for Residual Chlorine tests		>0	>0	>0	
Total Samples taken for Bacteriological tests		>0	>0		

If none is "Yes", it will calculate D.

# Assessment of Reliability Improvements – Quality of Treatment of Sanitation System

- In the year 2015, only 2% of cities have reported higher level of data reliability (grades A or B).
- Out of total 572 cities of Gujarat and Maharashtra states for the year 2020, only 7% of cities have reported higher reliability grades (A or B). Whereas 9% of cities have reported reliability D grade. 74% cities reported not applicable in quality of treatment indicator due to non-availability of treatment facility and 9% cities reported “ND” value.
- Municipal Corporation has higher data reliability and only few of them have reported “NA” indicator value in sanitation treatment (of sewage and fecal sludge) quality.
- In quality of sewage treatment, none of the corporation has lower reliability grade because of the established testing procedures at STPs (sewage treatment plants).

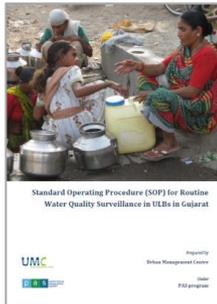


Question	Options	A	B	C*	D
Are proper records of samples conducted and passed/failed for all parameters (BOD, COD, etc) maintained?		Y			
Are tests for quality conducted through	1. Own laboratory regularly <sup>#</sup>	Y	Y		
	2. Accredited centers regularly <sup>#</sup>	Y	Y		
How are audits to monitor waste water quality procedures carried out?	1. by independent agencies periodically	Y			
Record keeping	1. Computerised <sup>##</sup>	Y	Y		
	2. Only Manual <sup>##</sup>	Y	Y		

Notes: \* SLB doesn't define reliability C, # Test conducted either by Own laboratory or Accredited centers, ## Records are maintained either Computerised or Manual, If none is "Yes", it will calculate D.

# Measures to Strengthen Water and Wastewater Quality Monitoring Data System

- A step-by-step guide (standard operating procedures) has been prepared for water supply department staff to establish a uniform water quality sampling and testing procedure. It also contains a set of recording formats to help cities in documentation of water surveillance results for better decision making and improved governance.
- Developed an excel based water quality sampling tool to formulate city specific sampling regime.
- In Wai and Sinnar, Maharashtra, CWAS provided support for real time monitoring of FSTP operations including quality testing results.



Standard operating procedures for routine water quality surveillance

Tool to formulate drinking water quality surveillance regime

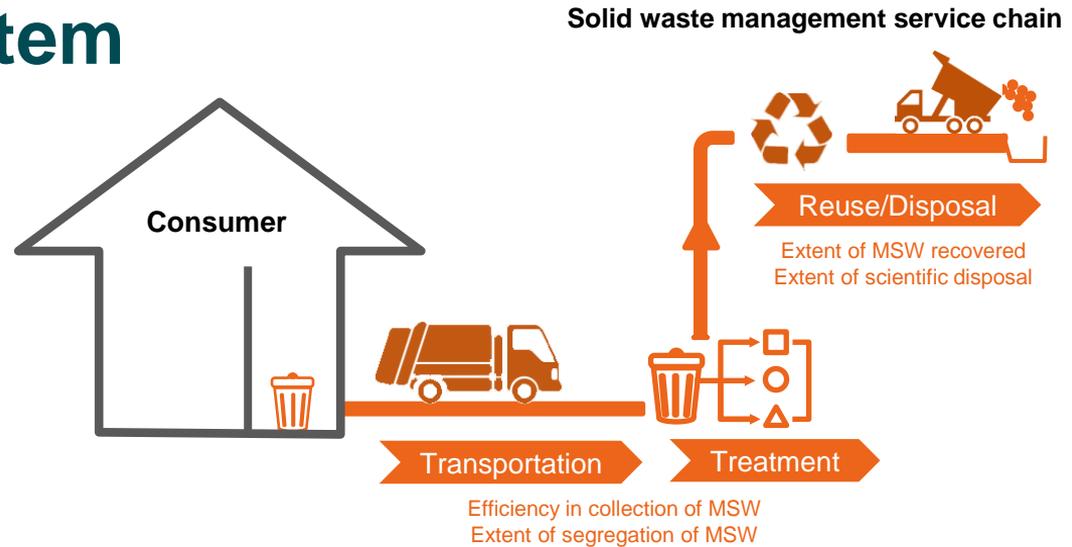
City:	Frequency of Required Tests							
	Lathi		Residual Chlorine		Bacteriological Tests		Chemical Tests	
	Numbers	Frequency	Numbers	Frequency	Numbers	Frequency	Numbers	Frequency
All source								
Ground water								
Take well (bore well) log well (if drinking water is directly supplied to consumer end, chlorine dosage needs to be added)	1	Quarterly	1	Daily	1	Monthly	1	Quarterly
Hand pumps	1	Weekly			1	Weekly		Weekly
Surface water								
Raw water (reservoir, infiltration well, lake/stream/canal)	1	Daily			1	Weekly	1	Daily
At Water Treatment Plant								
Outlet of WTP	1	Daily (Purifiable Only)	1	Daily	1	Weekly	1	Daily
At Water Distribution System								
Point of main supply, Ground level Storage Reservoir, Elevated Service Reservoir	1	Daily	1	Daily	1	Weekly	1	Monthly
At Consumer End								
Consumer End	1	Daily (Purifiable Only)	1	Daily	1	Monthly	1	Weekly

SanQ



Real time monitoring of FSTP operations with dashboard

# Solid Waste Management Operation Data System

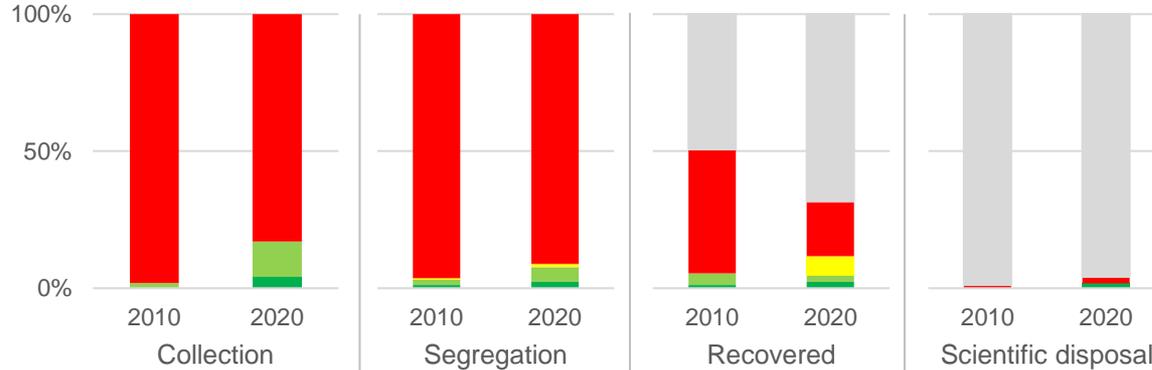


## Municipal Solid Waste Operation Data System

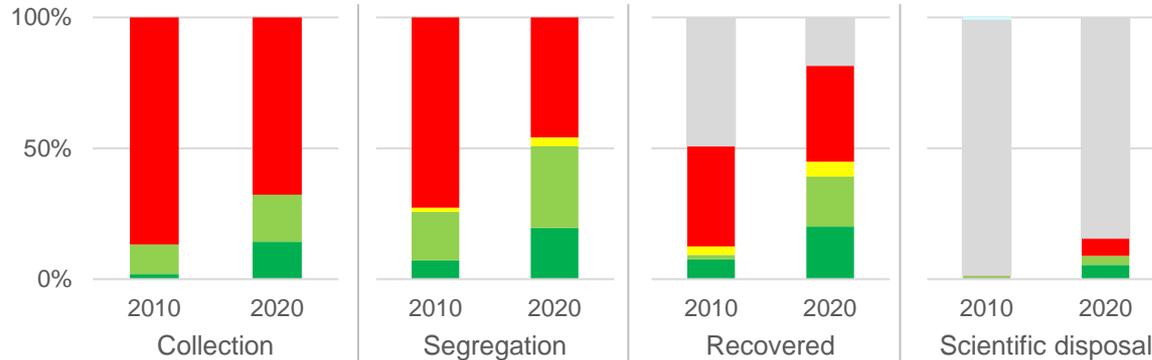
- Around 27% cities have reported that quantity of waste generation is estimated based on the sample surveys. In other cities, quantity of municipal solid waste generation is estimated based on the assumed per capita generation value.
- In majority of cities, quantity of municipal solid waste across service chain is based on the trips and capacity of the vehicles used for the waste collection and capacity of treatment facilities.
- Only one third cities have reported measurement of municipal solid waste collected, transported, segregated, treated and disposal through weighbridge.
- Though cities have started segregation of municipal waste at source and treatment but still one third cities don't have treatment facility and reported not applicable "NA" in extent of municipal solid waste recovered indicators.
- Pre and post treatment reject materials should be scientifically disposed. Scientific disposal facilities are majorly available in municipal corporations. Hence, most municipalities and nagar panchayats have reported NA in extent of scientific disposal of municipal solid waste indicator.

# Assessment of Reliability Improvements – Solid Waste Management Operation Indicators

Gujarat



Maharashtra

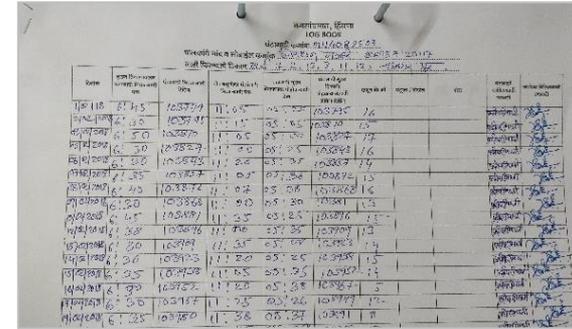


■ Reliability A 
 ■ Reliability B 
 ■ Reliability C 
 ■ Reliability D 
 ■ NA – Not applicable 
 ■ ND – No Data

- Highest number of cities have reported **improvement in segregation and recovered indicators** as compared to other solid waste operational indicators.
- If city don't have a collection system or segregation at source then reliability of these indicators is generated as grade "D".
- In **Gujarat**, due to lack of segregation, treatment and scientific disposal facilities, **many cities have indicated a lower reliability grades in solid waste operation indicators**.
- Higher percentage of cities in **Maharashtra** has indicated **improvements in reliability of solid waste operation indicators**.

# Assessment of Reliability Improvements – Collection Efficiency of Municipal Solid Waste

- In the year 2010, only 9% of cities have reported higher level of data reliability (grades A or B) and 91% of cities have reported lowest level of data reliability (grade D).
- Out of total 572 cities of Gujarat and Maharashtra states for the year 2020, 28% of cities have reported higher level of data reliability. Whereas 72% of cities have reported reliability D grade.
- Municipal Corporation has higher data reliability as compared with Municipalities and Nagar panchayats.



Example of log book maintained for solid waste collection vehicles

Question	Options	A	B	C*	D
How quantity of waste generated is estimated?	1. Quarterly/ sample surveys	Y			
	2. Per capita waste generation		Y		Y
Estimation of municipal waste received at - Treatment plant	1. Weighbridge	Y	Y		
	2. On the basis of Trips				Y
	3. Aggregate mass balance				
	4. Installed capacity				
Estimation of municipal waste received at - Scientific landfill	1. Weighbridge	Y	Y		
	2. On the basis of Trips				Y
	3. Aggregate mass balance				
	4. Installed capacity				
Estimation of municipal waste received at - Open dumps	1. Weighbridge	Y	Y		
	2. On the basis of Trips				Y
	3. Aggregate mass balance				

\* Note – SLB doesn't define reliability C; if none is "Yes", it will calculate D.

Collection of municipal solid waste reliability, class-wise, 2020



# Assessment of Reliability Improvements – Extent of Segregation of Municipal Solid Waste

- In the year 2010, only 17% of cities have reported higher level of data reliability (grades A or B) and 82% of cities have reported lowest level of data reliability (grade D).
- Out of total 572 cities of Gujarat and Maharashtra states for the year 2020, 38% of cities have reported higher level of data reliability. Whereas 59% of cities have reported reliability D grade.
- Municipal Corporation has higher data reliability as compared with Municipalities and Nagar panchayats.

SOLID WASTE MANAGEMENT DEPARTMENT

INDICATOR NUMBER : 3.4  
 UIC CODE : WWSW  
 DOCUMENT CODE : E

Door to Door Garbage collection logbook record showing daily waste collection for the month of October, November/December per trip.

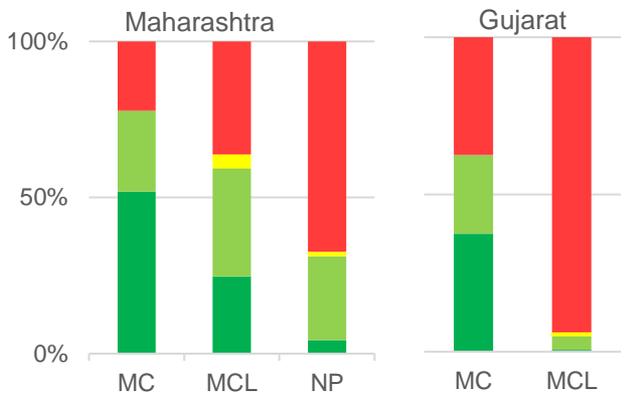
WMO NO.	DATE	VEHICLE NO.	CAPACITY OF THE VEHICLE IN MT	Total quantity of dry waste collected by the municipality (in MT)	Total quantity of wet waste collected by the municipality (in MT)	Total quantity of hazardous waste collected by the municipality (in MT)	Total quantity of waste collected by the municipality (in MT)
1	01/10/2018	4860	1.00	350	342	NA	692
1	02/10/2018	4860	1.00	420	420	NA	840
1	03/10/2018	4860	1.00	380	380	NA	760
1	04/10/2018	4860	1.00	400	400	NA	800
1	05/10/2018	4860	1.00	320	320	NA	640
1	06/10/2018	4860	1.00	450	450	NA	900
1	07/10/2018	4860	1.00	380	380	NA	760
1	08/10/2018	4860	1.00	420	420	NA	840
1	09/10/2018	4860	1.00	350	350	NA	700
1	10/10/2018	4860	1.00	400	400	NA	800
1	11/10/2018	4860	1.00	380	380	NA	760
1	12/10/2018	4860	1.00	420	420	NA	840
1	13/10/2018	4860	1.00	350	350	NA	700
1	14/10/2018	4860	1.00	400	400	NA	800
1	15/10/2018	4860	1.00	380	380	NA	760
1	16/10/2018	4860	1.00	420	420	NA	840
1	17/10/2018	4860	1.00	350	350	NA	700
1	18/10/2018	4860	1.00	400	400	NA	800
1	19/10/2018	4860	1.00	380	380	NA	760
1	20/10/2018	4860	1.00	420	420	NA	840
1	21/10/2018	4860	1.00	350	350	NA	700
1	22/10/2018	4860	1.00	400	400	NA	800
1	23/10/2018	4860	1.00	380	380	NA	760
1	24/10/2018	4860	1.00	420	420	NA	840
1	25/10/2018	4860	1.00	350	350	NA	700
1	26/10/2018	4860	1.00	400	400	NA	800
1	27/10/2018	4860	1.00	380	380	NA	760
1	28/10/2018	4860	1.00	420	420	NA	840
1	29/10/2018	4860	1.00	350	350	NA	700
1	30/10/2018	4860	1.00	400	400	NA	800
1	31/10/2018	4860	1.00	380	380	NA	760
1	01/11/2018	4860	1.00	420	420	NA	840
1	02/11/2018	4860	1.00	350	350	NA	700
1	03/11/2018	4860	1.00	400	400	NA	800
1	04/11/2018	4860	1.00	380	380	NA	760
1	05/11/2018	4860	1.00	420	420	NA	840
1	06/11/2018	4860	1.00	350	350	NA	700
1	07/11/2018	4860	1.00	400	400	NA	800
1	08/11/2018	4860	1.00	380	380	NA	760
1	09/11/2018	4860	1.00	420	420	NA	840
1	10/11/2018	4860	1.00	350	350	NA	700
1	11/11/2018	4860	1.00	400	400	NA	800
1	12/11/2018	4860	1.00	380	380	NA	760
1	13/11/2018	4860	1.00	420	420	NA	840
1	14/11/2018	4860	1.00	350	350	NA	700
1	15/11/2018	4860	1.00	400	400	NA	800
1	16/11/2018	4860	1.00	380	380	NA	760
1	17/11/2018	4860	1.00	420	420	NA	840
1	18/11/2018	4860	1.00	350	350	NA	700
1	19/11/2018	4860	1.00	400	400	NA	800
1	20/11/2018	4860	1.00	380	380	NA	760
1	21/11/2018	4860	1.00	420	420	NA	840
1	22/11/2018	4860	1.00	350	350	NA	700
1	23/11/2018	4860	1.00	400	400	NA	800
1	24/11/2018	4860	1.00	380	380	NA	760
1	25/11/2018	4860	1.00	420	420	NA	840
1	26/11/2018	4860	1.00	350	350	NA	700
1	27/11/2018	4860	1.00	400	400	NA	800
1	28/11/2018	4860	1.00	380	380	NA	760
1	29/11/2018	4860	1.00	420	420	NA	840
1	30/11/2018	4860	1.00	350	350	NA	700
1	01/12/2018	4860	1.00	400	400	NA	800
1	02/12/2018	4860	1.00	380	380	NA	760
1	03/12/2018	4860	1.00	420	420	NA	840
1	04/12/2018	4860	1.00	350	350	NA	700
1	05/12/2018	4860	1.00	400	400	NA	800
1	06/12/2018	4860	1.00	380	380	NA	760
1	07/12/2018	4860	1.00	420	420	NA	840
1	08/12/2018	4860	1.00	350	350	NA	700
1	09/12/2018	4860	1.00	400	400	NA	800
1	10/12/2018	4860	1.00	380	380	NA	760
1	11/12/2018	4860	1.00	420	420	NA	840
1	12/12/2018	4860	1.00	350	350	NA	700
1	13/12/2018	4860	1.00	400	400	NA	800
1	14/12/2018	4860	1.00	380	380	NA	760
1	15/12/2018	4860	1.00	420	420	NA	840
1	16/12/2018	4860	1.00	350	350	NA	700
1	17/12/2018	4860	1.00	400	400	NA	800
1	18/12/2018	4860	1.00	380	380	NA	760
1	19/12/2018	4860	1.00	420	420	NA	840
1	20/12/2018	4860	1.00	350	350	NA	700
1	21/12/2018	4860	1.00	400	400	NA	800
1	22/12/2018	4860	1.00	380	380	NA	760
1	23/12/2018	4860	1.00	420	420	NA	840
1	24/12/2018	4860	1.00	350	350	NA	700
1	25/12/2018	4860	1.00	400	400	NA	800
1	26/12/2018	4860	1.00	380	380	NA	760
1	27/12/2018	4860	1.00	420	420	NA	840
1	28/12/2018	4860	1.00	350	350	NA	700
1	29/12/2018	4860	1.00	400	400	NA	800
1	30/12/2018	4860	1.00	380	380	NA	760
1	31/12/2018	4860	1.00	420	420	NA	840

Example of computerized record of dry, wet and hazardous waste collection

Question	Options	A	B	C	D
How quantity of waste segregated is estimated?	1. Measurement at treatment/disposal site	Y			
	2. HHs & establishments with two bins			Y	
	3. Inputs from door to door collection agencies		Y		
Record keeping at - Treatment plant	1. Computerised <sup>#</sup>	Y			
	2. Only Manual <sup>#</sup>	Y			
Record keeping at - Scientific landfill	1. Computerised <sup>#</sup>	Y			
	2. Only Manual <sup>#</sup>	Y			
Record keeping at - Open dumps	1. Computerised <sup>#</sup>	Y			
	2. Only Manual <sup>#</sup>	Y			
Segregation of waste	Quantity of waste taken away by recyclers from intermediate points	>0			

# Note: Records are maintained either Computerised or Manual, if none is "Yes", it will calculate D.

Segregation of municipal solid waste reliability, class-wise, 2020



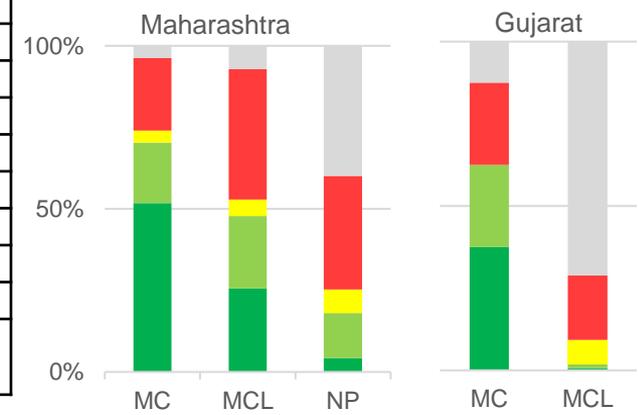
# Assessment of Reliability Improvements – Extent of Municipal Solid Waste Recovered

- In the year 2010, only 8% of cities have reported higher level of data reliability (grades A or B) and 43% of cities have reported lower level of data reliability (grades C or D). Around half of cities have reported not applicable – “NA” due to lack of treatment facilities.
- Out of total 572 cities of Gujarat and Maharashtra states for the year 2020, 29% of cities have reported higher level of data reliability and 38% of cities have reported lower level of data reliability. And one third of cities have reported NA.
- Municipal Corporation has higher data reliability as compared with Municipalities and Nagar panchayats.

Sl. No.	Vehicle No	Weighing Slip Ref No	Gross Weight	Tare Weight	Net Weight	Remarks
1	MH-04-DM-3818	04/13-17/09/01	2000.00	100.00	1900.00	
2	MH-13-AM-6021	04/13-17/09/05	2885.00	100.00	2785.00	
3	MH-09-ES-1232	04/13-17/09/06	10,800.00	100.00	10,700.00	
4	MH-14-AJ-1311	04/13-17/09/07	1200.00	100.00	1100.00	
5	MH-14-CL-213	04/13-17/09/08	1700.00	100.00	1600.00	
6	MH-13-AM-6402	04/13-17/09/09	1685.00	100.00	1585.00	
7	MH-14-DM-3818	04/13-17/09/10	2100.00	100.00	2000.00	
8	MH-14-AJ-1012	04/13-17/09/11	2200.00	100.00	2100.00	
9	MH-13-AM-6016	04/13-17/09/12	2100.00	100.00	2000.00	
10	MH-13-AM-6002	04/13-17/09/13	1620.00	100.00	1520.00	
11	MH-14-CD-1293	04/13-17/09/14	2175.00	100.00	2075.00	
12	MH-13-AM-6103	04/13-17/09/15	1900.00	100.00	1800.00	

Example of computerized record maintained at treatment facilities

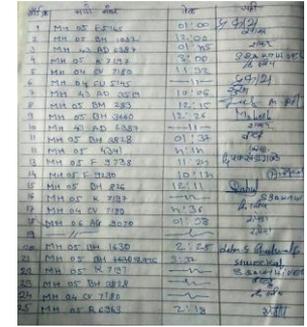
Municipal solid waste recovered reliability, class-wise, 2020



Question	Options	A	B	C	D
Estimation of municipal waste received at - Treatment plant	1. Weighbridge	Y	Y		
	2. On the basis of Trips				
	3. Aggregate mass balance			Y	
	4. Installed capacity				Y
Record keeping at - Treatment plant	1. Computerised#	Y			
	2. Only Manual#	Y			
Record keeping at - Scientific landfill	1. Computerised#	Y			
	2. Only Manual#	Y			
Record keeping at - Open dumps	1. Computerised#	Y			
	2. Only Manual#	Y			
Segregation of waste	Quantity of waste taken away by recyclers from intermediate points	>0			

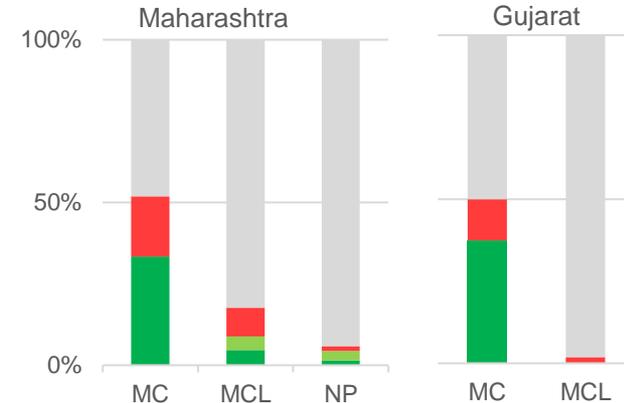
# Note: Records are maintained either Computerised or Manual, if none is "Yes", it will calculate D.

# Assessment of Reliability Improvements – Scientific Disposal of Municipal Solid Waste



Example of log book maintained at dump site

Scientific disposal of municipal solid waste reliability, class-wise, 2020



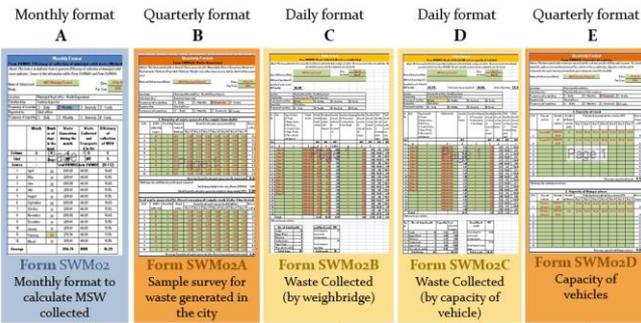
- In the year 2010, 98% of cities have reported not applicable – “NA” due to lack of scientific disposal facilities. And 1% cities have reported higher level of data reliability (grades A or B) and 1% of cities have reported lowest level of data reliability (grade D).
- Out of total 572 cities of Gujarat and Maharashtra states for the year 2020, still 88% cities don't have scientific disposal facilities. And 6% cities have reported higher level of data reliability (grades A or B) and 6% of cities have reported lowest level of data reliability (grade D).
- Municipal Corporation has higher data reliability as compared with Municipalities and Nagar panchayats.

Question	Options	A	B	C	D
Estimation of municipal waste received at - Scientific landfill	1. Weighbridge	Y			
	2. On the basis of Trips				Y
	3. Aggregate mass balance			Y	
Record keeping at - Scientific landfill	1. Computerised#	Y			
	2. Only Manual#	Y	Y		

# Note: Records are maintained either Computerised or Manual, if none is "Yes", it will calculate D.

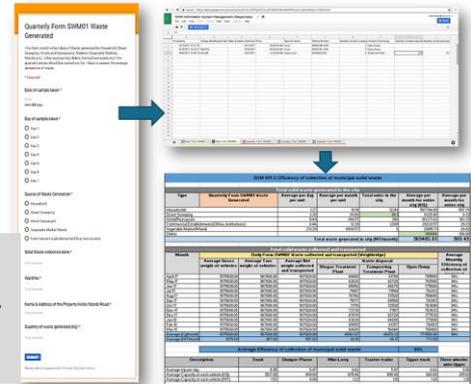
# Measures to Strengthen Solid Waste Management Operation Indicators

- Developed a standard forms that can be used by field staff and then will further be reported at senior level or by chief officer. These formats help cities for better data management and tracking.
- Monthly formats are designed in the manner of compilation of daily records. These will also record the quantity of waste generated, collected, segregated and recovered. Quarterly forms will record waste generated by sampling at various locations, capacity of vehicles, waste recycled by rag pickers. Yearly formats will calculate SLB indicators based on the data entered in daily, monthly and quarterly forms.
- For easier implementation, converted in google forms and tested in pilot cities.

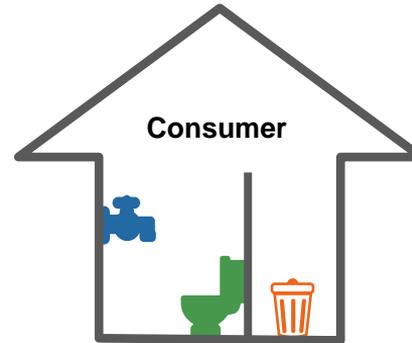


Developed and tested standard forms for data record, collation and analysis

Google forms were also developed to enter daily records and summary will be generated online



# Municipal Finance Data System



Efficiency of collection of water supply taxes, Efficiency of collection of wastewater management taxes and Efficiency of collection of SWM services taxes



**Urban Local Government**

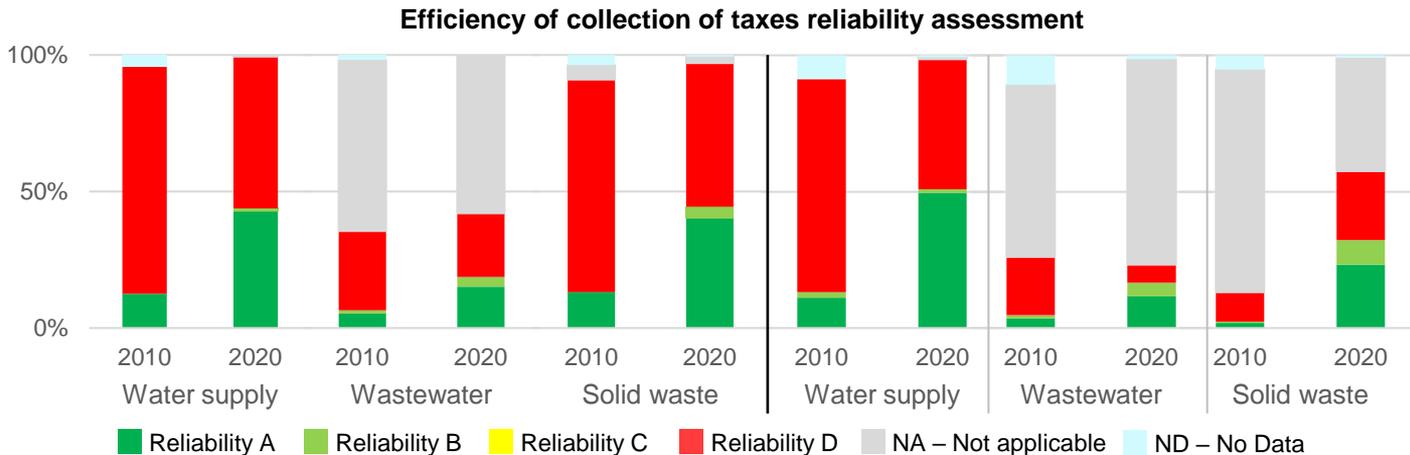
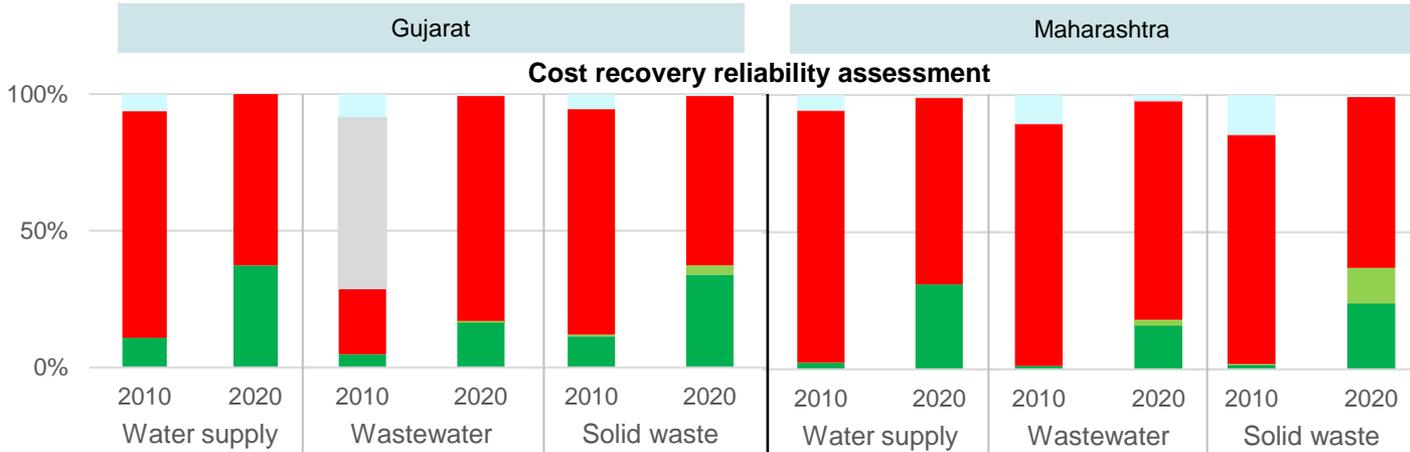


Cost recovery of water supply,  
Cost recovery of wastewater management and  
Cost recovery of SWM services

## Municipal Finance Data System

- Both the states, Gujarat and Maharashtra have implemented a double entry accrual based accounting system. But it has been running parallel to an on-going cash-based accounting system.
- Around 60% cities of Gujarat and Maharashtra follow both accrual based double entry and cash based accounting systems. And around 12% cities follow only accrual based double entry accounting systems.
- In most cities, budgets are prepared based on the cash based accounting system. There is no standard budget format and each city has its own budget format. And classification of many of the items is not uniform across cities.
- There is a separate revenue collection system to record the taxes income. And its not linked with the accounting system.
- Municipal finance data system is assessed based on review of the reliability grades of operations and maintenance (O and M) cost recovery in water and sanitation services and efficiency of collection of various water and sanitation taxes. The finance data for these indicators is mainly obtained from the budget documents and demand collection balance (DCB) statements.

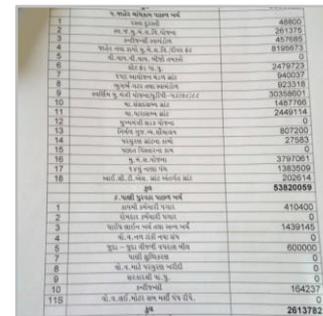
# Assessment of Reliability Improvements – Finance Indicators



- Reliability of finance indicators - **operations and maintenance (O and M) cost recovery and efficiency of collection of taxes is improved** in a decade.
- Highest number of cities have reported **improvement in water supply finance data reliability** as compared to other services.
- In non-sewered cities, the expenditure of wastewater and solid waste management is merged under health department, bifurcation is not easily available.

# Assessment of Reliability Improvements – Cost recovery of Water Supply Services

- In the year 2010, only 6% of cities have reported highest level of data reliability (reliability A grade) and 88% of cities have reported lowest level of data reliability (reliability D grade).
- Out of total 572 cities of Gujarat and Maharashtra states for the year 2020, 33% of cities have reported reliability A grade. Whereas 66% of cities have reported reliability D grade. In Maharashtra, Municipal Corporation has higher data reliability as compared with Municipalities and Nagar panchayats.
- Cost recovery data is collated from the budget documents and many a times unpaid expenditures like electricity and bulk water purchase charges are not reported in the operating expenditure and income from other sources like new connection charges is not segregated.

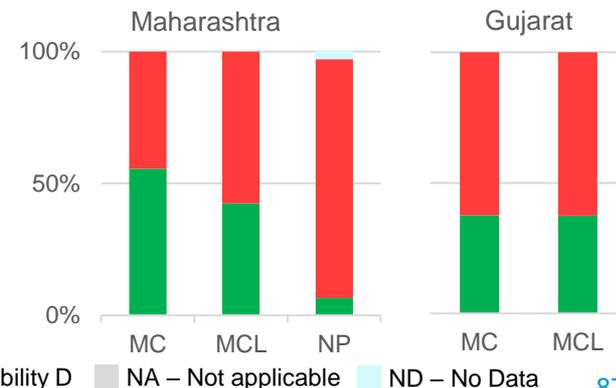


Example of water supply expenditure details in the income expense statement document

Question	Options	A	B	C*	D
Is regular (quarterly/annual) reporting of the financial statements conducted to state/central agencies?		Y	Y		
Extent of segregation of budget heads for (water supply)	1. Fully	Y			
	2. Partially		Y		
Accounting System	1. Accrual-Double entry	Y	Y		
	2. Cash Based				Y
	3. Both systems				
Record keeping	1. Computerised	Y			
	2. Only Manual				

\* Note – SLB doesn't define reliability C; if none is "Yes", it will calculate D.

Cost recover of water supply services reliability, class-wise, 2020



# Assessment of Reliability Improvements – Cost recovery of Wastewater Management

- In the year 2010, only 3% of cities have reported highest level of data reliability (reliability A grade) and 63% of cities have reported lowest level of data reliability (reliability D grade). 25% cities have reported not applicable - "NA" because there was zero expenditure (city is not providing any services) related to wastewater management services.
- In the year 2020, 81% of cities have reported reliability D grade and 18% of cities have reported higher level of reliability (A / B grade).
- Municipal Corporation has higher data reliability as compared with Municipalities and Nagar panchayats.
- Mainly in Municipalities and Nagar Panchayats, the expenditure of wastewater and solid waste management are merged under Health department expenditure, bifurcation is not easily available. Income from septic tank cleaning, pay and use toilet, other revenue are not segregated and compiled.

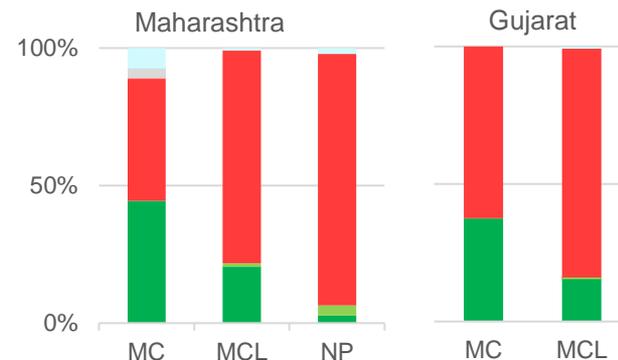
Surat Municipal Corporation Cost Recovery in Sewerage FY 2017-18			
Sr. No.	Expenditure Head	Rs. in Crore	
8.1	Regular Staff and Administration	33.484	
8.2	Outsourced and contracted staffs	0	
8.3	Electricity/Fuel Cost	46.025	
8.4	Chemical Cost	0.0301	
8.5	Repair and Maintenance Cost	59.0996	
8.6	Contractor Costs for O&M	0.8489	
8.7	Other costs	0.0852	
Total (Rs. in Crore)		139.5728	
2017-18			
Sr. No.	Income Head	Demand	Collection
8.8	Arrears	32.94037	12.647
8.9	Revenue demand from UC	54.5675	50.2366
8.10	Revenue demand from Tax	0	0
8.11	Revenue demand from Others	5.8562	9.2227
Total (Rs. in Crore)		93.36407	72.10630

Example of customized report generated from double entry accrual based accounting system

Question	Options	A	B	C*	D
Is regular (quarterly/annual) reporting of the financial statements conducted to state/central agencies?		Y	Y		
Extent of segregation of budget heads for (Wastewater)	1. Fully	Y			
	2. Partially		Y		
Accounting System	1. Accrual-Double entry	Y	Y		
	2. Cash Based				Y
	3. Both systems				
Record keeping	1. Computerised	Y			
	2. Only Manual				

\* Note – SLB doesn't define reliability C; if none is "Yes", it will calculate D.

Cost recover of wastewater management services reliability, class-wise, 2020



# Assessment of Reliability Improvements – Cost recovery of Solid Waste Management

- In the year 2010, only 6% of cities have reported highest level of data reliability (reliability A grade) and 83% of cities have reported lowest level of data reliability (reliability D grade). 11% cities have reported no data “ND” in cost recovery of solid waste management services.
- Out of total 572 cities of Gujarat and Maharashtra states for the year 2020, 37% of cities reported higher level of reliability (A / B grade). Still 62% of cities have reported reliability D grade. In Maharashtra, Municipal Corporation has higher data reliability as compared with Municipalities and Nagar panchayats.
- Mainly in Municipalities and Nagar Panchayats, the expenditure of wastewater and solid waste management are merged under Health department expenditure, bifurcation is not easily available.

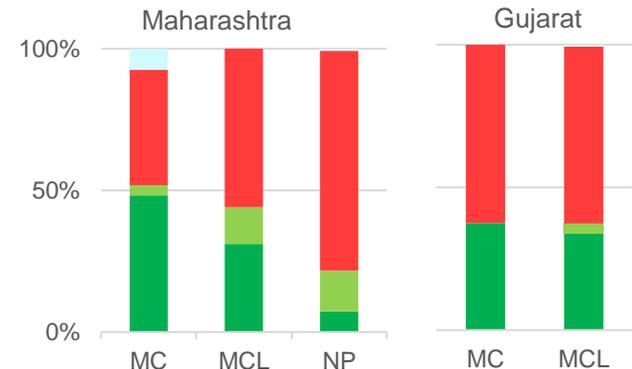
Surat Municipal Corporation Cost Recovery in Solid Waste Management FY 2017-18			
Sr. No.	Expenditure Head	Rs. in Crore	
7.1	Regular Staff and Administration	17.5734	
7.2	Outsourced and contracted staffs	2.4644	
7.3	Electricity/Fuel Cost	4.1313	
7.4	Chemical Cost	0.0319	
7.5	Repair and Maintenance Cost	35.7686	
7.6	Contractor Costs for O&M	42.9969	
7.7	Other costs	0.6028	
<b>Total (Rs. in Crore)</b>		<b>103.5693</b>	
2017-18			
Sr. No.	Income Head	Demand	Collection
7.8	Arrears	32.94037	12.647
7.1	Revenue demand from UC	142.1622	124.9666
7.9	Revenue demand from Tax	0	0
7.15	Revenue demand from Others	6.0571	6.246
<b>Total (Rs. in Crore)</b>		<b>181.15967</b>	<b>143.85960</b>

Example of customized report generated from double entry accrual based accounting system

Question	Options	A	B	C*	D
Is regular (quarterly/annual) reporting of the financial statements conducted to state/central agencies?		Y	Y		
Extent of segregation of budget heads for (solid waste)	1. Fully	Y			
	2. Partially		Y		
Accounting System	1. Accrual-Double entry	Y	Y		
	2. Cash Based				Y
	3. Both systems				
Record keeping	1. Computerised	Y			
	2. Only Manual				

\* Note – SLB doesn't define reliability C; if none is "Yes", it will calculate D.

Cost recover of solid waste management services reliability, class-wise, 2020



# Assessment of Reliability Improvements – Efficiency of Collection of Water Supply Service Related Taxes

- In the year 2010, only 13% of cities have reported higher level of data reliability (A / B grade) and 80% of cities have reported lowest level of data reliability (D grade).
- Out of total 572 cities of Gujarat and Maharashtra states for the year 2020, 49% of cities have reported higher level of data reliability (A / B grade). And 50% of cities have reported reliability D grade. In Maharashtra, Nagar panchayats has lower data reliability as compared with Municipal Corporations and Municipalities.
- Demand and collection statement for water supply is available in 96% cities, and only 4% cities don't maintained records for charges collected against the specific bill issues.

9.2 / 9.3

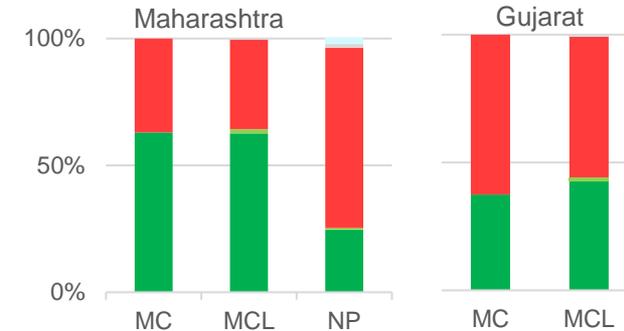
Sr No	Zone	No. of Conn.	Target			Recovery (Rs.)		Excess Amount (Rs.)	Total Recovery (Rs.)	Recovery (%)	
			Arrears	Current	Total	Arrears	Current			Arrears	Current
1	SATPUR	29166	94767175	75529411	170296586	22278683	38078160	46834	60403677	24 %	50 %
2	PANCHAVATI	41250	137355894	12888619	266244513	26499084	62541216	2058364	91098664	19 %	49 %
3	NEW NASIK	54522	121397823	119153701	240551524	43408886	66668540	297726	110375152	36 %	56 %
4	NASIK ROAD	32331	129622086	156516454	286138540	45349147	65714881	651998	1117180026	35 %	42 %
5	NASIK WEST	10592	33527285	101345895	134873180	14862326	68313025	5820403	88995754	44 %	67 %
6	NASIK EAST	29327	140292295	131762411	252054706	27024695	58364769	81134	85470598	19 %	52 %
Grand Total		197188	656962558	693196491	1350159049	179422821	359680591	8958459	548061871	27 %	52 %

Example of water supply taxes demand and collection statement document

Question	Options	A	B	C*	D
Are arrears segregated from current demand in financial statements/budgets?		Y	Y		
Accounting System	1. Accrual-Double entry	Y	Y		
	2. Cash Based				Y
	3. Both systems				
Are records maintained for charges collected against the specific bill issued? (Water Supply)		Y			

\* Note – SLB doesn't define reliability C; if none is "Yes", it will calculate D.

Efficiency of collection of water supply related taxes reliability, class-wise, 2020



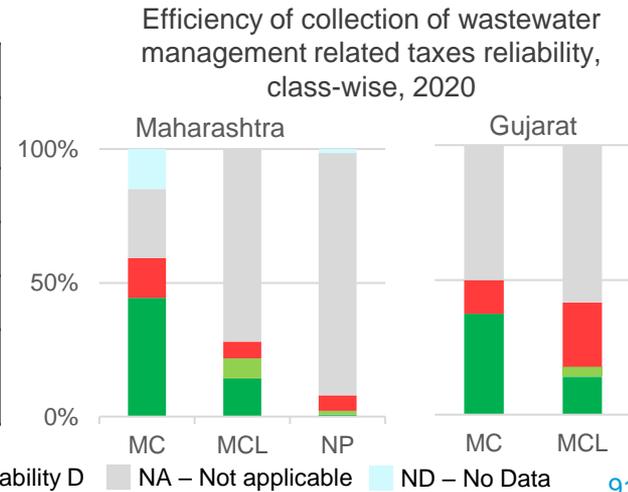
# Assessment of Reliability Improvements – Efficiency of Collection of Wastewater Management Related Taxes

- In the year 2010, only 5% of cities have reported highest level of data reliability (reliability A grade) and 24% of cities have reported lowest level of data reliability (reliability D grade). 63% cities have reported not applicable “NA” because cities don’t levied taxes related to wastewater management.
- Out of total 572 cities of Gujarat and Maharashtra states, around 28% cities levied taxes related to sewerage / toilet for the year 2020.
- From 159 cities that levied the taxes, 59% of cities have reported higher reliability grade (A / B). Whereas 41% of cities have reported reliability D grade. Municipal Corporation has higher data reliability as compared with Municipalities and Nagar panchayats.

Example of demand and collection statement document of various taxes

Question	Options	A	B	C*	D
Are arrears segregated from current demand in financial statements/budgets?		Y	Y		
Accounting System	1. Accrual-Double entry	Y	Y		
	2. Cash Based				Y
	3. Both systems				
Are records maintained for charges collected against the specific bill issued? (Wastewater)		Y			

\* Note – SLB doesn’t define reliability C; if none is “Yes”, it will calculate D.





# Measures to Strengthen Municipal Finance Data System

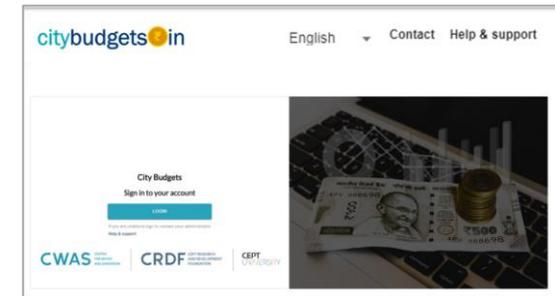
- To create a standard compiled data system at state level for municipal finance, CWAS provided support to Gujarat for setting up online module for municipal finance. Because of the various formats at city level and lack of follow up efforts at state level, this initiative sustained only for 3 years.
- To enable uniformity and digitization of municipal budgeting in Maharashtra, CWAS created a city budget portal.
- There are various isolated systems like double entry accrual based accounting system, various taxes collection system, cash based accounting system (budget document / income expenditure statement) in municipal finances.
- There is a need for an integrated municipal finance system that should cover a comprehensive payment, receipt, accounting and budgeting system.
- Availability of skilled city officials are required to use the double entry accrual based accounting system in day to day reporting and decision making.



The screenshot displays a software interface for a finance assessment module. At the top, there are navigation tabs: General Information, Tax Collection, Income Details, Revenue Expenditure, Debt Information, Revenue Grant, Capital Grant, and Utilities. The main content area is titled 'Patrak - 3 Income Details : FY 2012-2013'. It features a table with columns for 'Glan Details', 'Account Code', and two columns for 'FY 2012-13(In Rupees)'. The table lists various tax items with their corresponding account codes and values. The values for all items are 0.00.

Glan Details	Account Code	FY 2012-13(In Rupees)	FY 2013-14(In Rupees)
(M) 2012-13 (A) Tax Income			
1 000000 Consolidated Tax		0.00	0.00
2 000000 Property Tax	11001	0.00	0.00
3 000000 Street Light Tax	1100001	0.00	0.00
4 000000 General Water Tax	1100201	0.00	0.00
5 000000 Special Water Tax	1100203	0.00	0.00
6 000000 General Conservancy Tax	1100401	0.00	0.00
7 000000 Special Conservancy Tax	1100403	0.00	0.00
8 000000 Drainage Tax	1100801	0.00	0.00

Finance assessment module - data entry screen of city's income details



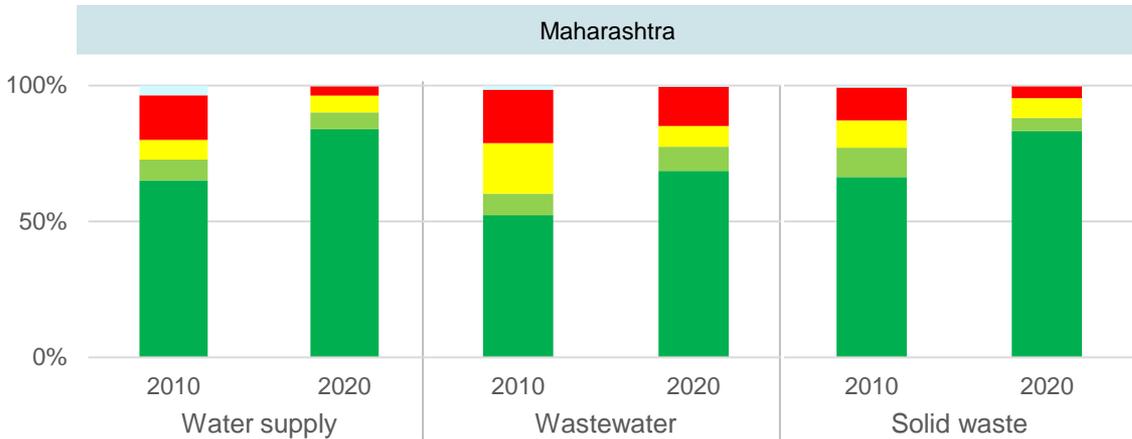
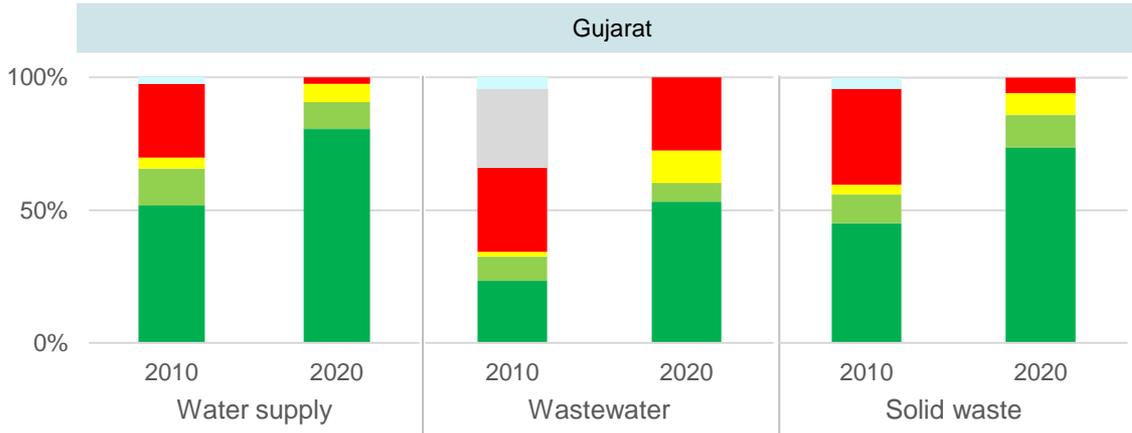
Web based system for simplified, recasted and digitized municipal budgeting – screen of home page



## Public Grievances (Complaint) Redressal Data System

- Public grievance redressal is a crucial function for transparent and an service-oriented city. It provides a bridge for citizens to engage with the city, voice their concerns, provide feedback on its functioning and various aspects of service delivery.
- Complaint redressal data system is well recorded and analyzed in many cities even in the initial years of performance assessment also.
- More than 90% cities have multiple mechanisms to register complaints (through telephone, in person, by email) available to the consumers. Online as well as manual register is maintained but many a times complaint resolved within 24 hours is not maintained.
- Though there is a one system for recording, collating, sorting and tracking of complaints in a city but least no of cities have lower reliability grades for water supply. In city, water supply system related complaints are collated, sorted and records are maintained type wise like low water pressure, no water, water leakage, polluted water, etc.
- In many non-sewered cities, complaint related to onsite sanitation and solid waste management are redressed under health department, bifurcation is not easily available.

# Assessment of Reliability Improvements – Complaint Redressal System Indicators



■ Reliability A 
 ■ Reliability B 
 ■ Reliability C 
 ■ Reliability D 
 ■ NA – Not applicable 
 ■ ND – No Data

- In a decade, **complaint redressal system has been improved in both the states.** Very few cities especially small cities have lower data reliability of indicators related to complaint redressal system.
- Highest number of cities have reported **improvement in water supply complaint redressal** as compared to wastewater and solid waste management complaint redressal indicators.
- In many non-sewered cities, complaint related to onsite sanitation and solid waste management are redressed under health department, bifurcation is not easily available.**

# Assessment of Reliability Improvements – Complaint Redressal of Water Supply Services

- In the year 2010, 60% of cities have reported highest level of data reliability (reliability A grade) and 21% of cities have reported lowest level of data reliability (reliability D grade).
- Out of total 572 cities of Gujarat and Maharashtra states for the year 2020, 83% of cities have reported reliability A grade. Whereas only 3% of cities have reported reliability D grade.
- Municipal Corporation has higher data reliability as compared with Municipalities and Nagar panchayats.

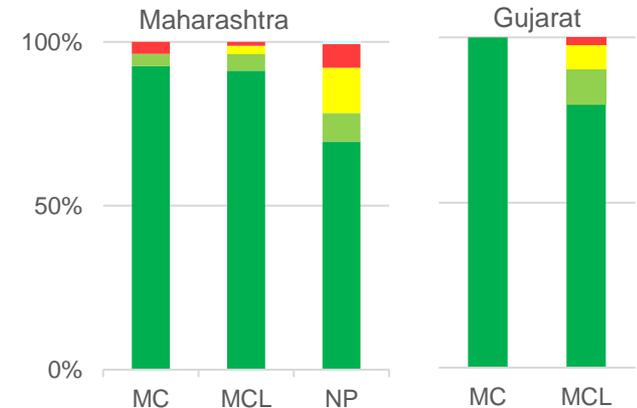
Head of Accounts	Year	Month												Total
		April	May	June	July	August	September	October	November	December	January	February	March	
Complaints Received	2013-2014	55	50	57	50	45	58	40	50	65	70	72	75	987
	2014-2015	55	47	50	45	48	35	30	40	45	35	40	65	527
	2015-2016	52	55	51	52	55	55	50	60	52	53	60	65	605
	2016-2017	55	60	55	40	52	38	45	42	45	40	40	30	556
Complaints attended	2013-2014	40	50	45	40	30	45	0	15	5	8	8	8	286
	2014-2015	40	40	47	41	41	57	35	43	50	50	60	62	557
	2015-2016	40	42	40	41	35	32	25	30	30	30	30	50	424
	2016-2017	47	45	46	47	47	41	40	35	40	47	50	50	535
Complaints balance	2013-2014	35	40	40	35	23	40	0	15	5	8	8	8	250
	2014-2015	15	10	10	9	4	1	4	7	15	20	12	13	120
	2015-2016	15	5	18	4	5	3	5	10	15	5	10	5	83
	2016-2017	5	5	5	5	3	4	10	5	10	5	3	10	70
Complaints balance	2013-2014	10	8	8	7	8	5	4	7	6	6	50	78	
	2014-2015	5	10	5	4	7	5	0	0	0	0	0	35	
	2015-2016	5	5	5	5	3	4	10	5	10	5	3	10	70
	2016-2017	10	8	8	7	8	5	4	7	6	6	50	78	

Example of computerized compilation of water supply related complaints

Question	Options	A	B	C	D
Are records of complaints resolved maintained?	Water supply	Y	Y		
System for Collating, sorting and tracking of complaints (water supply)	1. Computerised	Y			
	2. Only Manual				
Are the records of types of complaints (low water pressure, no water, sewer blocks, etc) maintained?	Water supply	Y			
Are multiple mechanisms to register complaints (through telephone, in person, by email) available to the consumers in	Water supply	Y	Y	Y	

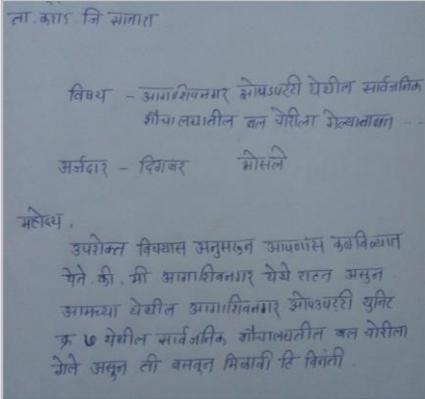
If none is "Yes", it will calculate D.

Water supply complaint redressal reliability, class-wise, 2020



# Assessment of Reliability Improvements – Complaint Redressal of Wastewater Management

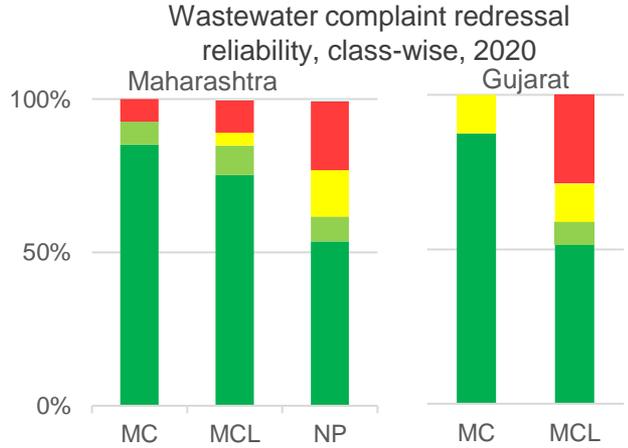
- In the year 2010, 49% of cities have reported higher level of data reliability (reliability A / B grades) and 25% of cities have reported lowest level of data reliability (reliability D grade). 12% cities have reported “NA” because city was not providing any services related to wastewater management.
- Out of total 572 cities of Gujarat and Maharashtra states for the year 2020, 72% of cities have reported higher reliability grades (A or B). Whereas only 18% of cities have reported reliability D grade. None of the city has reported “NA” in complaint redressal indicator value.
- Municipal Corporation has higher data reliability as compared with Municipalities and Nagar panchayats



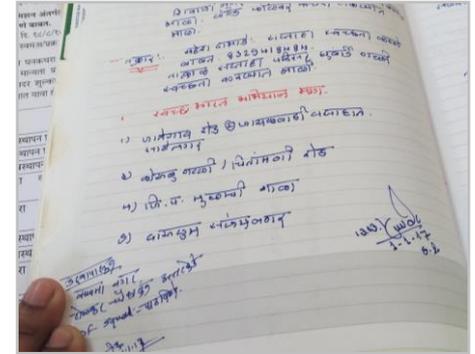
Example of complaint file of Health Department

Question	Options	A	B	C	D
Are records of complaints resolved maintained? (Sewerage)		Y	Y		
System for Collating, sorting and tracking of complaints (Sewerage)	1. Computerised#	Y			
	2. Only Manual#	Y			
Are the records of types of complaints (low water pressure, no water, sewer blocks, etc) maintained? (Sewerage)		Y			
Are multiple mechanisms to register complaints (through telephone, in person, by email) available to the consumers in (Sewerage)		Y	Y	Y	

# Note: Records are maintained either Computerised or Manual, if none is "Yes", it will calculate D.



# Assessment of Reliability Improvements – Complaint Redressal of Solid Waste Management



Example of written SWM complaint in notebook

Solid waste complaint redressal reliability, class-wise. 2020



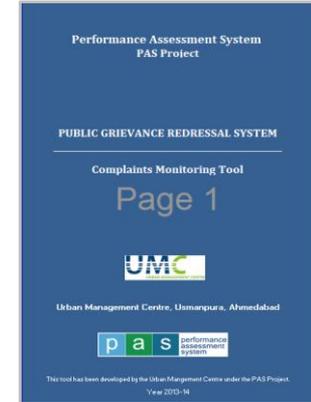
- In the year 2010, 69% of cities have reported higher level of data reliability (reliability A / B grades) and 22% of cities have reported lower level of data reliability (reliability D grade).
- Out of total 572 cities of Gujarat and Maharashtra states for the year 2020, 87% of cities have reported higher reliability grades (A or B). Whereas only 5% of cities have reported reliability D grade.
- Municipal Corporation has higher data reliability whereas lower reliability grades are in Municipalities and Nagar panchayats

Question	Options	A	B	C	D
Are records of complaints resolved maintained? (SWM)		Y	Y		
System for Collating, sorting and tracking of complaints - SWM	1. Computerised#	Y			
	2. Only Manual#	Y			
Are the records of types of complaints (low water pressure, no water, sewer blocks, etc) maintained? (SWM)		Y			
Are multiple mechanisms to register complaints (through telephone, in person, by email) available to the consumers in - SWM		Y	Y	Y	

# Note: Records are maintained either Computerised or Manual, if none is "Yes", it will calculate D.

# Measures to Strengthen Complaint Redressal Data System

- Cities have understood the importance of an efficient complaint redressal system and have also undertaken numerous initiatives. For example, tracking of complaints to understand areas for further improving quality of service delivery and established an interactive voice response (IVR) based complaints system.
- Developed an excel based complaints monitoring tool to record and track spatial and sectoral complaints. It produces monthly and yearly reports so that the cities could use these for improving services.
- Developed a model citizen charter for cities of Gujarat. A citizens' charter is a document addressed to the citizens and is aimed at defining standards of services provided by government body to the citizens.



Complaints monitoring tool

Annexure A MODEL CITIZENS' CHARTER FOR ULBs OF GUJARAT						
WATER SUPPLY						3
S.No.	Description of Service	Nature Of Service	Documents Required	Suggested Time	Contract Period, Depth	Fee/ Charges (to be filled by ULB)
(Applicable to be adopted by ULB)						
1	New connection	DIS/CLB	1. Application form 2. Proof of residence of owner/ occupant (property tax bill/ Aadhar card) 3. BE Permission	2 weeks		
2	Change of connection category	DIS/CLB	Approved plan/ BE permission	2 weeks		
3	Disconnecting existing connection	DIS/CLB	1. Application form 2. Proof of residence of owner/ occupant	3 days		
4	Supply of water through water supply of water through water supply a) In case of failure of water supply b) For marriages/other functions	DIS/CLB	No documents required Photo paper application	a) Within 6 hrs of complaint b) 3 days		
5	Request for installation of a new standpost.	DIS/CLB	Recommendation from coparcener	2 weeks		
S.No.	Description Of Complaint	Nature Of Complaint	Suggested Time	Contract Period, Depth	Fee/ Charges	Mode Of Registration (Online/Offline/Phone Call/Door to Door)
1	Illegal water connections	DIS/CLB	3 days			
2	Leakage in the pipelines	DIS/CLB	Within 24 hrs			

Model citizen charter for cities of Gujarat



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## Summary

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Overview of Water and Sanitation  
Data Management Practices – At the  
Beginning of PAS Program

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PAS Approach to Data System  
Strengthening

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Overview of Data Reliability  
Improvements in a Decade

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Recommendations for Data System  
Strengthening

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## Summary of Measures to Strengthen Water and Sanitation Data Systems in Pilot Cities (1/4)

- Over the years, CWAS in partnership with various institutions has conducted many studies and supported selected cities for data system improvement in Gujarat and Maharashtra states.
- Pilot cities include various sizes of cities, including municipal corporations, municipalities, and nagar panchayats.
- Data system improvement measures span a wide range, ranging from basic paper-based forms to advanced online automatic monitoring systems equipped with app-based control.
- Whether it's a basic paper based forms or advanced online monitoring system, involvement and training of various levels of city staffs is necessary. Capacity building for data recording, analysis and management is required to ensure that data is effectively used to inform decision-making and drive resource allocation and policy development in the water and sanitation sector.
- Implementation of various measures to improve data systems is just a starting point towards strengthening them. As the quality of data improves, it becomes necessary to assess the advancements in data-driven decision-making or assessing the impact of the data system strengthening approach on the overall water and sanitation service provision.

# Summary of Measures to Strengthen Water and Sanitation Data Systems in Pilot Cities (2/4)

## Consumer information system



Household and property survey for water and sanitation using SaniTab app

Modification in existing property tax re-assessment survey forms



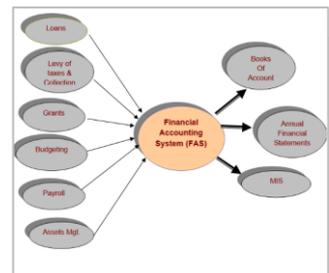
Link with the e-governance system at state / city level

## Financial information system

Income Category	Tax Category	Income Details	Assessment Details	Local Information	Assessment Class	Capital Class	Location
Income Details FY 2012-2013							
Income Details		Account Code	Assessment FY FY 2012-2013 (Revenue)				
(B) Income Details (A) Tax Income							
1. Salary	Income Tax		0.00	0.00			
2. Dividend	Income Tax	110001	0.00	0.00			
3. Interest	Income Tax	1100001	0.00	0.00			
4. Pension	Income Tax	1100002	0.00	0.00			
5. Gratuity	Income Tax	1100003	0.00	0.00			
6. Bonus	Income Tax	1100004	0.00	0.00			
7. Other Income	Income Tax	1100005	0.00	0.00			
8. Total Income	Income Tax	1100006	0.00	0.00			
9. Tax Paid	Income Tax	1100007	0.00	0.00			
10. Net Income	Income Tax	1100008	0.00	0.00			

Online module for municipal finance

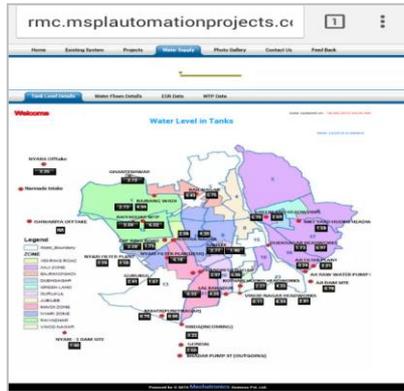
Budget software with standardize budget head and generates collated data on sector-wise allocation of financial resources



Integrated municipal finance system to cover a comprehensive payment, receipt, accounting and budgeting functions

# Summary of Measures to Strengthen Water and Sanitation Data Systems in Pilot Cities (3/4)

## Water supply operation information system



Real time online monitoring system for water quantity and calculation of losses

Periodic sample survey:  
Preliminary water audit



Installation of flow meters and consumer water meters

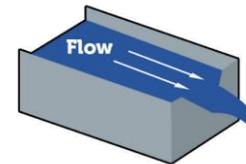


## Wastewater operation information system



SaniTrack: Online system for monitoring scheduled de-sludging and FSTP operations in a city

Real time online monitoring systems for conveyance and treatment of wastewater (sewage or grey water)



Installation of flow meters in wastewater pipelines or V-Notch at outlet of treatment plant channel

# Summary of Measures to Strengthen Water and Sanitation Data Systems in Pilot Cities (4/4)

## Water quality monitoring information system

Standard operating procedures for routine water quality surveillance



Frequency of Required Tests						
City	Lathi	Physical Tests		Bacteriological Tests		Chemical Tests
		Number	Frequency	Number	Frequency	
At source						
Ground water						
Tap water from public supply/ drinking water in directly supplied/ community water supply needs to be tested						
Hand-pumps	0-1000	0-1000	0-1000	0-1000	0-1000	0-1000
Surface water	0-1000	0-1000	0-1000	0-1000	0-1000	0-1000
At Water Treatment Plant						
Output of STP	0-1000	0-1000	0-1000	0-1000	0-1000	0-1000
At Water Distribution System						
Final Chlorination/Chloramination/Reservoir Chlorination Service Reservoir	0-1000	0-1000	0-1000	0-1000	0-1000	0-1000
At Consumer End						
0-1000	0-1000	0-1000	0-1000	0-1000	0-1000	0-1000

Tool to formulate drinking water quality surveillance regime

## Wastewater quality monitoring information system

Establish wastewater quality monitoring system

SanQ

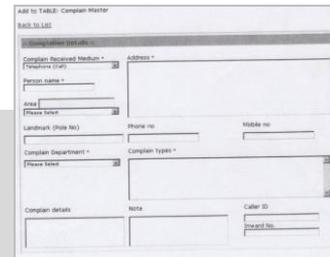


## Complaint redressal system

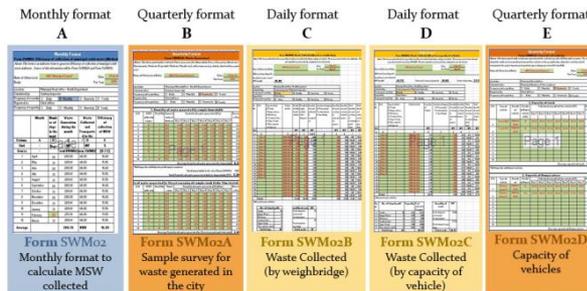
Spreadsheet based citizens complaints monitoring tools



Online system for citizens complaints monitoring



## Standard data formats for water, wastewater and municipal solid waste management services



Standard forms for data record, collation and analysis

# Interrelated Building Blocks in Water and Sanitation Data Systems

## Measures to strengthen the interrelated key building blocks in WASH data system

### Data management

Centralize and standardised data collection, storage, and sharing function.

Use data analytics tools to generate insights and use in decision-making

### Stakeholder engagement

With the help of data, engage with citizens, financial institutions and other stakeholders more meaningfully and in transparent ways

### Technology adoption

Use of mobile application, sensors, web based systems to generate, store, transmit, analyse and use data and information



### Enabling policies

Issue guidelines, policies and standard operating procedures to improve data systems like water metering policy

### Governance structure

Establish state level performance monitoring cell to review the service levels and its reliability grade

### Capacity building

To improve the data literacy in government officials, review the staff strength in terms of numbers and staff capacity

# Emerging Measures for National, State and Local Governments (1/2)

Data system strengthening is the cyclic process that involves adjusting the approach based on monitoring results in order to continually enhance the quality and accessibility of data for decision-making.

## National Government

- Governance structure: Include data system strengthening activities like generation of water and sanitation consumer information, establishing monitoring system for measurement of water quantity and wastewater collection and treatment, etc. in Swachh Survekshan or PayJal Survekshan.
- Enabling policies: Link data system improvement measures with performance grant.

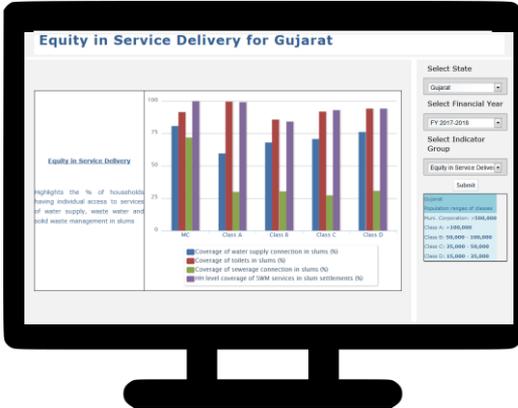
## State Government

- Enabling policies: Issue guidelines, policies and standard operating procedures to improve data systems like standardization of property tax assessment forms, water metering policy, water and wastewater treatment, distribution / conveyance / transportation monitoring systems.
- Governance structure: Establish state level performance monitoring cell to review the service levels and its reliability grade. Allocate financial resources for setting up monitoring systems in water, wastewater and municipal solid waste operations.
- Governance structure: Water and sanitation service level data generation, collation and analysis should be integrated with the city officials day to day work and regular updating should be a part of their job responsibility.
- Stakeholder engagement: Share water and sanitation data across different stakeholders, including government agencies, non-governmental organizations, and the private sector. Stakeholders engagement through data sharing improves the coordination, promote transparency and accountability in the water and sanitation sector.
- Capacity building: Review the staff strength in local governments in terms of numbers and staff capacity.
- Data management: Include water and sanitation service coverage and operations details in state level E-governance system. Develop various dashboards to generate insights of water and sanitation services and use in decision-making.

## Emerging Measures for National, State and Local Governments (2/2)

### Urban Local Government

- **Enabling policies:** Implement an open data policy that promotes the release of water and sanitation data to the public in a timely and accessible manner while also protecting the sensitive / personal data. Share water and sanitation service level data in easily understandable formats for citizens.
- **Data management:** Measure service delivery performance at the smallest geographical jurisdiction. When laid out spatially on the city map, offer interesting insights that can be used to enable equality in service provision. Leveraging data for predictive and prescriptive analytics and use to achieve services that are equitable, efficient, sufficient, and sustainable.
- **Technology adoption:** Setting up monitoring systems by installing and using sensors, IoT devices and artificial intelligence in water and wastewater services. Its' costs are often marginal compared to the large investments that are typical for the sector.
- **Capacity building:** Awareness and capacity enhancement of city officials (at all levels - from field staffs to management staffs) to capture, collate and analyse the water and sanitation performance data. Training for data analysis and management to ensure that data is effectively used to inform decision-making and drive policy development in the water and sanitation sector.
- **Stakeholders engagement:** Engage citizens in data collection, such as through reporting water leaks or septic tank / sewer overflow issues. Community generated data can be used to supplement existing data sources, as well as to identify areas where additional data collection is needed. Discuss with citizens about service performance and improvement plans. Establish channels for citizens to provide feedback and ensure that their perspectives and concerns are considered in decision-making processes.



**PAS is First Step towards Empowering Cities through Data: Strengthening Water and Sanitation Systems for Equitable, Efficient, Sufficient and Sustainable Services**

**CWAS** CENTER  
FOR WATER  
AND SANITATION

**CRDF** CEPT RESEARCH  
AND DEVELOPMENT  
FOUNDATION

CEPT  
UNIVERSITY

### Suggested Citation :

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### About us

The Center for Water and Sanitation (CWAS) at CEPT University carries out various activities – action research, training, advocacy to enable state and local governments to improve delivery of services.



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