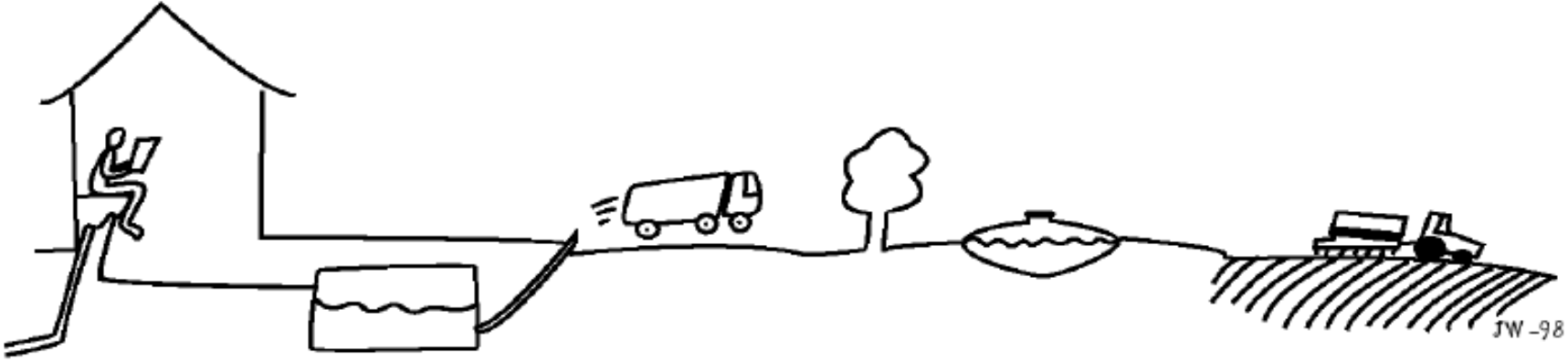


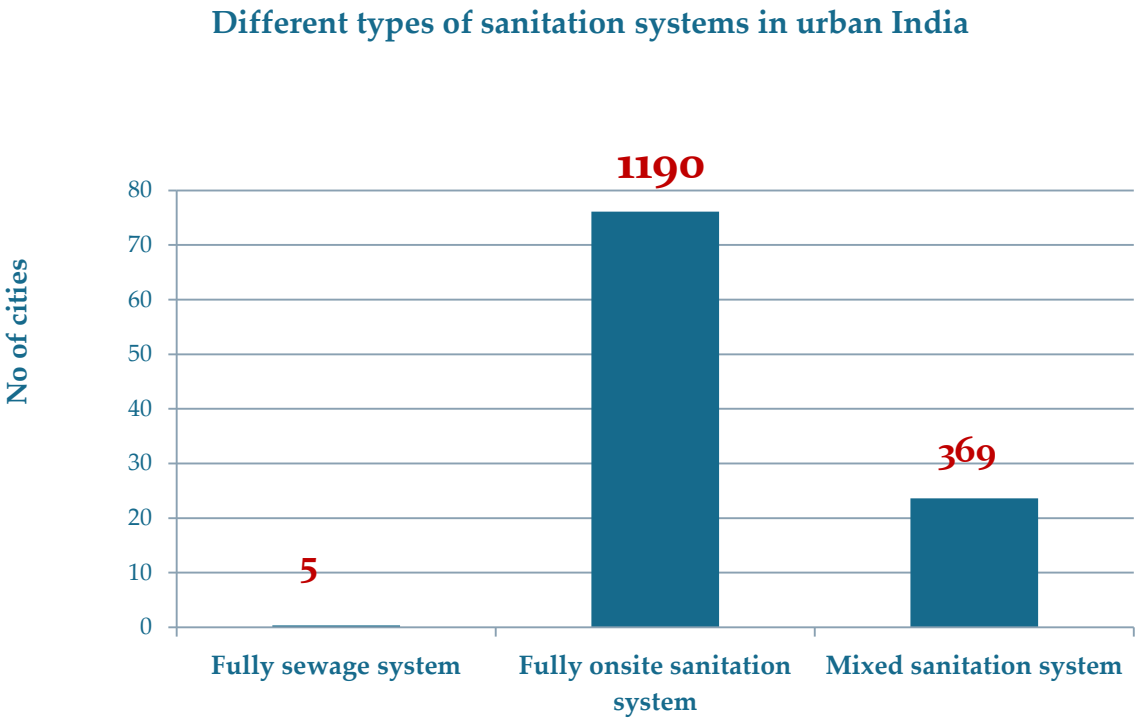
SAN Benchmarks:

Citywide assessment of sanitation service delivery Including on-site sanitation

CEPT UNIVERSITY

PAS Project, CEPT University, Ahmedabad

Sanitation systems in Urban India



- ✓ Only 5 cities are reported to have 100% sewerage system
- ✓ Nearly 1200 cities have fully onsite sanitation systems

76% of cities in India are fully dependent on on-site sanitation systems

24% are dependent on mixed sanitation systems

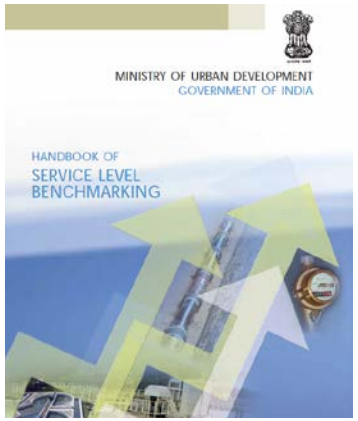
Source: Based on the SLB data submitted to GOI by 16 states covering 1564 cities

Need for San Benchmark ?

Recognition of Properly managed onsite sanitation system as "Safe Sanitation"

(NUSP, CPHEEO, USEPA, WHO, IWA)

Funding for FSM available under SBM, AMRUT and Smart city Programmes



स्वच्छ भारत
एक कदम स्वच्छता की ओर

अमृत
Atal Mission for Rejuvenation and Urban Transformation

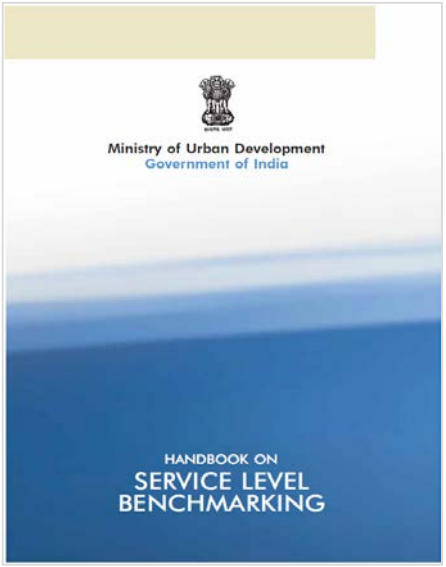
Smart City
MISSION TRANSFORM-NATION

No Monitoring framework available for onsite sanitation system

Current monitoring framework for WSS (MOUD, GoI)

Service Level Benchmark framework: Basis to measure service delivery outcomes

- Performance monitoring through **Service Level Benchmarks (SLB)** under 13th and 14th Finance commission
- SLB under **SLIP for AMRUT**
- SLB put the focus on measurement of service delivery performance. Benchmarks published for each of the four sectors:
  - Water supply,
  - Waste water,
  - Solid Waste Management (SWM) and
  - Storm water
- This framework comprises of 28 SLB indicators



अमृत
Atal Mission for Rejuvenation and Urban Transformation

Are SLB indicators for Wastewater captures ground reality?

Water supply	
Coverage of water supply connections	100%
Per capita supply of water	135 lpcd
Extent of metering of water connections	100%
Extent of Non- Revenue Water (NRW)	20%
Continuity of water supply	24 hours
Quality of water supplied	100%
Efficiency in redressal of customer complains	80%
Cost recovery in water supply services	100%
Efficiency in collection of water supply related charges	90%

Solid Waste Management	
Household level coverage of solid waste management services	100%
Efficiency of collection of municipal solid waste	100%
Extent of segregation of municipal solid waste	100%
Extent of municipal solid waste recovered	80%
Extent of scientific disposal of municipal solid waste	100%
Efficiency in redressal of customer complains	80%
Extent of cost recovery in SWM services	100%
Efficiency in collection of SWM charges	90%

Wastewater	
Coverage of toilets	100%
Coverage of sewage network services	100%
Collection efficiency of the sewage network	100%
Adequacy of sewage treatment capacity	100%
Quality of sewage treatment	100%
Extent of reuse and recycling of sewage	20%
Efficiency in redressal of customer complains	80%
Extent of cost recovery in sewage management	100%
Efficiency in collection of sewage charges	90%

SLB indicators only captures performance of underground sewer network

Storm Water Drainage	
Coverage of storm water drainage network	100%
Incidence of water logging / flooding	0

PAS

Performance Assessment System

Assess service delivery in water and sanitation

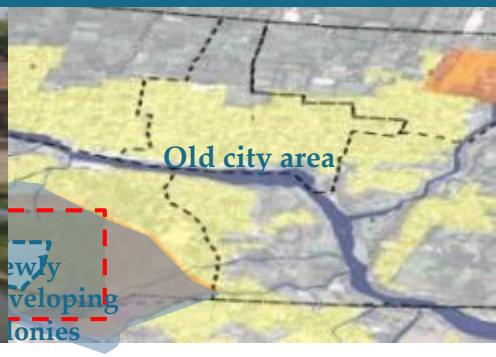
profile for 800+ Cities

in 5 States

National database for 1800 cities
For 18 states for 3 years

www.pas.org.in

Water supply, Waste Water, Solid waste Management & Storm Water



Online Performance Assessment System

- Performance measurement framework (PMF) has been developed for state-wide implementation of the benchmarking of water and sanitation with a focus on a 'real' developing country context.
- It is align with the Government of India's initiative Service Level Benchmarks (SLB).
- In addition to SLB indicators, it also includes aspect of **equity and onsite sanitation system** to capture the ground realities in Indian cities.
- **Online performance assessment system** is based on the PMF and used by all cities of Gujarat and Maharashtra as an annual self assessment tool since 2011.
- Online tool is also used by cities of Chhattisgarh, Assam, Jharkhand and Telangana for publication of service level benchmarks.

SLB+ Framework developed by PAS

WATER SUPPLY

9
SLB Indicators

33
Additional Indicators

WASTE WATER

9
SLB Indicators

39
Additional Indicators

STORM WATER

2
SLB Indicators

SOLID WASTE

8
SLB Indicators

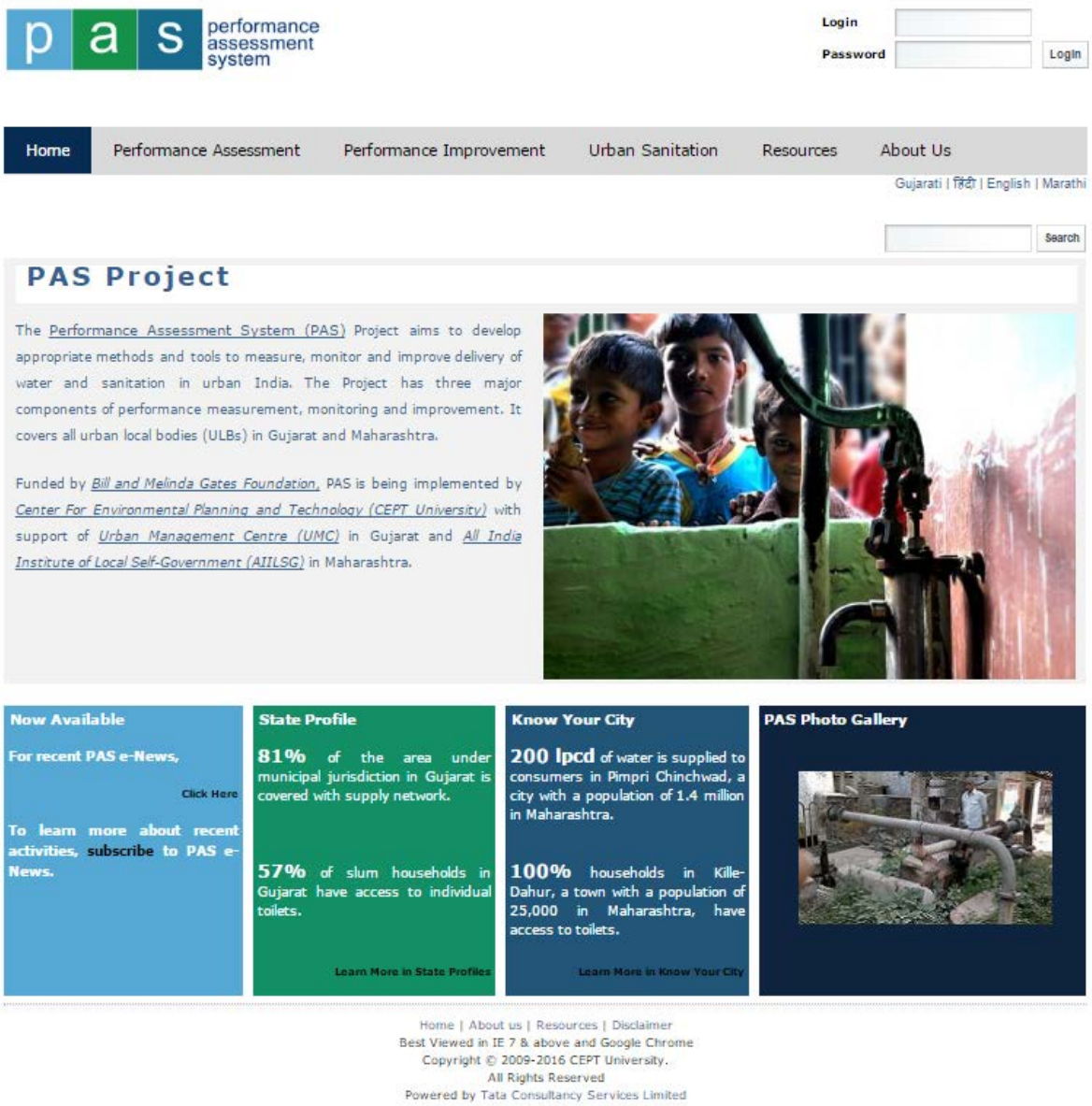
12
Additional Indicators

EQUITY

4
Key Indicators

13
Additional Indicators

PAS Project – www.pas.org.in



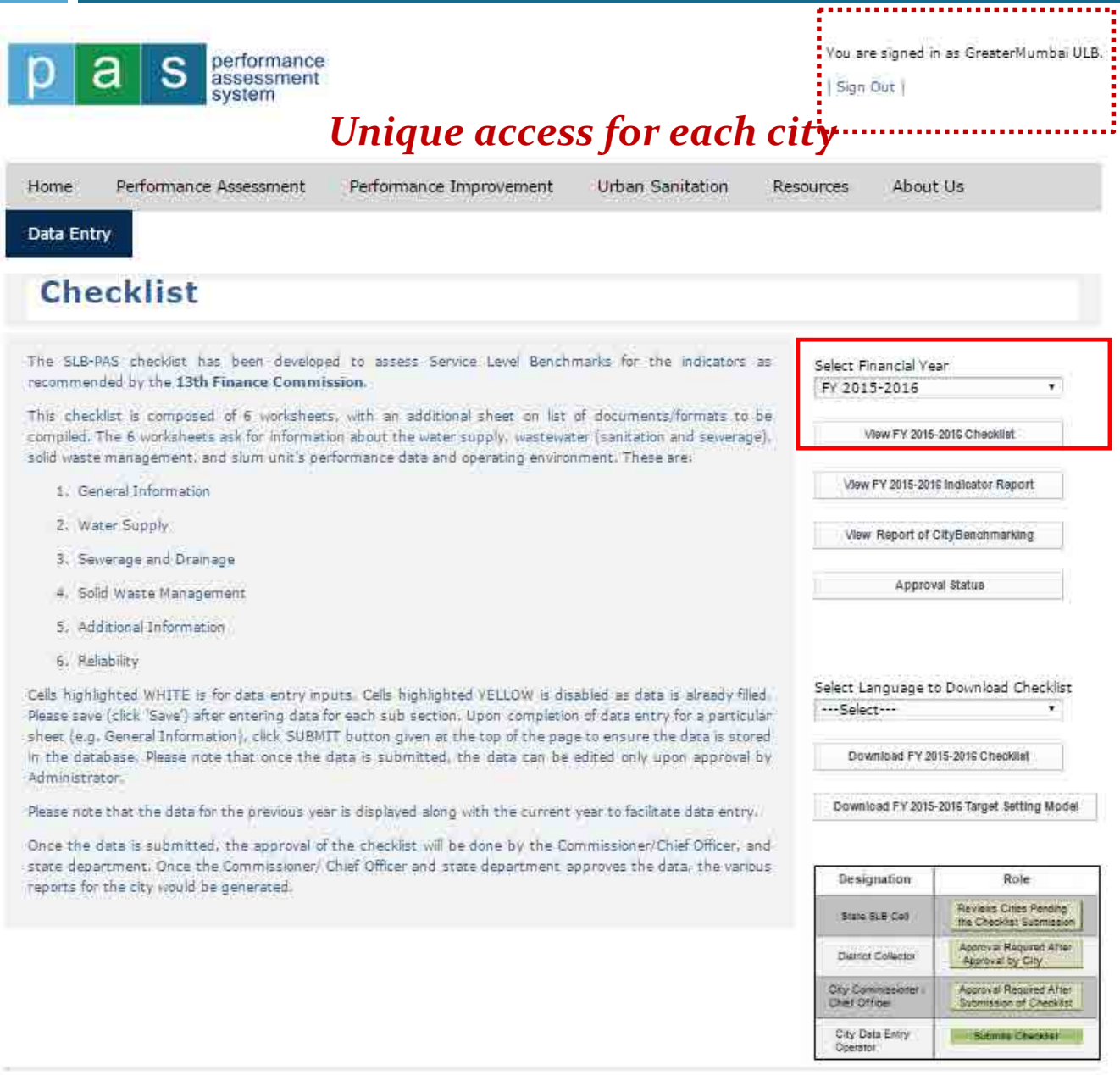
SLB Framework has been implemented by **PAS Project, CEPT University**

and is being used since **last 7 years**, for:

- 13th FC
- 14th FC
- SBM
- AMRUT
- Smart city mission

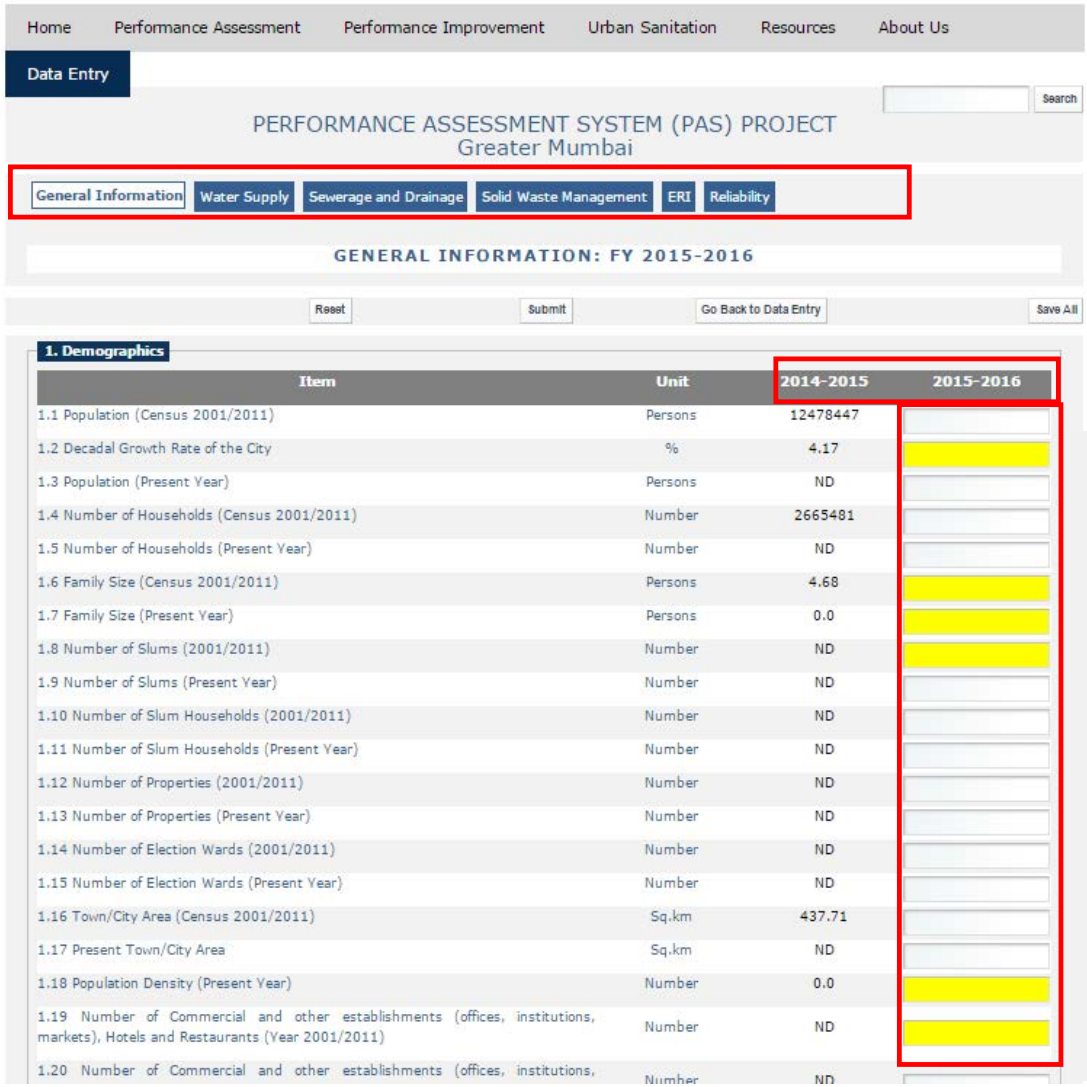
Handholding support to State for training and data entry

Online data entry for SLB



- General instructions on how to fill checklist online
- Options to download checklist in excel format, and in local language
- Option to view the approval status

Online data entry for SLB

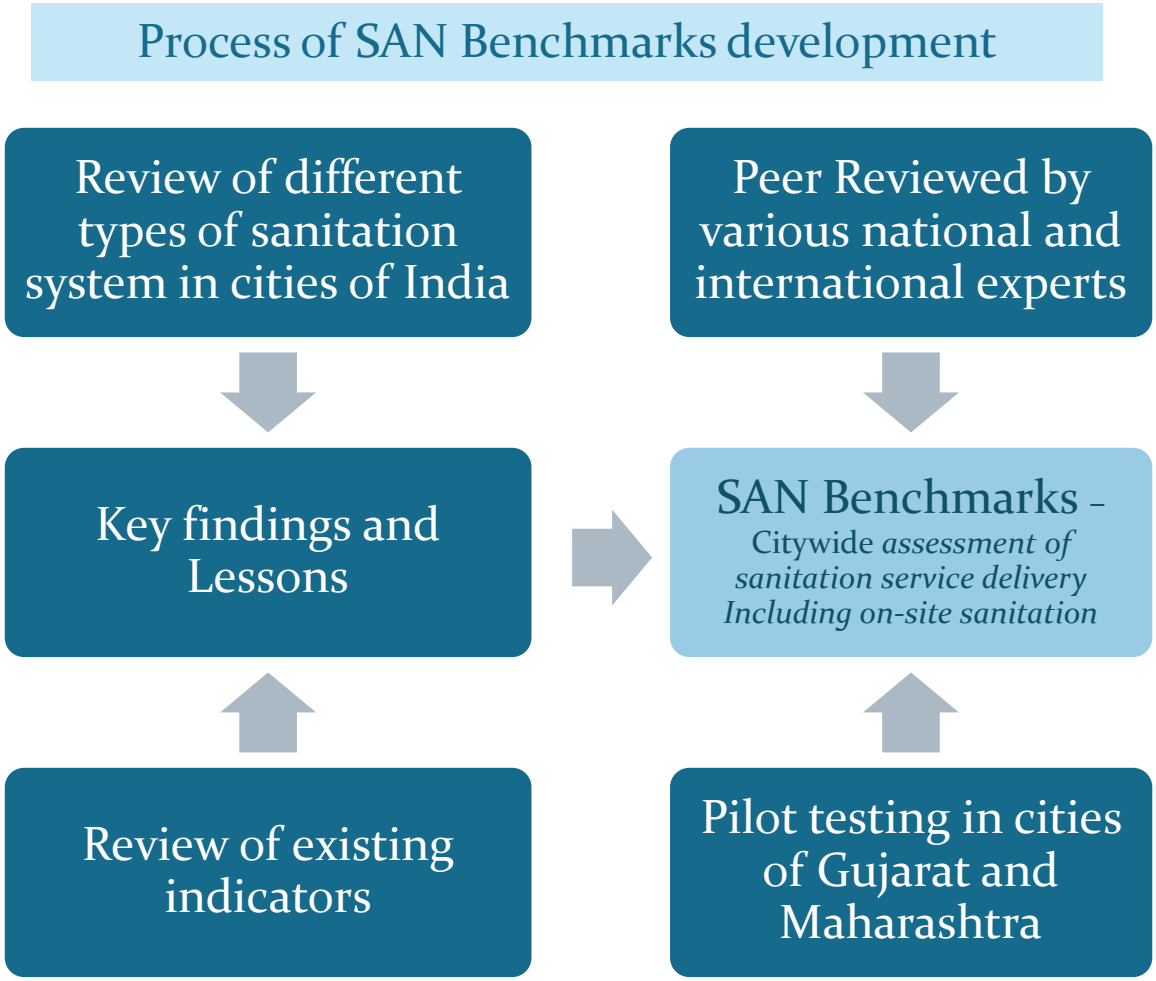


Item	Unit	2014-2015	2015-2016
1.1 Population (Census 2001/2011)	Persons	12478447	
1.2 Decadal Growth Rate of the City	%	4.17	
1.3 Population (Present Year)	Persons	ND	
1.4 Number of Households (Census 2001/2011)	Number	2665481	
1.5 Number of Households (Present Year)	Number	ND	
1.6 Family Size (Census 2001/2011)	Persons	4.68	
1.7 Family Size (Present Year)	Persons	0.0	
1.8 Number of Slums (2001/2011)	Number	ND	
1.9 Number of Slums (Present Year)	Number	ND	
1.10 Number of Slum Households (2001/2011)	Number	ND	
1.11 Number of Slum Households (Present Year)	Number	ND	
1.12 Number of Properties (2001/2011)	Number	ND	
1.13 Number of Properties (Present Year)	Number	ND	
1.14 Number of Election Wards (2001/2011)	Number	ND	
1.15 Number of Election Wards (Present Year)	Number	ND	
1.16 Town/City Area (Census 2001/2011)	Sq.km	437.71	
1.17 Present Town/City Area	Sq.km	ND	
1.18 Population Density (Present Year)	Number	0.0	
1.19 Number of Commercial and other establishments (offices, institutions, markets), Hotels and Restaurants (Year 2001/2011)	Number	ND	
1.20 Number of Commercial and other establishments (offices, institutions,	Number	ND	

- Previous year's data displayed alongside current year of data entry
- Options to save each sub section within a sheet; useful in case of connectivity issues during data entry
- Inbuilt data validation rule

Process of developing SAN Benchmarks: Citywide

assessment of sanitation service delivery Including on-site sanitation



Application of SAN Benchmarks

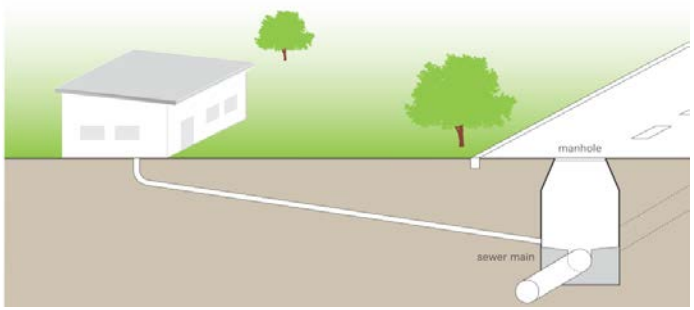
- Data required to calculate SAN Benchmarks indicators were added in online performance assessment system. More than 600 cities have entered information in online module and SAN Benchmarks are calculated.
- SAN Benchmarks were included in **IFSM toolkit and SANI PLAN tool**.
- This can also be used for preparation of **Shit Flow Diagram (SFD)**

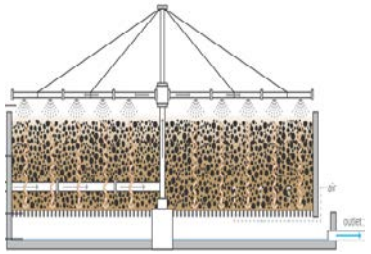
Dissemination of SAN Benchmarks: NIUA capacity building platform can be used to add SAN Benchmarks in current service level benchmarks indicators of Government of India.

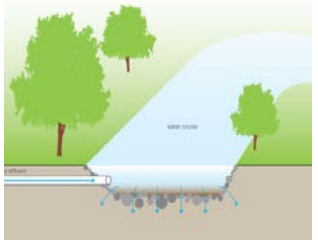
National level indicators - Sewerage system

Conventional Underground Sewerage system

User interface	Collection	Conveyance	Treatment	Recycle & Reuse





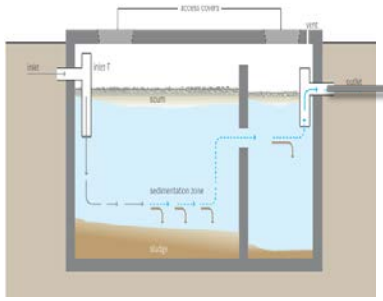


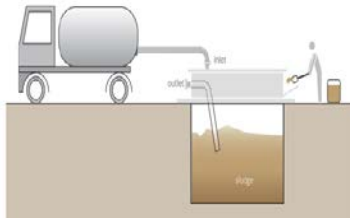
1. Coverage of toilets	3. Collection efficiency of sewerage network	4. Adequacy of sewage treatment capacity	6. Extent of reuse and recycling of sewage
2. Coverage of sewerage network		5. Quality of sewage treatment	

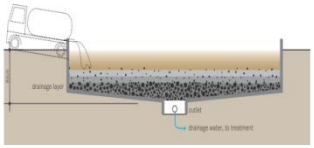
Indicators for Onsite sanitation systems

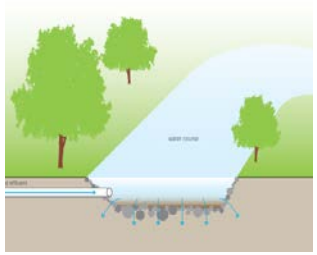
Onsite system – Septic tank with Settled Sewer/lined drain

User interface	Collection	Conveyance	Treatment	Recycle & Reuse

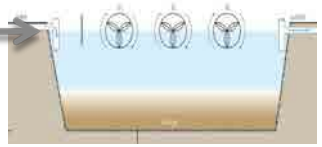








Settled sewers/drains

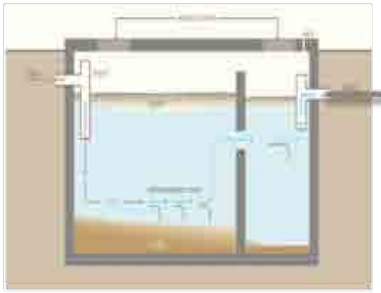


1. Coverage of toilets	2. Coverage of onsite sanitation system	3a. Collection efficiency of septage	4a. Adequacy of septage treatment plant	6a. Extent of reuse and recycling of treated Septage
			4b. Adequacy of effluent and grey water treatment plant	
		3b. Collection efficiency of effluents from septic tank and grey water	5a. Quality of septage treatment plant	6b. Extent of reuse and recycling of treated effluent and grey water
			5b. Quality of effluent and grey water treatment plant	

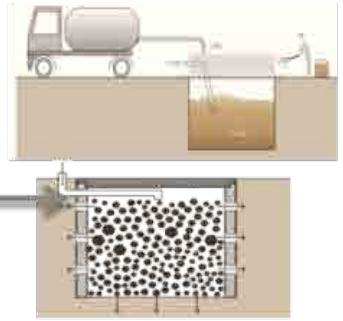
Indicators for Onsite sanitation systems

Onsite system – Septic tank with Soak pit

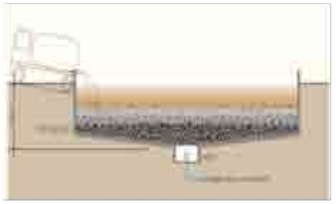
Toilets



Toilets connected to septic tank



Septage collection through septic tank emptying service



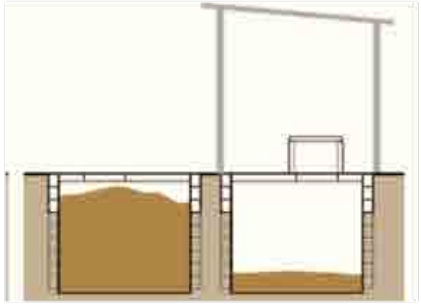
Treatment of septage

Reuse and recycling of treated septage

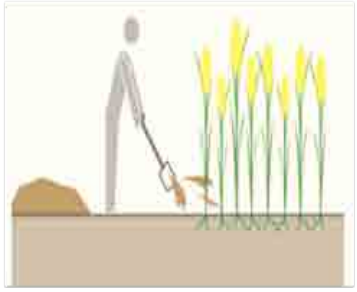
Effluents from septic tank and grey water are collected and treated in soak pit

Onsite system –Double Pit toilet

Toilets



Toilet connected to double pit



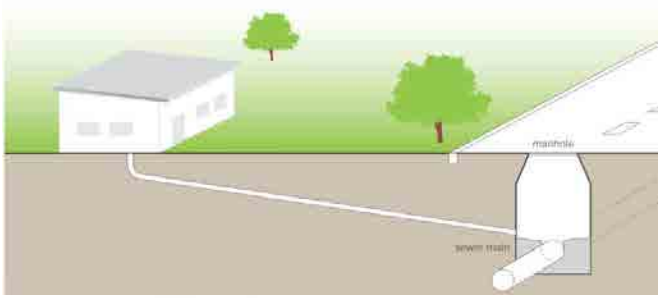
Reuse as manure in Agriculture

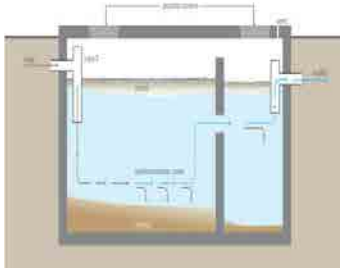
SAN Benchmarks: *Citywide assessment of sanitation service delivery Including on-site sanitation*

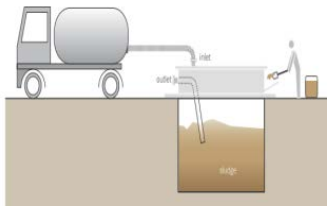
SAN Benchmarks provides a framework for performance assessment of city wide sanitation by capturing onsite sanitation systems along with the conventional sewerage systems.

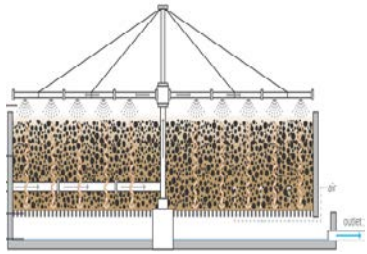
Mixed Sanitation System

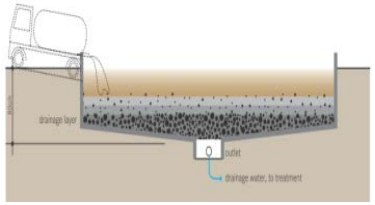
Access	Collection	Conveyance	Treatment	Recycle & Reuse

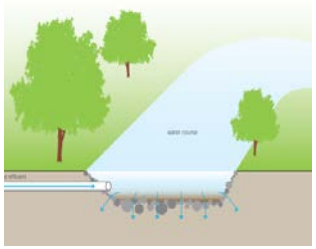












1. Coverage of toilets	3. Collection efficiency of sanitation system (weighted average)	4. Adequacy of treatment capacity of sanitation system (weighted average)	6. Extent of reuse and recycling in sanitation system (weighted average)
2. Coverage of adequate sanitation systems		5. Quality of treatment of sanitation system (weighted average)	

SAN Benchmarks: *Citywide assessment of sanitation service delivery Including on-site sanitation*

Revised Sanitation Indicators (Sewerage system + Onsite systems)	
1. Coverage of toilets	Percentage of properties with access to toilet facility in the city
2. Coverage of adequate sanitation system	Percentage of households with individual toilets connected with adequate sanitation systems (sewer network/ septic tank / double pit system) to total households in the city.
3. Collection efficiency of sanitation system	Weighted average of collection efficiency of each sanitation system, weighted by share of households dependent on each sanitation system.
4. Adequacy of treatment capacity of Sanitation System	Weighted average of adequacy of treatment plant capacity available for each sanitation system, weighted by share of households dependent on each sanitation system.
5. Quality of treatment of sanitation system	Weighted average of quality of treatment of each sanitation system, weighted by share of households dependent on each sanitation system.
6. Extent of reuse and recycling in sanitation system	Weighted average of extent of reuse of treated wastewater and sludge after adequate treatment as a percentage of wastewater and sludge received at the treatment plant, weighted by share of household dependent on each sanitation system.

SAN Benchmarks: *Citywide assessment of sanitation service delivery Including on-site sanitation*

Key Indicators

Monitored by local governments as well as higher level of governments at state and national level

Drill Down Indicators

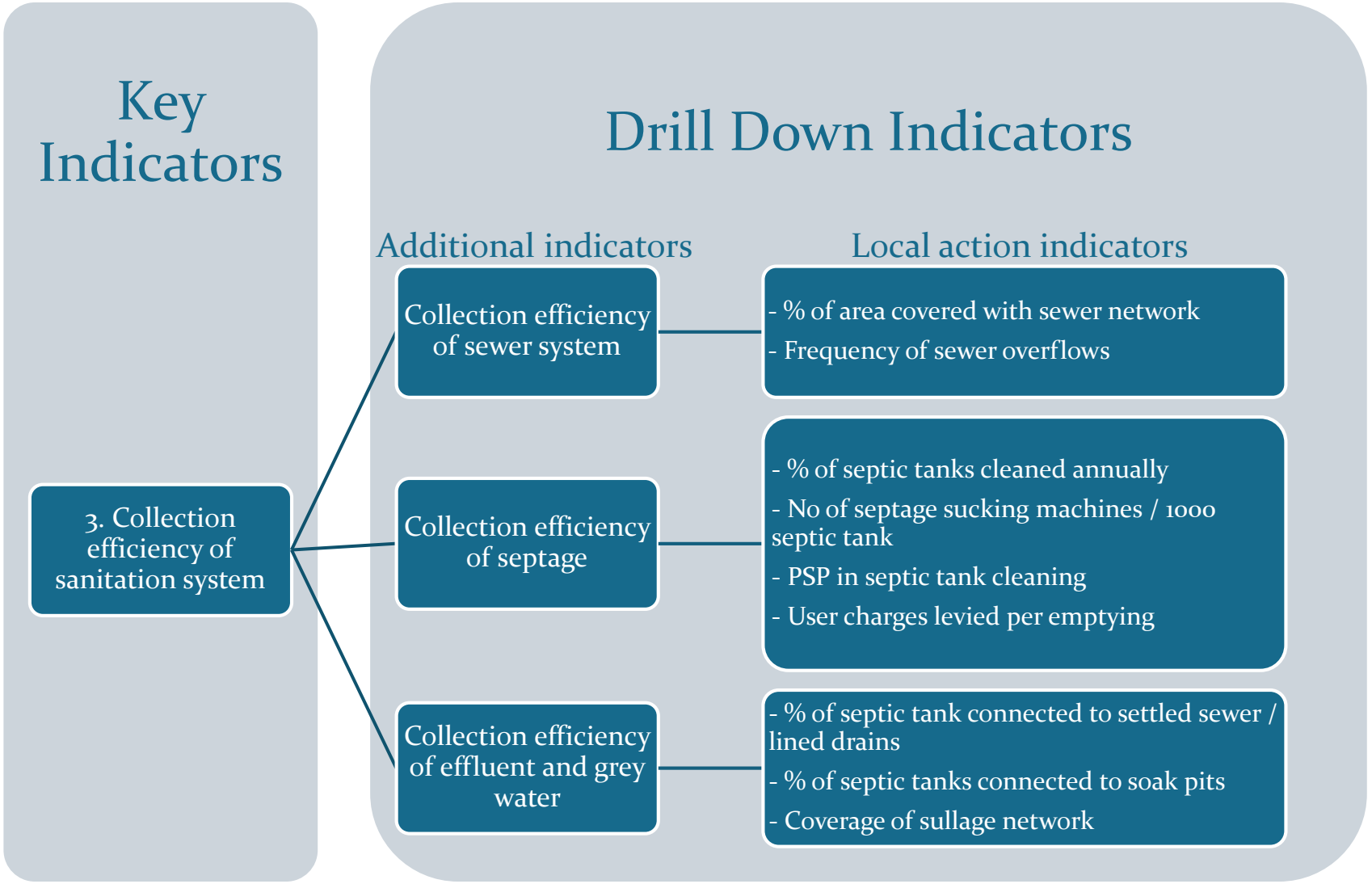
Additional indicators

- Monitored by local governments
- Provide more details on the key indicators and explain the indicator better to the city officials.

Local action indicators

- Monitored by local governments
- Facilitate in identifying local actions required and set sub-targets to achieve improved performance on service delivery.

SAN Benchmarks: *Citywide assessment of sanitation service delivery Including on-site sanitation*



SAN Benchmarks: *Citywide assessment of sanitation service delivery Including on-site sanitation*

Key Indicators

Capture	Collection	Conveyance	Treatment	Recycle and Reuse
1. Coverage of toilets	2. Coverage of each sanitation system	3. Weighted average of collection efficiency of each sanitation system	4. Weighted average of adequacy of each sanitation system 5. Weighted average of quality of treatment of each sanitation system	6. Weighted average of extent of reuse and recycling of each sanitation system

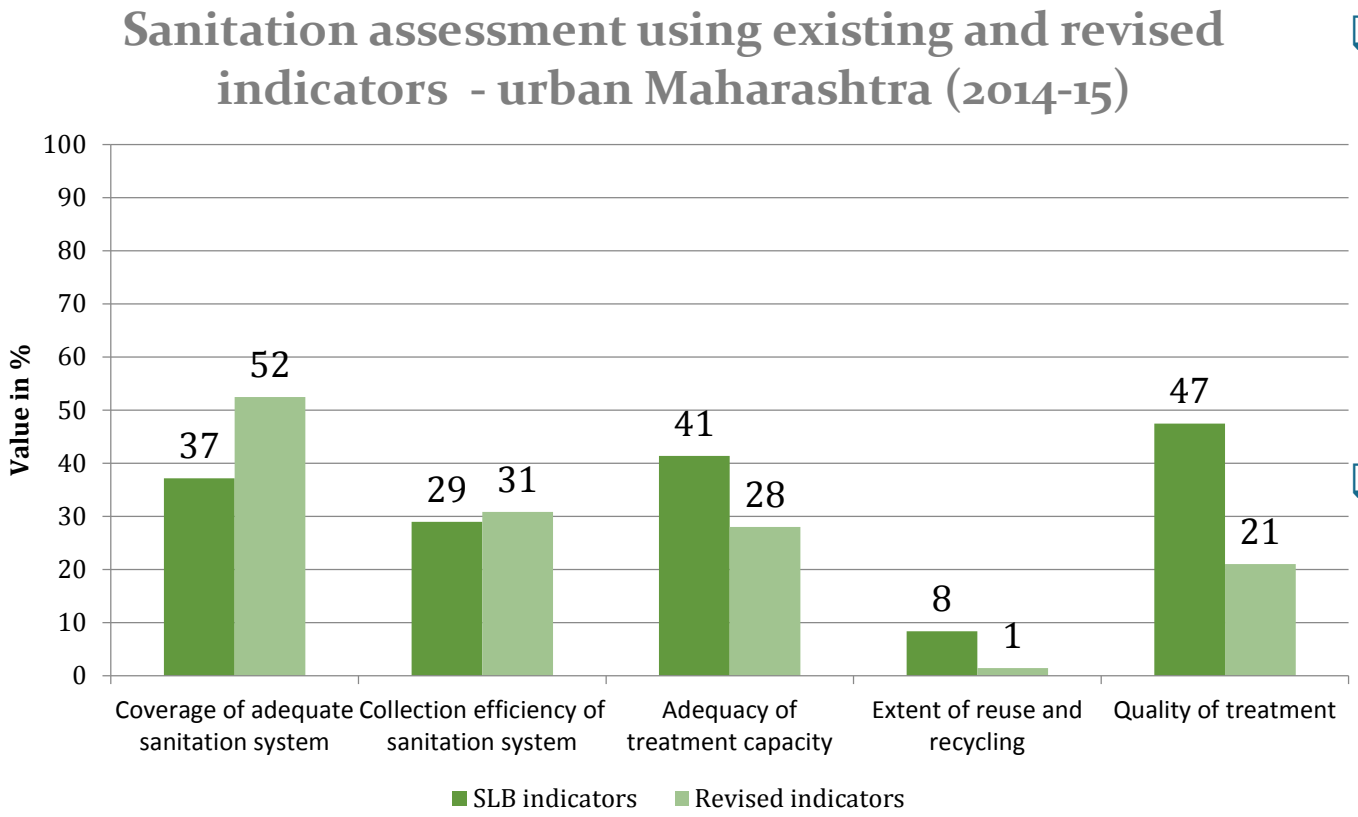
Drill Down Indicators

▪ Coverage of households with own toilets (%)	▪ Percentage of households connected to septic tank (%)	▪ Collection efficiency of septage (%) ▪ % of septic tanks cleaned annually	▪ Adequacy of septage treatment facility (%)	▪ Extent of reuse and recycling of treated septage received at treatment plant (%)
▪ Percentage of functional community toilet seats (%)	▪ Percentage of households connected to septic tank as per design standards (%)	▪ Number of septage sucking machines/1000 septic tanks (Ratio)	▪ Adequacy of effluent (from septic tank and grey water) treatment capacity (%)	▪ Extent of reuse and recycling of treated effluent (from septic tank and grey water) (%)
	▪ Percentage of households connected to twin pit system (%)	▪ PSP in septic tank cleaning services (Y/ N) ▪ User charges levied per emptying	▪ PSP in O & M operations for treatment plant (Y/N)	▪ Extent of reuse and recycling of treated sewage (%)
	▪ Percentage of households connected to sewer network (%)	▪ Percentage of septic tanks connected to settled sewer / drains for effluent disposal	▪ Quality of septage treatment (%)	
	▪ Percentage of illegal sewer network connections (%)	▪ Percentage of septic tanks connected to soak pit for effluent disposal (%)	▪ Quality of effluent (from septic tank) treatment (%)	
	▪ Percentage of identified illegal sewer network connections that are regularized (%)	▪ Collection efficiency of effluent (from septic tank) and grey water (%) ▪ Coverage of sullage network (open + covered) (%)	▪ Adequacy of sewage treatment facility (underground sewerage system) (%)	**Onsite indicators**
	▪ Percentage of area covered with sewer network (%)	▪ Collection efficiency of sewer network (%) ▪ Frequency of sewer overflows (number)	▪ Quality of treated sewage disposed (BOD & COD) (%)	

Indicator definition , formula and rationale have been developed…

Application of San Benchmark

SAN Benchmarks: *State Level Sanitation Assessment*

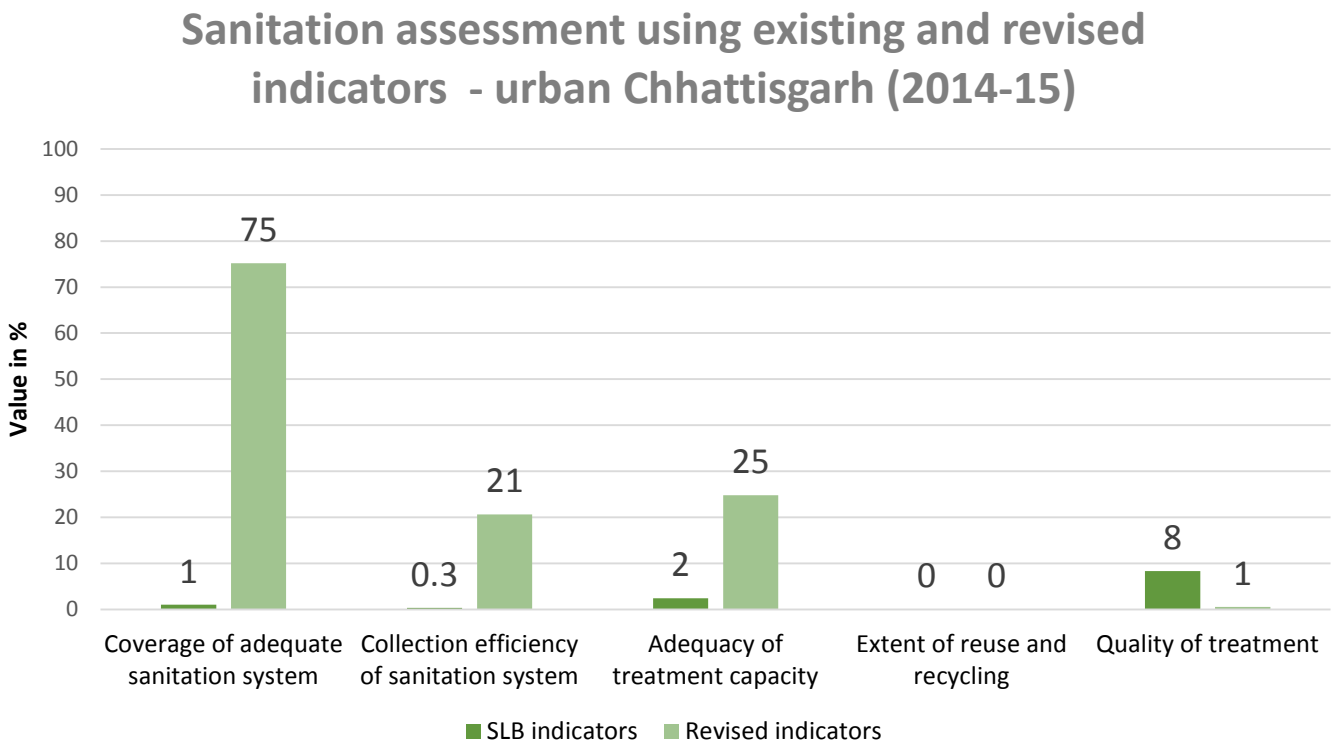


- Maharashtra has 259 urban local bodies (ULBs) of various sizes ranging from 3000 to 3.5 million population *(excluding greater Mumbai)*
- Only 34 ULBs has partial underground sewer network and 22 ULBs has sewerage treatment plant

- Revised indicators show **better performance for coverage of adequate sanitation system** and **collection efficiency**.
- Adequacy decreases as **only a few cities treat septage and grey water**
- None of the city reuses treated septage

Note: State level values are calculated using weighted average, above chart excludes Greater Mumbai, Akola, Aurangabad and Mirabhayantar ULBs values.

SAN Benchmarks: *State Level Sanitation Assessment*

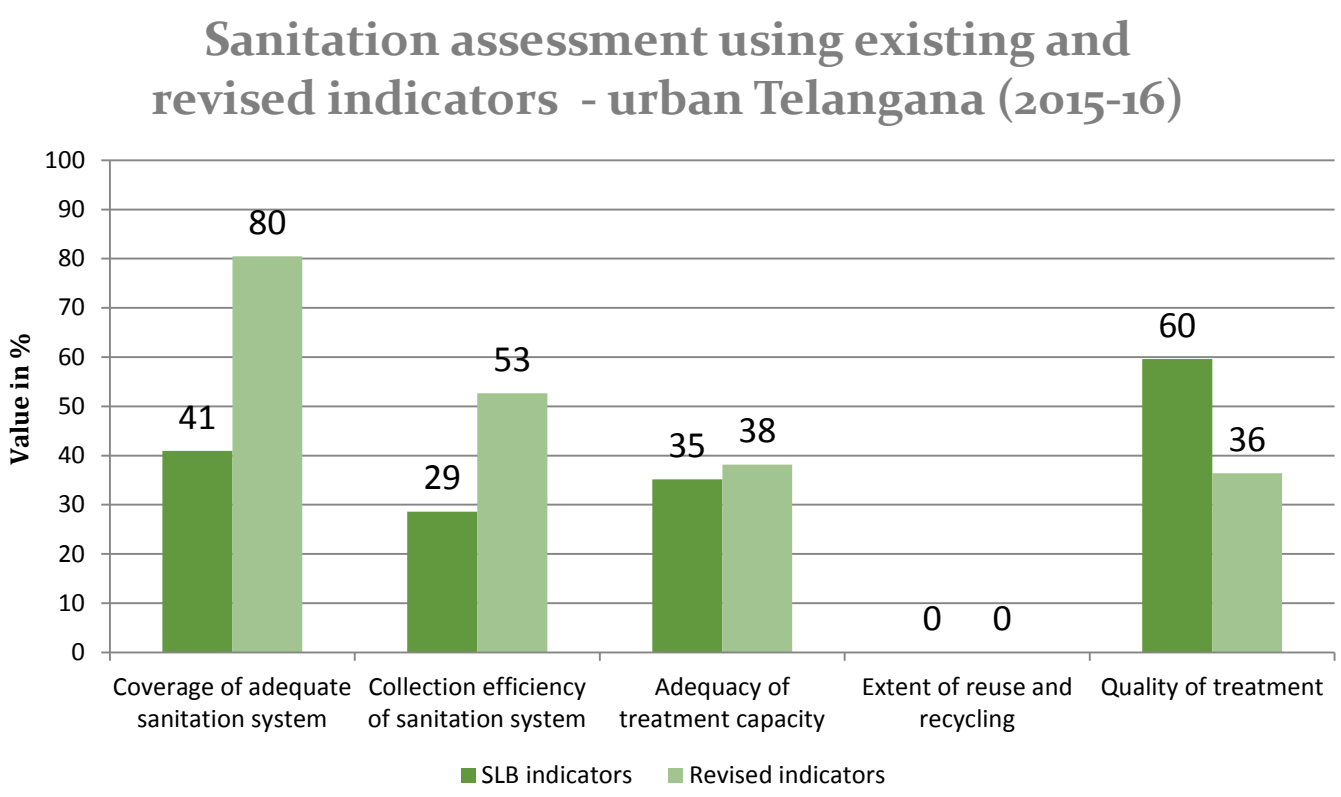


- Chhattisgarh has 43 urban local bodies (ULBs) of various sizes ranging from 11,000 to 1.2 million population
- Only 2 ULBs has partial underground sewer network and only 1 ULBs *(Bilaspur)* has sewerage treatment plant

- Revised indicators show **better performance for coverage of adequate sanitation system** and **collection efficiency**.
- Adequacy increases because it captures treatment of **grey water through septic tank connected to soak pit**
- None of the city treat septage

Note: State level values are calculated using weighted average

SAN Benchmarks: *State Level Sanitation Assessment*



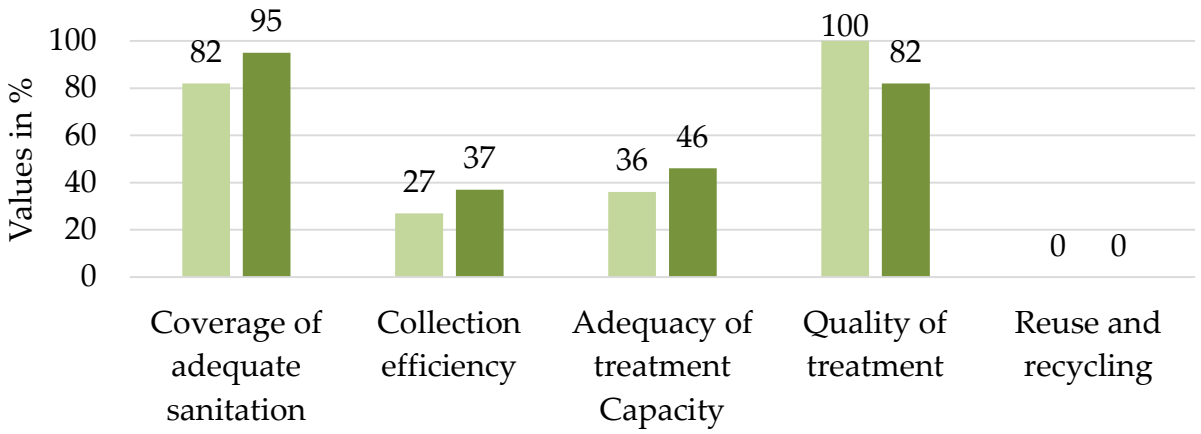
- Telangana has 69 urban local bodies (ULBs) of various sizes ranging from 24,000 to 9.3 million population
- Only 3 ULBs has partial underground sewer network and only 1 ULBs *(Greater Hyderabad)* has sewerage treatment plant

- Revised indicators show **better performance for coverage of adequate sanitation system** and **collection efficiency**.
- Adequacy increases because it captures treatment of **grey water through septic tank connected to soak pit**
- None of the city reuses treated sewerage or septage

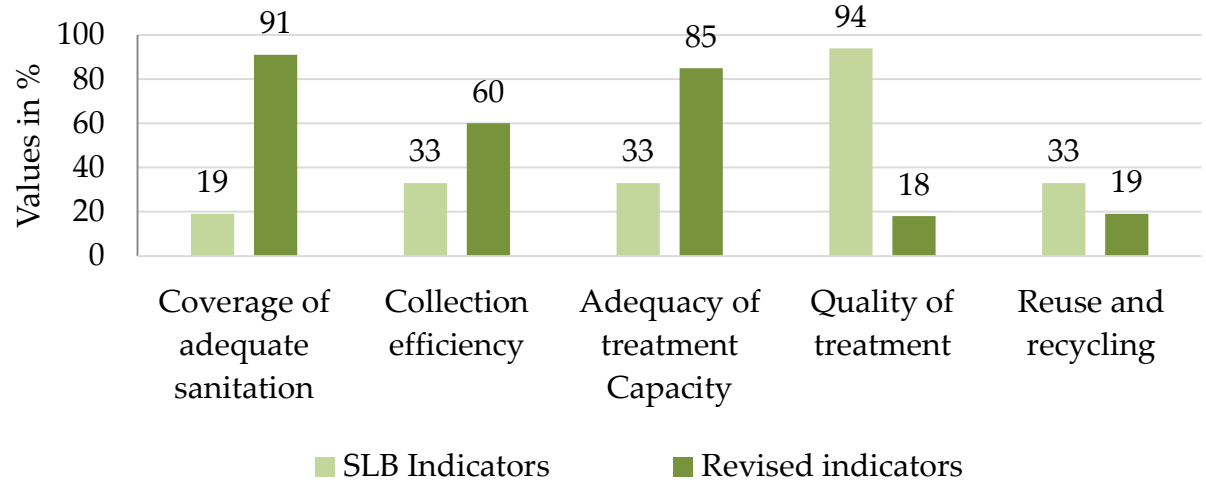
Note: State level values are calculated using weighted average

SAN Benchmarks: *City Level Sanitation Assessment*

Sanitation assessment using SLB and proposed sanitation indicators framework (mixed sanitation system - Nagpur)



Kalyan Dombivli



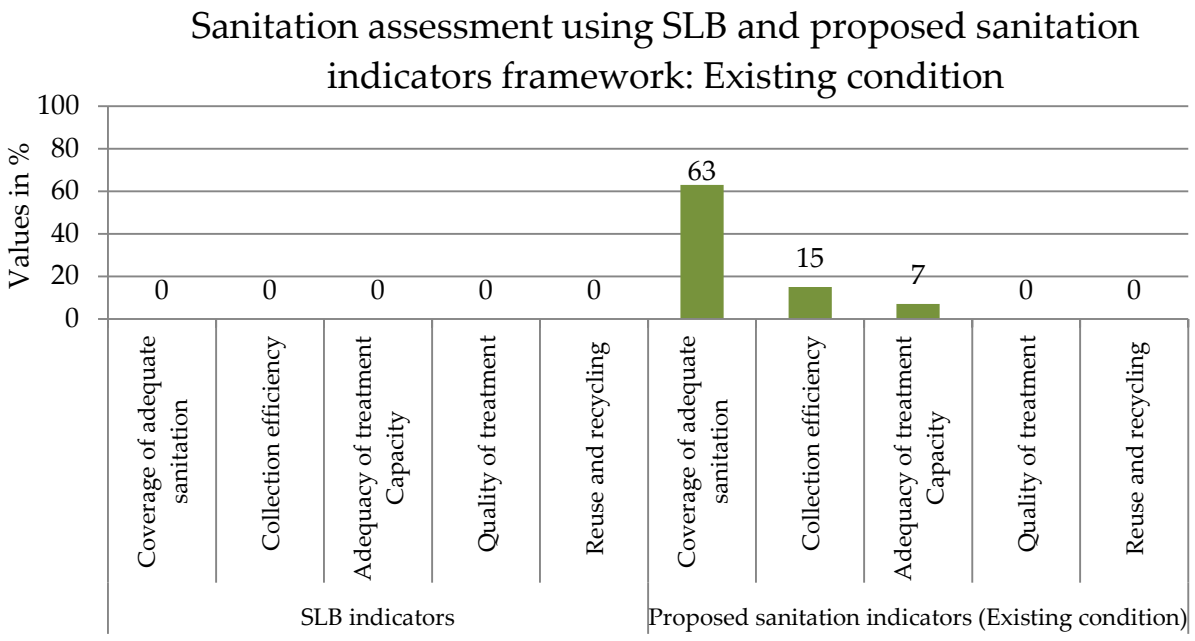
Nagpur :

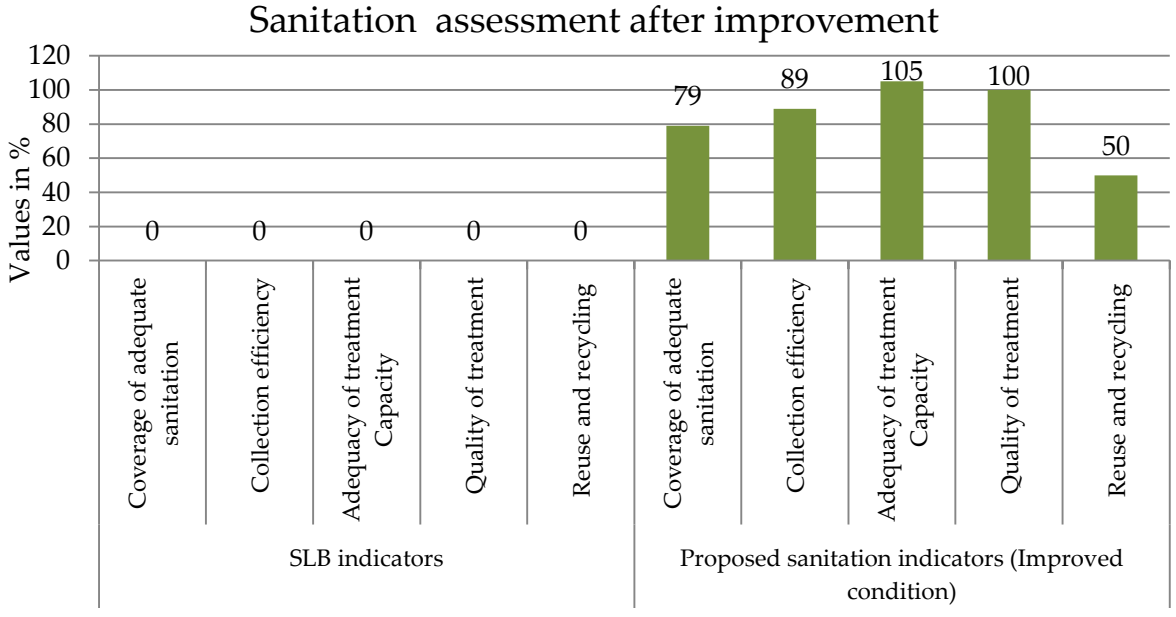
- 82% of properties are connected to sewer network. 13% have septic tanks with soak pits.
- WW generated: 276 MLD
- STP capacity: 100 MLD
- 12% of septic tanks are cleaned annually and treated in existing STP
- Quality tests are not carried out for sludge treatment

Kalyan Dombivli:

- 19% of properties are connected to sewer network. 78% have septic tanks with soak pits.
- WW generated: 370 MLD
- STP capacity: 123 MLD
- 8% of septic tanks are cleaned annually and treated in existing STP
- Quality tests are not carried out for sludge treatment
- 30 MLD treated sewage is reused

SAN Benchmarks: *City Level Sanitation Assessment*





Sinnar :

- 49% of households are connected to septic tanks with lined drains and 14% connected to septic tank with soak pit
- WW generated: 5 MLD
- 6% of septic tanks are cleaned annually and discharged on land without treatment
- **SLB indicators show zero value for all indicators.** Proposed sanitation indicators show performance of coverage, collection efficiency and adequacy of treatment (effluent treatment through soak pits).
- **Implementation of fecal sludge management plan is not reflected in old SLB indicators**. Whereas proposed sanitation indicators framework shows improvements in sanitation service

Addressing the data challenges

Major challenge in assessing performance using the revised indicators is availability of adequate information for onsite sanitation system

Challenges	Measures
User interface: Lack of recorded **information on household level access to onsite sanitation system**, i.e. HHs with septic tank, no of septic tank connected to soak pit, etc.	Currently estimated based on city officials knowledge. Can be improved by **addition of onsite sanitation related question in property tax assessment form**
Collection: **Septic tank cleaned by private operators**	**Provide license to private operators** and need monitoring mechanism
Conveyance: **Quantity of grey water and effluent collected** by drains	Estimated based HHs covered with septic tank and drains. **Monitor flow** in outlet drains.
Treatment: **Quantity of septage treated** in existing treatment plant	**Maintain record at treatment plant** for septage received

Thank You

Website: **pas.org.in**

Download SAN Benchmarks document

Email: **pas@cept.ac.in**

Phone no: +91-79-26302470, ext - 467