# Regional Training Institute

*Centre of excellence in 'Corporate Governance and Finance' and 'Audit of Municipal Corporations'*

**(Indian Audit and Accounts Department)**

# Case Study on Service level Benchmarking in Urban Local Bodies

## Paras 4.1.6, 4.1.7 & 4.1.8 of Maharashtra Local Bodies Report 6 of 2015 for YE 31-03.2014

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**-From the PD's Desk**

Regional Training Institute, Mumbai is designated as a Knowledge Centre for Commercial Audit, Corporate Governance and Finance, General Purpose Financial Reporting (IPSAS). As part of our Knowledge Centre activities, we come out with case studies and research papers on certain important aspects relating to these areas so that readers are benefited from these documents and can also use them in their day to day audit work.

Till recently RTI, Mumbai was also a Knowledge Centre on Audit of Municipal Corporations. The case study "Service Level Benchmarking in Urban Local Bodies" has been prepared based on Audit findings reported in Paras 4.1.6, 4.1.7 and 4.1.8 of the Maharashtra Local Bodies Report 6 of 2015 for the year ending 31-3-2014. The case study intends to bring out the benefits of the use of the benchmarking technique in performance audits of ULBs.

I hope readers benefit from the case study in understanding the application of this technique in Performance Audits and how it impacts audit conclusions and recommendations.

We welcome suggestions of readers so that we could incorporate them in our efforts in future.

RTI Mumbai Sd/-

31-03-2016 (Abdul Rauf)

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# Case Study on Service Level Benchmarking in Urban Local Bodies

**Objective**

The case study intends to familiarize readers with benchmarking as an evidence gathering technique, the steps involved in selection of benchmarks, collection of data for comparison and the characteristics of good benchmarking indicators for arriving at effective audit conclusions.

**Benchmarking**

Benchmarking, in audit, is a process whereby an auditor evaluates various activities of an auditee organisation in relation to the best practice usually within the same sector in which the auditee operates. A benchmark may be a standard set by an accredited body, or a certain desired level of standard achieved by a similar organisation or it may be just an indicator that has a general approval.

The objective of using benchmarking as an evidence gathering technique is to identify problem areas and areas of excellence. It is an ongoing process whereby the benchmarks keep changing with changes in the environment in which an auditee organisation engages itself. Benchmarking as an audit technique essentially involves comparison of the subject matter with the best practices.

The inherent strength of the benchmarking technique in audit is that it enables the auditor to identify the strengths and weaknesses in the processes of the auditee organisation and come out with effective recommendations that can help the auditee organisations achieve the expected standards of performance. Also in view of the dynamism built into this technique it compels the auditor to be constantly on the lookout for standards of performance that the auditee can be evaluated against and recommend improvements accordingly.

As explained earlier, benchmarking is a process for measuring an organization's performance or process against similar organizations that have consistently achieved superior standards themselves in the same categories of performance. In the context of performance audits, benchmarking helps identify opportunities of achieving better economy, efficiency and effectiveness. Benchmarking can be done with other external organizations or with internal units of the same organization having different levels of performance. Internal benchmarking can be

used efficiently in performance audit. For example, processes and performances of a state/ district in a project can be benchmarked against a high performing state/ district to efficiently highlight problems and their causes.

**When to use the technique?**

Benchmarking can be of use both during the planning and execution phase of performance audit. In the planning phase, benchmarking helps in setting audit criteria.

Cause effect analysis in the execution phase is greatly enhanced through the use of benchmarking. Comparing detailed processes of the auditee with its benchmarks will reveal the gaps and areas of mismatch. This can provide a good insight into the cause of problems faced by the auditee and the possible effects. In this manner it helps in substantiating audit findings and conclusions and reinforces audit recommendations with greater credibility.

**Steps in using this technique**

The benchmarking process will involve the following stages:

- *Deciding the aspects of performance or process that will be benchmarked:*
  The audit objectives would determine the processes that need to be benchmarked. These normally include the key performance parameters and critical processes of the organization.

- *Deciding the type of comparison and benchmarking partners:* The type of comparison that would need to be done normally depends on the information available with the auditee and extent of its reliability and appropriateness. Alongside the possible benchmarking parameters, the availability of benchmarking tools in the partners need to be assessed. Discussion of the choice of parameter and the benchmarking tools with the auditee organization is always a good practice and ensures auditee's acceptance of the results of benchmarking,

- *Collect data:* Collection of credible and reliable data for comparison is an important step as it is vital to the success of benchmarking as an audit technique. In case data required for benchmarking is not readily available, it could be collected independently

by audit through surveys, interviews, questionnaires and sampling. Where data is available, their reliability needs to be checked and specific information required collected and compiled to suit the study requirements.

- *Determine the performance gap:* Comparing the performance indicators of the auditee with the accepted yardsticks of performance would reveal gaps in performance and these are to be thoroughly examined to analyse the reasons for below par performance. This helps audit in coming out with suitable recommendations.
- *Framing conclusions and recommendations for betterment:* Recommendations flow from the audit conclusions drawn from a comparison of the actual performance with the benchmarks and could be suggestive of a restructuring of processes in line with the best practices revealed by benchmarking tools and also highlight the benefits that are likely to be associated with the change

**Strengths and concerns of the technique**

*Strengths:* Benchmarking can be an effective tool for performance audit as:

- It stimulates an objective review of processes, practices, and systems.
- It provides objective data on methods of operation
- It identifies better ways of operating
- It supports recommendations for making changes
- It presents a target for improvement in the audited organizations

*Concerns:* Some concerns while using benchmarking are:

- Benchmarking requires high degree of skill
- The acceptability of the findings of benchmarking with the auditees is an area, which will require attention

Audit findings reported in Paras 4.1.6.3, 4.1.7.3 and 4.1.8.4 of the Maharashtra Local Bodies Report 6 of 2015 for the year ending 31-3-2014 have emanated thorough the use of the benchmarking technique.

**Background of the case study**

To measure and monitor the performance of local bodies in delivery of key services, Ministry of Urban Development (MoUD), Government of India (GoI) promulgated, in July 2008, Service Level Benchmarking (SLB) in four key sectors viz. Water Supply, Sewage Management (Sewage and Sanitation), Solid Waste Management (SWM) and Storm Water Drainage (SWD).

Audit selected three of the above services ie Water Supply, Solid Waste Management (SWM) and Storm Water Drainage (SWD) for use of the benchmarking technique. MoUD, GOI has prescribed 26 indicators for measuring the effectiveness of the services under the above three category of services.

**The Benchmarking Indicators**

**Water Supply**

| Sl No. | Service level benchmark indicators | National Benchmarks |
|---|---|---|
| 1. | Coverage of water supply connection | 100% |
| 2. | Per capita supply of water | 135 lpcd |
| 3. | Extent of metering of water connection | 100 % |
| 4. | Extent of non-revenue water | 20% |
| 5. | Extent of cost recovery in water supply services | 100% |
| 6. | Efficiency in collection of water supply related charges | 90% |
| 7. | Continuity of water supply | 24 hours per day |
| 8. | Quality of water supplied | 100 % |
| 9. | Efficiency in redressal of customer complaints | 80% |

**Solid Waste Management**

| Sl No. | Service level benchmark indicators | National Benchmarks |
|---|---|---|
| 1. | Household level coverage of MSW | 100% |
| 2. | Efficiency of collection | 100% |
| 3. | Extent of segregation of MSW | 100 % |
| 4. | Extent of scientific disposal of MSW | 100% |
| 5. | Extent of MSW recovered | 80% |
| 6. | Efficiency in redressal of consumer complaints | 80% |
| 7. | Efficiency in collection of SWM charges | 90 % |
| 8. | Efficiency in collection of SWM charges | 90% |

**Sewage Management**

| Sl No. | Service level benchmark indicators | National Benchmarks |
|---|---|---|
| 1. | Coverage of toilets | 100% |
| 2. | Coverage of sewage network services | 100% |
| 3. | Collection efficiency of sewage network | 100 % |
| 4. | Adequacy of sewage treatment capacity | 100% |
| 5. | Quality of sewage treatment | 100% |
| 6. | Extent of reuse and recycling of sewage | 20% |
| 7. | Efficiency of redressal of consumer complaints | 80% |
| 8. | Extent of cost recovery in sewage management | 100% |
| 9. | Efficiency in collection of sewage charges | 90% |

**Learning Points from the case study**

- The principal learning point from this case study is the selection of the benchmarking parameters. The benchmarking indicators have been prescribed by the Ministry of Urban Development of the Government of India. An audit comment that emanates from a

comparison of parameters that have been laid down by an authority that holds the supervisory jurisdiction over the auditee finds acceptance from the auditee.

- Audit also measured performance of the ULBs against the internal benchmarks set by the ULBs. Comparison of performance against internal benchmarks are always appreciated and accepted by auditees.
- The data for comparison was sourced either from the Government of Maharashtra or collected by audit directly from the ULBs concerned and hence is reliable and cannot be repudiated
- Being benchmarks set by the Ministry and the ULBs the benchmarking indicators are realistic and hence comparable
- The indicators selected are clearly defined and hence can be clearly understood by the reader of the audit report.
- Further the services selected for use of the benchmarking technique are central to the functioning of the ULBs and of great concern to the citizens of the ULBs who are recipients of these services
- Thus all the characteristics of good benchmarking indicators i.e reliability, clarity, being realistic, practicable and intelligible etc are met
- This has enabled audit in arriving at worthwhile conclusions on the performance of the ULBs audited. The recommendations that flow from these conclusions can be of great use to the auditee to improve the quality of services and thus have the desired impact by way of improved services.

**Conclusion:**

We could thus see how the benchmarking technique can be an effective tool for comparing performance of an auditee organization with the prescribed yardsticks of performance and hence lead to effective audit findings that can have the desired impact of value addition by audit through recommendations that flow from the findings bringing about the desired level of performance for the benefit of citizens.

pumping capacity of 52.14 MLD and requirement of 13.81 MLD (projections up to 2042). After accounting for the permissible evaporation losses of 30 *per cent* from Waghdardi dam (as also considered by the MC), 2,951 ML would be available in the dam that would be sufficient to cater to the needs of the MC for 214 days[15] in a year during canal closure period.

- Given the existing capacity of PBT (148 ML), 888 ML would be available during the year (in six intervals) and, after accounting for the permissible evaporation losses of 30 *per cent*, 622 ML would be available. This would be sufficient to meet the needs of the MC for 45 days[16].

Thus, the MC would be in a position to cater to the needs of the citizens for 369 days (110 days +214 days +45 days) without increasing the capacity of the PBT from 148 ML to 652 ML. Further, even after considering the projected demand of the MC for 10 MLD up to the year 2030, the MC would be in a position to cater to the needs of the citizens for 496 days. In addition, the MC did not consider the availability of rain water during monsoon period while preparing the DPR. If rain water had also been taken into account, the need for augmentation would not have arisen at all due to increased availability of water in both the storage tanks (PBT and Waghdardi dam).

The decision of the MC to augment the capacity of PBT was therefore, flawed and resulted in an unnecessary expenditure of ₹ 9.03 crore.

#### 4.1.6.3 Service level benchmarking

Benchmarking is recognized as an important mechanism for introducing accountability in service delivery. It involves measuring and monitoring of service provider performance on a systematic and continuous basis. Sustained benchmarking can help utilities to identify performance gaps and introduce improvements through the sharing of information and best practices, ultimately resulting in better services to people. Recognizing its importance, Ministry of Urban Development (MoUD), GoI promulgated (July 2008) Service Level Benchmarking (SLB) in four key sectors *viz*. Water Supply, Sewage Management (Sewage and Sanitation), Solid Waste Management (SWM) and Storm Water Drainage (SWD).

The SLBs prescribed by GoI was adopted by GoM in February 2010 to be achieved by all MCs. As per the instructions issued (October 2010) by GoM, each MC was to fix goals for SLB achievements during each financial year and furnish the details of achievement of these goals to State Government.

**(a) Non-achievement of SLBs**

During 2013-14, number of MCs (out of 36 selected MCs) which did not achieve the SLBs prescribed by GoI or those set by the MCs themselves in respect of nine indicators in water supply services, are shown in **Table 4.**

[16] 148 ML x 6 intervals = 888 ML less 30 *per cent* evaporation losses = 622 ML ÷ 13.81 ML = 45 days

**Table 4: Achievement against SLBs during 2013-14**

| Service level benchmark indicators | National bench-marks | No. of MCs which did not achieve the SLB of GoI as on March 2014 | Range of achieve-ment by the MCs | Range of targets fixed by MCs to be achieved as on March 2014 | No. of MCs which could not achieve their own targets as on March 2014. | Percentage of MCs which could not achieve their own targets |
|---|---|---|---|---|---|---|
| Coverage of water supply connection | 100 *per cent* | 36 | 35-96 *per cent* | 40-100 *per cent* | 31 | 86 |
| Per capita supply of water | 135 lpcd | 30 | 25-129 lpcd | 35-340 lpcd | 27 | 75 |
| Extent of metering of water connection | 100 *per cent* | 35 | 0-94 *per cent* | 5-100 *per cent* | 17 | 100 |
| Extent of non-revenue water | 20 *per cent* | 26 | 21-56 *per cent* | 0-50 *per cent* | 29 | 81 |
| Extent of cost recovery in water supply services | 100 *per cent* | 27 | 20-99 *per cent* | 25-305 *per cent* | 22 | 61 |
| Efficiency in collection of water supply related charges | 90 *per cent* | 36 | 12-87 *per cent* | 15-99 *per cent* | 29 | 81 |
| Continuity of water supply | 24 hours per day | 36 | 6 | 1-7 | 24 | 75 |
| Quality of water supplied | 100 *per cent* | 18 | 52-99 *per cent* | 85-100 *per cent* | 18 | 50 |
| Efficiency in redressal of customer complaints | 80 *per cent* | 13 | 28-77 *per cent* | 42-100 *per cent* | 13 | 36 |
| Source: Data published by GoM | | | | | | |

Evidently, none of the 36 MCs were able to achieve the SLBs prescribed by GoI in respect of all the nine indictors during 2013-14. Individual targets fixed by the MCs could also not be achieved by 36 *per cent* to 100 *per cent* of the MCs during 2013-14.

Findings of audit on three of the nine indicators *i.e*. cost recovery in water supply services, extent of non-revenue water and extent of metering of water connections are discussed below.

***(i) Shortfalls in cost recovery of water supply services***

The SLBs of GoI prescribed 100 *per cent* recovery of cost of water supply services in order to ensure that services being provided are cost-effective. The GoM issued detailed guidelines (August 2010) for fixation of rates for water supply services for various category of consumers by considering cost of raw water, establishment charges, capitalization of interest, if any, depreciation charges *etc*. in order to ensure that full cost of operations and maintenance or recurring costs are recovered.

Audit however, observed that of the 36 selected MCs, 28 MCs during 2011-12, 25 MCs during 2012-13 and 24 MCs during 2013-14 were not able to achieve the national benchmark of 100 *per cent* cost recovery in water supply services and consequently, sustained an operational loss[17] totalling ₹ 130.45 crore. The main reasons for operational losses were non-revision of rates for water supply services by the MCs to meet their actual costs, high percentage of non-revenue water, poor collection of water charges *etc*. Audit also noticed that six[18] MCs were able to reduce their operational losses during March 2014 as compared to March 2012.

The Secretary, UDD stated during exit conference that it was very difficult to insist on 100 *per cent* recovery of water charges by the MCs, considering that the MCs were not able to supply water regularly to its citizens.

***(ii) High percentage of non-revenue water***

The major reasons of non-revenue water (NRW) are loss of water due to poor maintenance of distribution network, water theft, illegal connections, non-metering of water connections *etc.*

Audit observed that of the 36 selected MCs, 19 MCs during 2011-12, 23 MCs during 2012-13 and 26 MCs during 2013-14 registered high NRW to the extent of 21 *per cent* to 57 *per cent*, against the national benchmark of maximum 20 *per cent*. However, during 2013-14, 10 MCs[19] were able to restrict the NRW within the national benchmark of 20 *per cent*.

The Secretary, UDD stated that the instructions would be issued to the MCs for ensuring NRW within permissible limit.

***(iii) Non-metering of water connections***

Consumer metering induces efficiency in water use, reveals leakages in the distribution system and enables high-end consumers to be charged more for consuming more.

Audit observed that during 2011-14, of the 36 selected MCs, only one MC (Sawantwadi) met the national benchmark of 100 *per cent* metering of water connections, 22 MCs had no metering while 13 MCs had partial metering between 0.1 *per cent* and 94 *per cent*.

## 4.1.7 Solid Waste Management

### 4.1.7.1 Management of municipal solid waste

Municipal solid waste management involves collection, segregation, storage, transportation, processing and disposal of municipal solid waste generated in municipal or notified areas. The Municipal Solid Wastes (Management and Handling) Rules, 2000 (MSW Rules) were notified by the Ministry of Environment and Forest (MoEF), GoI in September 2000 that made every municipality, within its territorial jurisdiction, responsible for management and handling of solid waste.

[17] Cost of water supply services minus total demand raised for water charges
[18] Hinganghat, Ichalkaranji, Khamgoan, Umarkhed, Washim and Mehekar
[19] Alandi, Ichalkaranji, Katol, Lonavala, Phaltan, Shirdi, Sinner, Tuljapur, Udgir and Uran

this purpose, each MC was required to maintain database of all the health units functioning in its jurisdiction. Eight[34] of the 36 selected MCs did not have the list/details of health units functioning and generating BMW within their jurisdiction.

- In 17[35] of the remaining 28 MCs, 1,161 health units were functioning but, only 712 health units (61 *per cent*) were treating the BMW. 39 *per cent* of the health units were not treating BMW thus, exposing the human beings and animals to health hazards. In the remaining 11 MCs, all the health units were treating BMW as per Rules.

The Secretary, UDD while accepting the facts stated during exit conference that specific guidelines for implementation of norms envisaged in the BMW Rules would be issued.

#### 4.1.7.3 Non-achievement of SLBs

The SLBs prescribed by GoI in July 2008 against eight performance indicators in MSW and the achievements there against by 36 selected MCs is shown in **Table 7.**

**Table 7: Achievements against SLBs of GoI during 2013-14**

| Service Level Benchmark indicators | National benchmarks (*per cent*) | No. of MCs which achieved the SLBs | SLB achievement by remaining MCs (range of achievement in percentage) |
|---|---|---|---|
| Household level coverage of MSW | 100 | 1 | 35 MCs (1- 98) |
| Efficiency of collection | 100 | 6 | 30 MCs (67 -99) |
| Extent of segregation of MSW | 100 | 0 | 36 MCs (0 -25) |
| Extent of scientific disposal of MSW | 100 | 0 | 36 MCs (0) |
| Extent of cost recovery in SWM services | 100 | 0 | 36 MCs (0-45) |
| Extent of MSW recovered | 80 | 1 | 35 MCs (0-70) |
| Efficiency in redressal of consumer complaints | 80 | 29 | 7 MCs (46-77) |
| Efficiency in collection of SWM charges | 90 | 1 | 35 MCs (0-81) |
| Source : Data published by GoM | | | |

It could thus, be seen that none of the 36 MCs were able to achieve the national benchmarks with regard to collection, segregation, scientific disposal of MSW, cost recovery of services *etc*.

### 4.1.8 Sewage Management

As per MMC Act, construction of drains, sewers, tunnels, culverts, Sewage Treatment Plants (STP) *etc*. across or under any street or any place for the purpose of disposal of effluents generated and their discharge into sea/river

[34] Kulgaon-Badlapur, Panvel, Sinner, Yavatmal, Jalna, Akot, Nandurbar and Lonavala
[35] Alandi, Chalisgaon, Hinganghat, Katol, Khamgaon, Manmad, Mehekar, Narkhed, Osmanabad, Pandharpur, Ratnagiri, Sawantwadi, Shirdi, Tuljapur, Umarkhed, Uran and Washim

completed in five of 36 selected MCs, the underground sewage system in these MCs either did not commence or partially completed to the extent of only three to 39 *per cent* as of October 2014. The details are shown in **Table 10.**

**Table 10: Status of implementation of underground sewage system works *vis-à-vis* water supply augmentation works**

| Name of MCs | Date of sanction of water supply augmentation works | Physical progress as on October 2014 (in percentage) | Date of sanction of underground sewage system | Physical progress as on October 2014 (in percentage) |
|---|---|---|---|---|
| Gondia | July 2008 | 73 | June 2013 | Not yet started |
| Washim | December 2006 | 71 | November 2010 | 39 |
| Hingoli | September 2007 | 64 | July 2013 | Not yet started |
| Nandurbar | March 2008 | 100 | February 2010 | 39 |
| Ichalkaranji | September 2007 | 100 | February 2014 | 3 |
| Source: Information collected from MCs | | | | |

Evidently, this mismatch between water supply augmentation works and underground sewage network system would create civic hazard and pollution in the municipal areas as soon as the level of 135 lpcd is achieved by all the five MCs.

#### 4.1.8.4 Non-achievement of SLBs

The SLB achievement by 36 selected MCs against nine indicators prescribed by MoUD, GoI or those set by the MCs themselves for sewage management is shown in **Table 11**.

**Table 11: Achievement against SLBs during 2013-14**

| Sl. No. | SLB indicators | National benchmarks (*per cent*) | No. of MCs which achieved the national benchmarks (range in *per cent*) | No. of MCs which fixed its own targets (range in *per cent*) | No. of MCs which achieved the targets |
|---|---|---|---|---|---|
| 1. | Coverage of toilets | 100 | None | 36 MCs (35-100) | 11 MCs |
| 2. | Coverage of sewage network services | 100 | None | 7 MCs (30-75) | None |
| 3. | Collection efficiency of the sewage network | 100 | None | 6 MCs (30-70) | None |
| 4. | Adequacy of sewage treatment capacity | 100 | 2 MCs (100-160) | 5 MCs (40-90) | 1 MC |
| 5. | Quality of sewage treatment | 100 | 4 MCs (100) | 5 MCs (35-100) | 3 MCs |
| 6. | Extent of reuse and recycling of sewage | 20 | 1 MC (87) | 6 MCs (8-90) | None |
| 7. | Efficiency in redressal of consumer complaints | 80 | 25 MCs | 36 MCs (45-100) | 21 MCs |
| 8. | Extent of cost recovery in sewage management | 100 | 1 MC | 22 MCs (1-100) | 3 MCs |
| 9. | Efficiency in collection of sewage charges | 90 | 1 MC (100) | 22 MCs (15-100) | 2 MCs |

It could be seen from **Table 11** that except for efficiency in redressal of consumer complaints (refer indicator at **Sl. No. 7** above), the achievement of SLBs by the MCs against rest of the eight indicators was poor.

# 2.1 WATER SUPPLY SERVICES

## 2.1.1 COVERAGE OF WATER SUPPLY CONNECTIONS

| Performance Indicator | | |
|---|---|---|
| **Indicator** | **Unit** | **Definition** |
| Household level coverage of direct water supply connections | % | Total number of households in the service area that are connected to the water supply network with direct service connections, as a percentage of the total number of households in that service area. Service area implies a specific jurisdiction in which service is required to be provided. |
| **Data Requirements** | | |
| **Data required for calculating the indicator** | **Unit** | **Remarks** |
| a. Total number of households in the service area | Number | The total number of households (not properties) in the service area should be calculated. The service area refers to either the ward or ULB limits. Cadastre maps supplemented through actual ground level surveys (carried out once in four to five years) should provide these data. Exclusive surveys need not be carried out, and data can be collected during other surveys carried out for property tax, or other such purposes. |
| b. Total number of households with direct water supply connection | Number | This will include households which receive municipal water supply at one common point, from where it is stored and distributed to all households (for example, as in apartment complexes). Households supplied water through public standposts or tankers should be excluded. Households completely dependent on other water sources such as borewells, open wells, etc., should not be included. |
| **Household coverage for water supply connections** | % | **Coverage = [(b/a)*100]** |

| Rationale for the Indicator |
|---|
| The minimum level acceptable standard for water supply service should be a household level water supply connection, that is, a direct piped connection for water supply within the household. Water provision to households (urban poor or otherwise), at common public standposts cannot be considered as an acceptable/long-term permanent service provision standard. The social costs of not having access to a piped water connection at the household level are significant. Innovative service delivery options may be adopted for delivery of piped water connections to properties with inappropriate tenure rights (as in many urban slums). It is therefore important to measure this performance indicator, the benchmark value for which should be 100 percent. |

| Reliability of Measurement | |
|---|---|
| **Reliability scale** | **Description of method** |
| Lowest level of reliability (D) | Estimation of households covered on the basis of geographical area of the city covered with the pipeline network, as a surrogate indicator for water supply coverage. |
| Intermediate level (C) | Estimation of households covered on the basis of road length in the city covered by the pipeline network, as a surrogate indicator for water supply coverage. |
| Intermediate level (B) | Estimation of households covered computed as the total number of connections (for which data are maintained) as a percentage of the estimated number of households on the basis of population (total population divided by average household size). |
| Highest/preferred level of reliability (A) | Calculation based on the actual number of households with direct service connections (for which data are maintained); and the total number of households as revealed in ground level surveys. Data are periodically updated on the basis of building units approved, and new household level water connections provided. |

| Minimum frequency of measurement of performance indicator | | Smallest geographical jurisdiction for measurement of performance | |
|---|---|---|---|
| **Measurement** | **Quarterly** | **Measurement** | **Zone/DMA level** |

## 2.1.2 PER CAPITA SUPPLY OF WATER

| Performance Indicator | | |
|---|---|---|
| **Indicator** | **Unit** | **Definition** |
| Per capita quantum of water supplied | litres per capita per day (lpcd) | Total water supplied to consumers expressed by population served per day. |
| **Data Requirements** | | |
| **Data required for calculating the indicator** | **Unit** | **Remarks** |
| a. Water supplied to the distribution system | litres per month | Daily quantities should be measured through metering, and records maintained. The total supply for the month should be based on an aggregate of daily quantum. Only treated water input into the distribution system should be measured. If water is distributed from multiple points, the aggregate of that quantity should be considered. The quantum should exclude bulk water transmission and distribution losses, as measured through water audit tests. This quantum should include water purchased directly from any other sources and put into the distribution system, if any. Water may have been purchased from neighbouring ULBs, Cantonment Boards, etc. Water supplied in bulk to large water intensive industries/industrial estates should be excluded. |
| b. Population served | Number | The number of people in the service area served by the utility. While typically the number of residents are considered, if the city has a significant floating population of tourists who temporarily reside in the city, such a population should be included. Tourist population estimates can be reasonably computed on the basis of bed capacity of hotels, and occupancy rates. |
| c. Number of days in the month | Number | The number of days in the specific month. |
| d. Additional information on areas where water is supplied at a rate less than 70 lpcd | litres per capita per day (lpcd) | The number of people in these service areas served by the utility. The quantity of water supplied to these areas measured through bulk meters or by scientific calculation using flow velocity and head. |
| **Water supplied** | lpcd | **Per capita water supplied = [(a/c) /b]** |

## Rationale for the Indicator

This frequently used performance indicator provides an overall indication of the adequacy of the water supply to meet the needs of the citizens in the city. Per capita water supplied, expressed in lpcd, indicates the adequacy of the municipal water supply system in being able to source, treat water to potable standards and supply it into the distribution system. Therefore, this indicator should be periodically measured and monitored. Monitoring this on a monthly basis will reveal seasonal variations. The benchmark value for this indicator is 135 lpcd. However, the additional information in respect of the areas where water is supplied at the rate of 70 lpcd should also be indicated. The key limitation of this indicator is that it provides information on a city-wide basis, and does not reveal intra-city variations.

## Reliability of Measurement

| Reliability scale | Description of method |
|---|---|
| Lowest level of reliability (D) | The quantity of water produced is estimated on the basis of assumed pump capacity and efficiencies, and the number of hours of operation. The population served is calculated on the basis of past census figures, extrapolated to current levels. Reliable estimates of the floating population are not available. |
| Intermediate level (C) | The quantity of water produced is estimated on the basis of measurement of periodic sample surveys of production flows at all bulk production points. Reliable estimates of transmission losses and industrial water consumption are available. The population served is calculated on the basis of past census figures, extrapolated to current levels. Reliable estimates of the floating population are not available. |
| Intermediate level (B) | Not applicable. |
| Highest/preferred level of reliability (A) | The quantity of water produced is computed on the basis of measurement by bulk flow meters at the outlet of the treatment plant and/or at all bulk production points. The quantum of losses and bulk industrial consumption are periodically monitored. The population served is known with reasonable accuracy. Any expansion of municipal limits and other significant factors are measured and factored into the current population computation. The floating population is estimated with reasonable accuracy. |

| Minimum frequency of measurement of performance indicator | | Smallest geographical jurisdiction for measurement of performance | |
|---|---|---|---|
| **Measurement** | **Quarterly** | **Measurement** | **Zone/DMA level** |

## 2.1.3 EXTENT OF METERING OF WATER CONNECTIONS

| Performance Indicator | | |
|---|---|---|
| **Indicator** | **Unit** | **Definition** |
| Extent of metering of water connections | % | The total number of functional metered water connections expressed as a percentage of the total number of water supply connections. Public standpost connections should also be included. |
| **Data Requirements** | | |
| **Data required for calculating the indicator** | **Unit** | **Remarks** |
| a. Total number of direct service connections | Number | This will include households and establishments which receive municipal water supply at one common point, from where it may be stored and distributed for all households (for example, as in apartment complexes). Households completely dependent on other water sources such as bore wells, open wells, etc., should not be included. |
| b. Total number of public standposts | Number | The total number of public standpost connections, which are currently in use, should be considered. |
| c. Number of metered direct service connections | Number | Of the total number of direct service connections (to all categories of consumers), the number of connections which have functional meters, and metered quantities is the basis for billing of water charges. |
| d. Number of metered public standposts | Number | Typically, public standposts are not metered. However, if some are metered, they should be included. |
| **Extent of metering of water connections** | % | **Extent of metered connections = [(c + d)/ (a + b)]*100** |

## Rationale for the Indicator

While water is a basic need, the supply of potable water to citizens at their doorstep involves significant costs in building, operating and maintaining a system to do so. In a water supply system, the quantum of service provided to citizens is directly measurable, and therefore it is necessary that all the water supplied to all categories of consumers should be metered. Metering will also induce efficiency in use of water, reveal physical and administrative leakages in the system, and enable high-end consumers to be charged for consuming more. Therefore, to introduce a volumetric-based tariff structure for water charges, metering all connections is essential. It is, therefore, important to monitor this indicator, the benchmark value for which is 100 percent.

## Reliability of Measurement

| Reliability scale | Description of method |
|---|---|
| Lowest level of reliability (D) | A few meters have been installed. All installed meters are assumed to be functional and used as the basis for billing water charges. |
| Intermediate level (C) | Meters are installed for only certain categories of consumers. It is assumed all consumers of these categories have meters installed which are functional and used as the basis for billing. Records do not reveal the exact number of connections which are metered. Water is charged on the basis of average readings for the consumer category or on the basis of past trends in most cases. |
| Intermediate level (B) | Databases/records reveal the list of consumers that have meters installed in their water connections. However, there are no clear data on functioning of meters, and no linkage with the billing system that may or may not use metered quantity as the basis for billing. |
| Highest/preferred level of reliability (A) | Billing records and databases clearly identify consumers with meters (against specific meter serial number). Billing processes reveal regular reading of meters and meter readings are the basis for charging consumers. Records on standposts are available. Databases of water connections and meters are complete, and spatially referenced with a geographic information system (GIS) database. There is a mechanism in place to repair meters if found faulty. Processes for installation of new water connections, installation of meters and generation of water bills based on this are interlinked, and the data systems enable such continuity of data flow regarding these. |

| Minimum frequency of measurement of performance indicator | | Smallest geographical jurisdiction for measurement of performance | |
|---|---|---|---|
| **Measurement** | **Quarterly** | **Measurement** | **Zone/DMA level** |

## 2.1.4 EXTENT OF NON-REVENUE WATER (NRW)

| Performance Indicator | | |
|---|---|---|
| **Indicator** | **Unit** | **Definition** |
| Extent of NRW | % | This indicator highlights the extent of water produced which does not earn the utility any revenue. This is computed as the difference between the total water produced (ex-treatment plant) and the total water sold expressed as a percentage of the total water produced. NRW comprises: a) Consumption which is authorised but not billed, such as public standposts; b) Apparent losses such as illegal water connections, water theft and metering inaccuracies; and c) Real losses which are leakages in the transmission and distribution networks. |
| **Data Requirements** | | |
| **Data required for calculating the indicator** | **Unit** | **Remarks** |
| a. Total water produced and put into the transmission and distribution system | million litres per day (or) month | Daily quantities should be measured through metering, and records on the transmission and distribution system should be maintained. The total supply for the month should be based on the aggregate of the daily quantum. Only treated water input into the distribution system should be measured. If water is distributed from multiple points, the aggregate of that quantity should be considered. This quantum should include water purchased directly from any other sources and put into the distribution system, if any. Water may have been purchased from neighbouring ULBs, Cantonment Boards, etc. |
| b. Total water sold | million litres per day (or) month | The actual volume of water supplied to customers who are billed for the water provided. Ideally, this should be the aggregate volume of water consumed as per which consumers have been billed. However, in the absence of a complete and functionally effective metering regimen, alternate methods of measurement need to be evolved, with lower but acceptable levels of reliability. |
| **NRW** | % | **NRW = [((a - b)/a)*100]** |

| Rationale for the Indicator |
|---|
| The reduction in NRW to acceptable levels is vital for the financial sustainability of the water utility. NRW can be reduced through appropriate technical and managerial actions, and therefore monitoring NRW can trigger such corrective measures. The reduction of real losses can be used to meet currently unsatisfied demand or to defer future capital expenditures to provide additional supply capacity. The reduction of NRW is desirable not just from a financial standpoint, but also from the economic and environmental benefits' point of view. The benchmark value for NRW may be considered at 20 percent, the levels achieved by most well-performing utilities in developed countries. NRW is also influenced by factors outside the control of the water utility such as the topography of the city, age of the network, length of the network per connection and water use per capita. |

| Reliability of Measurement | |
|---|---|
| **Reliability scale** | **Description of method** |
| Lowest level of reliability (D) | The quantity of water produced is estimated on the basis of assumed pump capacity and efficiencies, and the number of hours of operation. A few meters have been installed in the distribution system and at the consumer end. The quantity of water sold to the category of consumers to whom bills are raised is estimated on the basis of assumed average consumption in that category and the number of consumers in that category. |
| Intermediate level (C) | The quantity of water produced is estimated on the basis of measurement of periodic sample surveys of production flows at all bulk production points. Meters are installed for a select category of consumers, such as commercial and bulk consumers. For other categories of consumers, such as domestic consumers, the number of such consumers and the average consumption per consumer are considered, to arrive at the quantum of water sold. |
| Intermediate level (B) | The quantity of water produced is computed on the basis of measurement at bulk flow meters at the outlet of the treatment plant and/or at all bulk production points. The quantum of water sold is based on the metered quantity for bulk and commercial consumers. For households, ferrule size (the size of the distribution pipe outlet at the consumer end) of each consumer connection as well as the hours of supply are known, to compute the quantum of water sold. |
| Highest/preferred level of reliability (A) | The quantity of water produced is computed on the basis of measurement at bulk flow meters at the outlet of the treatment plant and/or at all bulk production points. Metering is undertaken at all key distribution nodes (entry to DMAs) and at the consumer's end for all categories of consumers. Billing records and databases clearly reveal regular reading of meters and, therefore, the total quantum of water billed to consumers in the given time period (month/bi-monthly). |

| Minimum frequency of measurement of performance indicator | | Smallest geographical jurisdiction for measurement of performance | |
|---|---|---|---|
| **Measurement** | **Quarterly** | **Measurement** | **ULB level** |

## 2.1.5 CONTINUITY OF WATER SUPPLY

| Performance Indicator | | |
|---|---|---|
| **Indicator** | **Unit** | **Definition** |
| Continuity of water supply | Hours per day | Continuity of supply is measured as the average number of hours of pressurised water supply per day. Water pressure should be equal to or more than a head of 7 metre (m) at the ferrule point/meter point for the connection (7 m head corresponds to the ability to supply to a single-storey building). |

| Data Requirements | | |
|---|---|---|
| **Data required for calculating the indicator** | **Unit** | **Remarks** |
| Average hours of pressurised supply per day | Hours | The number of hours of supply in each operational zone (or DMA) should be measured continuously for a period of seven days. The average of the seven days should be considered for that month. Measurement should exclude hours of supply where the pressure is less than the minimum standards for piped water supply. The zone-wise figures should be averaged out to get city-wise data. |

## Rationale for the Indicator

Almost no Indian city has a continuous (24x7) water supply system, the norm for all cities in the developed world. From a citizen's perspective, it is desirable to have round-the-clock water supply daily, as it eliminates the need to provide and manage household/establishment level storage, and other resultant inconveniences. Water utilities in most Indian cities provide intermittent and limited number of hours of supply, as a means to manage inadequate supply. A number of studies have demonstrated the negative fallouts of designing and operating a system for intermittent water supply. A number of cities are undertaking substantial investments to improve this service level. It is, therefore, critical to monitor this indicator on a city-wide basis and move towards the benchmark value of 24 hours.

## Reliability of Measurement

| Reliability scale | Description of method |
|---|---|
| Lowest level of reliability (D) | Estimation of the number of hours based on feedback from field level engineers. Zone-wise data are not available. |
| Intermediate level (C) | Not applicable. |
| Intermediate level (B) | The calculation is based on detailed operational records at each of the valve operating points. Pressure availability at the consumers' end is assumed to be adequate and meeting the stated norms. |
| Highest/preferred level of reliability (A) | The calculation is based on detailed operational records at each of the valve operating points. Pressure adequacy and the number of hours of supply at the consumers' end are assessed on the basis of a statistically valid sample survey, across all zones in the city. |

| Minimum frequency of measurement of performance indicator | | Smallest geographical jurisdiction for measurement of performance | |
|---|---|---|---|
| **Measurement** | **Monthly** | **Measurement** | **Zone/DMA level** |

## 2.1.6 QUALITY OF WATER SUPPLIED

| Performance Indicator | | |
|---|---|---|
| **Indicator** | **Unit** | **Definition** |
| Quality of water supplied | % | The percentage of water samples that meet or exceed the specified potable water standards, as defined by the Central Public Health and Environmental Engineering Organisation (CPHEEO). The sampling regimen should meet standards and norms laid down. |
| **Data Requirements** | | |
| **Data required for calculating the indicator** | **Unit** | **Remarks** |
| a. Total number of water supply-related complaints received per month | Number per month | The actual number of water samples that are taken for testing in the month. Samples should be drawn at both points—outlet of the treatment plant and at the consumer end. The sampling regimen should meet laid down standards and norms. |
| b. Number of samples that meet the specified potable water standards in the month | Number per month | Of the total number of samples drawn in the month, the number of samples that have met or exceeded the specified potable water standards. All parameters of the quality standards should be met. Even if one standard is not met, the sample cannot be assumed to have met the standards. |
| **Quality of water supply** | % | **Quality of water supply = [(b/a)*100]** |

| Rationale for the Indicator |
|---|
| The quality of water supplied is as important a performance indicator as other service delivery indicators. Poor water quality can pose serious public health hazards. Water-borne diseases are quite common in Indian cities, particularly among the urban poor. Although, in most cases, the source of water that causes such diseases/epidemics is not the municipal piped water supply, it is very important to monitor the supply. Therefore, this performance indicator must be regularly monitored, the benchmark value for which is 100 percent. |

| Reliability of Measurement | |
|---|---|
| **Reliability scale** | **Description of method** |
| Lowest level of reliability (D) | Sampling is done only at treatment plant outlets. There is absence of a sampling regimen and of required laboratory equipment, and only very basic tests are carried out. |
| Intermediate level (C) | Sampling is done at production and intermediate points along the distribution network, but only for residual chlorine. There is absence of a sampling regimen and of required laboratory equipment, and tests are intermittently carried out through a third party. |
| Intermediate level (B) | Regular sampling is done at the treatment plant outlet and consumption points. Consumption points are spatially spread across the city. The sampling regimen is well documented and practiced. Tests include residual chlorine as well as bacteriological tests. The ULB/utility has its own laboratory equipment or easy and regular access to accredited testing centres. |
| Highest/preferred level of reliability (A) | Regular sampling is done at the treatment plant outlet and consumption points. The sampling regimen is well documented and practiced. Tests include residual chlorine as well as bacteriological tests. The ULB/utility has its own laboratory equipment or easy and regular access to accredited testing centres. A periodic, independent audit of water quality is carried out. |

| Minimum frequency of measurement of performance indicator | | Smallest geographical jurisdiction for measurement of performance | |
|---|---|---|---|
| **Measurement** | **Monthly** | **Measurement** | **ULB level** |

## 2.1.7 EFFICIENCY IN REDRESSAL OF CUSTOMER COMPLAINTS

| Performance Indicator | | |
|---|---|---|
| **Indicator** | **Unit** | **Definition** |
| Efficiency in redressal of customer complaints | % | The total number of water supply-related complaints redressed within 24 hours of receipt of complaint, as a percentage of the total number of water supply-related complaints received in the given time period. |
| **Data Requirements** | | |
| **Data required for calculating the indicator** | **Unit** | **Remarks** |
| a. Total number of water supply-related complaints received per month | Number per month | The total number of all supply-related complaints from consumers received during the month. Systems for receiving and logging in complaints should be effective and easily accessible to the citizens. Points of customer contact will include common phone numbers, written complaints at ward offices, collection centres, drop boxes, online complaints on the website, etc. |
| b. Total number of complaints redressed within the month | Number per month | The total number of water supply-related complaints that are satisfactorily redressed within 24 hours or the next working day, within that particular month. Satisfactory resolution of the complaint should be endorsed by the person making the complaint in writing, as a part of any format/proforma that is used to track complaints. |
| **Efficiency in redressal of complaints** | % | **Efficiency in redressal of complaints = [(b/a)*100]** |

| Rationale for the Indicator |
|---|
| It is important that, in essential services such as water supply, the ULB/water utility has effective systems to capture customer complaints/grievances, escalate them internally for remedial action and resolve them. While many ULBs/utilities have put in place systems to capture complaints, much more work needs to be done to put in place back-end systems for satisfactory resolution of those complaints on time. As water supply is an essential service, the benchmark time for redressal is 24 hours or the next working day. It is, therefore, important to monitor this indicator. The benchmark value for this indicator will depend on a number of factors such as the size of the city, age of the network, etc. The benchmark value for this indicator may be set at 80 percent. |

| Reliability of Measurement | |
|---|---|
| **Reliability scale** | **Description of method** |
| Lowest level of reliability (D) | Complaints data are not maintained either at the ward or city level. |
| Intermediate level (C) | There are multiple mechanisms/means by which consumers can register their complaints such as by telephone, in person or by writing or e-mail. All complaints received are assumed to be resolved quickly. |
| Intermediate level (B) | There are multiple mechanisms/means by which consumers can register their complaints such as by telephone, in person or by writing or e-mail. However, systems do not exist for aggregating, sorting and tracking the complaints. Data available for some months have been used as a trend to report the figures for some other months. |
| Highest/preferred level of reliability (A) | There are multiple mechanisms by which consumers can register their complaints such as by telephone, in person or by writing or e-mail. Complaints are segregated into different categories. They are collated through the computer network or other systems, and tracked on a daily basis. The status of redressal of complaints is maintained. Consumers endorse complaints being addressed on the municipal proforma. |

| Minimum frequency of measurement of performance indicator | | Smallest geographical jurisdiction for measurement of performance | |
|---|---|---|---|
| **Measurement** | **Monthly** | **Measurement** | **Zone/DMA level** |

## 2.1.8 COST RECOVERY IN WATER SUPPLY SERVICES

| Performance Indicator | | |
|---|---|---|
| **Indicator** | **Unit** | **Definition** |
| Cost recovery in water supply services | % | The total operating revenues expressed as a percentage of the total operating expenses incurred in the corresponding time period. Only income and expenditure of the revenue account must be considered, and income and expenditure from the capital account should be excluded. |
| **Data Requirements** | | |
| **Data required for calculating the indicator** | **Unit** | **Remarks** |
| a. Total annual operating expenses | Rs crore per quarter | Should include all operating expenses (for the year) such as electricity, chemicals, staff, outsourced operations/staff related to water supply, bulk water purchase costs and other operations and maintenance (O&M) expenses. Should exclude interest payments, principal repayments and other capital expenses. |
| b. Total annual operating revenues | Rs crore per quarter | Should include all water supply-related revenues (billed) during the corresponding time period, including taxes/cess/surcharges, user charges, connection charges, sale of bulk water, etc. This should exclude capital income such as grants, loans, etc. |
| **Cost recovery in water supply services** | % | **Cost recovery = [(b/a)*100]** |

| Rationale for the Indicator |
|---|
| Financial sustainability is critical for all basic urban services. In services such as water supply, benefits received by the consumers are more direct and can be quantified. Therefore, through a combination of user charges, fees and taxes, all operating costs may be recovered. Therefore, this indicator is critical for measuring overall cost recovery, the benchmark value for which is 100 percent. Cost recovery objectives provide a basis for tariff fixation, enable setting targets for revenue mobilisation and cost control in the delivery of water supply services. |

| Reliability of Measurement | |
|---|---|
| **Reliability scale** | **Description of method** |
| Lowest level of reliability (D) | There is no segregation of budget heads related to water supply services and sanitation from the rest of the functions of the agency. A cash-based accounting system is practiced. There are no clear systems for reporting unpaid expenditure, or revenues that are due. Disclosures and reporting are not timely. Audits have a time lag and are not regular. |
| Intermediate level (C) | Not applicable. |
| Intermediate level (B) | Budget heads related to water and sanitation are segregated. Key costs related to water and sanitation are identifiable, although complete segregation is not practiced (for example, electricity costs for water supply services are not segregated from overall electricity costs of the ULB). Key income and expenditure are recognised based on accrual principles. Disclosures are complete and are timely. |
| Highest/preferred level of reliability (A) | In case of multi-function agencies such as municipal corporations, the budget heads related to water and sanitation are clearly separated. Cost allocation standards for common costs are in place. An accrual-based double entry accounting system is practiced. Accounting standards are comparable to commercial accounting standards with clear guidelines for recognition of income and expenditure. Accounting and budgeting manuals are in place and are adhered to. Financial statements have full disclosure and are audited regularly and on time. |

| Minimum frequency of measurement of performance indicator | | Smallest geographical jurisdiction for measurement of performance | |
|---|---|---|---|
| **Measurement** | **Quarterly** | **Measurement** | **ULB level** |

## 2.1.9 EFFICIENCY IN COLLECTION OF WATER SUPPLY-RELATED CHARGES

| Performance Indicator | | |
|---|---|---|
| **Indicator** | **Unit** | **Definition** |
| Efficiency in collection of water-related charges | % | Efficiency in collection is defined as current year revenues collected, expressed as a percentage of the total operating revenues, for the corresponding time period |
| **Data Requirements** | | |
| **Data required for calculating the indicator** | **Unit** | **Remarks** |
| a. Current revenues collected in the given year | Rs crore per annum | Revenues collected for bills raised during the year. This should exclude collection of arrears as inclusion of arrears will skew the performance reflected. Collection efficiency is in fact an indicator of how many arrears are being built up, and therefore only current revenues should be considered. |
| b. Total operating revenues billed during the given year | Rs crore per annum | The total quantum of revenues related to water supply services that is billed during the year. This should include revenues from all sources related to water such as taxes, charges, cess, surcharges, sale of bulk water, etc. |
| **Collection efficiency** | **%** | **Collection efficiency = [(a/b)*100]** |

| Rationale for the Indicator |
|---|
| For a water utility, it is not just enough to have an appropriate tariff structure that enables cost recovery objectives but also efficient collection of revenues that are due to the utility. It is also important that the revenues are collected in the same financial year, without allowing for dues to get accumulated as arrears. It is, therefore, critical to monitor this indicator. The benchmark value for collection efficiency may be considered at 90 percent, since it is possible that about 10 percent of the dues may be delayed to the next year. |

| Reliability of Measurement | |
|---|---|
| **Reliability scale** | **Description of method** |
| Lowest level of reliability (D) | There is no segregation of arrears versus current year revenue collection. A cash basis of accounting is followed. The accounting code structure does not enable clear segregation of water revenues. |
| Intermediate level (C) | Not applicable. |
| Intermediate level (B) | There is clear segregation of current year revenues collection versus arrears collection. However, revenue collection is not matched against the specific bill issued. Overall accrual principles of accounting are followed, and therefore deposits and advances are not included in income and expenditure, respectively. |
| Highest/preferred level of reliability (A) | Collection records are maintained for each billing cycle. Collections are clearly identified against the specific bill which has been issued. Overall accrual principles of accounting are followed, and therefore deposits and advances are not included in income and expenditure, respectively. The accounting code structure also enables monitoring of billing and collections for each ward within the ULB. |

| Minimum frequency of measurement of performance indicator | | Smallest geographical jurisdiction for measurement of performance | |
|---|---|---|---|
| **Measurement** | **Annually** | **Measurement** | **Zone/DMA level** |

# 2.2 SEWAGE MANAGEMENT (SEWERAGE AND SANITATION)

## 2.2.1 COVERAGE OF TOILETS

| Performance Indicator | | |
|---|---|---|
| **Indicator** | **Unit** | **Definition** |
| Coverage of toilets | % | This indicator denotes the extent to which citizens have access to a toilet (whether individual or community) in a service area. The toilets would include those in the category of residential, commercial, industrial and institutional properties. The service area implies a specific jurisdiction in which the service is required to be provided. |
| **Data Requirements** | | |
| **Data required for calculating the indicator** | **Unit** | **Remarks** |
| a. Total number of properties with access to individual or community toilets within walking distance in the service area | Number | The total number of toilets (as against households) should be assessed. A property may have multiple tenants. A property is considered unique if it is recorded as a unique property in the municipal records. Municipal records should be up-to-date, and preferably backed up by a cadastre map. |
| b. Total number of properties without individual or community toilets within walking distance | Number | Only the total number of properties without access to individual or community toilets should be assessed. |
| **Coverage of toilets** | % | **Coverage of toilets = [a/a+b]*100** |

| Rationale for the Indicator |
|---|
| Last mile access to toilets is key to improvement in service levels of sanitation facilities. In many Indian cities, there is inadequate access to toilet facilities. Therefore, it is important to measure this parameter. The benchmark value for this indicator is 100 percent. Substantial investment in this area is being taken up under the Basic Services to the Urban Poor (BSUP) component of JNNURM as well as the Integrated Low Cost Sanitation (ILCS) scheme. |

| Reliability of Measurement | |
|---|---|
| **Reliability scale** | **Description of method** |
| Lowest level of reliability (D) | Estimation based on the geographical area of the ULB covered with and without toilet facilities as a percentage of the total ULB area, as an indicator of service coverage. |
| Intermediate level (C) | Estimation based on the total number of properties with toilets on the premises or with access to a community toilet at walking distance and without such facilities as a percentage of the estimated number of properties, to arrive at the indicator of service coverage. |
| Intermediate level (B) | None. |
| Highest/preferred level of reliability (A) | Calculation based on the actual number of properties and the count of properties with or without toilet facilities, measured through a field survey. These data should be periodically updated on the basis of data regarding provision of toilet facilities and new properties being developed (from the building plan approval department). Field surveys throughout the city should be carried out at least once in five years. |

| Minimum frequency of measurement of performance indicator | | Smallest geographical jurisdiction for measurement of performance | |
|---|---|---|---|
| **Measurement** | **Quarterly** | **Measurement** | **Ward level** |

## 2.2.2 COVERAGE OF SEWAGE NETWORK SERVICES

| Performance Indicator | | |
|---|---|---|
| **Indicator** | **Unit** | **Definition** |
| Coverage of sewage network services | % | This indicator denotes the extent to which the underground sewage (or sewerage collection) network has reached out to individual properties across the service area. Properties include those in the categories of residential, commercial, industrial and institutional. The service area implies a specific jurisdiction in which service is required to be provided. |
| **Data Requirements** | | |
| **Data required for calculating the indicator** | **Unit** | **Remarks** |
| a. Total number of properties in the service area | Number | The total number of properties (as against households) should be assessed. A property may have multiple tenants. A property is considered unique if it is recorded as a unique property in the municipal records. Municipal records should be up-to-date, and preferably backed up by a cadastre map. |
| b. Total number of properties with direct connection to the sewage network | Number | Only properties with access connection to the underground sewage network should be included. Properties that connect their sewerage outlet to storm water drains or open drainage systems should not be considered. However, this may include one or more properties with access to decentralised/ standalone underground sewage networks, which have treatment and safe effluent disposal facilities, which has been set up and operated according to laid down environmental standards. |
| **Coverage of sewage network** | % | **Coverage of sewage network services = [b/a]*100** |

| Rationale for the Indicator |
|---|
| Last mile access to sewage networks is key to improvement in service levels of sewage management. In many Indian cities, sewage also flows through open drains/storm water drains, posing serious public health hazards. Also, the coverage of sewage network services is very low across most Indian cities. With substantial investments in this area being taken up in programmes such as JNNURM, it would be important to monitor this indicator to observe the impact being made on the ground. Therefore, it is important to measure this parameter. Its benchmark value is 100 percent. |

| Reliability of Measurement | |
|---|---|
| **Reliability scale** | **Description of method** |
| Lowest level of reliability (D) | Estimation based on the geographical area of the ULB covered with the sewage pipeline network, as a percentage of the total ULB area, as an indicator of service coverage. |
| Intermediate level (C) | Estimation based on the road length in the city covered by the pipeline network, as a percentage of the total road length, as an indicator of service coverage. |
| Intermediate level (B) | Estimation based on the total number of connections as a percentage of the estimated number of properties, to arrive at the indicator of service coverage. |
| Highest/preferred level of reliability (A) | Calculation based on the actual number of properties and the count of properties with a direct connection, measured through a field survey. These data should be periodically updated on the basis of new sewage connections taken (from the sewage department), and new properties being developed (from the building plan approval department). Field surveys throughout the city should be carried out at least once in five years. |

| Minimum frequency of measurement of performance indicator | | Smallest geographical jurisdiction for measurement of performance | |
|---|---|---|---|
| **Measurement** | **Quarterly** | **Measurement** | **Ward level** |

## 2.2.3 COLLECTION EFFICIENCY OF THE SEWAGE NETWORK

| Performance Indicator | | |
|---|---|---|
| **Indicator** | **Unit** | **Definition** |
| Efficiency in collection of sewage | % | This indicator is measured as the quantum of wastewater collected as a percentage of normative sewage generation in the ULB. Wastewater generation is linked to the quantum of water supplied through piped systems, and other sources such as bore wells, when they are very extensively used.<br><br>Data should be collected daily for an entire month, so as to measure the quantities per month. While daily variations may be normalised, monthly variations may exist on account of seasonal variations. Data should be aggregated from multiple points across the ULB. |
| **Data Requirements** | | |
| **Data required for calculating the indicator** | **Unit** | **Remarks** |
| a. Total water supplied | million litres per day (or) month | Data on the total quantum of water supplied to consumers should be based on the water supplied to the distribution system (ex-treatment plant and including purchased water, if any), less physical losses of water in the transmission and distribution system through leakages. In case municipal water is supplied through decentralised distribution networks or sourcing water from deep bore wells, it should be included. |
| b. Estimated water use from other sources | million litres per day (or) month | An estimate of water drawn from other sources such as private bore wells. Data that will drive this estimate include the number of properties with access to bore wells or other sources of water, spatially spread across the city, and the quantity of water supplied in those areas. Alternately, data may also be collected from sample surveys. |
| c. Wastewater collected | million litres per day (or) month | The quantum of wastewater measured at the inlet of treatment plants. The quantum of untreated sewage at outfalls, leading into rivers, lakes or other water bodies should not be included in the quantum of sewage collected. |
| **Wastewater collection efficiency** | % | **Collection efficiency of sewage networks = [c/ ((a+b)*0.8)]x100** |

| Rationale for the Indicator |
|---|
| While the performance indicator for coverage provides an idea of infrastructure available for access to sewage networks, the effectiveness of the system in capturing the sewage may not be adequate. Therefore, the performance indicator related to collection efficiency signifies the effectiveness of the network in capturing and conveying it to the treatment plants. Thus, it is not just adequate to have an effective network that collects sewage, but also one that treats the sewage at the end of the network. The benchmark value for this indicator is 100 percent. |

| Reliability of Measurement | |
|---|---|
| **Reliability scale** | **Description of method** |
| Lowest level of reliability (D) | Water production is based on 'D' category systems for measuring NRW. There are no meters at sewage treatment plants (STPs), intake is estimated on the basis of flow or treatment plant capacity. No estimates are available for water consumed from other sources. |
| Intermediate level (C) | Water production is based on 'C' category systems for measuring NRW. Sewage intake is estimated on the basis of flow or treatment plant capacity. No estimates are available for water consumed from other sources. |
| Intermediate level (B) | Water production is based on 'B' category systems for measuring NRW. Periodic measurement of wastewater collection is based on flow assessment methods at the STPs. There are no estimates for water consumed from other sources. |
| Highest/preferred level of reliability (A) | Water production is based on 'A' category measurement systems for measuring NRW. Estimates are available for water consumed from other sources. Measurement of wastewater collection occurs at all inlets of STPs by flow assessment methods. Process control automation provides accurate data, for both water production and distribution and for sewage intake and treatment. |

| Minimum frequency of measurement of performance indicator | | Smallest geographical jurisdiction for measurement of performance | |
|---|---|---|---|
| **Measurement** | **Monthly** | **Measurement** | **ULB level** |

## 2.2.4 ADEQUACY OF SEWAGE TREATMENT CAPACITY

| Performance Indicator | | |
|---|---|---|
| **Indicator** | **Unit** | **Definition** |
| Adequacy of capacity for treatment of sewage | % | Adequacy is expressed as secondary treatment (that is, removing oxygen demand as well as solids, normally biological) capacity available as a percentage of normative wastewater generation, for the same time period |
| **Data Requirements** | | |
| **Data required for calculating the indicator** | **Unit** | **Remarks** |
| a. Total water consumed | million litres per day (or) month | Data on the total quantum of water supplied to consumers should be based on the water supplied to the distribution system (ex-treatment plant and including purchased water, if any), less physical losses of water in the transmission and distribution system through leakages. In case municipal water is supplied through decentralised distribution networks or sourcing water from deep bore wells, it should be included. |
| b. Total number of properties with direct connection to the sewage network | million litres per day (or) month | An estimate of water drawn from other sources such as private bore wells. Data that will drive this estimate include the number of properties with access to bore wells or other sources of water, spatially spread across the city, and the quantity of water supplied in those areas. Alternately, data may also be collected from sample surveys. |
| c. Treatment plant capacity | million litres per day (or) month | Total functional capacity of all wastewater treatment plants that can meet secondary treatment standards. |
| **Wastewater treatment capacity** | % | **Adequacy of treatment capacity = [c/ ((a+b)*0.8)]x100** |

| Rationale for the Indicator | |
|---|---|
| Most Indian cities have inadequate capacity for treatment of sewage that is generated in their cities. Significant investments are under way in creating such capacities through programmes such as JNNURM. This indicator will highlight the adequacy of available and operational sewage treatment capacity. The benchmark value for this indicator is 100 percent. | |
| **Reliability of Measurement** | |
| **Reliability scale** | **Description of method** |
| Lowest level of reliability (D) | Water consumption is based on 'D' category systems for measuring NRW. There is no estimate of wastewater treatment capacity that is actually functional and in operation, nor for water consumed from other sources. |
| Intermediate level (C) | Water consumption is based on 'C' category systems for NRW. There is no estimate of wastewater treatment capacity that is actually functional and in operation, nor for water consumed from other sources. |
| Intermediate level (B) | Water consumption is based on 'B' category systems for NRW. Sound engineering estimates of functional wastewater treatment capacity are available, on the basis of reliable operational data that are maintained. There are no estimates for water consumed from other sources. |
| Highest/preferred level of reliability (A) | Water consumption is based on 'A' category measurement systems for NRW. Reliable estimates are available for the quantity of water consumed from non-municipal sources. STP system capacity is assessed through rigorous testing and commissioning procedures (after which there have been no modifications to the plant). In case any modifications to the STP have been carried out, system capacity is reassessed through measuring peak throughput. |

| Minimum frequency of measurement of performance indicator | | Smallest geographical jurisdiction for measurement of performance | |
|---|---|---|---|
| **Measurement** | **Annually** | **Measurement** | **ULB level** |

## 2.2.5 QUALITY OF SEWAGE TREATMENT

| Performance Indicator | | |
|---|---|---|
| **Indicator** | **Unit** | **Definition** |
| Quality of treatment | % | Quality of treatment is measured as a percentage of wastewater samples that pass the specified secondary treatment standards, that is, treated water samples from the outlet of STPs are equal to or better than the standards laid down by the Government of India agencies for secondary treatment of sewage. While the samples are collected at the STP outlet and results should be computed per STP, this indicator should be reported at city/ULB level. |
| **Data Requirements** | | |
| **Data required for calculating the indicator** | **Unit** | **Remarks** |
| a. Total number of wastewater samples tested in a month | Number per month | Sampling (quantity, periodicity, point of sample collection, etc.) should be taken as per good industry practices and laid down norms by environmental agencies, such as pollution control boards of respective States. |
| b. Number of samples that pass the specified secondary treatment standards | Number per month | Within the total valid samples, the number of samples that pass the specified secondary treatment standards, along all key parameters. |
| **Quality of treatment** | % | **Quality of treatment capacity = [(b/a)*100]** |

| Rationale for the Indicator |
|---|
| For sustainable sewage management, it is not just enough to have the infrastructure to collect and convey the sewage, or the installed capacity to treat it. It is important that the treated water that is discharged back into water bodies, or used for other purposes such as irrigation, meets the laid down environmental standards. It is therefore important to monitor this indicator. Its benchmark value is 100 percent. |

| Reliability of Measurement | |
|---|---|
| **Reliability scale** | **Description of method** |
| Lowest level of reliability (D) | There is an absence of a sampling regimen and of required laboratory equipment. Irregular tests are carried out. Not all parameters are tested. |
| Intermediate level (C) | Not applicable. |
| Intermediate level (B) | The sampling regimen is well documented and practiced on most occasions. The ULB/utility has its own laboratory equipment or easy and regular access to accredited testing centres. Only a few key parameters are assessed. |
| Highest/preferred level of reliability (A) | The sampling regimen is well documented and practiced completely. The ULB/utility has its own laboratory equipment or easy and regular access to accredited testing centres. There is periodic independent audit of wastewater quality. All parameters are assessed. |

| Minimum frequency of measurement of performance indicator | | Smallest geographical jurisdiction for measurement of performance | |
|---|---|---|---|
| **Measurement** | **Monthly** | **Measurement** | **ULB level** |

## 2.2.6 EXTENT OF REUSE AND RECYCLING OF SEWAGE

| Performance Indicator | | |
|---|---|---|
| **Indicator** | **Unit** | **Definition** |
| Extent of recycling or reuse of sewage | % | The percentage of wastewater received at the treatment plant that is recycled or reused after appropriate treatment for various purposes. This should only consider water that is directly conveyed for recycling or reuse, such as use in gardens and parks, use for irrigation, etc. Water that is discharged into water bodies, which is subsequently used for a variety of purposes, should not be included in this quantum.<br><br>While measurements are done at STP inlets and outlets, the indicator should be reported at the city/ULB level as a whole. |
| **Data Requirements** | | |
| **Data required for calculating the indicator** | **Unit** | **Remarks** |
| a. Wastewater received at STPs | million litres per day (or) month | This should be based on the actual flow measurement, the quantum for which should be measured daily. Daily quantities should be aggregated to arrive at monthly quantum. |
| b. Wastewater recycled or reused after appropriate treatment | million litres per day (or) month | This should be based on the actual flow measurement by functional flow meters, the quantum for which should be measured daily. Daily quantities should be aggregated to arrive at the monthly quantum. |
| **Wastewater recycled or reused** | % | **Extent of sewage recycled or reused = [(b/a)*100]** |

| Rationale for the Indicator |
|---|
| For sustainable water management, it is desirable that sewage is recycled or reused after appropriate treatment. Effluent water can be directly reused in a number of areas such as used in parks and gardens, supplied for irrigation purposes for farmland on the city periphery, etc. To maximise this reuse, it is important that this indicator is measured and monitored. Its benchmark could be 20 percent. |

| Reliability of Measurement | |
|---|---|
| **Reliability scale** | **Description of method** |
| Lowest level of reliability (D) | There are no meters at STP inlets or points of supply of recycled water. Estimates are based on observation and STP capacity. |
| Intermediate level (C) | Not applicable. |
| Intermediate level (B) | Not applicable. |
| Highest/preferred level of reliability (A) | Based on data from flow measurement at STP inlets and outlets (that is, points of supply of recycled water). Data should be measured daily, and aggregated for monthly totals. |

| Minimum frequency of measurement of performance indicator | | Smallest geographical jurisdiction for measurement of performance | |
|---|---|---|---|
| **Measurement** | **Annually** | **Measurement** | **ULB level** |

## 2.2.7 EFFICIENCY IN REDRESSAL OF CUSTOMER COMPLAINTS

| Performance Indicator | | |
|---|---|---|
| **Indicator** | **Unit** | **Definition** |
| Efficiency in redressal of customer complaints | % | The total number of sewage-related complaints redressed within 24 hours of receipt of complaints, as a percentage of the total number of sewage-related complaints received in the given time period. |
| **Data Requirements** | | |
| **Data required for calculating the indicator** | **Unit** | **Remarks** |
| a. Total number of sewage-related complaints received per month | Number per month | The total number of all sewage-related complaints from consumers received during the month. Systems for receiving and logging in complaints should be effective and easily accessible to the citizens. Points of customer contact will include common phone numbers, written complaints at ward offices, collection centres, drop boxes, online complaints on the website, etc. |
| b. Total number of complaints redressed within the month | Number per month | The total number of sewage-related complaints that are satisfactorily redressed within 24 hours or the next working day, within that particular month. Satisfactory resolution of the complaint should be endorsed by the person making the complaint in writing, as part of any format/proforma that is used to track complaints. |
| **Efficiency in redressal of complaints** | % | **Efficiency in redressal of complaints = [(b/a)*100]** |

| Rationale for the Indicator |
|---|
| It is important that in essential services such as sewage, the utility has effective systems to capture customer complaints/grievances, escalate them internally for remedial action and resolve them. While many ULBs/utilities have put in place systems to capture complaints, much more work needs to be done to put in place back-end systems for satisfactorily resolving those complaints on time. As sewage treatment is an essential service, the benchmark time for redressal is 24 hours or the next working day. It is therefore important to monitor this indicator. The benchmark value for this indicator will depend on a number of factors such as the size of the city, age of the network, etc. The benchmark value for this indicator may be set at 80 percent. |

| Reliability of Measurement | |
|---|---|
| **Reliability scale** | **Description of method** |
| Lowest level of reliability (D) | Complaints data are not maintained either at ward or city level. |
| Intermediate level (C) | There are multiple mechanisms/means by which consumers can register their complaints such as by telephone, in person or by writing or e-mail. All complaints received are assumed to be resolved quickly. |
| Intermediate level (B) | There are multiple mechanisms/means by which consumers can register their complaints such as by telephone, in person or by writing or e-mail. However, systems do not exist for aggregating, sorting and tracking the complaints. Data available for some months have been used as a trend to report the figures for some other months. |
| Highest/preferred level of reliability (A) | There are multiple mechanisms by which consumers can register their complaints such as by telephone, in person or by writing or e-mail. Complaints are segregated into different categories, and are collated through a computer network or other systems, and tracked on a daily basis. The status of redressal of complaints is maintained. Consumers endorse complaints being addressed on the municipal proforma. |

| Minimum frequency of measurement of performance indicator | | Smallest geographical jurisdiction for measurement of performance | |
|---|---|---|---|
| **Measurement** | **Monthly** | **Measurement** | **Zone/DMA level** |

## 2.2.8 EXTENT OF COST RECOVERY IN SEWAGE MANAGEMENT

| Performance Indicator | | |
|---|---|---|
| **Indicator** | **Unit** | **Definition** |
| Extent of cost recovery in sewage management | % | The extent of cost recovery is expressed as wastewater revenues as a percentage of wastewater expenses, for the corresponding time period. |
| **Data Requirements** | | |
| **Data required for calculating the indicator** | **Unit** | **Remarks** |
| a. Total annual operating expenses | Rs crore | Should include all operating expenses (for the year) such as electricity, chemicals, staff and other establishment costs, outsourced operations/staff related to wastewater collection and treatment, and O&M expenses. Should exclude interest payments and principal repayments. |
| b. Total annual operating revenues | Rs crore | Should include all wastewater-related revenues billed for the year including taxes/cess/surcharges, user charges, connection charges, sale of sludge, sale of recycled water, etc. |
| **Cost recovery in sewage management** | % | **Cost recovery = [(b/a)*100]** |

| Rationale for the Indicator |
|---|
| Financial sustainability is a critical factor for all basic urban services. In services such as sewerage management, some benefits are received directly by the consumers, and some benefits accrue indirectly through a sustainable environment and public health benefits. Therefore, through a combination of user charges, fees and taxes, all operating costs may be recovered. Therefore, the indicator is critical for measuring overall cost recovery, the benchmark value for which is 100 percent. |

| Reliability of Measurement | |
|---|---|
| **Reliability scale** | **Description of method** |
| Lowest level of reliability (D) | There is no segregation of budget heads related to wastewater from the rest of the functions of the agency. A cash-based accounting system is practiced. There are no clear systems for reporting unpaid expenditure. Disclosures and reporting are not timely. Audits have a time lag and are not regular. |
| Intermediate level (C) | Not applicable. |
| Intermediate level (B) | Budget heads related to wastewater are segregated. Key costs related to wastewater are identifiable, although complete segregation is not practiced. Key income and expenditure are recognised, based on accrual principles. Disclosures are complete and on time. |
| Highest/preferred level of reliability (A) | In case of multi-function agencies such as municipal corporations, the budget heads related to wastewater are clearly separated. Cost allocation standards for common costs are in place. An accrual-based double entry accounting system is practiced. Accounting standards comparable to commercial accounting standards with clear guidelines for recognition of income and expenditure are followed. Accounting and budgeting manuals are in place and are adhered to. Financial statements have full disclosure and are audited regularly and on time. |

| Minimum frequency of measurement of performance indicator | | Smallest geographical jurisdiction for measurement of performance | |
|---|---|---|---|
| **Measurement** | **Annually** | **Measurement** | **ULB level** |

## 2.2.9 EFFICIENCY IN COLLECTION OF SEWAGE CHARGES

| Performance Indicator | | |
|---|---|---|
| **Indicator** | **Unit** | **Definition** |
| Efficiency in collection of sewage charges | % | Efficiency in collection is defined as current year revenues collected, expressed as a percentage of the total operating revenues, for the corresponding time period. |
| **Data Requirements** | | |
| **Data required for calculating the indicator** | **Unit** | **Remarks** |
| a. Current revenues collected in the given year | Rs crore per annum | Revenues collected for bills raised during the year. This should exclude collection of arrears as inclusion of arrears will skew the performance reflected. Collection efficiency is in fact an indicator of how many arrears are being built up, and therefore only current revenues should be considered. |
| b. Total operating revenues billed during the given year | Rs crore per annum | The total quantum of revenues related to sewage services that are billed during the year. This should include revenues from all sources related to sewage such as taxes, charges, cess, surcharges, etc. |
| **Collection efficiency** | % | **Collection efficiency = [(a/b)*100]** |

| Rationale for the Indicator |
|---|
| For a utility, it is not just enough to have an appropriate tariff structure that enables cost recovery objectives, but also efficient collection of revenues that are due to the utility. It is also important that the revenues are collected in the same financial year, without allowing for dues to get accumulated as arrears. It is therefore critical to monitor this indicator. The benchmark value for collection efficiency may be considered at 90 percent, since it is possible that about 10 percent of the dues may be delayed to the next year. |

| Reliability of Measurement | |
|---|---|
| **Reliability scale** | **Description of method** |
| Lowest level of reliability (D) | There is no segregation of arrears versus current year revenue collection. A cash basis of accounting is followed. The accounting code structure does not enable clear segregation of water revenues. |
| Intermediate level (C) | Not applicable. |
| Intermediate level (B) | There is a clear segregation of current year revenues collection versus arrears collection. However, revenue collection is not matched against the specific bill issued. Overall accrual principles of accounting are followed, and therefore deposits and advances are not included in income and expenditure, respectively. |
| Highest/preferred level of reliability (A) | Collection records are maintained for each billing cycle. Collections are clearly identified against the specific bill which has been issued. Overall accrual principles of accounting are followed, and therefore deposits and advances are not included in income and expenditure, respectively. The accounting code structure also enables monitoring of billing and collections for each ward within the ULB. |

| Minimum frequency of measurement of performance indicator | | Smallest geographical jurisdiction for measurement of performance | |
|---|---|---|---|
| **Measurement** | **Annually** | **Measurement** | **Zone/DMA level** |

# 2.3 SOLID WASTE MANAGEMENT

## 2.3.1 HOUSEHOLD LEVEL COVERAGE OF SOLID WASTE MANAGEMENT SERVICES

| Performance Indicator | | |
|---|---|---|
| **Indicator** | **Unit** | **Definition** |
| Household level coverage of SWM services through door-to-door collection of waste | % | Percentage of households and establishments that are covered by a daily doorstep collection system. |
| **Data Requirements** | | |
| **Data required for calculating the indicator** | **Unit** | **Remarks** |
| a. Total number of households and establishments in the service area | Number | The total number of households and establishments (not properties) in the service area should be calculated. The service area refers to either the ward or the ULB limits. |
| b. Total number of households and establishments with daily doorstep collection | Number | Include doorstep collection by the ULB itself or ULB approved service providers. This can even include door-to-door collection systems operated by RWAs, etc. |
| **Coverage** | % | **Coverage = [(b/a)*100]** |

## Rationale for the Indicator

This indicator provides the coverage of door-to-door solid waste collection services. Doorstep level collection is an essential and critical starting point in the entire chain of scientific SWM services. Waste-free clean roads and drains, scientific treatment of waste so as to maximise treatment, recycling and disposal can all be achieved in a sustainable manner only if door-to-door collection of waste is sustained. The benchmark value for this indicator is 100 percent.

## Reliability of Measurement

| Reliability scale | Description of method |
|---|---|
| Lowest level of reliability (D) | Coverage numbers based on aggregate city level estimate by the service provider. |
| Intermediate level (C) | Coverage is estimated on the basis of the number of wards serviced by doorstep collection, as a percentage of the total number of wards in the ULB. |
| Intermediate level (B) | Estimation of coverage is based on the average daily waste collected by the ULB (in tonnes) from areas serviced by doorstep waste collection, divided by the estimated daily waste generation (in tonnes) by the entire city. Daily averages are based on the actual weighing of the waste collected on designated weighbridges, measured daily for seven consecutive days in a month. |
| Highest/preferred level of reliability (A) | Calculation is based on the actual number of households and establishments with doorstep collection as stated by the agency involved in doorstep collection. This may be verified from records of user charges collected for the doorstep collection services. The total number of households/establishments should be measured from updated GIS spatial data of the city. |

| Minimum frequency of measurement of performance indicator | | Smallest geographical jurisdiction for measurement of performance | |
|---|---|---|---|
| **Measurement** | **Quarterly** | **Measurement** | **Ward level** |

## 2.3.2 EFFICIENCY OF COLLECTION OF MUNICIPAL SOLID WASTE

| Performance Indicator | | |
|---|---|---|
| **Indicator** | **Unit** | **Definition** |
| Collection efficiency | % | The total waste collected by the ULB and authorised service providers versus the total waste generated within the ULB, excluding recycling or processing at the generation point. (Typically, some amount of waste generated is either recycled or reused by the citizens themselves. This quantity is excluded from the total quantity generated, as reliable estimates will not be available for these.) |
| **Data Requirements** | | |
| **Data required for calculating the indicator** | **Unit** | **Remarks** |
| a. Total waste that is generated and which needs to be collected | Tonnes per month | The total waste generated excluding waste processed or recycled at the generation point. This would depend on the population of the city, and the composition of economic activities. |
| b. Total quantum of waste that is collected by the ULB or authorised service providers | Tonnes per month | The total waste collected from households, establishments and common collection points. This should be based on actual weighing of the collected waste. Daily generation should be aggregated to calculate the total monthly quantum. This should exclude any special drives for waste collection, and waste generated from one-off activities such as demolitions, desilting canals, etc. |
| **Collection efficiency** | % | **Collection efficiency = [(b/a)*100]** |

| Rationale for the Indicator |
|---|
| This indicator is relatively easy to measure, and has been used for a long time as an indicator of efficiency in collection of waste. While the indicator is well understood, the reliability varies significantly on account of different methods used for measurement. Collection efficiency should measure waste collected in the normal course by SWM systems. Typically, the uncollected waste tends to gradually find its way into recycling, or is strewn along the roads, clogs the drains or in case of bio-degradable waste, putrefies and degrades. Therefore, collection efficiency is a key performance indicator. The benchmark value for this indicator is 100 percent. |

| Reliability of Measurement | |
|---|---|
| **Reliability scale** | **Description of method** |
| Lowest level of reliability (D) | Waste generation estimates are based on empirical standards of per capita waste generation based on the size of the city. Inadequate data available on waste collection, which is estimated based on the number of trips made by waste collection vehicles to the disposal site. |
| Intermediate level (C) | Nil. |
| Intermediate level (B) | Waste generation estimates are based on empirical standards of per capita waste generation based on the size of the city. Data available on waste collection, based on waste weighed by the weighbridge at the disposal site. |
| Highest/preferred level of reliability (A) | Waste generation estimates are based on quarterly surveys/samples of statistically significant and representative number of households and establishments. Seasonal variation in waste quantity generation is captured in these estimates. Waste collection is based on actual weighing of waste on a weighbridge at the disposal site (which is the aggregate of the waste measured at the composting yard, sanitary landfill site, and waste taken out for recycling/reuse after it has been collected). |

| Minimum frequency of measurement of performance indicator | | Smallest geographical jurisdiction for measurement of performance | |
|---|---|---|---|
| **Measurement** | **Monthly** | **Measurement** | **Ward level** |

## 2.3.3 EXTENT OF SEGREGATION OF MUNICIPAL SOLID WASTE

| Performance Indicator | | |
|---|---|---|
| **Indicator** | **Unit** | **Definition** |
| Extent of segregation of waste | % | Percentage of waste from households and establishments that is segregated. Segregation should at least be at the level of separation of wet and dry waste at the source, that is, at the household or establishment level. Ideally, the separation should be in the following categories: bio-degradable waste, waste that is non-biodegradable, and hazardous domestic waste such as batteries, etc. In line with this description, the ULB may further refine the criteria for classifying waste as being 'segregated'.<br><br>It is important that waste segregated at the source is not again mixed, but transported through the entire chain in a segregated manner. It is therefore important that this indicator is based on measurement of waste arriving in a segregated manner at the treatment/disposal site, rather than being measured at the collection point. |
| **Data Requirements** | | |
| **Data required for calculating the indicator** | **Unit** | **Remarks** |
| a. Quantum of waste that is segregated | Tonnes per month | The total quantum of waste that arrives in a segregated manner at the treatment and/or disposal site (that is, composting yards, waste treatment plants, landfill sites, etc.). Waste that arrives at these locations in an unsegregated manner should not be considered. Waste taken away by recyclers from intermediate points should be added to this quantum. |
| b. Total quantum of waste that is collected by the ULB or authorised service providers | Tonnes per month | The total waste collected from households, establishments and common collection points. This should be based on actual weighing of the collected waste, and should exclude any special drives for waste collection, and waste generated from one-off activities such as demolitions, desilting canals, etc. (This corresponds to the quantity of (b), as measured for the indicator on collection efficiency.) |
| **Extent of segregation** | % | **Extent of segregation = [(a/b)*100]** |

## Rationale for the Indicator

Segregation of waste is a critical requirement for sustainable SWM systems. Segregation enables recycling, reuse, treatment and scientific disposal of the different components of waste. Segregation of waste should ideally be at source, and should then also be transported in a segregated manner up to the point of treatment and/or disposal. If waste is received at these points in a segregated manner, it can be safely assumed that it has been segregated at source and transported so, while the converse may not be true. Therefore, segregation is being measured at this point of receipt, rather than at the point of collection. The benchmark value for this indicator is 100 percent. In cases where the ULB is adopting an integrated approach with various options for waste treatment where segregation is also taken care of, compliance with this provision may not be mandatory.

## Reliability of Measurement

| Reliability scale | Description of method |
|---|---|
| Lowest level of reliability (D) | Segregation is estimated by the service provider without any documentation of measurement methods adopted. |
| Intermediate level (C) | All households and establishments provided two separate waste containers are assumed to be 'segregating' waste. Then the percentage of households provided with two bins is used as the basis for estimating the extent of segregation. |
| Intermediate level (B) | Estimates of segregation are based on the input from agencies engaged in doorstep collection. The aggregates of estimates across all areas should be added up for the ULB-wide estimate. |
| Highest/preferred level of reliability (A) | The daily total of waste arriving in a segregated manner at disposal/ treatment sites should be measured, on the basis of weighing of individual trips. Waste taken away by recyclers from intermediate points should be added to this quantum, which can be assessed from wholesale waste recycling traders (*kabadiwalas*).<br><br>Alternately, the quantum of unsegregated waste received at the disposal point, that is, the composting yard, landfill site, or dump site, should be measured through regular weighing on a weighbridge. The daily totals should be arrived at by adding weights of all trips. The difference between the quantum collected and this quantum (unsegregated waste) should be equal to the quantity that is segregated.<br><br>A daily log of waste intake at processing facilities is maintained, which is aggregated for the monthly data. |

| Minimum frequency of measurement of performance indicator | | Smallest geographical jurisdiction for measurement of performance | |
|---|---|---|---|
| **Measurement** | **Monthly** | **Measurement** | **ULB level** |

## 2.3.4 EXTENT OF MUNICIPAL SOLID WASTE RECOVERED

| Performance Indicator | | |
|---|---|---|
| **Indicator** | **Unit** | **Definition** |
| Extent of recovery of waste collected | % | This is an indication of the quantum of waste collected, which is either recycled or processed. This is expressed in terms of percentage of waste collected. |
| **Data Requirements** | | |
| **Data required for calculating the indicator** | **Unit** | **Remarks** |
| a. Amount of waste that is processed or recycled | Tonnes per month | The total quantum of waste intake by waste processing/recycling facilities operated by the ULB or operator at a city/ward/locality level. Inert matter, and other material refused by the processing/recycling facilities, which will go back to the dumping sites/landfills, should be deducted from the intake quantities.<br><br>Waste collected at intermediate points by informal mechanisms (rag pickers, etc.) and fed back into the recycling chain should be included in this quantity. This can be assessed through data from wholesale traders of such waste at the city level. Typically, there would be a few wholesalers at the city level from whom data can be collected. |
| b. Total quantum of waste that is collected by the ULB or authorised service providers | Tonnes per month | The total waste collected from households, establishments and common collection points. This should be based on actual weighing of the collected waste. This should exclude any special drives for waste collection, and waste generated from one-off activities such as demolitions, desilting canals, etc. (This corresponds to the quantity of (b), as measured for the indicator on collection efficiency.) |
| **Recovery** | % | **Extent of recovery = [a/b ]*100** |

| Rationale for the Indicator |
|---|
| Environmental sustainability demands that the maximum amount of waste should be either recycled, reused or processed. While the processing, recycling and reuse should be carried out without creating any health and environmental hazards, the total quantum of waste recovered is in itself a key performance parameter. Therefore, measurement of this indicator is critical. The benchmark value for this indicator will depend on the amount of inert matter included in the waste collected by the ULB. Waste composition is typically unique for each city, while being within a broad range of values for similar cities. The benchmark value for this indicator could be 80 percent. |

| Reliability of Measurement | |
|---|---|
| **Reliability scale** | **Description of method** |
| Lowest level of reliability (D) | Recovery estimates are based on the installed capacity of waste processing facilities. |
| Intermediate level (C) | Estimation of waste recovery is based on an aggregate mass balance. From the total estimated waste collection, deduct moisture loss and amount disposed at landfill/dump sites to arrive at the extent of waste recovered in the ULB. |
| Intermediate level (B) | Recovery estimates are based on measured consumption/inputs at the large, organised waste processing facilities, such as composting yards and waste-to-energy facilities. |
| Highest/preferred level of reliability (A) | Recovery estimates are based on measured consumption/inputs at the large, organised waste processing facilities, such as composting yards and waste-to-energy facilities. To this quantum, unorganised sector waste intake for processing is added. This will typically include community/colony level composting facilities, waste collected for recycling and reuse through the chain of waste recyclers (aggregates measured at the wholesaler level). A daily log of waste intake at processing facilities is maintained, which is aggregated for the monthly data. |

| Minimum frequency of measurement of performance indicator | | Smallest geographical jurisdiction for measurement of performance | |
|---|---|---|---|
| **Measurement** | **Monthly** | **Measurement** | **ULB level** |

## 2.3.5 EXTENT OF SCIENTIFIC DISPOSAL OF MUNICIPAL SOLID WASTE

| Performance Indicator | | |
|---|---|---|
| **Indicator** | **Unit** | **Definition** |
| Extent of scientific disposal of waste at landfill sites | % | The amount of waste that is disposed in landfills that have been designed, built, operated and maintained as per standards laid down by Central agencies. This extent of compliance should be expressed as a percentage of the total quantum of waste disposed at landfill sites, including open dump sites. |
| **Data Requirements** | | |
| **Data required for calculating the indicator** | **Unit** | **Remarks** |
| a. Total waste disposed in 'compliant' landfills every month | Tonnes per month | A daily log of waste being disposed at such 'compliant' landfill sites should be maintained, based on actual measurement at weighbridges that are preferably located at the entrance to such sites. The monthly total should be the sum of daily totals in the month. |
| b. Total waste disposed in all landfills every month | Tonnes per month | The total waste disposed after collection and recovery (if any) at landfills (including compliant landfills and open dumpsites). This quantity should be based on actual measurement at weighbridges that are preferably located at the entrance to such sites. The monthly total should be the sum of daily totals in the month. |
| **Extent of scientific disposal** | % | **Extent of scientific disposal = [a/b]*100** |

| Rationale for the Indicator |
|---|
| Inert waste should finally be disposed at landfill sites, which are designed, built, operated and maintained according to standards laid down in prevailing laws and manuals of nodal agencies. This includes collection and treatment of leachate at the landfill site. The extent of compliance should be evaluated against the total quantum of waste that is disposed at landfills. This is a critical performance parameter from an environmental sustainability perspective. The benchmark value for this indicator is 100 percent. |

| Reliability of Measurement | |
|---|---|
| **Reliability scale** | **Description of method** |
| Lowest level of reliability (D) | Poor data and records are available at landfill sites. There is no documentation of operations. Estimates are provided on the basis of estimated number of trips of trucks to the landfill site. |
| Intermediate level (C) | The quantity of waste being disposed at the landfill site is estimated on the basis of mass balance, that is, the total waste collected less moisture loss and waste recovered through recycling or processing. Actual measurements are not available. |
| Intermediate level (B) | Records are maintained and good quality data are available on the quantity of waste being disposed at the landfill/open dumping sites. However, there are no clear records on O&M of landfill operations. |
| Highest/preferred level of reliability (A) | Accurate and detailed records on the amount of waste being disposed at landfill sites are regularly collected, and records are maintained on operating practices and routines carried out at all landfill sites. |

| Minimum frequency of measurement of performance indicator | | Smallest geographical jurisdiction for measurement of performance | |
|---|---|---|---|
| **Measurement** | **Monthly** | **Measurement** | **ULB level** |

## 2.3.6 EFFICIENCY IN REDRESSAL OF CUSTOMER COMPLAINTS

| Performance Indicator | | |
|---|---|---|
| **Indicator** | **Unit** | **Definition** |
| Efficiency in redressal of customer complaints | % | The total number of SWM-related complaints redressed within 24 hours of receipt of the complaint, as a percentage of the total number of SWM-related complaints received in the given time period. |
| **Data Requirements** | | |
| **Data required for calculating the indicator** | **Unit** | **Remarks** |
| a. Total number of SWM-related complaints received per month | Number per month | The total number of all SWM-related complaints from consumers received during the month. Systems for receiving and logging in complaints should be effective and easily accessible to the citizens. Points of customer contact will include common phone numbers, written complaints at ward offices, collection centres, drop boxes, online complaints on the website, etc. |
| b. Total number of complaints redressed within the month | Number per month | The total number of SWM-related complaints that are satisfactorily redressed within 24 hours or the next working day, within that particular month. Satisfactory resolution of the complaint should be endorsed by the person making the complaint in writing, as part of any format/proforma that is used to track complaints. |
| **Efficiency in redressal of complaints** | % | **Efficiency in redressal of complaints = [(b/a)*100]** |

| Rationale for the Indicator |
|---|
| It is important that in essential services such as SWM, the utility has effective systems to capture customer complaints/grievances, escalate them internally for remedial action and resolve them. While many ULBs/utilities have put in place systems to capture complaints, much more work needs to be done to put in place back-end systems for satisfactorily resolving those complaints on time. As SWM is an essential service, the benchmark time for redressal is 24 hours or the next working day. It is therefore important to monitor this indicator. The benchmark value for this indicator will depend on a number of factors such as the size of the city, manpower, institutional network, etc. The benchmark value for this indicator may be set at 80 percent. |

| Reliability of Measurement | |
|---|---|
| **Reliability scale** | **Description of method** |
| Lowest level of reliability (D) | Complaints data are not maintained either at ward or city level. |
| Intermediate level (C) | There are multiple mechanisms/means by which consumers can register their complaints such as by telephone, in person or by writing or e-mail. All complaints received are assumed to be resolved quickly. |
| Intermediate level (B) | There are multiple mechanisms/means by which consumers can register their complaints such as by telephone, in person or by writing or e-mail. However, systems do not exist for aggregating, sorting and tracking the complaints. Data available for some months have been used as a trend to report the figures for some other months. |
| Highest/preferred level of reliability (A) | There are multiple mechanisms by which consumers can register their complaints such as by telephone, in person or by writing or e-mail. Complaints are segregated into different categories and are collated through a computer network or other systems, and tracked on a daily basis. The status of redressal of complaints is maintained. Consumers endorse complaints being addressed on the municipal proforma. |

| Minimum frequency of measurement of performance indicator | | Smallest geographical jurisdiction for measurement of performance | |
|---|---|---|---|
| **Measurement** | **Monthly** | **Measurement** | **Ward level** |

## 2.3.7 EXTENT OF COST RECOVERY IN SWM SERVICES

| Performance Indicator | | |
|---|---|---|
| **Indicator** | **Unit** | **Definition** |
| Extent of cost recovery for the ULB in SWM services | % | This indicator denotes the extent to which the ULB is able to recover all operating expenses relating to SWM services from operating revenues of sources related exclusively to SWM.<br><br>This indicator is defined as the total annual operating revenues from SWM as a percentage of the total annual operating expenses on SWM. |
| **Data Requirements** | | |
| **Data required for calculating the indicator** | **Unit** | **Remarks** |
| a. Total annual operating expenses | Rs crore | Should include all operating expenses incurred by the ULB towards SWM services. This should include costs related to O&M expenses, all directly attributable administrative and establishment expenditure (including salaries, wages, contract labour hire charges, etc.). Operating expenses should also include payments to contractors for activities outsourced by the ULB. Should exclude interest payments and principal repayments. |
| b. Total annual operating revenues | Rs crore | Should include all taxes and charges for SWM, plus proceeds from processing or recycling that accrue to the account of the ULB. This should exclude income earned by contractors, or the informal sector, that is not passed onto the ULB. |
| **Cost recovery** | % | **Cost recovery = [b/a]*100** |

| Rationale for the Indicator |
|---|
| Financial sustainability is a critical factor for all basic urban services. In services such as SWM, some benefits are received directly by the consumers while some other benefits accrue indirectly through a cleaner and sustainable environment, apart from public health benefits. Therefore, costs related to SWM may be recovered through a combination of taxes and user charges. In case of SWM, there is potential to supplement user charges with revenues that can be gained from recycling, reuse and conversion of waste to either compost or fuel or directly to energy. Therefore, it is critical for measuring overall cost recovery. There is enough past precedence to reveal that the benchmark value for cost recovery may be set at 100 percent. |

| Reliability of Measurement | |
|---|---|
| **Reliability scale** | **Description of method** |
| Lowest level of reliability (D) | There is no segregation of budget heads related to solid waste from other functions such as street sweeping and drainage. A cash-based accounting system is practiced. Account codes are not entered function-wise, and it is difficult to estimate SWM-related establishment, administrative and O&M costs. Disclosures and reporting are not timely. |
| Intermediate level (C) | Not applicable. |
| Intermediate level (B) | Budget heads related to SWM are segregated. Key costs related to SWM are identifiable, although complete segregation is not practiced. Key income and expenditure are recognised based on accrual principles. Disclosures are complete and on time. Accounts are finalised and closed, although the audit may be pending. |
| Highest/preferred level of reliability (A) | Budget heads related to SWM are clearly separated and cost allocation standards for common costs are in place. The accrual-based double entry accounting system is practiced. Accounting standards comparable to commercial accounting standards with clear guidelines for recognition of income and expenditure are followed. Accounting and budgeting manuals are in place and are adhered to. Financial statements have full disclosure and are audited regularly and on time. |

| Minimum frequency of measurement of performance indicator | | Smallest geographical jurisdiction for measurement of performance | |
|---|---|---|---|
| **Measurement** | **Annually** | **Measurement** | **ULB level** |

## 2.3.8 EFFICIENCY IN COLLECTION OF SWM CHARGES

| Performance Indicator | | |
|---|---|---|
| **Indicator** | **Unit** | **Definition** |
| Efficiency in collection of SWM charges | % | Efficiency in collection is defined as current year revenues collected, expressed as a percentage of the total operating revenues, for the corresponding time period. |
| **Data Requirements** | | |
| **Data required for calculating the indicator** | **Unit** | **Remarks** |
| a. Current revenues collected in the given year | Rs crore per annum | Revenues collected for bills raised during the year. This should exclude collection of arrears as inclusion of arrears will skew the performance reflected. Collection efficiency is in fact an indicator of how many arrears are being built up, and therefore only current revenues should be considered. |
| b. Total operating revenues billed during the given year | Rs crore per annum | The total quantum of revenues related to SWM services that are billed during the year. This should include revenues from all sources related to SWM such as taxes, charges, cess, surcharges, etc. |
| **Cost recovery** | % | **Collection efficiency = [(a/b)*100]** |

| Rationale for the Indicator |
|---|
| For a utility, it is not just enough to have an appropriate tariff structure that enables cost recovery objectives, but also efficient collection of revenues that are due to the utility. It is also important that the revenues are collected in the same financial year, without allowing for dues to get accumulated as arrears. It is therefore critical to monitor this indicator. The benchmark value for collection efficiency may be considered at 90 percent, since it is possible that about 10 percent of the dues may be delayed to the next year. |

| Reliability of Measurement | |
|---|---|
| **Reliability scale** | **Description of method** |
| Lowest level of reliability (D) | There is no segregation of arrears versus current year revenue collection. Cash basis of accounting is followed. The accounting code structure does not enable clear segregation of revenues. |
| Intermediate level (C) | Not applicable. |
| Intermediate level (B) | There is clear segregation of current year revenues collection versus arrears collection. However, revenue collection is not matched against the specific bill issued. Overall accrual principles of accounting are followed, and therefore deposits and advances are not included in income and expenditure, respectively. |
| Highest/preferred level of reliability (A) | Collection records are maintained for each billing cycle. Collections are clearly identified against the specific bill which has been issued. Overall accrual principles of accounting are followed, and therefore deposits and advances are not included in income and expenditure, respectively. The accounting code structure also enables monitoring of billing and collections for each ward within the ULB. |

| Minimum frequency of measurement of performance indicator | | Smallest geographical jurisdiction for measurement of performance | |
|---|---|---|---|
| **Measurement** | **Annually** | **Measurement** | **Ward level** |