Report of the Comptroller and Auditor General of India

Performance audit of Solid Waste Management in Urban Local Bodies

Government of Karnataka

Report No. 4 of the year 2018

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Preface

1. This Report of the Comptroller and Auditor General of India has been prepared for submission to the Governor of Karnataka under CAG's DPC Act, 1971.

2. The Report covering the period 2012-17 contains the results of performance audit of 'Solid Waste Management in Urban Local Bodies'.

3. Audit has been conducted in conformity with the Auditing Standards issued by the Comptroller and Auditor General of India.

Executive summary

Municipal Solid Waste Management in urban areas has emerged as one of the biggest challenges that our country faces today. The situation is aggravated by rapid urbanisation. Inadequate management of waste has significant negative externalities in terms of public health and environmental outcomes. Besides, it has an adverse impact on the aesthetic appearance of the surroundings.

We conducted a performance audit on 'Solid Waste Management in Urban Local Bodies' for the period 2012-13 to 2016-17 to assess whether management of municipal solid waste (MSW) and special waste (including construction and demolition waste) was effective, efficient, and carried out economically and scientifically. It involved examination of the records relating to Solid Waste Management (SWM) in the Directorate of Municipal Administration, District Urban Development Cells in the selected districts, the Karnataka State Pollution Control Board (KSPCB) and its Regional Offices and 35 Urban Local Bodies (ULBs).

The status of devolution of funds for urban governance disclosed that ULBs are dependent on Central/State Governments. In addition, the ULBs do not have powers to appoint personnel – officers/officials. The lack of capacity, both in terms of funds and functionaries, tends to affect the implementation of SWM activities.

The performance audit showed that the test-checked ULBs had not conducted any survey during the period 2010-16 but had adopted per capita estimates that had low level of reliability. The per capita estimates adopted were also not realistic. Action plans and strategy documents envisaged in the State policy formulated in 2004 was not prepared and State policy and strategy in accordance with the SWM Rules, 2016 was yet to be formulated. ULBs neither prepared short term nor long-term plans. Detailed Project Reports (DPRs) prepared during 2016 were deficient. The State Government did not operationalise any waste minimisation strategy during the review period and ULBs did not take up initiatives to promote waste minimisation activity exclusively other than Town Municipal Council, Kumta.

Though requisite committees were formed at the State level, the District and ULB level Committees were not formed in any of the test-checked districts leading to poor support for effective implementation of SWM plans.

Dedicated SWM Cell was absent at ULB level. There was shortage of manpower in all cadres *viz.* Environment Engineer (32 *per cent*); Health Inspectors (70 *per cent*) and *Pourakarmikas* (65 *per cent*).

It appears that the Karnataka Municipalities Act, 1964 and the Karnataka Municipal Corporations Act, 1976 are not in consonance with the Constitution provisions, as contained in the Constitution (74th Amendment) Act, 1992, as the Constitution provisions are silent about the approval of the budget while both the Acts specifically mention the role of the State Government in sanctioning/modifying the budget.

None of the test-checked ULBs assessed the requirement of capital and revenue funds for SWM activities until the preparation of DPRs and hence, they were unaware of the resource deficit. Though DPRs prepared during 2016-17 assessed the resource deficit, these failed to address measures for bridging this deficit. But audit did not come across any instance of ULB asking for funds from the State Government.

ULBs did not utilise the funds provided for creation of capital assets by the Central and State Finance Commissions. In comparison, the funds allocated for revenue expenditure were utilised in full by the ULBs. The expenditure on SWM was not commensurate with the funds available, resulting in accumulation of balances to the tune of ₹93.19 crore at the end of March 2017.

There was an appreciable increase in the number of test-checked ULBs collecting SWM cess and the quantum of cess increased significantly during the period 2012-13 to 2016-17. The test-checked ULBs were not collecting cess from places of public worship, occupiers of buildings/shops owned by ULBs and Government buildings as these properties were either exempt from payment of property tax or service charges. ULBs also did not levy cess on vacant lands despite the enabling provisions. Consequently, the ULBs lost revenue of ₹3.07 crore during the period 2012-13 to 2016-17. There was short accounting of cess of ₹5.41 crore in six ULBs and Hubballi-Dharwad Municipal Corporation alone short accounted to the extent of ₹5.11 crore.

Ten ULBs diverted funds of ₹3.81 crore for works and purchase of equipment/machinery/vehicles related to underground drainage purposes and other activities not connected with SWM. City Municipal Council, Sira diverted ₹15.80 lakh resulting in non-achievement of intended objective of constructing bio-methanation plant, purchasing secondary storage containers, *etc*.

The Information, Education and Communication (IEC) activities did not specifically focus on segregation of special waste and did not emphasise 'not to bury' and 'not to burn' waste.

Segregation of waste at different levels was either absent or partial in all the test-checked ULBs. The State/District/ULBs did not notify the classification of items as domestic hazardous waste and therefore, the need to segregate them separately was not publicised. Consequently, segregation of domestic hazardous waste was not done. Similarly, sanitary waste was not collected separately. Hence, mixed waste was transported to landfills.

Ward-wise collection of waste was absent in six of the test-checked ULBs and it was partial in nine ULBs. The test-checked ULBs did not carry out street sweeping of 6,935 (83 *per cent*) out of 8,324 km of roads on daily basis. Occupational waste (cut *beedi* leaves and ash) was mixed with regular MSW during collection. Shortage of primary collection vehicles was to the extent of 57 *per cent*.

Open vehicles and vehicles without necessary partition were used for transportation of waste. Absence of functional global positioning system (GPS) and tracking systems resulted in unauthorised dumping of waste near the bank of River Kabini in City Municipal Council, Nanjangud.

The test-checked ULBs were able to process only 26 *per cent* of waste collected during the review period. This was because of non-creation of required infrastructure and under-utilisation of infrastructure created. Eleven ULBs processed waste through composting and only three ULBs adopted bio-methanation technology.

The ULBs were operating disposal facilities without valid authorisation from KSPCB and necessary environmental clearance. The required buffer zone round the landfill sites were not maintained. Activities that do not conform to the provisions of MSW/SWM Rules were taken up in the landfill sites. Many of the landfills test-checked lacked basic infrastructure such as waste inspection facilities, weighbridge, fire-fighting equipment, toilet, *etc*. There was evidence of unscientific dumping and burning of mixed waste in the landfills.

The above lapses indicate lack of basic monitoring by ULBs and district /State level authorities to ensure compliance to statutory requirements and posed a serious threat to the environment besides leading to health hazards.

The absence of proper segregation of waste led to mixing of MSW with plastic waste, bio-medical waste, e-waste and slaughterhouse waste. The ULBs did not comply with the directions/instructions stipulated under the various acts and rules governing management of special waste.

Plastic waste, though found feasible for use in laying of roads, was not used for the purpose. This not only resulted in mismanagement of plastic waste but also in environmental degradation and death of cattle. Health care institutions were functioning without authorisation and resorting to unauthorised disposal of bio-medical waste.

Test-checked ULBs did not collect and channelise e-waste to authorised dismantlers/recyclers and e-waste was found mixed with MSW. Slaughterhouses in the test checked ULBs were functioning without authorisation and slaughterhouse waste was not managed properly. Thirty-two of the 35 test-checked ULBs were yet to identify sites for disposal of construction and demolition waste. Consequently, construction debris was dumped on roadsides, near water bodies and low-lying areas. Inefficient management of special waste would lead to environment degradation, pollution and health hazards besides affecting the aesthetics of the cities/towns.

List of recommendations

1. The State Government may expedite preparation of State policy incorporating strategies for waste minimisation and management.
2. The State Government needs to devise better information systems to assist ULBs in preparation of action plans for effective implementation of waste management.
3. The State Government may ensure pro-active and continuous engagement of non-government sector in waste management.
4. The State Government may revise the model agreement for each SWM service/activity considering the deficiencies pointed out. It should be ensured that the terms and conditions of the agreement are clear, free from ambiguity and protect the interests of ULB/Government.
5. The State Government may draw a time-bound plan for ULBs to achieve the highest/preferred level of reliability of Service Level Benchmark (SLB) data.
6. The State Government may ensure that the required District/ULB level Committees are constituted for effective institutional mechanism and implementation of SWM plans.
7. The State Government may devise mandatory modules for training all personnel involved in SWM and ensure coverage of all personnel within a specified period.
8. The Central and State Governments may devise a system for need-based allocation of funds and accord greater flexibility to ULBs in their utilisation to bridge the resource-expenditure gap.
9. While the number of ULBs collecting SWM cess as well as the amount being collected by these ULBs showed a rising trend, it is necessary that ULBs conduct a realistic assessment of the Operation & Maintenance cost involved in SWM and levy and collect SWM cess accordingly with a view to achieving SLBs. The State Government may make suitable amendments to Karnataka Municipalities Act, 1964 for levy and collection of SWM cess as was done in case of Karnataka Municipal Corporations Act, 1976.

   ULBs may ensure maximisation of own resources through efficient collection and widening of SWM cess base through measures such as collection of cess from (i) individual units instead of on plinth area; (ii) functions/activities conducted in open spaces; (iii) unorganised sector and levy of interest for belated payment of cess, (iv) railway authorities, *etc*.
10. The State Government should accord required priority to IEC and ensure that IEC activities are appropriate and create awareness about the harmful effects of ineffective SWM management on health and environment. It may explore usage of more effective means of communication for increasing the impact and efficacy of IEC activities.

    The IEC activities should be undertaken, keeping in view the particular wastes in particular areas and particular seasons. This may be taken up consequent to assessments and pilots.

11. Segregation should be given greater emphasis by means of publicity and awareness campaigns and holding regular meetings with housing associations and non-government organisations. The State Government should encourage segregation of waste at source by devising a system for incentivising waste generators and collectors for segregation of waste, and should prevent mixing of segregated waste during various stages of SWM.

12. ULBs should ensure that the informal system co-exists and supplements the formal system of waste collection, treatment and disposal and larger percentage of MSW generated is collected. ULBs should also ensure that workers involved in handling waste follow occupational health and safety protocols by wearing safety gear and other protective equipment.

13. The State Government may issue suitable instructions to enable ULBs to manage occupational waste such as beedi leaves, wood ash, *etc.*, effectively and efficiently.

14. The ULBs, in addition to increasing the number of vehicles, should also ensure that the vehicles already procured comply with the statutory requirements of registration, obtaining authorisation, insurance, fitness certificate, *etc*. The vehicles procured should be suitably designed to collect and transport segregated waste efficiently.

15. The State Government/ULBs should maximise processing of waste through complete utilisation of the infrastructure created and encourage adoption of bio-methanation technology by ULBs.

16. The State Government should ensure that all landfill sites are operating with valid authorisation and environmental clearances. It should also enforce and monitor scientific and proper disposal of the unprocessed waste through periodic checks.

17. The State Government may promote use of plastic waste in laying of both urban and rural roads as this enables reduction of considerable amount of waste reaching the landfill and lessens the expenditure on maintenance of roads. It may also explore other areas where plastic can be used.

18. The State Pollution Control Board needs to ensure that all health care institutions, slaughterhouses, recyclers, *etc.*, obtain necessary authorisation for their functioning and enforce adherence to prescribed standards.

19. KSPCB/ULBs may maintain a comprehensive database of health care institutions, slaughterhouses, recyclers, *etc.*, and strictly enforce their adherence to bio-medical waste, plastic, e-waste, slaughterhouse and construction and demolition rules.

20. The State Government and ULBs may put in place suitable systems to enforce Extended Producer Responsibility for specific waste categories as per the relevant rules.

Chapter I

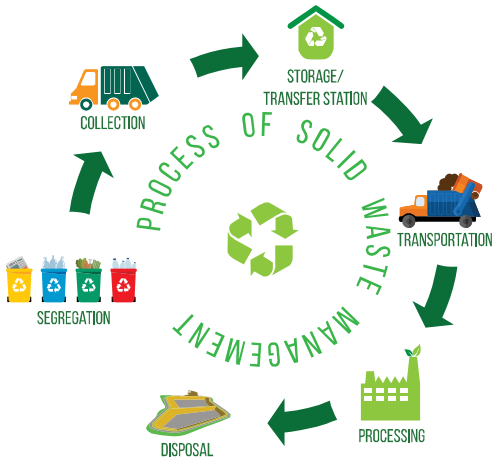
Introduction

1.1 Definition and classification of waste

Wastes are materials that are not prime products (that is products produced for the market) for which the generator has no further use in terms of his/her own purposes of production, transformation or consumption, and of which he/she wants to dispose[1]. Wastes are generally classified into municipal solid waste (MSW), bio-medical waste (BMW), construction and demolition (C&D) waste, e-waste, plastic waste, slaughterhouse waste, industrial waste and hazardous waste by virtue of their nature. They are also classified as biodegradable, non-biodegradable, combustible, dry and inert based on their characteristics. Municipal Solid Waste Management (MSWM) in urban areas has emerged as one of the biggest challenges that our country faces today. The situation is aggravated by rapid urbanisation. Inadequate management of waste has significant negative externalities in terms of public health and environmental outcomes. Besides, it has an adverse impact on the aesthetic appearance of the surroundings.

1.2 Process of waste management

The process of waste management is depicted below:



1.3 Regulatory framework governing management of waste

The Central Government, has the power to take measures necessary for protecting and improving the quality of the environment, subject to the provisions of the Environment (Protection) Act, 1986. Judicial interventions[2] have had a significant impact on Solid Waste Management (SWM).

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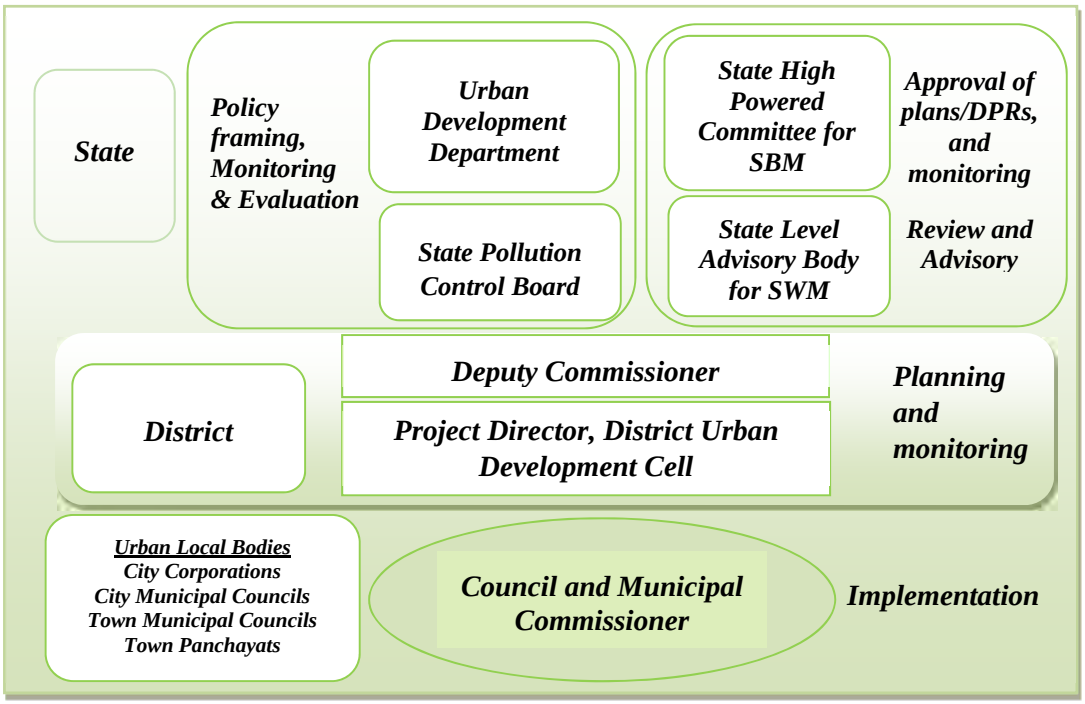
[1] According to United Nations Statistics Division (UNSD).

[2] (a) Municipal Council, Ratlam vs. Shri Vardichand and others (1980) – Supreme Court opined that lack of finances cannot be the reasons for not discharging statutory duties.
(b) B.L. Wadhera vs. Union of India (1994) – Supreme Court issued directives to Delhi Municipal Corporation regarding the collection, transportation and disposal of garbage and hospital waste.
(c) Ms. Almitra Patel vs. Union of India (1996) - Supreme Court constituted a committee to look into SWM in Class I cities i.e. cities with a population of over one lakh.

The Ministry of Environment, Forests and Climate Change (MoEFCC) notified (September 2000) the Municipal Solid Waste (Management and Handling) Rules, 2000 (MSW Rules, 2000). Subsequently, MoEFCC amended the MSW Rules, 2000 and introduced rules for management of biomedical, plastic, hazardous, C&D and e-waste. The regulatory framework governing the management of different types of waste is indicated in **Appendix 1.1**.

The Solid Waste Management Rules, 2016 superseded (April 2016) MSW Rules, 2000. **Chart 1.1** depicts the role of various authorities at all levels in planning, execution and monitoring of MSW management.

Chart 1.1: Role of various authorities in MSW management



Source: SWM Rules and Manuals

The organisational structure with respect to functioning of Urban Local Bodies (ULBs) in the State is given in **Appendix 1.2**.

1.4 Status of devolution in urban governance

The 74th Constitutional Amendment Act, 1992 made provisions for the establishment of ULBs as the third tier of governance in urban areas. The amendment sought to empower the ULBs to perform functions and implement schemes in relation to 18 subjects specified in the 12th Schedule, which *inter alia* included urban planning, regulation of land use, public health, sanitation, conservancy and solid waste management. It also made provisions for enabling ULBs by according them power to impose taxes, duties, tolls and fees and prescribing assignment of resources by the State Government to the ULBs. It prescribed that all Municipalities would be empowered with such powers and responsibilities as may be necessary to enable them to function as effective institutions of self-government. Each state was expected to enact a legislation to implement the amendment.

The State Government amended (i) Karnataka Town and Country Planning Act, 1961, (ii) Karnataka Municipalities Act, 1964 (KM Act, 1964) and

(iii) Karnataka Municipal Corporations Act, 1976 (KMC Act, 1976), in order to give effect to the above amendment.

Out of the 18 functions, all except Fire Services have been transferred to ULBs. Further, of the 17 functions transferred, six functions which included Urban poverty alleviation, slum improvement and upgradation were assigned to ULBs as discretionary functions and not as obligatory functions.

The ULBs are empowered to levy and collect various taxes and non-tax revenues such as property tax, advertisement tax, trade license, town planning and building fee, various cess, *etc*. In addition to generating their own revenue, ULBs receive grants from the Central and State Governments. As per the recommendations of the Third State Finance Commission (SFC), the ULBs were to receive 10 *per cent* of Non-Loan Net Own Revenue Receipts (including salary expenditure) and the Panchayat Raj Institutions (PRIs) were to receive 23 *per cent*. However, the State Government in partial modification of this recommendation took a decision to devolve 32 *per cent* of Non-Loan Net Own Revenue Receipts to PRIs and 8.5 *per cent* to 10 *per cent* to ULBs as given in **Table 1.1**.

Table 1.1: Status of devolution of funds to ULBs and PRIs

Year	Percentage to be devolved		Percentage actually devolved	
	ULBs	PRIs	ULBs	PRIs
2011-12	8.5	32	8.59	30
2012-13	9.0	32	6.96	32
2013-14	9.5	32	7.53	31
2014-15	10	32	8.02	33
2015-16	10	32	7.51	33
2016-17	10	32	6.41	33

Source: Finance Accounts

It is evident from the table above that the actual amount devolved to ULBs was less than that prescribed in all the years except 2011-12. With effect from the 10th Central Finance Commission (CFC) period, the Central Government made recommendations for fiscal transfers to urban and rural local bodies. Subsequent FCs have enhanced the quantum of fiscal transfers.

Further, as per the Acts governing ULBs, the State Government has the powers to regulate classification, method of recruitment, conditions of service, pay and allowances, discipline and conduct of the staff and officers of ULBs. The Karnataka Municipalities (Recruitment of Officers and Employees) Rules, 2010 and the Karnataka Municipal Corporations (Common Recruitment of Officers and Employees) Rules, 2010, list out the Appointing Authorities for various categories of posts as indicated below:

Group A – State Government
Group B and C – Director of Municipal Administration (DMA) or Officer empowered by Government
Group D – Deputy Commissioner (DC) for City Municipal Councils (CMCs), Town Municipal Councils (TMCs) and Town Panchayats (TPs) and Municipal Commissioner for City Corporations (CCs).

Thus, the authority to appoint/depute personnel to ULBs vests mainly with the State Government.

1.5 Role of urban local bodies in solid waste management

SWM was one of the eighteen subjects devolved to the ULBs under Article 243 (12th Schedule) of the Constitution of the India. Section 87 of the KM Act, 1964 and Section 58 of the KMC Act, 1976 mandate management of solid waste as an obligatory function of the ULBs. The 13th and 14th FCs identified SWM as one of the core sectors besides water supply, sewerage and storm water drainage.

Chapter II

Audit framework

2.1 Audit objectives

The objectives of the Performance audit were to ascertain whether:

- the strategy and planning envisioned for SWM by the ULBs were in accordance with the extant provisions and supported by an adequate institutional mechanism;
- management of Municipal solid waste and Special waste[3] (segregation, collection, transportation, processing and disposal) was effective, efficient, and carried out economically and scientifically; and
- the risks to environment posed by waste were identified and minimised.

2.2 Audit criteria

The criteria for evaluating the performance of SWM were derived mainly from:

- The Municipal Solid Waste (Management and Handling) Rules, 2000 and Solid Waste Management Rules, 2016 and respective Manuals (Ministry of Urban Development);
- The Bio-medical Waste (Management and Handling) Rules, 1998 and Bio-medical Waste Management Rules, 2016;
- The Plastic Waste (Management and Handling) Rules, 2011 and Plastic Waste Management Rules, 2016;
- The E-Waste (Management and Handling) Rules, 2011 and E-waste Management Rules, 2016;
- The Construction and Demolition Waste Management Rules, 2016;
- The State Policy on Integrated Solid Waste Management, 2004; and
- Central Pollution Control Board (CPCB)/Karnataka State Pollution Control Board (KSPCB) guidelines issued from time to time and National Green Tribunal (NGT) orders and other Court orders.

2.3 Audit scope

The performance audit on 'Solid Waste Management in Urban Local Bodies' was carried out during April to November 2017. The period of audit coverage was from April 2012 to March 2017. It involved examination of the records relating to SWM in the Directorate of Municipal Administration, District Urban Development Cells (DUDC), KSPCB and its Regional Offices and 35 ULBs[4]

[3] Special waste includes e-waste, BMW, slaughterhouse waste and plastic waste, *etc*.

[4] This office conducted a performance audit on SWM in BBMP which featured in the Audit Report on Local Bodies for the year ended March 2013 (Paragraph 4.1 of Report No. 5 of the year 2014). Hence, BBMP was kept outside the scope of this performance audit. The report was discussed by the Committee on Local Bodies and Panchayat Raj Institutions during April-May 2016 and the Report (19th Report) containing the recommendations thereof was placed in the Legislature on 18.7.2016. There were no recommendations with reference to the process of SWM.

(**Exhibit 2.1**) across all the four strata in 19 districts as shown in **Table 2.1**. The list of selected ULBs is given in **Appendix 2.1**.

Table 2.1: Number of ULBs selected for test-check

Sl. No.	Category of ULBs	Total number of ULBs in the State	Number of ULBs selected for test-check
1	City Corporations	10 excluding Bruhat Bengaluru Mahanagara Palike (BBMP)	4 (40%)
2	City Municipal Councils	57	11 (19%)
3	Town Municipal Councils	114	12 (11%)
4	Town Panchayats	89	8 (9%)

We adopted simple random sampling method on each tier of ULBs under each Revenue division to select the sample. The selected ULBs accounted for approximately 28 *per cent* of waste generated in the State during the review period.

2.4 Audit methodology

An entry conference was held on 17 May 2017 with the Secretary, Urban Development Department (UDD), in which the audit methodology, scope, objectives and criteria were explained. The audit methodology involved document analysis, responses to audit queries, joint physical verifications (JPV) with municipal staff and collection of photographic evidence. While framing the conclusions and recommendations, good practices regarding waste management in Karnataka and in other states have also been quoted to illustrate the fact that these practices are possible in the field of waste management and can serve as examples to policy makers while framing policies. The results of the performance audit were discussed with the Secretary, UDD in an exit conference on 23 April 2018. Replies of the State Government were received on 16 May 2018 and have been suitably incorporated.

Audit also consulted Mrs. Almitra Patel, Member of the Supreme Court Committee on Solid Waste Management, and engaged Centre for Environmental Education, Research and Advocacy (CEERA), National Law School of India University, Bengaluru, for their domain knowledge and inputs on issues pertaining to SWM (Brief profile of Mrs. Almitra Patel is given in **Appendix 2.2**).

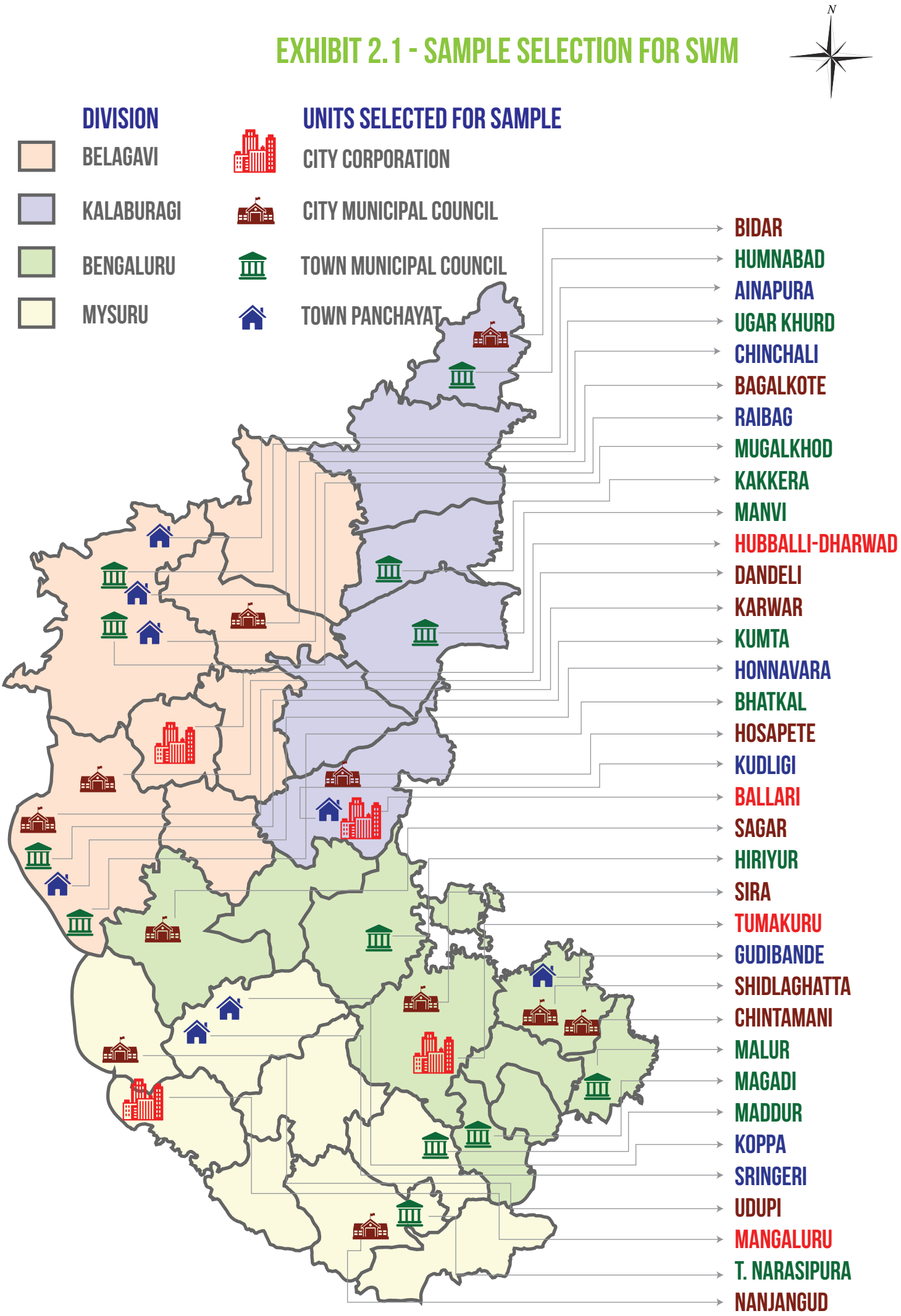
2.5 Acknowledgement

Audit acknowledges the cooperation and assistance extended by the State Government, all the ULBs, KSPCB and Regional Pollution Control Boards (RPCBs) in conducting the performance audit.

Audit findings

Audit findings are organised into three sections and are discussed in the following chapters.

EXHIBIT 2.1 - SAMPLE SELECTION FOR SWM



SECTION I

Effectiveness of Planning, Institutional mechanism and utilisation of funds for efficient solid waste management


REUSE
REDUCE
RECYCLE

Chapter III

Planning and institutional mechanism

3.1 Entities involved in solid waste management

The framework for administration and management of SWM in India is broadly divided into three tiers - Central, State and Urban Local Bodies (ULBs). Other stakeholders that play a crucial role are households, businesses, industries, informal sector, non-governmental organizations (NGOs), community-based organizations (CBOs), self-help groups (SHGs), *etc*. Involvement of all these stakeholders is necessary at several stages of SWM. **Appendix 3.1** lists out the roles and major responsibilities of stakeholders involved in the process of SWM.

3.2 Generation and assessment of waste

A reliable assessment of different kinds of waste generated in the city limit is essential for planning and effective implementation of SWM. Section 3.3.6 of MSWM Manual, 2000, stipulated that data on waste generation, weight and volume should be collected by each authority for application in its own area of operation.

The details of MSW generated by all ULBs (except BBMP) in the State for the period from 2013-14 to 2016-17 are given in **Table 3.1**:

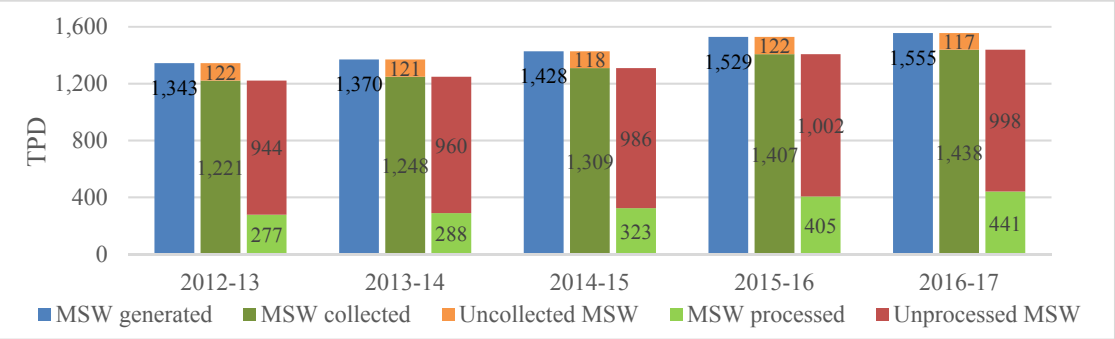
Table 3.1: Details of MSW generated by all ULBs (except BBMP)

Years	2013-14	2014-15	2015-16	2016-17
Ton per day (TPD)	5,284	5,197	5,342	5,506

Note: Data for 2012-13 not furnished.
Source: Annual Reports of KSPCB

The details of generation, collection and processing of MSW during the years 2012-13 to 2016-17 as per the information furnished by 35 test-checked ULBs are depicted in **Chart 3.1**:

Chart 3.1: Generation, collection and processing of MSW in 35 test-checked ULBs



Source: Information furnished by test-checked ULBs

As evident from above, 92 *per cent* of the waste was collected and only 26 *per cent* was processed each year and a major portion of the remaining MSW was dumped at landfills, which would have a harmful impact on health and environment.

The information furnished by 35 test-checked ULBs was not verified as survey was not conducted to assess the quantum of waste generated during the period from 2012-13 to 2015-16. Most of the data on quantity of MSW were per capita based estimates. However, as per Handbook on Service Level Benchmarks (SLBs), per capita based assessments have low reliability[5]. The quantum of special waste and C&D waste generated by ULBs, were not available with either KSPCB or DMA/ULBs.

DMA stated (June 2017) that assessment of waste generation was conducted in the year 2005 for a period of five years and later in 2016 under Swachh Bharat Mission (SBM) scheme for similar period. The fact, however, remains that after 2010, no survey/assessment was done for the period 2010-16. Audit also attempted to estimate the per capita waste quantity by adopting the municipal refuse generation rates suggested in MSWM Manual, 2000 (Section 3.3.6.2) and found that the per capita estimates indicated by ULBs were in variance with the audit estimation, as detailed in **Appendix 3.2**. Hence, the assessment of waste by ULBs was not realistic.

While accepting audit's observation regarding MSW, the State Government stated (May 2018) that assessment of plastic waste and C&D waste was being carried out in the SWM DPRs prepared under SBM. The assessment of e-waste and bio-medical waste generated by households was not done as the quantity generated was very little in comparison with MSW. The reply is not convincing as these wastes require special handling and disposal due to their physical and chemical characteristics.

3.3 State Policy and strategy on solid waste management

MSWM Manual 2000 (Section 25.2) stipulated that the State Government should prepare a State Policy and strategy on SWM. The Secretary, UDD notified a State Policy for integrated SWM in August 2004. The Policy highlighted that a long-term management strategy and action plan would be developed. We observed that strategy documents and action plans addressing the following crucial aspects were not prepared. As a result, the State Policy was not fully operationalised.

a. Assessment of MSW generation in various ULBs and identification of the best possible means for managing it;

b. Setting operational targets for each of the waste management activities and indicating the means of achieving them for various ULBs;

c. Setting out roles and responsibilities of stakeholders under various contract arrangements; and

d. Developing resource (human and financial) utilisation guidelines for different categories of ULBs.

[5] Highest/preferred level of reliability - Waste generation estimates based on quarterly survey/sample 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 weighment of waste on a weighbridge at the disposal site (which is aggregate of waste measured at composting yard, sanitary landfill site, and waste taken out for recycling / reuse after it has been collected).

Subsequently, the MSWM Manual 2016 (Section 1.4.1.4) and Rule 11(a) of SWM Rules, 2016, stipulated that the Secretary, UDD should prepare the State Policy, consistent with these rules, National Policy on SWM and National Urban Sanitation Policy of the MoUD, by April 2017. Audit observed that this was not done. Non-revision of State policy and strategy is bound to affect effective planning in all ULBs adversely. The State Government may refer to the efforts made by Ahmedabad Municipal Corporation (AMC) in this regard (detailed in **Appendix 11.1**).

The State Government stated (May 2018) that State Policy and strategy as per SWM Rules, 2016 was under preparation stage (tender floated).

3.4 Municipal solid waste management plan

MSWM Manual, 2000 (Sections 26.1 and 26.2) and 2016 (Section 1.4.5 and 1.4.6) emphasised the need for ULBs to prepare a detailed SWM plan, with short term (2-5 years) and long-term (20-25 years) actions. The short-term plan should lead to the achievement of the long-term plan. Each short-term plan should be reviewed every 2-3 years, to ensure higher success of implementing all plan activities. Short-term plan should cover aspects of institutional strengthening, community mobilisation, waste minimisation initiatives, waste collection and transportation, treatment and disposal, and financial outlay.

We observed that during the audit period (2012-13 to 2016-17), municipal authorities neither prepared short-term plans nor long-term plans, which deprived ULBs the opportunity of adopting a systematic approach to SWM. In the absence of these plans, the planning and selection of infrastructure projects in ULBs was, to a large extent, driven by perceived availability of funds rather than a need-based analysis. Audit observed instances of construction of sanitary landfill pit without purchasing sieving/sorting machine, inadmissible works, idle investments, *etc.*, as detailed in subsequent chapters.

The State Government accepted (May 2018) the audit observation and stated that as 100 *per cent* implementation of Integrated Solid Waste Management could take some time, short-term and long-term activities that needed to be taken up would be circulated to all ULBs shortly.

3.5 Detailed project reports for solid waste management

The Government of India launched its flagship scheme of Swachh Bharat Mission-Urban (SBM) in October 2014 and SWM was one of its six components. As per Paragraph 7.2 of SBM Guidelines, ULBs were to prepare Detailed Project Reports (DPRs) for SWM of their city in consultation with the State Government. It also stipulated that the State Government may handhold ULBs in quickly preparing DPRs for SWM by shortlisting/identifying private or government agencies.

We observed that the DUDCs invited (November-December 2015) tenders for preparing DPRs for all ULBs under their jurisdiction from agencies empanelled by GoI and entrusted the work on the basis of terms of reference (ToR) provided by the State Government. The ToR stipulated time limit of 50 days for completion and finalisation of each DPR.

As of March 2018, DPRs of 223 out of 281 ULBs (except BBMP) were prepared; of which, High Powered Committee approved 218. In the remaining 58 ULBs, preparation of DPRs did not commence, even after a lapse of more than two years.

In respect of 35 test-checked ULBs, six[6] empanelled agencies prepared DPRs for 28 ULBs. CC, Ballari and Hubballi-Dharwad Municipal Corporation (HDMC) prepared DPRs on their own. As of March 2018, all the 30 DPRs were approved. In five[7] new ULBs (erstwhile Gram Panchayats), DPR preparation was not taken up as these were upgraded during 2015-16.

Review of DPRs of 30 test-checked ULBs showed the following deficiencies:

3.5.1 Inadequate estimation of waste generated

Section 1.4.3.3.1 of Manual on MSWM, 2016 stipulated that for the purpose of long term planning, the average amount of waste disposed by a specific class of generators may be estimated only by averaging data from several samples. These samples were to be collected continuously for a period of seven days at multiple representative locations within the jurisdiction of the ULB, in each of the three main seasons *viz*. summer, winter and rainy season. Waste should be aggregated over the seven-day period, weighed and averaged. These quantities could then be extrapolated to the entire ULB and per capita generation assessed.

Audit observed that none of the 30 ULBs for which DPRs were prepared, adhered to the prescribed methodology. Twenty[8] test-checked ULBs assessed waste generated by conducting a sample survey for three consecutive days in one season only. One ULB (T. Narasipura) assessed waste generation by conducting a sample survey for seven days in a single season. One ULB (HDMC) did not conduct any survey but adopted population estimation/per capita method to arrive at the average waste generated in ULB. Remaining eight ULBs claimed to have quantified the waste by collecting samples but there was no documentary evidence for having conducted any survey.

The State Government stated (May 2018) that due to lack of time, 3 to 7 days sampling period for short term planning was followed and uniformity could not be ensured. The reply, however, does not address the issue of estimation of waste for long term planning as already discussed in Paragraph 3.2.

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[6] M/s. All India Institute of Local Self Government (AIILSG), Pune (Manvi and Raibag); M/s. IRG Systems South Asia Private Limited (Bidar, Dandeli, Karwar, Bhatkal, Humnabad, Kumta, T. Narasipura, Honnavara); M/s. MaRS Planning and Engineering Services Pvt Ltd, Ahmedabad (Hosapete, Nanjangud, Sagar, Udupi, Magadi, Malur, Kudligi); M/s. MSV International Inc. (Maddur); M/s. Tata Consulting Engineers ltd (Mangaluru, Bagalkote, Koppa, Sringeri); and M/s. Tide Technocrats Pvt Ltd, Bengaluru (Tumakuru, Chintamani, Shidlaghatta, Sira, Hiriyur, Gudibande).

[7] Three TMCs (Kakkera, Mugalkhod and Ugar Khurd); two TPs (Ainapura and Chinchali).

[8] CC, Tumakuru; CMCs - Bidar, Chintamani, Dandeli, Hosapete, Karwar, Nanjangud, Shidlaghatta, Sira and Udupi; TMCs - Bhatkal, Hiriyur, Humnabad, Kumta, Maddur and Manvi; TPs - Gudibande, Honnavara, Kudligi and Raibag.

3.5.2 Incomplete coverage of waste generators and non-assessment of unprocessed waste dumped at landfill

A complete and reliable database is essential for effective planning. Section 1.4.3.3.2 of Manual on MSWM, 2016 stipulated that multiple samples at multiple locations need to be taken to determine waste composition as daily, seasonal and temporal fluctuations are usually observed within a ULB. Hence, data on waste generation should capture all types of waste generation (including temporal fluctuations) and existing quantity of unprocessed MSW dumped in landfill sites in and around the city.

We observed that none of the DPRs included generation of solid waste from public buildings such as places of public worship (except Udupi and Maddur), industrial buildings (except HDMC and Sagar), *etc*. The DPRs did not capture and include temporal fluctuations (festivals/functions – social, economic, religious, political, *etc.*) in generation of waste in urban limits. Thus, the database lacked complete and significant data required for waste assessment.

Further, 21 out of 30 DPRs did not mention the quantum of unprocessed waste dumped at landfill sites. DPR of CMC, Sira indicated the quantum of waste accumulated (3,070 tons) at the dumpsite based on a topographical survey[9] (July 2016). We compiled the weighbridge data maintained by CMC, Sira and observed that waste dumped at this site during the period of 15 months (April 2015 to July 2016) was 7,647 tons. Hence, the quantum of waste accumulated as mentioned in the DPR was inconsistent with ULB's data. Similarly, the authenticity of quantification as mentioned in DPRs of remaining eight[10] ULBs was not verified as these ULBs did not have any/working weighbridge facility.

The State Government accepted (May 2018) the observation regarding incomplete coverage and stated that actual position in respect of CMC, Sira would be intimated to audit.

3.5.3 Non-coverage of special waste

The State Level Technical Committee (constituted in January 2016 to accord technical approval to DPRs) opined in its first meeting (February 2016) that measures to manage other wastes like e-waste, hazardous waste, hospital waste, industrial waste, *etc.*, should be addressed in DPRs.

We observed that none of the 30 DPRs addressed measures to manage e-waste, hazardous waste, hospital waste and industrial waste.

The State Government stated (May 2018) that this issue was considered in the recent DPRs prepared in the year 2017-18. It further stated that assessment of e-waste, bio-medical waste and plastic waste was not done earlier as the quantity compared with generation of MSW was very little. The fact remains that the directives of State Level Technical Committee were not complied with and documentary evidence in support of the reply was not furnished.

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[9] Topographical surveys are used to identify and map the contours of the ground and existing features on the surface of the earth or slightly above or below the earth's surface (*i.e.* trees, buildings, streets, walkways, manholes, utility poles, retaining walls, *etc*).

[10] HDMC; CMCs – Chintamani and Shidlaghatta; TMCs - Hiriyur, Maddur and Manvi; TPs - Gudibande and Raibag.

3.5.4 Incorrect assessment of design capacity

Quantity of waste generated in the city needs to be assessed to establish adequacy of existing systems and to plan for augmentation of treatment and disposal facilities.

We observed that 13 of the test-checked DPRs wrongly assessed the design capacity of disposal facilities in ULBs. **Table 3.2** depicts significant cases of over/under assessment of design capacity.

Table 3.2: Statement showing over/under assessment of design capacity in DPRs

Sl. No.	Name of ULB	(Weight in TPD)					Resultant Over(+)/Under(-) assessment of capital expenditure (₹ in crore)
		Projection of waste generation (2021)	Existing capacity	Design capacity required	Design capacity exhibited in DPR	Over(+)/Under(-) assessment of design capacity	
1	Mangaluru	411	200	211	422	(+)211	6.28
2	Maddur	11.10	0.38	10.72	15.30	(+)4.58	2.20
3	Bidar	83.68	0	83.68	104.77	(+)21.09	2.25
4	Bagalkote	56.96	20	36.96	59	(+)22.04	2.28
5	Koppa	2.49	0.94	1.55	2.59	(+)1.04	0.41
6	HDMC	478	3	475	400	(-)75	(-)11.28

Source: DPRs of test-checked ULBs

There is a possibility of over/under assessment of design capacity due to unrealistic assessment of waste as detailed in Paragraph 3.2.

3.6 Non-preparation of contingency plans

MSWM Manuals, 2000 (Section 26.1) and 2016 (Section 5.4) stipulated that ULBs should prepare contingency plans for appropriate storage of waste, to tide over situations of non-performance of processing/treatment/disposal facilities.

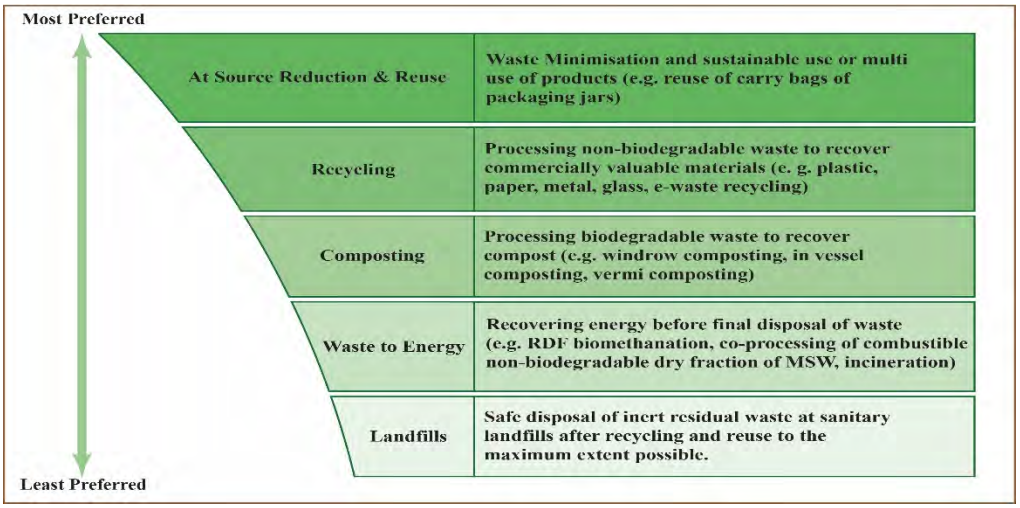
Requirement of a contingency plan was neither envisaged in the State Policy on SWM (2004) nor addressed by any of the test-checked ULBs. As a result, ULBs were not prepared to tackle any unforeseen situation, crises such as public protest in CC, Tumakuru, when the villagers did not allow (2014) passage of waste transportation vehicles, resulting in piling up of waste on streets, instances of fire at landfill sites in CC, Ballari, HDMC, CMC, Bidar, CMC, Dandeli, *etc*.

The State Government stated (May 2018) that a contingency plan to tackle any unforeseen situations would be included in the State Policy and strategy.

3.7 Strategy for implementation of 3R approach

MSWM Manuals, 2000 (Section 2.3) and 2016 (Section 2.1) prescribe a step-wise approach in the order of environmental priority for different waste management options with prevention being the most preferred option and disposal the least favoured. It is closely linked to the 3R (Reduce, Reuse, and Recycle) approach, which helps to reduce the quantity of waste, the cost associated with its handling, and its environmental impacts.

The Manuals also stipulated that waste minimisation strategies require policy interventions at the national, state and local level. ULBs were to play a pioneering role by reducing the amount of waste to be handled.



Source: MSWM Manual, 2016

We observed that though the principle of creating public awareness regarding minimising of waste was mentioned in the State policy (2004), the State Government had not operationalised a focussed waste minimisation strategy so far (December 2017). With the exception of TMC, Kumta, no other test-checked ULBs took up initiatives to promote waste minimisation and reuse activity exclusively.

Good practice

TMC, Kumta introduced (January 2016) decentralised composting systems such as pipe composting (household waste) and pit composting (horticulture and market waste) for converting wet waste into compost. TMC also initiated collection of food waste from 40 restaurants and marriage halls. These initiatives resulted in processing of 1,684 tons of wet waste during the period from January 2016 to March 2017, thus, reducing the burden on the landfill site to that extent.

The State Government stated (May 2018) that the strategy for waste minimisation was being adopted in the upcoming State policy.

3.8 Non-involvement of all stakeholders in planning

The provisions of MSW Rules, 2000 and 2016, and State Policy (2004) recommended extensive involvement of community in waste management. Manual on MSWM, 2016 (Section 1.4.4) provided for constitution of a core team or advisory team (internal stakeholders) involving all departments concerned with SWM services for developing the MSWM plan and involvement of the community (external stakeholders comprising households, informal sector, NGOs, CBOs, SHGs, women's groups, *etc.*), in MSWM planning and implementation.

We observed that neither a core/advisory team (internal stakeholders) nor a stakeholder committee (external stakeholders) was formed in any of the test-checked ULBs.

Although this was not done for 17 years, the State Government stated (May 2018) that this would be considered in the upcoming SWM State policy and comprehensive strategy.

3.9 Non-integration of informal waste collectors in waste management

MSWM Manuals, 2000 (Sections 8.6 and 9.6), 2016 (Section 2.3.7) and SWM Rules, 2016 (Clauses 11(c) and 15(c)) acknowledged the primary role played by the informal sector of waste pickers, waste collectors and recycling industry in reducing waste. SWM Rules, 2016 requires the State Government to provide broad guidelines regarding integration of waste pickers or informal waste collectors with the waste management system. It is the duty of ULB to establish a system to recognise organisations of informal waste collectors and establish a system to facilitate their participation in SWM.

We observed that though the State Policy (2004) proposed utilising the services of NGOs to provide support to the informal sector, no guidelines were issued in this regard. The test-checked ULBs (except CMC, Bagalkote) failed to recognise organisations of informal waste collectors and to integrate them in SWM. CMC, Bagalkote, made (January 2013) a beginning by identifying rag pickers and issued identity cards to 85 rag pickers (as of September 2017). The model adopted by Pune Municipal Corporation is detailed in **Appendix 11.2**.

The State Government stated (May 2018) that steps would be taken to enumerate waste pickers and impart necessary training.

Recommendation 1: The State Government may expedite preparation of State policy incorporating strategies for waste minimisation and management.

Recommendation 2: The State Government needs to devise better information systems to assist ULBs in preparation of action plans for effective implementation of waste management.

Recommendation 3: The State Government may ensure pro-active and continuous engagement of non-government sector in waste management.

3.10 Institutional mechanism

For planning an efficient and advanced MSWM system, it is essential to have an efficient institutional structure besides having adequate infrastructure and equipment (Sections 19.1 and 25.3 of Manual on MSWM, 2000 and Section 1.4.5.4 of Manual on MSWM, 2016).

The State Government constituted the three state-level committees required as per SBM guidelines (2014) and SWM Rules, 2016.

The District and ULB level Committees were not constituted, indicating lack of effective institutional mechanism leading to poor support to the effective implementation of SWM plans. The Committee-wise details are indicated in **Appendix 3.3**.

Good practices on engagement of ward level committees in Corporation of Cochin and Andhra Pradesh are detailed in **Appendix 11.3**.

3.11 Outsourcing of solid waste management activities

The test-checked ULBs outsourced few of the activities and the extent of outsourcing was higher in test-checked CCs compared with other ULBs. Majority of the other tiers of test-checked ULBs (CMCs/TMCs/TPs) were managing SWM services on their own, exception being:

- three CMCs (Dandeli, Nanjangud and Udupi); TMC, Bhatkal and TP, Gudibande which engaged SHGs/private agencies for door-to-door collection; and
- four CMCs (Bagalkote, Karwar, Shidlaghatta and Udupi) and two TMCs (Maddur and Malur) which engaged private sector for street sweeping and transportation.

Audit reviewed the terms and conditions of the agreements entered into by test-checked ULBs and observed following deficiencies which adversely affected the interest of the Government/service providers.

- Grievance redressal mechanism - SWM is a citizen-centric activity. The agreements, however, did not have local grievance redressal mechanism against the service provider. As a result, the status of citizens' grievances and their redressal was not ensured;

- Force Majeure clause – the agreements contained force majeure clauses. However, the removal of waste after a natural disaster is seminal to public health since failure to remove waste would increase the chances of epidemics and spread of fatal diseases. Hence, an appropriate clause to take care of restoration of services should be included;

- Arbitration - ULBs function under the control of DCs. However, the agreements contained arbitration clause referring the arbitration to the concerned DCs. This not only evidenced departmental bias but was also against the spirit of Government Order dated 10.01.2014 which directed all arbitral proceedings to the Karnataka Arbitration Centre; and

- Segregation - Source segregation by waste generators will not be successful unless segregated collection and transportation of segregated waste is practiced by the ULBs.

a) HDMC entrusted (November 2009) the work of door-to-door collection of MSW from 49 out of 67 wards to private agencies. The agreements, however, did not mention about segregation of waste. As a result, mixed waste was being transported and dumped at landfill.

b) Similarly, CC, Tumakuru, entered into an agreement (June 2015) with M/s. Sadhana Enviro Engineers Services, Bengaluru for operation and maintenance (O&M) activities wherein one of the conditions was that CC would be delivering mixed municipal waste to the agency. There was no commitment clause for reducing the amount of mixed waste over the years to reach a goal of 100 *per cent* segregation in a fixed duration.

- The scope of the agreement entered into by CC, Tumakuru envisaged payment of electricity charges, water charges, payments for staff, *etc.,* by the contractor. We observed that CC, Tumakuru incorrectly computed the monthly deductible amount resulting in excess payment of ₹40.86 lakh during the period from June 2015 to February 2017.

- Ambiguous terms and conditions - The terms of agreements should be clear and free from ambiguity. CC, Tumakuru engaged (February 2014) a service provider for door-to-door collection and transportation of MSW. Instead of prescribing specific periodicity for collection of dry waste, CC stipulated that dry waste was to be collected 'daily or twice in a week periodically whichever was convenient to the service provider'. Further, the penalty for non-collection of MSW even for a single day was specified as 'non-collection part of that area's amount'. Such a condition was vague and therefore, difficult to enforce. Further, the agreement did not specify the method of calculation of penalty.

- Basis for payments - Moisture increases the weight of MSW, and therefore the cost of collection and transportation increase. To prevent an increase in weight, waste should be insulated from rainfall or other extraneous water (Section 3.3.7.2 of Manual 2000 and Section 1.4.3.3.3 of Manual 2016). Further, Guidebook on Swachh Bharat stipulated that the cleaning work should never be entrusted only on a per-ton-payment basis or per-trip distance basis. This would encourage malpractice of falsifying bills for trips made and resist waste minimisation. So payment should be based on a maximum allowed weight per vehicle volume. Contracts can preferably be given on a per-capita or per-household basis (Section 6.6).

  CC, Mangaluru entrusted (August 2014) the work of door-to-door collection and transportation to M/s. Antony Waste Handling Cell Private Limited, Mumbai, at the rate of ₹3,201 per ton for North Zone and at the rate of ₹2,051 per ton for South Zone. The work of O&M of composting plant, vermi composting and sanitary landfill site at Mangaluru was entrusted (May 2013) to M/s. Unique Waste Processing Company Limited at rate of ₹238 per ton (tipping fee) of incoming MSW.

  We observed that the CC did not take cognizance of the fact that Mangaluru is a coastal city and moisture content of MSW increases considerably during monsoon period (June to October). We analysed the month-wise data for the period from 2013-14 to 2016-17 and observed that the average quantities of incoming waste during monsoon period were higher by 2,319.29 tons than those during normal period (November to May). The payments to the extent of ₹51.20 lakh to M/s. Antony Waste Handling Cell Private Limited and ₹26.60 lakh to M/s. Unique Waste

Processing Company Limited towards excess quantities could have been avoided had the CC factored the impact of moisture content while finalising the contract.

The State Government stated (May 2018) that comments would be submitted to audit on receipt of replies from test-checked ULBs.

Recommendation 4: The State Government may revise the model agreement for each SWM service/activity considering the deficiencies pointed out. It should be ensured that the terms and conditions of the agreement are clear, free from ambiguity and protect the interests of ULB/Government.

3.12 Service level benchmarks

Ministry of Urban Development (MoUD), Government of India, launched (2008) the Service Level Benchmarking (SLB) initiative covering water supply, waste water, SWM and storm water drainage. The 13th and 14th FCs have also endorsed the principle of benchmarking and included SLB as one of the conditions for the allocation of performance-based grants to ULBs. MoUD defined a common minimum framework for monitoring and reporting on performance indicators; of which eight performance indicators (detailed in **Appendix 3.4**) pertain to SWM.

3.12.1 Targets and achievement in test checked Urban Local Bodies

Analysis of SLB declarations (2016-17) by 30 test-checked ULBs (except five newly formed ULBs) in respect of these performance indicators (except efficiency in redressal of customer complaints) showed that in certain cases, targets were set at extremely low levels. As per ULBs' declarations, extent of segregation, recovery of MSW, scientific disposal and cost recovery of MSW in majority of the test-checked ULBs were significantly below the targets fixed/benchmarks. Achievements of these ULBs *vis-à-vis* targets and benchmarks in respect of these performance indicators are depicted in **Appendix 3.5**.

The correctness of the achievements declared by ULBs was not verified as ULBs did not furnish any documentary evidence in support of their claims. The Handbook on SLB prescribed by MoUD emphasises the need to ensure reliability of measurement and specifies four levels of reliability for each indicator. ULBs should strive to move towards the highest/preferred level of reliability.

The State Government stated (May 2018) that for any given ULB, performance indicators are improving progressively year by year. The reply, however, does not address the audit observation regarding correctness of the data on achievements *vis-à-vis* SLBs.

Recommendation 5: The State Government may draw a time-bound plan for ULBs to achieve the highest/preferred level of reliability of SLB data.

3.13 Allocation of responsibility and accountability

Identification of nodal agency and implementing bodies, and allocation of responsibility and accountability to these are essential for ensuring smooth and effective compliance with laws and rules. Section 1.4.5.4 of MSWM Manual, 2016 strongly recommends that ULBs should have an SWM cell or SWM department having staff with technical and managerial skills specific to MSW management.

As per provisions of MSW Rules, 2000 (Clause 5) and SWM Rules, 2016 (Clause 11), Secretary, UDD has the overall responsibility for the enforcement of the provisions of these rules in the metropolitan cities (except BBMP). The Director of Municipal Administration (DMA) assists the Secretary, UDD, in ensuring implementation of provisions of these rules by all ULBs and is the nodal agency at State level. An SWM cell, headed by Executive Engineer, assists the DMA on technical and managerial aspects of MSWM. DMA also coordinates with State Pollution Control Board to ensure compliance of SWM norms prescribed under the relevant rules.

- **Lack of accountability at district level**

At district level, Deputy Commissioner (DC) of the district with the assistance of Project Director, DUDC, is responsible for monitoring activities of ULBs including SWM. Executive Engineer and Assistant Executive Engineer support the Project Director in discharging his duties. We, however, observed that DUDC did not have a dedicated SWM cell or staff with technical and managerial skills specific to MSWM. There is no record to indicate whether DUDC is monitoring SWM related activity. Its role was confined to obtaining approval of DC for action plans (SWM) of ULBs and assist ULBs in obtaining approval of DC for designated site identified for C&D waste, common facility for bio-medical waste disposal, *etc*.

The State Government (May 2018) stated that posts of Assistant Executive Engineer (Environment) were proposed at DUDCs in the recent amendment to Municipality (C&R) Rules exclusively for effective implementation of SWM at ULB level.

- **Manpower/staff constraints**

At the ULB level, there was no required SWM cell to take care of SWM activities exclusively. The existing staff manage both SWM and sanitation activities in the ULBs. The staff position for SWM cum sanitation activities in the test-checked ULBs is given in **Table 3.3**.

Table 3.3: Statement showing the staff position (sanctioned strength, person-in-position and vacancy) for SWM cum sanitation activities in test-checked ULBs

ULB	Environment Engineers			Health inspectors			*Pourakarmikas*		
	SS	PIP	Vacancy (Percentage)	SS	PIP	Vacancy (Percentage)	SS	PIP	Vacancy (Percentage)
CCs	21	14	7 (**33**)	120	27	93 (**78**)	3,379	1,112	2,267 (**67**)
CMCs	11	09	2 (**18**)	66	30	36 (**55**)	1,600	574	1,026 (**64**)
TMCs	12	07	5 (**42**)	37	12	25 (**68**)	485	204	281 (**58**)
TPs	-	-	-	8	1	7 (**88**)	120	76	44 (**37**)
Total	**44**	**30**	**14 (32)**	**231**	**70**	**161 (70)**	**5,584**	**1,966**	**3,618 (65)**

Source: Information furnished by test-checked ULBs SS: Sanctioned strength; PIP: Person-in-position

It is seen from the table above that there was shortage of manpower at all cadres *viz.* Environment Engineer (32 *per cent*); Health Inspectors (70 *per cent*) and *Pourakarmikas* (65 *per cent*). For TPs, there was no sanctioned post of Environment Engineer. Hence, existing Health Inspector was in-charge of SWM in TPs. In order to address the vacancies in the post of *Pourakarmikas*, all test-checked ULBs except the five newly upgraded ULBs outsourced manpower.

The posts of Environment Engineers were created during July, 2004. We observed that the post was vacant in five test-checked CMCs/TMC (Dandeli, Hosapete, Humnabad, Nanjangud and Sira) for periods ranging up to five years during the review period. Absence of technical officers affected the implementation of approved action plans.

In CMC, Nanjangud, purchase of auto tippers was planned in 2013-14, 2015-16 and 2016-17 but actual purchase was effected (June 2017) only after the posting of an Environment Engineer in December 2016. CMC has been using pushcarts for collection of MSW from door-to-door instead of using auto tippers as per norms included in State policy issued in 2004. The collection of MSW was, thus, partial (only 9 out of 27 wards covered). Purchase of auto tippers would have ensured greater coverage in collection of waste.

More than 50 *per cent* of the posts of Health Inspector were vacant in the test-checked ULBs. Apart from SWM cum sanitation activities, Health Inspectors were also required to manage several other activities such as birth and death registration; preparation and updation of statistics; initiate action for removal of unauthorised hoardings; tackle animal menace, *etc*. The combination of an extensive job profile and acute shortage of manpower could have an adverse impact on the ability to meet the rigorous demands of SWM activities.

Severe shortage of manpower affected effective implementation and monitoring of SWM activities particularly collection and segregation of MSW in ULBs (detailed in subsequent paragraphs on collection and segregation).

The State Government accepted the audit observation and stated (May 2018) that necessary steps would be taken to bridge the gap in availability of human resource.

Recommendation 6: The State Government may ensure that the required District/ULB level Committees are constituted for effective institutional mechanism and implementation of SWM plans.

3.14 Capacity building

Manual on MSWM, 2000 (Section 19.1) stipulated that measures must be taken for institutional strengthening and internal capacity building, so that efforts made can be sustained over a period and the system put in place could be managed well. Clauses 11(k) and 15 (zc) of SWM Rules, 2016, required UDD and ULBs to arrange for capacity building of staff (including contract workers) in managing solid waste, segregation and transportation or processing of such waste at source.

Test-check of documents collected from training centres *viz.* State Institute of Urban Development, Mysuru (SIUD) and City Managers' Association Karnataka (CMAK), Bengaluru, showed that training, workshops, conferences on SWM were conducted for various target groups such as Mayors, Elected Representatives, Project Directors, Commissioners/Chief Officers, Engineers, Health Inspectors and *Pourakarmikas*.

- ***Poor turnout for training***

SIUD is the nodal agency to develop training modules/content and provide training to personnel of UDD for different urban development related activities. Accordingly, DMA provided funds for training courses to SIUD. The progress reports of SIUD revealed that it conducted (2012-13 to 2016-17) 31 training courses in connection with SWM activities.

Check of the training slots provided and those actually attended by officers/staff of ULBs showed that the utilisation of training slots in 21 of these 31 courses was less than 75 *per cent*. Course-wise details are given in **Appendix 3.6**. Poor utilisation of training activities rendered the effectiveness of training questionable. We also observed that there were no mandatory modules prescribed for SWM staff.

The State Government stated (May 2018) that the shortcomings in training would be addressed.

Thus, absence of adequate and trained staff is indicative of the lack of commitment of State Government towards SWM.

Recommendation 7: The State Government may devise mandatory modules for training all personnel involved in SWM and ensure coverage of all personnel within a specified period.

Chapter IV

Financial management

4.1 Assessment of requirement of funds

In accordance with the provisions[11] of KM Act, 1964 and KMC Act, 1976, the Commissioner/Chief Officer of each ULB prepares the budget estimate indicating the receipt of funds from various sources and allocates the resources to various activities undertaken by it and presents it to the Governing Council for approval. After the approval by the Governing Council, ULBs forward the budget to the DMA and the Government.

It appears that the KM Act, 1964 and the KMC Act, 1976 are not in consonance with the Constitution provisions, as contained in the Constitution (74th Amendment) Act, 1992, as the Constitution provisions are silent about the approval of the budget while both the Acts specifically mention the role of the State Government in sanctioning/modifying the budget. However, it is observed that in practice, in Karnataka the Governing Council forwards the budget to DMA and the State Government for information.

Scrutiny of the financial statements of the test-checked ULBs for the years 2014-15 to 2016-17 revealed that the ULBs were mainly dependent on Government grants. The dependency on Government grants was on an average in excess of 60 *per cent.*

Sustainable financing is paramount to ensure discharge of any function. The major types of expenditure[12] are capital expenditure and revenue expenditure, which take care of fixed costs for land, plant, machinery, daily expenses of managing MSW, refurbishment costs, O&M costs and contingent costs, *etc.*

We observed that until the preparation of DPRs, none of the test-checked ULBs assessed the requirement of capital and revenue funds for SWM activities and hence, they were unaware of the resource deficit. Though DPRs prepared during 2016-17 assessed the resource deficit, these failed to address measures for bridging this deficit. But audit did not come across any instance of ULB asking for funds from the State Government.

The State Government admitted (May 2018) that ULBs had to depend on grants released from Central and State Governments and hence took up the SWM works based on availability of funds.

4.2 Sources of funds for solid waste management

The various sources of financing for waste management are indicated in **Table 4.1**:

Table 4.1: Sources of financing in ULBs for waste management

Sl. No.	Source	Particulars
1	Central Grants	▪ 13th Finance Commission - capital expenditure, ▪ 14th Finance Commission - capital expenditure, ▪ Swachh Bharat Mission - capital expenditure

[11] Section 287 of KM Act, 1964 and Section 167 to 170 of KMC Act, 1976.
[12] Paragraph 1.4.5.6.1 of MSWM Manual, 2016.

Sl. No.	Source	Particulars
2	State Grants	▪ State Finance Commission (tied) -revenue expenditure, ▪ State Finance Commission (Untied) - capital/revenue expenditure, ▪ State Finance Commission (entry tax devolution) - capital expenditure
3	Own Sources (Municipal Fund)	▪ Levy of SWM cess/user charges, ▪ Sale of products and by-products (compost, *etc*.), ▪ Sale of recyclables (Own sources are utilised for revenue expenditure)

The funds under 13th and 14th Finance Commissions (FC) in the form of basic grants and performance grants and the State Finance Commission (SFC) grants were released to ULBs on weighted average method[13].

4.3 Receipts and expenditure

The details of funds received and spent during the period 2012-13 to 2016-17 in 35 test-checked ULBs are shown in **Table 4.2**.

Table 4.2: Year-wise details of receipts and expenditure under SWM in 35 test-checked ULBs

(₹ in crore)

Year	Opening balance (Capital)	Receipts		Total funds available		Expenditure		Closing balance (Capital)
		Revenue	Capital	Revenue	Capital	Revenue	Capital	
2012-13	8.10	101.27	38.47	101.27	46.57	101.27	29.68	16.89
2013-14	16.89	119.53	48.12	119.53	65.01	119.53	27.14	37.87
2014-15	37.87	127.12	34.17	127.12	72.04	127.12	18.54	53.50
2015-16	53.50	152.01	22.13	152.01	75.63	152.01	10.57	65.06
2016-17	65.06	177.45	44.83	177.45	109.89	177.45	16.70	93.19
Total		**677.38**	**187.72**			**677.38**	**102.63**	

Source: Information furnished by ULBs

It could be seen from the above table that the capital expenditure on SWM was not commensurate with the funds available resulting in accumulation of balances to the tune of ₹93.19 crore at the end of March 2017. ULBs did not utilise the funds provided for creation of capital assets. In comparison, the funds provided for revenue expenditure were utilised in full by the ULBs.

Table 4.3 shows the source-wise details of receipts and expenditure in the test-checked ULBs during the period 2012-13 to 2016-17.

Table 4.3: Source-wise details of receipts and expenditure under SWM in 35 ULBs

(₹ in crore)

Source of funds	Opening balance	Receipts	Total funds available	Expenditure	Closing balance	Percentage of unspent amount
13th FC	6.40	68.25	74.65	46.82	27.83	37
14th FC	0.00	35.35	35.35	6.10	29.25	83
SFC-Untied	1.70	52.41	54.11	43.84	10.27	19

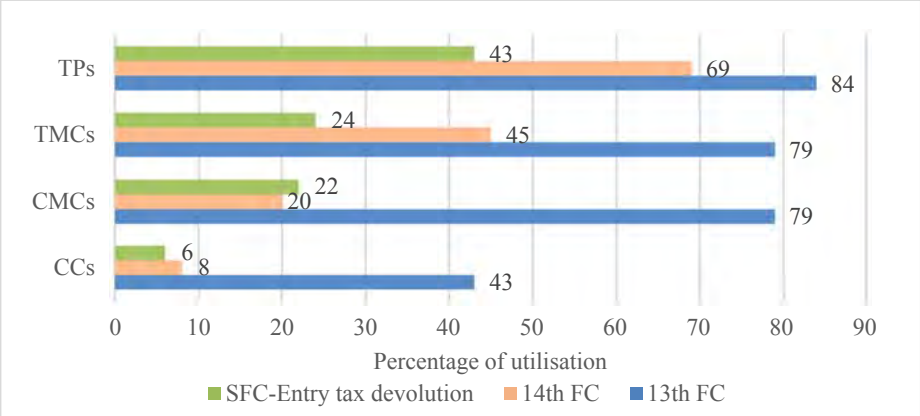
[13] In weighted average method, funds are allocated to ULBs on percentage basis determined in proportion to total population (40 *per cent*), area (20 *per cent*), Scheduled Caste/Scheduled Tribe population (20 *per cent*) and literacy (20 *per cent*).

Source of funds	Opening balance	Receipts	Total funds available	Expenditure	Closing balance	Percentage of unspent amount
SFC-Entry tax devolution	0.00	17.79	17.79	3.53	14.26	80
Municipal Fund	0.00	405.70	405.70	405.70	0.00	-
Others (SFC tied, SBM, *etc.*)	0.00	285.60	285.60	274.02	11.58	4
Total	**8.10**	**865.10**	**873.20**	**780.01**	**93.19**	**11**

Source: Information furnished by ULBs

Table above indicates that municipal fund which is used for revenue expenditure was spent fully on daily expenses of managing MSW, refurbishment costs, and O&M, *etc.* However, ULBs were deficient in asset creation as can be seen from the expenditure incurred under 13th FC (37 *per cent*), 14th FC (83 *per cent*) and the grants provided under SFC-entry tax devolution (80 *per cent*). ULB-wise details are indicated in **Appendix 4.1**. Further analysis revealed that the utilisation of the grants was less in CCs when compared to CMCs, TMCs and TPs. The category-wise utilisation of capital funds in the test-checked ULBs is depicted in **Chart 4.1**:

Chart 4.1: Category-wise utilisation of funds in test-checked ULBs



We observed that:

(i) Fifteen test-checked ULBs did not utilise even a single rupee of the grant of ₹11.71 crore released as at the end of March 2017 under SFC. ULBs attributed this to non-preparation of action plan, procedural lapses, *etc.*;

(ii) Twenty-six test-checked ULBs did not utilise the entire allocation as of March 2017 despite the end of the 13th FC period. CC, Tumakuru utilised ₹79.10 lakh (towards purchase of enzyme culture for preventing bad smell in SWM plant - ₹27.76 lakh and yearly maintenance of SWM plant -₹51.34 lakh) that were of the nature of revenue expenditure. This was against the 13th FC guidelines, which stipulated use of funds for creation of capital assets; and

(iii) Nine and 19 ULBs test-checked allocated less than 15 *per cent* of the 14th FC grants received during 2015-16 and 2016-17 respectively. Twelve[14] ULBs did not utilise any amount allocated for SWM under the 14th FC.

[14] CCs - Ballari, HDMC and Mangaluru; CMCs - Dandeli, Hosapete, Nanjangud, Shidlaghatta and Udupi; TMCs - Kakkera, Magadi and Ugar Khurd; TP, Chinchali.

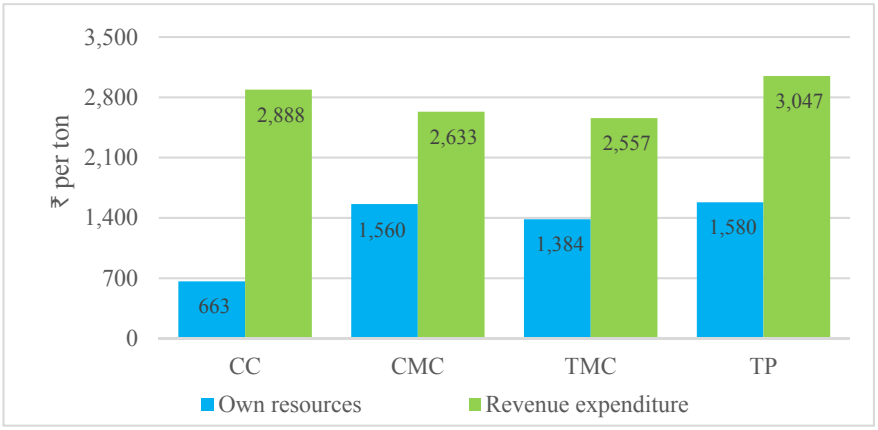
The non-utilisation of funds received under the CFC/SFC thus, resulted in non-creation of infrastructure at landfill sites such as construction of compound walls, windrow platforms, internal drains and roads; purchase of segregating and screening machineries; purchase of vehicles for collection and transportation, construction of vermi-compost sheds, dry waste collection centres, *etc*.

The State Government stated (May 2018) that ULBs were asked to hold back procurement and other infrastructure activities till the SWM DPRs are approved in order to prevent ineffectual expenditure in waste management sector due to lack of detailed comprehensive plan. It further stated that the funds would be utilised in due course. The Government's reply is non-committal since it does not specify the period within which the funds would be utilised.

4.4 Resource-expenditure gap

Own resources form a major source of revenue of ULBs in meeting their O&M expenses. Hence, strict enforcement of levy and collection of SWM cess is essential. The levy and collection of SWM cess was found to be deficient as discussed in Paragraph 4.5. The impact thereof is the increase in the gap between generation of own resources and the expenditure in relation to SWM activities as indicated in the **Chart 4.2**.

Chart 4.2: Resource-expenditure Gap in ₹ per ton (average for the period from 2012-13 to 2016-17)



As could be seen from the above chart, the resource-expenditure gap was more in CCs and TPs. Further analysis revealed that the gap during the year 2016-17 increased in 24 out of 30 test-checked ULBs and decreased in six ULBs in comparison with the year 2012-13 as detailed in **Appendix 4.2**.

This gap is being met out by ULBs from out of their own revenue (property tax, license fee, *etc.*). A case study of CC, Mangaluru is illustrated below.

CC, Mangaluru outsourced (November 2014) the door-to-door collection, sweeping and transportation of waste to M/s Antony Waste Handling Cell Pvt. Ltd., Mumbai (service provider) and the work of O&M of composting plant, vermi-composting and sanitary landfill site at Mangaluru to M/s Unique Waste Processing Company Ltd. It received ₹10 crore towards capital expenditure and allocated ₹106.40 crore towards revenue expenditure during the period 2012-13

to 2016-17 against which the utilisation was ₹2.33 crore and ₹106.40 crore respectively. CC had pending payments of ₹13.89 crore towards price escalation (₹0.23 crore) and difference of minimum wage reimbursement (₹13.66 crore).

The Commissioner of CC, Mangaluru requested (December 2015) the DMA to permit utilisation of funds received under the 13th/14th FC and SFC for O&M of SWM activities. The matter is under consideration by DMA. It also stated that payment would be made as per the availability of funds and verification of the bills concerned to that period. It is pertinent to mention that utilisation of such funds for revenue expenditure cannot be permitted as these are meant for capital expenditure.

The State Government stated (May 2018) that steps were being taken to recover 30 to 50 *per cent* of the total O&M cost from levy of SWM cess, sale of compost and recyclables, *etc.*, and to address other shortcomings in the existing system of levy of SWM cess/user charges. The reply is not consistent with the SLB, which mandated 100 *per cent* recovery of all operating expenses from operating revenues. In the instant case of CC, Mangaluru, O&M cost was ₹106.40 crore and cess collected was ₹19.36 crore. The sale proceeds on account of compost, recyclables, *etc.*, were nil. Hence, the recovery works out to less than 19 *per cent* and thus, the possibility of achieving 30 to 50 *per cent* of total O&M cost is remote.

Recommendation 8: The Central and State Governments may devise a system for need-based allocation of funds and accord greater flexibility to ULBs in their utilisation to bridge the resource-expenditure gap.

4.5 Levy and collection of solid waste management cess

Section 103B (2) of KMC Act, 1976 provides for levy of SWM cess for the purpose of collection, transportation and disposal of solid waste. There was no such provision under the KM Act, 1964. However, as per Chart of Accounts under the Karnataka Municipal Accounting Manual (KMAM), the Government as a matter of policy, and with a view to keep the town in a better hygienic/sanitary condition i.e., to maintain 'litter free zones', may direct the municipalities to levy and collect a cess, in the nature of revenue income, for this purpose. Accordingly, DMA issued (September 2009) instructions directing all ULBs to collect SWM cess. To facilitate collection of SWM cess with greater efficiency, the DMA directed ULBs to collect the cess along with property tax through the property tax returns.

As per Clause 15 (f) of SWM Rules, 2016 (effective from 8 April, 2016), the local authorities shall prescribe from time to time user fee as deemed appropriate and collect the fee from the waste generators on its own or through authorised agency.

4.5.1 Non-collection of cess

Scrutiny of the records relating to collection of SWM cess revealed that there is an appreciable increase in the number of test-checked ULBs collecting SWM cess. The quantum of cess increased significantly during the period 2012-13 to 2016-17. As of March 2017, 11 test-checked ULBs were yet to levy SWM cess

and thus, deprived themselves of the own revenue source. **Table 4.4** gives the status of collection of SWM cess in test-checked ULBs. ULB-wise details are given in **Appendix 4.3**.

Table 4.4: Status of ULBs collecting SWM cess during the period 2012-13 to 2016-17

(₹ in crore)

Year	ULBs collecting SWM cess		ULBs not collecting SWM cess		Revenue expenditure for all test-checked ULBs
	Number	Amount	Number	Amount foregone[15]	
2012-13	4	4.81¥	26	9.29	101.27
2013-14	7	6.69¥	23	5.95	119.53
2014-15	11	9.38	19	5.13	127.12
2015-16	21	18.78	9	2.00	152.01
2016-17	24	21.93	11	1.76	177.45
Total		**61.59**		**24.13**	**677.38**

¥ - Though CC, Ballari stated to have collected SWM Cess, the amount of cess collected was not furnished.

Source: Information furnished by ULBs

The reasons for non-collection of cess by ULBs were not forthcoming from the records made available to audit.

We, further, observed that test-checked ULBs were not collecting cess from places of public worship, occupiers of buildings/shops owned by ULBs and Government buildings as these properties were either exempt from payment of property tax or service charges were not collected. ULBs also did not levy cess on vacant lands despite enabling provisions. Consequently, the ULBs lost revenue of ₹3.07 crore[16] during the period 2012-13 to 2016-17.

The State Government stated (May 2018) that provisions were made in draft bye-laws for collection of SWM cess/user charges from such properties.

4.5.2 Collection of cess on plinth area of the building

The rates of cess prescribed under Rule 19A of Part II under Schedule III to KMC Act, 1976 and by DMA were based on the plinth area of the building with rates ranging from ₹10 (for residential buildings with plinth area less than 1,000 sq. ft.) to ₹600 (for hotels, *kalyana mantaps*, nursing homes with plinth area exceeding 50,000 sq. ft.) per month. The cess payable was irrespective of the extent of waste generated and the number of individual units in the building. To cite an example, scrutiny of the property tax return of a building belonging to Ballari Urban Development Authority with a built up area of 10,880 sq. ft. and housing 128 shops showed that the SWM cess paid during the period 2013-14 to 2015-16 was ₹2,400 per year (@ ₹200 per month for commercial buildings with plinth area of more than 5,000 sq. ft.). As each shop is a commercial entity in itself and generates certain quantity of waste, the minimum cess that should be collected from the building would amount to ₹76,800 per year (@ of ₹50 per month, the rate for commercial buildings with plinth area less than 1,000 sq. ft., for 128 shops).

[15] Calculated at the minimum rate prescribed (2009) by Government for residential and commercial buildings.

[16] ₹2.57 crore from places of public worship (24 ULBs); ₹0.34 crore from buildings/shops owned by ULBs (19 ULBs) and ₹0.16 crore from Government buildings (20 ULBs).

The absence of provision to collect cess from each occupier of the units in a building, thus, resulted in a loss of revenue income to ULBs.

The State Government stated (May 2018) that suitable provisions would be made to levy cess from all the units existing in complex/single building.

4.5.3 Non/short accounting of cess

ULBs collect various cesses such as health cess, library cess, beggary cess and urban transport cess as a percentage of property tax along with property tax. The cesses so collected are to be remitted by ULBs to the concerned departments or the specified heads of account after deducting 10 *per cent* as collection charges. SWM cess, on the other hand, is also collected along with property tax (at prescribed rates) and is to be utilised by ULBs. Hence, proper and separate accounting of this cess is required to be ensured so that ULBs can monitor its collection and utilise it exclusively for SWM. Chart of Accounts under the KMAM provides a separate code for accounting SWM cess.

We observed that 14 out of 24 test-checked ULBs collecting SWM cess were not accounting for the cess in the assigned code. While 3 of the 14 ULBs were accounting for it along with property tax, two ULBs were accounting for it under a different code. The status of accounting in the balance nine ULBs was not verifiable from the records made available to audit. Of the remaining 10 ULBs that were accounting the cess in the assigned code, we observed short accounting of cess of ₹5.41 crore in 6 ULBs. HDMC alone short accounted to the extent of ₹5.11 crore. Chartered Accountants also failed to point out short accounting of cess in their reports accompanying the financial statements.

The State Government stated (May 2018) that issue would be examined and duly addressed.

4.6 Diversion of funds

Scrutiny of approved action plans (approved by respective DCs) for the period 2012-13 to 2016-17 showed that in 10[17] out of 35 test-checked ULBs, the funds allocated for SWM activities included works and purchase of equipment/machineries/vehicles related to Underground Drainage (UGD) purposes and other activities not connected with SWM. An amount of ₹3.81 crore was incurred (February 2013 to January 2017) out of the allocation of ₹4.76 crore on the above activities (detailed in **Appendix 4.4**). This not only contravened the CFC guidelines but also resulted in reduced allocation of funds for SWM activities.

We also observed that in CMC, Sira, SWM works estimated to cost ₹42.01 lakh under SFC during the period 2009-10 to 2012-13 were not implemented, the reasons for which were not forthcoming from the records made available to audit. These works were subsequently dropped and the Council resolved (November 2015) to take up works not relating to SWM, which were approved

[17] CCs - Ballari, HDMC and Tumakuru; CMCs - Chintamani, Dandeli, Karwar and Sira; TMCs - Bhatkal, Humnabad and Kumta.

(February 2016) by the DC. An expenditure of ₹15.80 lakh incurred, as detailed in **Appendix 4.5**, thus, amounted to diversion of funds and non-achievement of intended objective of constructing bio-methanation plant, purchasing secondary storage containers, *etc*.

The State Government stated (May 2018) that since SWM was an integral part of Health Section along with UGD, ULBs utilised SWM funds on equipment such as sucking and jetting machines, open drain desilting machine, manhole desilting machine, *etc*. The reply is silent about diversion of funds relating to CMC, Sira and it was not consistent with the guidelines of CFC, which stipulate allocation and utilisation of certain percentage of funds for SWM and UGD activities separately.

4.7 Collection of user charges from railway authorities/other establishments

Provisions of SWM Rules, 2016 are also applicable to industrial townships, areas under the control of Indian Railways, airports, airbases, Ports and harbours, defence establishments, special economic zones, *etc*. (Section 2.2.1.5 of MSWM Manual, 2016).

In 19 test-checked ULBs, areas under the control of Indian Railways were within the municipal area limits. In six[18] of these ULBs, the waste generated within the railway premises were handed over to municipalities. Of the six ULBs, only CC, Mangaluru was collecting user fee of ₹300 per ton of waste received and the remaining five ULBs did not collect any user fee. In HDMC, the railway authorities were directly dumping the waste in the landfill site. The status in respect of other 12 ULBs is awaited.

As Indian Railways is a bulk generator, the Government/ULBs may consider levying user charges on the lines of CC, Mangaluru to augment the own revenue of ULBs.

The State Government stated (May 2018) that suitable action would be taken.

Recommendation 9: While the number of ULBs collecting SWM cess as well as the amount being collected by these ULBs showed a rising trend, it is necessary that ULBs conduct a realistic assessment of the O&M cost involved in SWM and levy and collect SWM cess accordingly with a view to achieving SLBs. The State Government may make suitable amendments to KM Act, 1964 for levy and collection of SWM cess as was done in case of KMC Act, 1976.

ULBs may ensure maximisation of own resources through efficient collection and widening of SWM cess base through measures such as collection of cess from (i) individual units instead of on plinth area; (ii) functions/activities conducted in open spaces; (iii) unorganised sector and levy of interest for belated payment of cess, (iv) railway authorities, etc.

[18] CCs - Mangaluru and Tumakuru; CMCs - Sagar and Shidlaghatta; TMC, Ugar Khurd; TP, Chinchali.

SECTION II

Effectiveness of Implementation of Solid Waste Management process

Chapter V

Information, Education & Communication activities

5.1 Introduction

Behavioural change is vital for effective SWM. Information, education and communication (IEC) is a multilevel tool for promoting and sustaining risk-reducing behaviour change in individuals and communities. The IEC campaign should target households, shops, and commercial and institutional premises as well as other stakeholders such as municipal officials, elected representatives, schools, non-government organisations (NGOs), the informal sector, media, *etc.*, to ensure their participation in managing city waste by discharging their role effectively.

Provisions of MSW Rules, 2000 (S. No. 2 of Schedule II) and SWM Rules, 2016 (Clause 15 (zg)); Manuals on MSWM, 2000 (Section 25.4.2.12) and 2016 (Section 1.4.5.13) underscored the importance of IEC activities and required the State Government and ULBs to create public awareness and educate waste generators to achieve the overall objectives of MSWM.

5.2 Deficiencies in Information, Education & Communication activities

The State Government developed (August 2004) a strategy document for IEC with the objective of creating awareness among citizens, bulk waste generators and agencies involved in handling of Municipal Solid Waste. The document detailed various IEC activities for target groups from public to municipal staff and officers including various associations.

Thirty-three out of 35 test-checked ULBs conducted IEC activities, encouraging waste generators to 'segregate waste into wet and dry' and 'not to litter' by issue of bills, banners, stickers, wall paintings, advertisement in local channels, *etc*. **Table 5.1** indicates the status of various modes of communication used in the test-checked ULBs.

Table 5.1: Modes of communication used in the test-checked ULBs

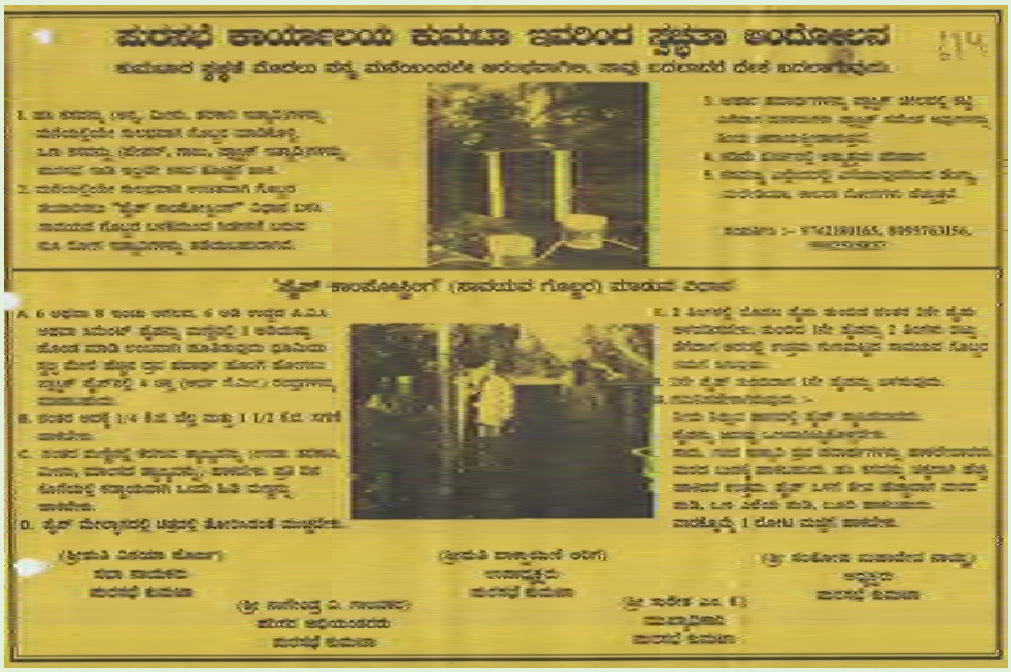
Sl. No.	Modes of communication used	Number of ULBs		
		Yes	No	Details not available
1	Audio	13	19	3
2	Video	10	22	3
3	Mass communication	10	22	3
4	Wall Paintings	7	25	3
5	Schools	13	19	3
6	Hoardings	11	21	3
7	Street *Jathas*	8	22	5
8	Pamphlets	24	8	3

Source: Records of test-checked ULBs

ULB-wise details are given in **Appendix 5.1**.

Good practice

TMC, Kumta, promoted (October 2016) production of biogas from domestic waste by creating awareness through handbills. Based on the meeting conducted with street vendors and shop owners in October 2016, the TMC tied sack bags on street light poles to address littering issues. The TMC also made (March 2017) a documentary film on pipe composting and aired it in local channels.



(*Handbill on Swachhta Andolan by TMC, Kumta – Promoting behaviour change through segregation of dry and wet waste and use of wet waste for production of bio gas through pipe composting*)

Source: Records of TMC, Kumta

We, however, observed that the following issues related to IEC were not addressed:

- The State Government claimed to have prepared six booklets for various target groups namely children, public, NGOs, ULBs, elected representatives and *pourakarmikas* and distributed them to ULBs during the year 2004. The Government, through Karnataka Urban Infrastructure Development and Finance Corporation (KUIDFC), also produced two documentary films on SWM (a) for general awareness and (b) exclusively on municipal landfill, for creating awareness and educating ULBs. We observed that these booklets and Compact Discs (CDs) were not available/accessible in any of the test-checked ULBs. DMA stated (June 2017) that the booklets were not in use at present.

- CMC, Shidlaghatta and TP, Honnavara did not conduct any IEC activity during the period 2012-13 to 2016-17.

- Domestic hazardous waste included both toxic and bio-medical wastes. However, neither the State level authorities (UDD, DMA and KSPCB) nor district/ULB level authorities notified and publicised the list of

domestic hazardous waste. We observed that ULBs in Uttara Kannada district (as shown below) and TP, Kudligi distributed pamphlets that indicated segregation of domestic hazardous waste. In the remaining test-checked ULBs, segregation of waste at source was not encouraged.

Pamphlet circulated by DC, Uttara Kannada

- E-waste consists of different components that are both hazardous and non-hazardous. Hence, e-waste should be segregated at source and should not be mixed with MSW. The estimated quantum of e-waste generated in the State was 86,118 metric ton (MT) per annum. However, no specific IEC activity focussed on e-waste segregation or Extended Producer Responsibility (EPR) was carried out.

- None of the test-checked ULBs created awareness on provisions regarding levy of penalty (Section 224 of KM Act, 1964 and Section 431A of KMC Act, 1976) for littering, non-segregation of different waste, *etc.*

- IEC activities conducted by test-checked ULBs did not emphasise 'not to burn' and 'not to bury' solid waste, and did not propagate the waste minimisation through 3R concept.

- None of the test-checked ULBs (except CMC, Bagalkote) encouraged community participation adequately to conduct awareness programme. In CMC, Bagalkote, though the segregation of waste was not adequately promoted, the CMC ensured active community participation in maintaining cleanliness in the city. It also supported the cause of Bagalkote Social Workers Group, which is a non-political group of social workers striving to ensure overall development of Bagalkote City and make it more peaceful through the community service. The impact of community involvement was evident during JPV conducted (August 2017) with ULB staff as general level of cleanliness in the areas visited was significantly better as compared to other cities (**Exhibit 5.1**).

- We also observed that ULBs did not create adequate awareness amongst the work force for utilisation of protective equipment as detailed in Paragraph 6.2.5.

The State Government stated (May 2018) that issues observed by audit would be addressed and DMA floated tenders to select suitable agencies to carry out various IEC programmes at ULB level.

Recommendation 10: The State Government should accord required priority to IEC and ensure that IEC activities are appropriate and create awareness about the harmful effects of ineffective SWM management on health and environment. It may explore usage of more effective means of communication for increasing the impact and efficacy of IEC activities.

The IEC activities should be undertaken, keeping in view the particular wastes in particular areas and particular seasons. This may be taken up consequent to assessments and pilots.

Exhibit 5.1: Status of cleanliness (Paragraph 5.2)

CMC, Bagalkote (29.8.2017)

CMC, Shidlaghatta (7.6.2017)

CMC, Bidar (10.8.2017)

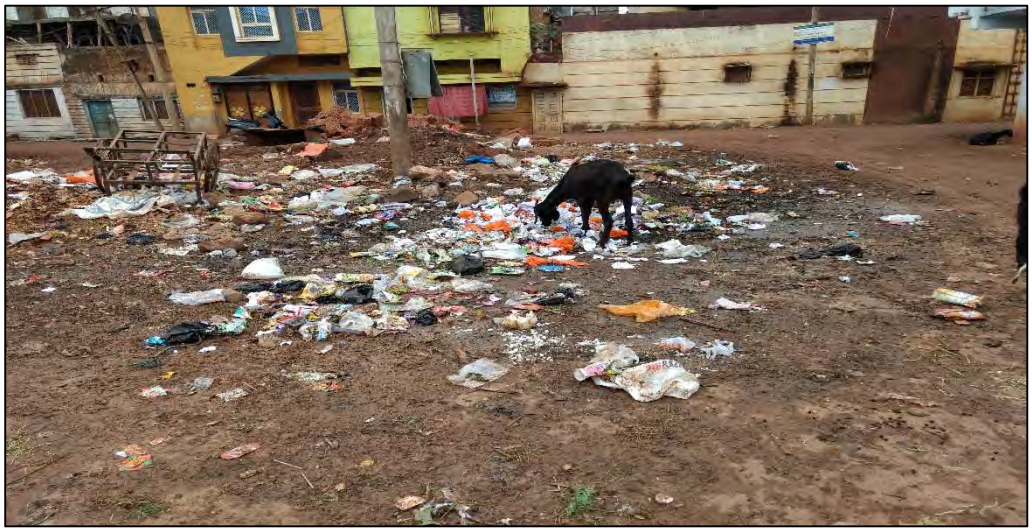


Exhibit 5.1: Status of cleanliness (Paragraph 5.2)

CMC, Bagalkote (29.8.2017)

CMC, Hosapete (11.5.2017)

HDMC (28.4.2017)

Chapter VI

Segregation, Collection and Transportation of waste

6.1 Segregation

Segregation refers to the process of separation of municipal solid waste into four groups *i.e.,* organic, inorganic, recyclables and hazardous wastes. It is a critical requirement since it enables recycling, reuse, treatment and scientific disposal of different components of waste. Chapter 8 of Manual on MSWM, 2000 deals with the importance of sorting[19] waste.

Sorting/segregation shall take place at different levels such as source/household level; transfer station or centralised sorting facility; waste processing site and landfill site to segregate waste into different streams such as dry recyclables, biodegradable waste, C&D waste, hazardous waste, *etc.*, to minimise waste and ensure reduction in landfill space for final disposal besides ensuring appropriate processing.

6.1.1 Segregation of waste at source/household level

MSWM Manuals, 2000 (Section 8.10.1(a)) and 2016 (Section 2.2.1) stipulate that ULBs must accord highest priority for segregation of waste at source. DMA stated (June 2017) that only 105 out of 270 ULBs in the State started segregation at source (partially in few selected wards).

The test-checked ULBs also declared having achieved service level benchmarks between zero and 55 *per cent* for segregation. As per SLB declarations by the ULBs themselves, segregation was totally absent in seven ULBs and averaged 31 *per cent* in 28 ULBs during 2016-17, indicating poor segregation of waste. Based on JPVs, we found that segregation at source was not followed in 32 out of 35 test-checked ULBs and it was partially carried out in three test-checked ULBs (CC, Tumakuru, CMC, Dandeli and TMC, Kumta).

6.1.1.1 Issue of bins

Scrutiny of records revealed that 11[20] test-checked ULBs procured bins at a total cost of ₹3.45 crore during the review period and issued them to 35 *per cent* of households to encourage segregation of waste at source. We observed during JPV conducted along with the officials of ULBs that segregation of waste was not adopted despite the issue of bins (**Exhibit 6.1**).

The JPV also showed that mixed waste was handed over to waste collectors by households despite audio announcements regarding the importance of

[19] The word 'sorting' is used synonymously with 'separation' and 'segregation' in this Chapter.

[20] CCs - HDMC, Mangaluru and Tumakuru; CMCs - Bagalkote, Hosapete, Sira and Udupi; TMCs - Hiriyur and Manvi; TPs - Koppa and Kudligi.

segregation into wet and dry waste in 26 test-checked ULBs. In six[21] other ULBs, there was no segregation as the mechanism of door-to-door collection was totally absent resulting in dumping of waste on roadsides, streets, *etc*.

In CC, Tumakuru, though segregated waste was handed over to the waste collector (observed during JPV in one ward), the segregated waste was getting mixed in the secondary collection vehicle (Compactor). In CMC, Dandeli, segregation of waste at source was followed in 4 out of 31 wards that were managed voluntarily by West Coast Paper Mills (a company located at Dandeli). In TMC, Kumta, wet waste was being processed through pipe/pit composting at source level and therefore, only dry waste was being collected.

The good practices in segregated collection of MSW in CMCs, Dandeli and Kolar are detailed in **Appendix 11.4**.

6.1.1.2 Non-segregation of domestic hazardous waste

Domestic hazardous waste requires special handling and disposal because of its harmful physical and chemical characteristics, or biological properties. Hence, there is a greater need for proper segregation of such waste. Manual on MSWM, 2000 and SWM Rules, 2016 specify the roles and responsibilities of ULBs in this regard.

As stated in Paragraph 5.2 of IEC, the concerned authorities both at the State/district level and in all the 35 test-checked ULBs did not notify and publicise the list of items classified as domestic hazardous waste to be segregated at source. Consequently, people were not aware of the effect of non-segregation of domestic hazardous waste and contaminated mixed waste was reaching the landfills.

6.1.1.3 Non-segregation of sanitary waste

Sanitary waste generated by households was to be wrapped in old newspaper/pouches provided by the manufacturers and handed over to the waste collectors separately as per the guidelines of KSPCB and clause 4 under Section 2.2.1 of SWM Manual, 2016.

We observed that none of the test-checked ULBs emphasised segregation and disposal of sanitary waste as required (except ULBs in Uttara Kannada District and TP, Kudligi).

6.1.1.4 Absence of incentive mechanism and enforcement

MSWM Manuals, 2000 (Sections 18.3 and 18.4) and 2016 (Section 2.1.4) specify the various activities and methodologies required to be adopted by ULBs to ensure proper segregation of waste at source. One such methodology is providing incentives in the form of rewards/grants/subsidies.

Similarly, Section 18.5 of MSWM Manual, 2000 provides for enforcement. While all efforts should be made to educate people to effectively participate in

[21] CMC, Shidlaghatta; TMCs - Kakkera, Mugalkhod and T. Narasipura; TPs - Ainapura and Chinchali.

the management of waste through IEC, they also need to be made aware of penalties if they fail to discharge their civic duties. The provision for penalties should be made known to the people and details of those punished should be publicised widely to deter others.

Audit did not notice any instances of incentive/disincentive mechanism to promote segregation of waste in any of the test-checked ULBs. We also noticed that penalty provisions under Schedule XIII to Section 431A of KMC Act, 1976 were not enforced.

The above observations indicate that the test-checked ULBs made very little effort to emphasise the importance of segregation of waste at source. DMA attributed (July 2017) this to lack of (i) micro-level planning, (ii) citizen's co-operation and awareness, (iii) stringent laws, bye-laws, *etc.*, (iv) infrastructure such as bins, partitioned vehicles, storage facilities, *etc.* and (v) incentivisation for effective segregation at source and further stated (July 2017) that segregation of waste at source was prioritised and presently 105 ULBs started segregation at source (partially in few selected wards) and continuous efforts were being made to accomplish 100 *per cent* segregation at source.

The State Government stated (May 2018) that 100 *per cent* source segregation cannot be achieved in a single stretch. It further stated that efforts were being continuously taken to achieve source segregation in a progressive manner with the help of IEC tools and introducing penal clauses for non-compliance in the draft bye-laws. Top priority needs to be accorded to the operation of these two strategies for achieving higher levels of segregation.

6.1.2 Segregation of waste at transfer station/central sorting facility

Section 8.10.3(a) of the Manual on MSWM, 2000 states that sorting at the waste storage depot/transfer station is not desirable. However, if source level sorting is not developed, then such sorting may be allowed till a household-level sorting and collection system is established. Since source level segregation was absent/deficient in the ULBs as stated above, there was a need for ensuring segregation of waste at least before it reaches the processing/landfill site. Further, as per Clause 15 (h) of SWM Rules, 2016, the local authorities shall set up material recovery facilities or secondary storage facilities for sorting of recyclable materials.

We observed that:

- In all the test-checked ULBs, waste was transferred in mixed form from primary transportation vehicles to secondary transportation vehicles (mechanically-without manual intervention) near roadsides or vacant lands. In CC, Ballari, the primary transportation vehicles were transferring mixed waste to secondary transportation vehicles at a centralised point (transfer station); and
- Out of the 35 test-checked ULBs, dry waste collection centres were functioning only in three ULBs (CC, Tumakuru, CC, Mangaluru and TMC, Kumta). The dry waste collection centres constructed at CC, Ballari (July 2016 at a cost of ₹21.52 lakh); CMC, Chintamani (March 2017 at a cost of ₹15 lakh) and TMC, Humnabad (April 2015 at a cost of ₹1.75 lakh) were yet to be made functional (May 2017).

Failure to segregate resulted in failure to recover the recyclables, thereby leading to dumping these resources in landfills. It also led to sub-optimal use of precious landfill space.

The State Government accepted (May 2018) the audit observation.

6.1.3 Segregation of waste at processing site

Segregation of waste at processing site is desirable to ensure that the processed output (such as compost) meets the regulatory standards (Section 8.10.5 of Manual on MSWM, 2000).

We observed that five[22] out of 35 test-checked ULBs had compost processing facilities within the landfill site and TMC, Maddur had a decentralised processing facility. Hence, partial segregation was being practised in these ULBs.

Failure to segregate waste at different stages resulted in dumping of mixed waste on windrow platforms/landfill **(Exhibit 6.2)** leading to ineffective waste management. Dumping of mixed waste on windrow platforms also results in reduction in quality and quantity of compost.

The State Government accepted (May 2018) the audit observation and stated that efforts were being taken at all levels to increase the percentage of source segregation.

Recommendation 11: Segregation should be given greater emphasis by means of publicity and awareness campaigns and holding regular meetings with housing associations and NGOs. The State Government should encourage segregation of waste at source by devising a system for incentivising waste generators and collectors for segregation of waste, and should prevent mixing of segregated waste during various stages of SWM.

6.2 Collection

Collection of segregated waste is the second step of SWM process. Waste collection system is necessary to ensure that waste stored at source is collected regularly and it is not disposed of on the streets, drains, water bodies, *etc*. Inefficient waste collection has an impact on public health and aesthetics of urban areas. Waste collection service is divided into primary and secondary collection.

Sections 10.3 and 10.4 of Manual on MSWM, 2000, state that ULBs shall arrange for the collection of domestic, trade and institutional, food/biodegradable waste, recyclable waste material/non-biodegradable waste besides domestic hazardous/toxic waste from doorstep or community bins or waste deposition centres specially established for the purposes. The collection service provided by ULBs should be regular and reliable.

6.2.1 Inadequate collection of waste generated

The quantum of waste generated and collected during the period 2012-13 to 2016-17 in the State (other than BBMP) and in the test-checked ULBs is shown in **Table 6.1**.

[22] CCs - Mangaluru and Tumakuru; CMCs - Bagalkote and Sira; TP, Koppa.

Table 6.1: Statement showing the status of quantum of waste generated and collected in the State and the test-checked ULBs

(in tons)

Period	State			Test-checked ULBs		
	Generated	Collected	Uncollected	Generated	Collected	Uncollected
2012-13	Not Available			4,90,305	4,45,782	44,523
2013-14	19,28,660	16,79,730	2,48,930	4,99,868	4,55,600	44,268
2014-15	18,96,905	15,10,370	3,86,535	5,21,074	4,77,829	43,245
2015-16	19,55,172	16,71,156	2,84,016	5,59,523	5,14,914	44,609
2016-17	20,09,690	15,71,690	4,38,000	5,67,652	5,24,881	42,771
Total	**77,90,427**	**64,32,946**	**13,57,481**	**26,38,422**	**24,19,006**	**2,19,416**

Source: Information furnished by KSPCB and test-checked ULBs

On an average, 13-22 *per cent* of waste generated was not collected in the State and 8-9 *per cent* in the test-checked ULBs.

Section 6.9.4.1 of MSWM Manual, 2000 stipulated that every landfill must have a weighbridge for assessing the quantum of waste. The availability and status of weighbridge in landfill sites is detailed in Paragraph 7.3.1. Only four test-checked ULBs had working weighbridge facility. Other ULBs did not maintain any documents to assess the actual extent of the collection. This led to poor oversight and monitoring as ULBs had no means to quantify SWM in order to address it suitably.

Audit attempted to verify[23] the correctness of data furnished by two ULBs (CC, Tumakuru and CMC, Sira) for the year 2016-17 with reference to the records made available. We found that the data was inconsistent in respect of both these ULBs as detailed in **Table 6.2**.

Table 6.2: Comparison of data furnished by ULBs with the records

(Quantity in TPD)

Sl. No.	Name of ULB	As per information furnished by ULB			As per records (weighbridge data)			As per DPR		
		G	C	CE	G	C	CE	G	C	CE
1	CMC, Sira	22	20	91	22	13	59	29	26	90
2	CC, Tumakuru	120	110	92	120	84	70	130	77	59

G – Generation; C – Collection and CE – Collection efficiency in percentage

The State Government cited (May 2018) inadequate number of vehicles and manpower with ULBs and non-existence of micro-level planning for inadequate collection of waste. The reply was silent on the inconsistency in data pointed out by audit.

6.2.2 Ward-wise collection of waste

The status of ward-wise collection of waste in the State and test-checked ULBs is indicated in **Table 6.3**.

[23] In CC, Mangaluru and CMC, Udupi, the landfills were provided with weighbridge facility and were also used by other ULBs. Hence, data of these ULBs was not compared.

Table 6.3: Status of ward-wise collection

Sl. No.	Position in	Number of ULBs		
		Complete coverage of wards	Partial coverage of wards	No coverage
1	State	128	76	66
2	Test-checked ULBs	20	9	6

Source: Information furnished by KSPCB and test-checked ULBs

Four[24] of the ULBs where there was no door-to-door collection were upgraded from Gram Panchayats in the year 2015. Two[25] ULBs where door-to-door collection was absent and nine[26] ULBs where the collection was partial, cited shortage of manpower and vehicles as the main reasons. Twenty test-checked ULBs with complete coverage of wards claimed household coverage between 70 to 100 *per cent*. We observed that the claims of 16 of these ULBs were inconsistent with their own SLB declaration on household coverage.

The State Government stated (May 2018) that replies would be obtained from concerned ULBs and furnished.

6.2.2.1 Use of community bins for collection

DMA issued directions (October 2014) prohibiting purchase of community bins. In contravention of these directions, TMC, Humnabad purchased (July 2017) containers (community bins) at a cost of ₹9.00 lakh. Chief Officer, TMC, Humnabad cited (August 2017) lack of awareness among citizens and non-implementation of 100 *per cent* door-to-door collection as the reasons for purchase of containers. The justification offered by Chief Officer, Humnabad, was not convincing. It was observed during JPV that the purchase of bins did not bring in improvement in waste collection (**Exhibit 6.3**).

6.2.2.2 Non-involvement of Self Help Groups and waste pickers in door-to-door waste collection

Manual on MSWM, 2000 and SWM Rules, 2016 stipulate that ULBs must establish a system for formation of SHGs and recognise organisation of waste pickers and integrate them into the waste management system including door-to-door collection. We observed that only five[27] test-checked ULBs involved SHGs in door-to-door collection of waste. In CMC, Shidlaghatta, SHGs were involved in street sweeping.

Thus, failure to enforce efficient and effective door-to-door collection resulted in littering/dumping of MSW/food waste on roadsides and encouraged the movement of stray animals towards the waste leading to serious consequences as illustrated in Paragraph 8.1.2.1.

The State Government stated (May 2018) that suitable action would be taken to involve SHGs and waste pickers.

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[24] TMCs - Kakkera and Mugalkhod; TPs - Ainapura and Chinchali.

[25] CMC, Shidlaghatta and TMC, T. Narasipura.

[26] CMC, Bidar (63 *per cent*), CMC, Hosapete (40 *per cent*), CMC, Nanjangud (33 *per cent*), TMC, Hiriyur (93 *per cent*), TMC, Humnabad (22 *per cent*), TMC, Maddur (87 *per cent*), TMC, Manvi (78 *per* cent), TMC, Ugar Khurd (22 *per cent*) and TP, Kudligi (40 *per cent*).

[27] CMCs -Dandeli (only during 2012-13 and 2013-14), Nanjangud and Udupi; TMC, Bhatkal and TP, Gudibande.

6.2.3 Street sweeping/street cleaning

Street cleaning is one of the primary services rendered by municipal authorities to ensure clean and hygienic urban conditions. Section 11.3.1 of Manual on MSWM, 2000 and Section 2.4.2 of Manual, 2016 stipulate that it is necessary to have a well-planned, time-bound daily system for street sweeping including adequate staffing and equipment. Further, the Supreme Court, keeping in view Articles 48A and 51A(g) of the Constitution, directed (1996) in one case that the streets, public premises, parks, *etc*., should be surface cleaned on daily basis, including on holidays (B.L. Wadhera vs. Union of India and others case).

We observed that the 35 test-checked ULBs did not carry out street sweeping of 6,935 (83 *per cent*) out of 8,324 km of roads on daily basis.

The State Government stated (May 2018) that ULBs based on the activities and population density decided the frequency of street sweeping and it varied from city to city. The reply is not consistent with the spirit of the Constitution enshrined in Articles 48A and 51A(g), which talk about protection and improvement of the environment. It is also in violation of the Supreme Court directives and does not address the fact of keeping the streets clean and hygienic at all times.

6.2.4 Mixing of occupational waste with Municipal Solid Waste

The provisions of Manual on MSWM, 2000 and SWM Rules, 2016 prohibit mixing of other wastes with MSW. We, however, observed mixing of occupational waste with MSW as detailed below:

6.2.4.1 Collection of cut *beedi* leaves

The activity of *beedi* rolling was prevalent in five[28] test-checked ULBs. The door-to-door collection of MSW in these ULBs involved sizeable quantity of 'cut *beedi* leaves', the residual product of the activity.

CC, Tumakuru and CMC, Sira, generated two TPD of cut *beedi* leaves each. Similarly, in CMC, Nanjangud (10 kg) and TMC, Maddur (300 kg), cut *beedi* leaves were generated each day on an average. A *Beedi Karmikara Nagara*, an exclusive colony of 200 houses established in Ward 66 in HDMC generated 150 kg of cut *beedi* leaf waste per day, which was found dumped openly in the colony as well as in the empty water sump (**Exhibit 6.4**). As cut *beedi* leaves waste is organic in nature and biodegradable, the collection of such waste along with MSW and transporting the mixed waste to the landfill contravenes the provisions of SWM Rules and may result in poor quality of compost.

The ULBs should have made separate arrangements for collection of this waste on collection of user charges or directed the concerned to arrange for collection and disposal of the waste either under 'Polluter pays principle' or 'Extended Producer Responsibility'.

6.2.4.2 Collection of ash waste generated from silk reeling units

CMC, Shidlaghatta houses approximately 1,450 to 1,650 silk reeling units, wherein, ash waste is generated by conventional method of burning wood to

[28] CCs - HDMC and Tumakuru; CMCs - Nanjangud and Sira; TMC, Maddur.

boil water for reeling silk (2 TPD which constitutes about 10 *per cent* of total waste generated). Similarly, TP, Sringeri generates ash waste (0.42 TPD – 12 *per cent* of total waste) from hotel industry (burning of rice husk). These two ULBs failed to make special arrangements to collect the ash waste from the generators and the ash waste was being mixed with MSW, ultimately, reaching the landfill site, without segregation **(Exhibit 6.5**).

Though DPR of CMC, Shidlaghatta suggested an economical way of disposal by channelising the ash waste to cement/brick industry, no steps were taken to implement the same. The DPR of TP, Sringeri did not suggest effective and economical way of ash disposal. Thus, failure to enforce segregation resulted in letting the ash waste mix with MSW. The ash waste generated, collected and dumped in landfill site in the two ULBs was 4,052 tonnes during the period 2012-17.

The State Government stated (May 2018) that steps were being taken in SWM DPRs to ensure that different types of waste including cut *beedi* leaves would not mix up with other wastes.

6.2.5 Personal protection equipment

MSWM Manuals, 2000 and 2016 prohibit manual handling of waste. If manual handling is unavoidable due to constraints, it should be carried out under proper precaution with due care for safety of workers. As per clause 15 (zd) of SWM Rules, 2016, local bodies shall ensure that the operator of a facility provides personal protection equipment including uniform, fluorescent jacket, hand gloves, raincoats, appropriate foot wear and masks to all workers handling solid waste and the same are used by workforce.

We observed during JPV in 30 test-checked ULBs (other than new upgraded ULBs) that majority of the work force involved in manual handling of waste were not using protective equipment particularly gloves and boots though they were provided with such equipment by the ULBs/contractors **(Exhibit 6.6)**. Non-utilisation of protective equipment is risky and may lead to serious health hazards especially in view of non-segregation of waste. ULBs need to analyse the reasons for non-utilisation of protective equipment by the work force and take steps to ensure utilisation.

The State Government stated (May 2018) that steps to educate the workers regarding significance of protection equipment would be taken up continuously.

Recommendation 12: ULBs should ensure that the informal system co-exists and supplements the formal system of waste collection, treatment and disposal and larger percentage of MSW generated is collected. ULBs should also ensure that workers involved in handling waste follow occupational health and safety protocols by wearing safety gear and other protective equipment.

Recommendation 13: The State Government may issue suitable instructions to enable ULBs to manage occupational waste such as beedi leaves, wood ash, etc., effectively and efficiently.

Exhibit 6.1: Unsegregated waste being handed over (Paragraph 6.1.1.1)

HDMC (28.4.2017)

CMC, Bagalkote (29.8.2017)

TMC, Humnabad (4.8.2017)

Exhibit 6.2: Dumping of mixed waste on windrow platform (Paragraph 6.1.3)

CC, Tumakuru (21.3.2017)

Exhibit 6.3: Status of waste collection (Paragraph 6.2.2.1)

TMC, Humnabad (3.8.2017)

Exhibit 6.4: Cut *beedi* leaf waste (Paragraph 6.2.4.1)

HDMC (5.5.2017)

CMC, Sira (17.6.2017)

Exhibit 6.5: Ash waste (Paragraph 6.2.4.2)

CMC, Shidlaghatta (8.6.2017)

TP, Sringeri (5.7.2017)

Exhibit 6.6: Handling of waste without protective equipment (Paragraph 6.2.5)

TMC, Maddur (5.6.2017)

CC, Ballari (4.8.2017)

CMC, Shidlaghatta (7.6.2017)

6.3 Transportation

Transportation plays a vital role in SWM services. Depending on the local conditions and location of landfill site, ULBs use different types of vehicles such as pushcarts, auto tippers, tractors, tipper trucks and compactors for collection and transportation of waste.

6.3.1 Shortage of vehicles for door-to-door collection

The State policy, 2004 envisaged use of auto tippers for door-to-door collection of MSW. In accordance with the normative standards prescribed under the policy for use of auto tippers for door-to-door waste collection, one auto tipper is required for 1,000 households. The status of availability of auto tippers in the test-checked ULBs as of March 2017 is indicated in **Table 6.4**.

Table 6.4: Statement showing the status of auto tippers

Category of ULB[29]	No. of auto tippers required as per normative standards	No. of auto tippers available	Shortage	Percentage of shortage
CMC	249	94	155	62
TMC	86	51	35	41
TP	29	11	18	62
Total	**364**	**156**	**208**	**57**

Source: Information furnished by test-checked ULBs

It is seen from the table that there was acute shortage of auto tippers despite availability of funds. The impact of shortage of collection vehicles in few test-checked ULBs is detailed below:

- In CMC, Hosapete, only 14 out of 35 wards were covered due to non-availability of sufficient number of vehicles;
- TMC, Ugar Khurd had one mini truck that was used for collection of waste in five wards on alternate days; and
- TP, Kudligi had only one tipper that was used to cover 8 out of 20 wards.

Therefore, shortage of vehicles up to 62 *per cent* led to serious inefficiency and irregularity in collection and transportation of MSW.

The State Government stated (May 2018) that integrated SWM plan was being prepared to include/procure vehicles required to achieve 100 *per cent* door-to-door collection. The reply indicates lack of commitment towards this activity of SWM despite Rules being in force for last 17 years. Further, in the absence of 100 *per cent* door-to-door collection, unscientific dumping of waste is bound to continue.

6.3.2 Use of vehicles without partition/open vehicles for transportation of Municipal Solid Waste

Source segregation is successful only when the segregated streams are not mixed at any stage of transportation while being taken to the respective processing or disposal facility directly or through a transfer station. Hence, segregated transportation of solid waste from source to destination is essential. Further, Section 7.7.4 of Manual on MSWM, 2000 and Section 2.3.2 of

[29] In all the test-checked CCs, the door-to-door collection activity was outsourced.

Manual, 2016 stipulate that vehicles used for transportation of waste should be covered so that waste is not visible to public and that they should have the facility for preventing spillage of waste. For this purpose, MSW vehicles need to be covered and provided with two separate containers or a single container with an effective partition.

We observed during JPV that majority of the vehicles used for door-to-door collection did not have partition to collect the segregated waste, if any. In four[30] ULBs, though the new vehicles procured had partitions for collection of wet and dry waste, the waste collectors were depositing both wet and dry waste in both the sections thereby defeating the purpose of segregation of waste (**Exhibit 6.7)**. The JPV also revealed that the test-checked ULBs were using open vehicles for transportation (**Exhibit 6.8)**, leading to scattering of waste, which caused littering and could also be a health hazard. KSPCB confirmed (December 2017) that open vehicles were used by ULBs for transportation of MSW.

HDMC, CMC, Bidar and TP, Kudligi purchased new vehicles with a provision of slider opening for depositing waste (**Exhibit 6.9)**. These vehicles were more appropriate as they prevented visibility of waste during transportation.

Thus, even after 18 years of MSW Rules, 2000 coming into force, ULBs have failed to comply with minimal requirements of hygiene such as covered vehicles and vehicles with partition. This also indicates failure of IEC/enforcement of training given to waste collectors.

The State Government stated (May 2018) that ULBs would procure vehicles with partition to ensure non-mixing of wet and dry waste and that ULBs have been instructed to use covered vehicles for transportation of waste.

6.3.3 Use of transportation vehicles without authorisation

Government of Karnataka directed (January 2004) that transportation vehicles used for MSW should have to be registered with KSPCB within 30 days and the same has been reiterated by KSPCB. Further, as per Motor Vehicle Act, all public transport vehicles are required to obtain fitness certificate for use of the vehicle besides possession of a valid insurance for the vehicle.

Scrutiny of records in 35 ULBs showed that the vehicles used for transportation of MSW were deficient in:

(i) authorisation from KSPCB - all 463 vehicles (100 *per cent*). Thus, the vehicles were being used by ULBs unauthorisedly for SWM activities;

(ii) fitness certificate from Regional Transport Office - 255 out of 463 vehicles (55 *per cent*); and

(iii) valid insurance for the vehicles - 101 out of 463 vehicles (22 *per cent*). This indicates a general lapse of internal control on part of ULBs.

We further observed that 14 vehicles (13 vehicles in 2016 and one rapid action vehicle in 2013) purchased by CC, Ballari were not registered with RTO.

[30] HDMC; CMCs – Bagalkote and Hosapete; TP, Kudligi.

Similarly, in TMC, Humnabad, six vehicles purchased during the period 2009 to 2016 were not registered (August 2017) and in TP, Raibag, four auto tippers were not registered. Thus, ULBs were using the vehicles for SWM purposes without necessary registration for periods ranging up to nine years.

The above deficiencies highlight the absence of internal control mechanism within the department.

6.3.4 Monitoring of transportation vehicles

Transportation of MSW from source of generation to the authorised destination is important to ensure its proper disposal. MSWM Manual, 2016 stipulates that communication technologies such as global positioning system (GPS) are to be integrated as part of monitoring of SWM system. This also helps in improving the collection and transportation efficiency of the vehicles.

Out of 463 transportation vehicles, 139 vehicles were affixed with GPS devices in 10[31] test-checked ULBs. In 56 vehicles, in five ULBs (CC, Mangaluru, CMC, Bidar, CMC, Hosapete, CMC, Udupi and TMC, Maddur), the devices were functional and in the other five ULBs, GPS devices were not functional due to issues such as software problems, damages due to short circuit (CMC, Chintamani). In the absence of GPS, ULBs were deprived of an effective tracking mechanism.

Further, the test-checked ULBs, other than CC, Mangaluru, CC, Tumakuru and CMC, Sira did not have the facility of weighbridge and CC TV cameras resulting in absence of effective monitoring of transportation activity.

Illustration - Unauthorised dumping of waste in CMC, Nanjangud

The authorised landfill site was located at a distance of eight kilometres from Nanjangud city and the ULB stated that waste collected was being dumped in the authorised site. ULB neither fixed GPS in MSW transportation vehicles nor installed closed circuit television (CCTV) camera and weighbridge in the landfill site.

We observed that huge quantity of mixed waste including plastics, food waste, chicken waste, clothes, cut-hair was dumped in a vast area of 6 acres close to the bank of River Kabini (50 metres), which passes through Nanjangud city. This unauthorised dumpsite was located at a distance of one kilometre from the city. The above area, which was enroute to the landfill site, was found to be grazed by pigs and stray dogs and unbearable foul smell was emanating from the area (**Exhibit 6.10**).

The quantum of waste seen in the area only indicate dumping of waste in an unauthorised area. Regional Office, KSPCB, Mysuru (Rural) also communicated (2015) this observation to CMC, Nanjangud. The CMC, however, failed to take preventive measures by way of either installing GPS to each MSW transporting vehicle or installing CCTV camera in the landfill site, which could have prevented dumping of waste at unauthorised site besides ensuring proper monitoring of movement of MSW vehicles by ULB.

The State Government agreed (May 2018) to look into the matter.

[31] CCs - Mangaluru and Tumakuru; CMCs - Bagalkote, Bidar, Chintamani, Hosapete, Karwar, Sira and Udupi; TMC, Maddur.

6.3.5 Usage of compactor trucks for transportation of Municipal Solid Waste against State policy

The State policy, 2004 stipulates that compactors have a separate system for secondary collection and these vehicles are not recommended for towns with population of less than 20 lakh. The population of all ULBs in the State other than BBMP is less than 20 lakh and hence use of compactors for transportation was not permitted.

We observed that nine[32] test-checked ULBs were using 47 compactors for secondary collection and transportation of MSW to landfill. In six ULBs, the DC/DMA, responsible for monitoring the functioning of ULBs, approved the action plans for purchase of compactors. In CC, Mangaluru, the agency entrusted with the work of secondary transportation was using compactors. Thus, the approval, purchase and usage of compactors was against the State policy.

As the unsegregated MSW which include domestic hazardous waste is compressed in the compactors, chances of contamination of MSW by toxic wastes such as batteries, glass pieces, *etc*., is significant. Therefore, handling of such waste would not only be risky but quality of by-products would be adversely affected. The usage of compactors also goes against the principle of facilitating aerobic composting in windrow platforms as it compresses waste, whereas windrows are meant to aerate waste to enhance the speed of aerobic decomposition.

The State Government stated (May 2018) that the State Policy would be suitably amended.

Recommendation 14: The ULBs, in addition to increasing the number of vehicles, should also ensure that the vehicles already procured comply with the statutory requirements of registration, obtaining authorisation, insurance, fitness certificate, etc. The vehicles procured should be suitably designed to collect and transport segregated waste efficiently.

[32] CCs – Ballari, HDMC, Mangaluru and Tumakuru; CMCs - Bidar, Hosapete and Udupi; TMCs – Hiriyur and Maddur.

Exhibit 6.7: Transportation of unsegregated waste (Paragraph 6.3.2)

CMC, Bagalkote (29.8.2017)

HDMC (28.4.2017)

CMC, Hosapete (11.5.2017)

Exhibit 6.8: Open vehicles used for transportation (Paragraph 6.3.2)

CMC, Shidlaghatta (8.6.2017)

CMC, Sira (17.6.2017)

TMC, Bhatkal (11.5.2017)

Exhibit 6.9: Vehicles with slider used for transportation (Paragraph 6.3.2)

HDMC (28.4.2017)

CMC, Bidar (8.8.2017)

Exhibit 6.10: Unauthorised dumping of waste (Paragraph 6.3.4)

CMC, Nanjangud (11.5.2017)

Chapter VII

Processing, Treatment and Disposal of Waste

7.1 Processing

In accordance with Section 4.1 of MSWM Manual, 2016 (Volume I), selection and adoption of MSW processing technologies should be based on defined selection criteria and subject to a detailed due diligence study which ascertains the appropriateness of the technology to the prevailing conditions of the respective ULB. Treatment and processing of segregated waste streams not only reduces operational costs but also increases the efficiency of the process. The waste processing technologies available for ULBs are composting, waste to energy, bio-methanation, *etc*.

7.1.1 Status of waste processing

The status of waste collected and processed in the test-checked ULBs during the period 2012-13 to 2016-17 is given in **Table 7.1**.

Table 7.1: Status of waste processed in test-checked ULBs

(in tons)

Year	2012-13	2013-14	2014-15	2015-16	2016-17
MSW collected	4,45,782	4,55,600	4,77,829	5,14,914	5,24,881
Processed	1,01,204	1,05,219	1,17,994	1,48,230	1,60,783
Percentage	23	23	25	29	31

Source: Information furnished by ULBs.

It can be seen from the above that on an average 26 *per cent* of the waste collected was processed in the test-checked ULBs during the period 2012-13 to 2016-17. The other 74 *per cent* was being dumped in the landfill. Low rate of processing in the test-checked ULBs was due to inadequate infrastructure and under-utilisation of infrastructure as explained in the subsequent paragraphs.

The State Government assured (May 2018) that necessary vehicles/machinery would be procured and all ULBs would have fully operational compost plants over a period of time.

7.2 Waste processing technology adopted by test-checked urban local bodies

7.2.1 Composting

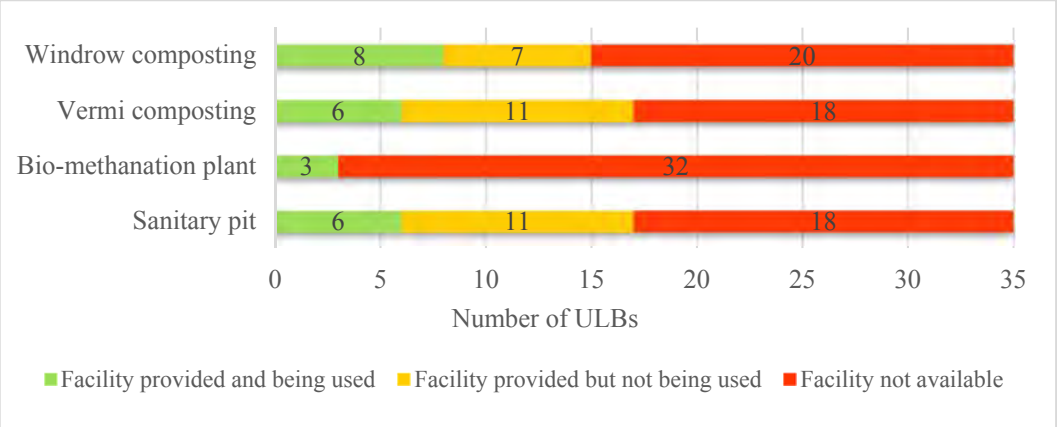
Out of the 35 ULBs test-checked, only 11[33] ULBs processed MSW. Only three[34] of them processed MSW throughout the audit period (2012-13 to 2016-17) whereas two[35] ULBs processed MSW for three out of five years and four[36] ULBs processed MSW for two out of five years. TMC, Kumta and TMC, Maddur, processed only during 2016-17 in decentralised processing centres located in the urban limit.

[33] CCs - HDMC, Mangaluru and Tumakuru; CMCs - Bagalkote, Bidar, Chintamani, Karwar and Sira; TMCs - Kumta, Maddur and Malur.
[34] CC, Mangaluru; CMCs - Karwar and Sira.
[35] HDMC and CMC, Chintamani.
[36] CC, Tumakuru; CMCs - Bagalkote and Bidar; TMC, Malur.

7.2.1.1 Inadequate creation and poor utilisation of infrastructure

The extent of infrastructure created (windrow platforms, vermi-compost sheds, *etc.*) and utilised in 35 test-checked ULBs as per the JPV conducted during audit is indicated in **Chart 7.1**.

Chart 7.1: Availability and utilisation of infrastructure



As can be seen from the chart, more than 50 *per cent* of the ULBs did not have any kind of processing facility despite availability of capital funds (as detailed in Paragraph 4.3), 20 *per cent* and 31 *per cent* of ULBs test-checked did not utilise the infrastructure created for windrow composting and vermi-composting respectively.

Scrutiny of the records revealed that infrastructure created in nine test-checked ULBs was not put to use, resulting in inadequate quantity of MSW being processed and unfruitful expenditure of ₹365.75 lakh as detailed in **Table 7.2**.

Table 7.2: Unfruitful expenditure on infrastructure

Sl. No.	ULB	Amount (₹ in lakh)	Remarks
1	CMC, Nanjangud	39.11	Four windrow platforms (February 2014) (**Exhibit 7.1**)
		62.96	Three large sheds constructed (2013 to 2016)
		18.94	Sorting/segregating machinery purchased (2013-14) not utilised for lack of electricity
2	CMC, Hiriyur	24.35	Vermi composting pits
		25.39	Machinery and solar lights (January 2014)
3	CMC, Hosapete	26.94	Vermi compost shed partially constructed and equipment (2015-16) lying idle
4	CMC, Bidar	40.00	Screening machine with conveyor belts (June 2016) kept idle for want of trained manpower
5	CMC, Shidlaghatta	8.57	Vermi compost pits constructed (May 2015) lying unutilised (**Exhibit 7.2**)
6	TMC, Humnabad	10.18	Vermi compost pits constructed (prior to 2012) lying unutilised (**Exhibit 7.3**)
		4.50	Segregating machine (2011-12) kept idle for want of power supply
7	TMC, Magadi	38.61	Sanitary pit (with High Density Polyethylene (HDPE) liner) constructed (August 2013) without constructing windrow platforms
		28.70	Processing equipment purchased in May 2015 kept idle for want of power supply

Sl. No.	ULB	Amount (₹ in lakh)	Remarks
8	TP, Gudibande	4.00	Shredder purchased (October 2014) lying idle due to non-availability of shed
9	CC, Ballari	33.50	Funds released (2013) to Nirmithi Kendra for construction of windrow platform remained unutilised
Total		**365.75**	

Source: Information furnished by test-checked ULBs

7.2.2 Bio-methanation

Only three[37] test-checked ULBs had functional Bio-methanation plants. Review of records showed that biogas produced in the three plants was used for running Diesel Generator set, crusher/air compressor/water pumps and lighting in market areas.

HDMC entered into an agreement (September 2014) with M/s Mailhem Engineers Private Limited for installation of a biogas plant (3 Ton capacity) including its O&M for 12 months, at a cost of ₹63 lakh.

Bio-methanation plant was commissioned only in July 2016, two years after the agreement. During the period from July 2016 to March 2017, the plant with a capacity of 3 ton, received only 20 kgs to 1,300 kgs per day. The plant did not get a supply of waste for 112 days (41 *per cent*) during the period of operation of 274 days. Though 0.75 TPD of slaughterhouse waste (suitable for bio-methanation) was generated in old Hubballi and Manikilla, Dharwad, it was not supplied to the plant but was dumped in the landfill site. This resulted in under utilisation of the capacity of the plant to obtain biogas and dumping of these waste in the landfill site causing additional burden on space and polluting the environment.

The State Government stated (May 2018) that reply would be furnished on receipt of reports from respective ULBs.

7.3 Disposal of waste

All the waste that cannot be reused/recycled/processed further finds its way to the landfills, the ultimate destination of the solid waste. The landfills are designed to minimise the impact of the waste on the environment by containment of the waste.

7.3.1 Status of landfills in Karnataka

As per the Annual Report (2015-16) of KSPCB (February 2017), out of 270 ULBs in the State, (excluding BBMP and all the four Notified Area Committees), 207 ULBs had designated landfill sites including four[38] ULBs which used the landfills of other neighbouring ULBs. Thus, 63 ULBs did not have landfill sites for disposal of MSW. Of the 35 test-checked ULBs, 29

[37] HDMC from July 2016; CC, Mangaluru and CMC, Udupi.
[38] CMC, Ullal and TMC, Bantwal (Mangaluru landfill); TMC, Kumta (landfill site of TP, Honnavara) and TP, Saligrama (landfill of CMC, Udupi).

ULBs operated 32 landfill sites, 5[39] newly formed ULBs did not have landfill site and TMC, Kumta was using the landfill site of TP, Honnavara.

7.3.1.1 Failure to designate land for setting up landfills

The provisions of Rule 11 (f) and 12 (a) of SWM Rules, 2016, state that the State and District authorities shall facilitate identification and allocation of suitable land for setting up solid waste processing and disposal facilities to local authorities within one year from the date of notification of the Rules.

We observed that six test-checked ULBs were yet to identify land for setting up of landfill facility (November 2017). The five test-checked ULBs that did not have a landfill site disposed the waste on sides of State highways, near hospitals, river canals, graveyards and within open areas of wards, as observed during JPV with the ULBs' staff, resulting in unauthorised and unhygienic disposal of mixed MSW including bio-medical waste posing health and environment hazards in the area (**Exhibit 7.4**).

Non-allocation of suitable land for landfill to ULBs indicates lack of effective monitoring by District/State level authorities to ensure setting up of disposal facility in time for scientific disposal of MSW in an authorised area and amounts to non-compliance with the SWM Rules.

The State Government accepted the audit observation and stated (May 2018) that letters were addressed to all DCs to facilitate ULBs in procuring waste processing sites.

7.3.1.2 No authorisation from Karnataka State Pollution Control Board for setting up of Landfill

As per Clause 4 (2), of MSW Rules, 2000, the municipal authority or an operator of a facility shall obtain grant of authorisation for setting up of waste disposal facility including landfills from the KSPCB in order to comply with the implementation programme laid down in Schedule I to the Rules. As per SWM Rules, 2016, ULBs shall obtain authorisation from KSPCB for disposal facility if the volume of waste exceeds five metric tons per day.

Records reveal that ULBs operating landfills sought authorisation of KSPCB every year. The authorisation status of the 32 test-checked landfills is as below:

- authorisation of 13 landfills were renewed by KSPCB for the year 2017;
- Of the three landfills in HDMC, two were operating without authorisation during the review period and one was refused authorisation from 2014 onwards due to non-compliance with the conditions of authorisation;

[39] TMCs - Kakkera, Mugalkhod and Ugar Khurd; TPs - Ainapura and Chinchali.

- Four[40] landfills did not apply for authorisation during the review period and hence were functioning unauthorisedly;

- In case of five[41] landfills, though renewal for authorisation was submitted (March and May 2017) to KSPCB for the year 2017, the decision of KSPCB was awaited;

- Six ULBs have not furnished the status of authorisation of six landfills; and

- CMC, Bagalkote continued to operate a landfill, though KSPCB did not issue an authorisation from the year 2011 onwards.

The State Government stated (May 2018) that appropriate action would be taken in this regard.

7.3.1.3 Irregularities in grant of authorisation by Karnataka State Pollution Control Board

The RPCB, Ballari in its Inspection Report on the landfill in CC, Ballari to KSPCB listed out its non-compliance to waste rules from the year 2011 such as (a) non-segregation of solid waste (b) plastics lying in and around the dump site (c) unscientific dumping of solid waste in site without coverings and without segregation (d) waste dumped in sanitary pit, burnt in pit and lining has been burnt (e) odour and smoke due to burning of waste and (f) movement of stray animals and dogs within the site. The RPCB sought permission for filing a criminal case against ULB and recommended for refusing of authorisation. However, the State level Authorisation Committee, ignoring the recommendations of RPCB, issued authorisation to operate the landfill for all the years. This was clearly against the provisions of Rule 16(1)(h) of SWM Rules, 2016 and the non-compliance as listed above has an adverse effect on the surrounding environment.

7.3.1.4 Operation of municipal solid waste management facility without obtaining Environment Clearance

In accordance with National Environmental Policy, GoI notified (September 2006) that construction of new projects or activities or the expansion or modernisation of existing projects or activities entailing capacity addition with change in process and or technology including Common Municipal Solid Waste Management Facility (CMSWMF)[42] shall be undertaken in any part of India only after the prior Environmental Clearance from the Central Government or as the case may be, by the State Environment Impact Assessment Authority (SEIAA), duly constituted by GoI.

[40] CMC, Dandeli, TMC, Malur, TMC, Manvi and TP, Koppa.
[41] CC, Mangaluru, CMC, Bidar (March 2017), TMC, Magadi (May 2017), TP, Raibag and TP, Sringeri (May 2017).
[42] CMSWMF is referred as centralised MSW facility for a given town, city, region.

SEIAA, Bengaluru furnished (September 2017) information that Environment Clearance was given to 16 CMSWMF which included six[43] ULBs other than BBMP. Out of 35 test-checked ULBs, CMSWMF was established in four ULBs prior to issue of notification. Seventeen ULBs which were allotted site for development of landfills during the period 2006-17 were to obtain Environmental Clearance from SEIAA for operating MSWM Facility. We observed that only three[44] ULBs applied for Environment Clearance with SEIAA, and all the three applications were treated as closed without issuing clearance due to non-submission of requisite information. CMC, Bagalkote was also operating a Common Bio-Medical Waste Treatment Facility (CBMWTF) within the premises of the landfill.

Operation of MSWM facilities without the mandatory environmental clearance indicated lack of basic monitoring by ULBs and district /State level authorities to ensure compliance to the GoI notification and posed a serious threat to the environment besides leading to health hazards.

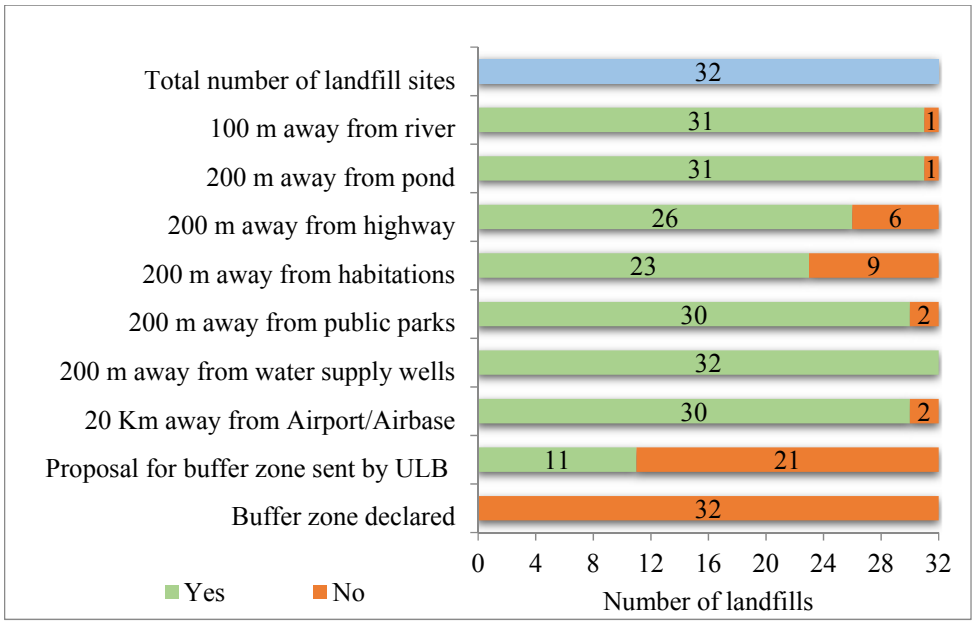
The State Government stated (May 2018) that instructions were given (March 2018) to all ULBs to obtain necessary clearances from competent authority.

7.3.1.5 Irregularities in selection/operation of landfill sites

Schedule III of MSW Rules, 2000 and Schedule I (A) of SWM Rules, 2016 lay down the criteria for selection of sites for landfills such as, landfill site shall be 100 metre away from river, 200 metre from a pond, highways, habitations, public parks and water supply wells and 20 km away from Airports or Airbase.

The status of compliance to the criteria at 32 test-checked landfills is exhibited in **Chart 7.2**.

Chart 7.2: Status of compliance at landfills



[43] CCs - Belagavi and Mysuru; TMC, Hanagal; TPs - Hirekerur, Sullia and Yellapura.
[44] CC, Mangaluru (25.07.2013); CMCs - Bagalkote (31.08.2012) and Dandeli (20.11.2010).

Analysis of the above revealed the following:

1) None of the test-checked ULBs (32 landfills) declared a Buffer zone of no development around the landfills. To cite an example, in TMC, T. Narasipura, Kittur Rani Chennamma Residential School was constructed (2009) adjacent to the landfill that was acquired in 2003 (**Exhibit 7.5**).

2) Landfill sites in following three test-checked ULBs were selected within a distance of 200 metres from existing residential colonies.

   - CMC, Karwar – The landfill site was identified within100 metres of fully developed layouts;
   - CMC, Nanjangud – The landfill site was developed within 100 metres from a residential layout (Ashraya Colony); and
   - CMC, Bagalkote – The landfill site was developed adjacent to Leprosy colony consisting of more than 20 residences.

3) Activities that do not conform to the provisions of MSW/SWM Rules were taken up in the landfill sites.

   - CC, Tumakuru - Four dwelling units were constructed for workers within the landfill in contravention of the norms;
   - CMC, Bagalkote – Children play equipment was installed (October 2016) in the landfill (**Exhibit 7.6**); and
   - CMC, Sira – A park with walk path and covered with chain fencing was formed within the landfill (**Exhibit 7.7**).

4) Six[45] ULBs had landfills located near highways.

5) In the landfill site of TMC, Bhatkal, a seasonal natural stream was traversing through the stretch of landfill. While developing the landfill site, the TMC provided stone embankment along the canal from one end of the landfill site to the other (**Exhibit 7.8**). We observed during JPV that leachate tank was under construction. KSPCB observed that the leachate generated was allowed to stagnate at the site and was getting mixed with rain water in the natural valley during the rainy season. KSPCB seeking compliance to arrest the discharge of leachate did not renew the authorisation for the landfill after January 2016.

6) In TMC, Maddur, the land required for landfill site was identified and after obtaining the approval of the RPCB, Mandya, the Chief Officer purchased (February 2011) 3 acres 21 guntas in Survey no. 118/P6 (New Sy.no. 733) and 3 acres 32 guntas in Survey no. 118/P26 (New Sy.no. 623) land from the concerned for ₹31.82 lakh. It was presumed that both the lands were adjacent to each other at the time of purchase. Subsequently on verification of the land before taking up development activities, it was found that the sites purchased by ULB were not

[45] HDMC; CMCs - Chintamani and Shidlaghatta; TMC, Bhatkal; TPs - Honnavara and Koppa.

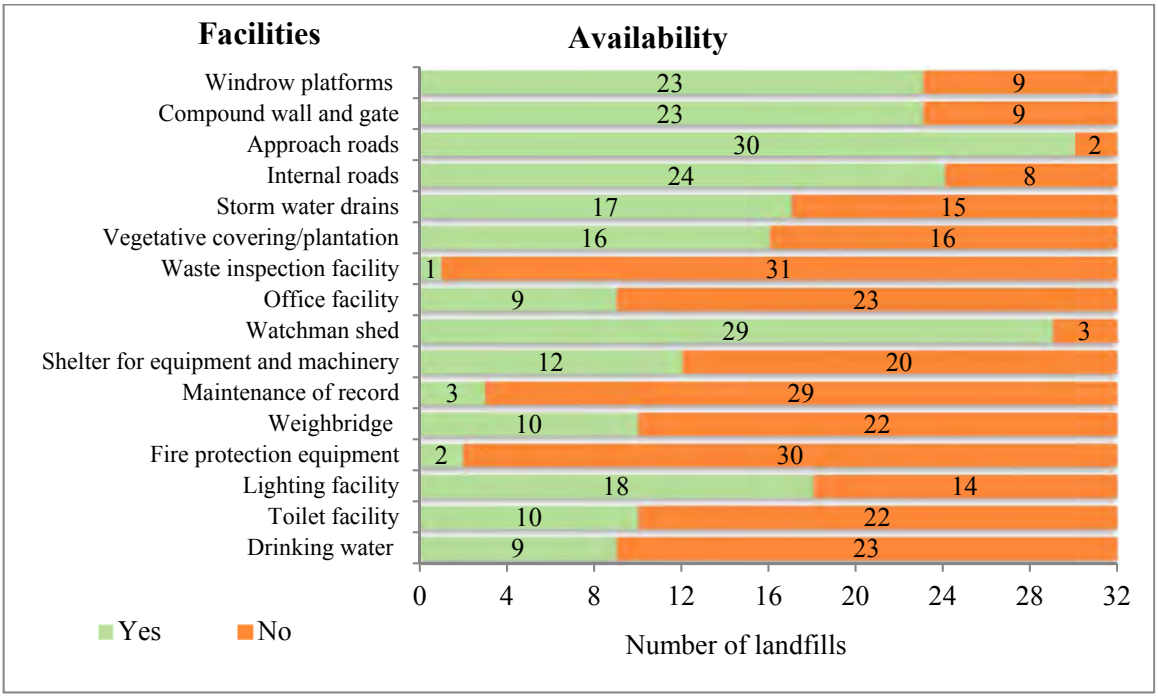
adjacent to each other. A legal notice was served (August 2013) on the owners of the land. During JPV (June 2017), we observed that both the lands were at a distance of approximately 10 kms and there was no proper connectivity and traces of crop cultivation was noticed in the intermediary lands. The ULB was using only 3 acres and 21 guntas in Sy.no. 733 for dumping of unprocessed waste. Thus, failure to ensure the exact location of the land before its purchase resulted in non-utilisation of the 3 acres and 32 guntas of land for more than seven years for processing and disposal of waste. Consequently, there was a possibility of polluting the agricultural lands adjacent to the landfill sites (**Exhibit 7.9**).

The State Government cited (May 2018) public litigation and non-availability of suitable land for failure to achieve 100 *per cent* compliance at landfills. It further stated that reports were sought from respective ULBs.

7.3.1.6 Absence of basic facilities in landfills

Schedule III of MSW Rules, 2000 and Schedule I (B) of SWM Rules, 2016 lay down the facilities that should be available at landfill sites. **Chart 7.3** depicts the status of the availability of these facilities in the 32 landfills.

Chart 7.3: Status of availability of basic facilities in landfills



Management at 29 landfills did not maintain any records, 31 landfills did not have any waste inspection facilities to monitor waste brought in for landfilling, hence, there was no check/preventive mechanism to reduce mixed waste to be brought to the landfills. Out of 21 landfills with windrow platforms, 15 had leachate drains and only nine had connection to leachate tanks. Weighbridge was not available in 22 landfills and it was not working in six of the balance 10 landfills. Firefighting equipment was not available in 30 landfills, drinking water in 23 landfills and toilet facilities in 22 landfills.

We further observed that 14[46] test-checked landfills did not have 10 or more of these facilities within the landfills.

The State Government stated (May 2018) that DPRs prepared under SBM would address these issues by proposing a system with adequate collection, transportation, treatment and disposal facility. The reply was not relevant to the audit observation.

7.3.1.7 Burning of waste in landfill sites

The JPV of landfill sites revealed burning / traces of burning of mixed waste in nine[47] ULBs (**Exhibit 7.10**). Failure of the ULBs to contain burning of waste in landfill site resulted in air pollution with reduced air quality index. NGT directed (December 2016) ULBs to implement complete prohibition on open burning of waste on lands, including at landfill sites and to penalise violators including ULBs responsible for such burning with an environmental compensation of ₹5,000 in case of simple burning and ₹25,000 in cases of burning of bulk waste.

The State Government stated (May 2018) that the issue would be taken up with KSPCB for issue of necessary guidelines.

7.3.2 Disposal of municipal solid waste by Town Municipal Council, Kumta in forest land

Government of Karnataka accorded (November 2007) permission for diversion of two hectares of forest land in Survey no. 108A of Manaki village after obtaining approval from Government of India. *Marur Gudda Hitharakshna Samithi* objected to the establishment of solid waste disposal unit in the said land alleging ground water pollution. Hence, the TMC identified an alternate land. The State Government accorded (April 2009) fresh approval without obtaining sanction from GoI, which was against the Forests (Conservation) Act, 1980. There was an objection to this by a few petitioners who filed a writ petition (WP no. 36467 of 2011) before the NGT. The NGT in its judgement (February 2017) held the Government order of April 2009 null and void.

In the meantime, TMC, Kumta, in anticipation of clearance by NGT started dumping MSW in the said land. Waste (27,740 tons) was dumped till February 2017 (**Exhibit 7.11**). Waste was transported to the landfill of TP, Honnavara from March 2017 onwards, based on the directions of DC, Karwar. TMC also had incurred an amount of ₹37.60 lakh towards lease rent, afforestation, *etc*.

The action of ULB to dump waste in forest land when the matter was subjudice was, therefore, incorrect, resulting in pollution of the forest area besides resulting in unfruitful expenditure.

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[46] TMC, Manvi-New landfill (14); TMC, Manvi-Old landfill (14); TMC, Malur (13); HDMC-Hosayallapura (12); TP, Raibag (12); TP, Sringeri (12); CC, Ballari (11); TMC, T. Narasipura (11); CMC, Dandeli (10); CMC, Nanjangud (10); TMC, Humnabad (10); TMC, Magadi (10); TP, Honnavara (10) and TP, Kudligi (10).

[47] CCs - Ballari and HDMC; CMCs - Bidar, Dandeli, Hosapete, Nanjangud and Sira; TMC, Maddur; TP, Kudligi.

7.4 Works proposed without ensuring post-closure care

CC, Ballari, was dumping MSW in the old compost yard in Roopanagudi area up to the period 2009-10. With the development of new landfill site at Haraginadoni village, MSW was sent to the new landfill site from the year 2010.

As per Schedule III of MSW Rules, 2000, post-closure care of landfill site shall be conducted for at least fifteen years and use of closed landfill sites after fifteen years of post-closure monitoring can be considered for human settlement or otherwise only after ensuring that gaseous emission and leachate quality analysis complies with the specified standards and the soil stability is ensured. Further, as per Section 6.9.4.3 of MSWM Manual, 2000, the operating agency should submit a certificate of completion of closure and post-closure to the State Boards.

Scrutiny of records revealed that the Council of CC approved (July 2015) for formation of residential layout for *Pourakarmikas* of CC at the old compost yard to construct G +2 housing complex. Similarly, the State Level High Powered Steering Committee approved (June 2017) development of a park under Atal Mission for Rejuvenation and Urban Transformation (AMRUT) Scheme.

We also observed that cement concrete approach road at old compost yard (ward no.17) and reinforced cement concrete ramp was constructed (December 2015 and February 2016) at a cost of ₹24.29 lakh and ₹12 lakh respectively out of 13th FC grants. Though the works of (a) construction of compound wall to old compost yard at an estimated cost of ₹98 lakh and (b) construction of secondary collection platform & providing mechanical conveyor system at old compost yard at an estimated cost of ₹25 lakh were approved under the 13th FC, these two works were not taken up so far (December 2017).

In all the above cases, the required approval/consent of the KSPCB was not obtained. It is pertinent to mention that the RPCB, Ballari, in its report (April 2010) stated that 35,000 tons of solid waste was dumped in the old compost yard and termed it as degraded land. Thus, according approval to take up construction of residential layout for *Pourakarmikas* and develop a park in the old compost yard besides other construction works in and around compost yard contravened the norms of taking up post closure activities as envisaged in MSW/ SWM Rules. This is bound to pose hazards to public health.

Recommendation 15: The State Government/ULBs should maximise processing of waste through complete utilisation of the infrastructure created and encourage adoption of bio-methanation technology by ULBs.

Recommendation 16: The State Government should ensure that all landfill sites are operating with valid authorisation and environmental clearances. It should also enforce and monitor scientific and proper disposal of the unprocessed waste through periodic checks.

Exhibits for Paragraph 7.2.1.1

Exhibit 7.1: Windrow platforms with sheds in CMC, Nanjangud (5.7.2017)

Exhibit 7.2: Vermi compost pits lying idle in CMC, Shidlaghatta (6.6.2017)

Exhibit 7.3: Unutilised vermicompost sheds at TMC, Humnabad (3.8.2017)

Exhibit 7.4: Dumping of waste on sides of State highways, near hospitals, river canals, *etc*. (Paragraph 7.3.1.1)

TP, Ainapura (16.6.2017)

TMC, Mugalkhod (30.8.2017)

TMC, Kakkera (7.9.2017)

Exhibits for Paragraph 7.3.1.5

Exhibit 7.5: Residential school adjacent to landfill at TMC, T. Narasipura (4.7.2017)

Exhibit 7.6: Children play equipment in landfill at CMC, Bagalkote (31.8.2017)

Exhibit 7.7: Park with walk path within the landfill at CMC, Sira (15.6.2017)

Exhibit 7.8: Seasonal stream passing through landfill (Paragraph 7.3.1.5)

TMC, Bhatkal (9.5.2017)

Exhibit 7.9: Landfill sites of CMC, Maddur (Paragraph 7.3.1.5) (3.6.2017)

Exhibit 7.10: Burning of mixed waste (Paragraph 7.3.1.7)

CC, Ballari (1.8.2017)

CMC, Bidar (8.8.2017)

HDMC (26.4.2017)

Exhibit 7.11: Dumping of waste in forest land (Paragraph 7.3.2)

TMC, Kumta (22.5.2017)

SECTION III

Management of Special Waste and Construction and Demolition Waste


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Chapter VIII

Special waste and Construction and Demolition waste

As per Section 7.1 of MSWM Manual, 2016, the following wastes are defined as special waste namely (a) Plastic waste, (b) Bio-medical waste (BMW), (c) Electric and Electronic waste (e-waste), and (d) Slaughterhouse waste.

8.1 Plastic waste

MoEFCC notified (February 2011) the Plastic Waste (Management and Handling) Rules, 2011 (PW Rules, 2011). It was replaced by the Plastic Waste Management Rules, 2016 (PWM Rules, 2016) notified (18 March 2016) by Government of India. These rules shall apply to every waste generator, local body, manufacturer, importers and producer.

8.1.1 Usage of banned plastic

Rule 5 (c) of PW Rules, 2011 prohibit manufacture, stock, distribution or sale of any carry bag made of virgin or recycled plastic, which is less than 40 microns in thickness. Subsequently, as per Rule 4(c) of PWM Rules, 2016, carry bag made of virgin or recycled plastic, shall not be less than 50 microns in thickness.

Government of Karnataka notified (11 March 2016) a ban on manufacture, supply, sale and usage of plastic carry bags, plastic banners, plastic buntings, flex, plastic flags, plastic plates, plastic cups, plastic spoons, cling films and plastic sheets used for spreading on dining table including the above items made of thermocol and plastic, which use plastic micro beads in the State.

As per the returns (2016-17) submitted by DMA to KSPCB, 760 TPD of plastic waste is generated in the State. To ensure compliance to the ban, ULBs (other than BBMP) conducted 3,588 raids on commercial establishments and seized 162 tons of banned plastic and collected ₹31.68 lakh towards fine/penalty.

We observed that 28 of the test-checked ULBs conducted 1,889 raids along with officials of the KSPCB during the period 2012-13 to 2016-17 and seized 86 tons of banned plastic. They were stored within the premises of ULBs, dry waste collection centres and at landfill sites. ULBs were yet to initiate action for disposal of the banned plastic. An amount of ₹9.30 lakh was collected as fine for non-compliance. Two ULBs (CMCs, Karwar and Sira) did not furnish replies and five[48] ULBs did not conduct any raid.

We further observed during JPV that banned plastic waste was collected at source from households, indicating that the ban was not implemented effectively.

[48] TMCs – Humnabad and Mugalkhod; TPs - Ainapura, Chinchali and Raibag.

The State Government stated (May 2018) that despite the ban, quantum of plastic carry bags in MSW had not reduced. However, raids were conducted throughout the State to recover banned plastic items and also impose fine on such units. Steps would also be taken to dispose seized plastic material.

8.1.2 Status of compliance to Plastic Waste Management Rules

Clause 6 of PW Rules, 2011 and Clauses 5 and 6 of PWM Rules, 2016 spell out the responsibility of the municipal authority/local body for plastic waste management. The status of compliance to these provisions in the test-checked ULBs is shown in **Table 8.1**.

Table 8.1: Status of compliance to PW Rules, 2011 and PWM Rules, 2016

Sl. No.	Requirement	Provision under		Compliance/Remarks
		PW Rules, 2011	PWM Rules, 2016	
1	Ensuring segregation, collection, storage, transportation, processing and disposal of plastic waste	Rule 6 (c) (i)	Rule 6 (2) (a)	Segregation followed only by TMC, Kumta. In the absence of segregation, the other test-checked ULBs were collecting and transporting mixed waste to the landfill site.
2	Creating awareness among all stakeholders about their responsibilities	Rule 6 (c) (v)	Rule 6 (2) (e)	Awareness on use of alternative products in place of plastic was promoted by the test-checked ULBs except the five newly upgraded ULBs.
3	Engaging civil societies or groups working in waste management including waste pickers	Rule 6 (c) (vi)	Rule 6 (2) (f)	No test-checked ULBs (other than CC, Tumakuru and CMC, Bagalkot) engaged civil societies or groups working in waste management including waste pickers.
4	For setting up of system for plastic waste management, the local body shall seek assistance of producers in line with the principle of Extended Producer Responsibility (EPR)	Rule 6 (d)	Rule 6(3)	No test-checked ULBs established an EPR based plastic waste management system.
5	The local body to frame bye-laws incorporating the provisions of these rules.	Rule 6(g)	Rule 6(4)	HDMC and CC, Mangaluru framed bye-laws during 2011. Councils in three[49] ULBs, passed resolutions adopting the Rules. However, they did not frame the bye-laws.

Thus, failure by ULBs to follow several stages prescribed in the rules for PWM (2011 and 2016) resulted in low rates of segregation. Thus, unsegregated mixed waste reached the landfill sites. The JPV also showed that banned plastic waste was dumped in the landfill site.

The State Government stated (May 2018) that directions had been issued (September 2017) to all DCs to implement the provisions of PWM Rules, 2016. It further stated that the draft bye-laws had been prepared for State incorporating certain provisions of PWM Rules, 2016 and the possibility of integrating EPR in plastic waste management would be taken up in the next State Level Plastic Advisory Committee.

8.1.2.1 Ingestion of plastic by cattle and resultant death

As per Schedule II to MSW Rules, 2000 and 2016, storage facilities should be maintained in such a way that stray animals do not have access to the waste.

[49] CC, Tumakuru (8.9.2011); TMCs, Hiriyur (21.3.2012) and T. Narasipura (27.2.2017).

Poor segregation at source, deficiency in door-to-door collection resulted in kitchen waste/discarded food packed in plastic bags being improperly disposed on roadsides, vacant lands and near market areas. Disposal of such waste at such places attract cattle (stray and domestic) and cattle eat food leftovers including the plastic.

JPV conducted in test-checked ULBs showed that stray animals were seen feeding on the MSW dumped on roadsides/bins kept on roadsides and found pulling out or scattering/consuming the food waste that was packed in plastic bags rendering the surroundings more unclean and unhygienic (**Exhibit 8.1**). Accumulation of large quantities of plastic inside their stomach overtime leads to ruminal infection, indigestion, *anestrus*[50] and weakness leading to death. In response to audit query about cases of plastic ingestion by cattle in 35 test-checked ULBs, four[51] ULBs informed that:

- out of 895 such cases, surgeries were conducted in 97 cases and 2,319 kilograms of plastic was removed (**Exhibit 8.2**); and
- 37 deaths were reported (**Exhibit 8.3**).

The State Government stated (May 2018) that instructions had already been issued to all ULBs to take measures for preventing stray animals feeding on waste.

8.1.3 Non-usage of plastic in formation of roads/energy recovery

Rule 6(h) of PW Rules, 2011 and Rule 5(b) of PWM Rules, 2016 stipulate that the municipal authorities/local bodies shall encourage the use of plastic waste (preferably the plastic waste which cannot be further recycled) for road construction as per Indian Roads Congress guidelines or energy recovery or waste to oil, *etc.*, in compliance with the standards and pollution control norms specified by the prescribed authority.

The Central Pollution Control Board (CPCB) in its overview of plastic waste management (June 2013) indicated the technologies that could be adopted for plastic waste management such as utilisation of plastic waste in road construction, co-processing of plastic waste as Alternative Fuel and Raw Material (AFR) in cement kilns and power plants, conversion of plastic waste into liquid RDF (Oil) and Plasma Pyrolysis Technology.

We observed that none of the test-checked ULBs adopted the use of plastic waste in formation of roads/energy recovery/waste to oil, *etc.*, despite 28 of these ULBs having recovered 86 tons of banned plastic. Illustrations of use of plastic in road formation by Karnataka Rural Road Development Agency (KRRDA) is given in **Appendix 11.5**. The CPCB in its evaluation report (2008) on built roads (2002-2007) in Tamil Nadu, stated that roads using plastic waste are stronger with better resistance towards rain water and water stagnation, no stripping and no potholes, cost effective, *etc*. It also mentioned that maintenance cost of such roads is almost nil and for 1km X 3.75m road, 1 ton of plastic (10 lakh carry bags) is used and 1 ton of bitumen is saved.

[50] *Anestrus* is the primary factor reducing reproductive efficiency in beef cow-calf operations.

[51] Bidar, Chikkamagaluru (TP, Koppa), Kolar (TMC, Malur) and Uttara Kannada.

As already been discussed in Paragraph 8.1.1 that 86 tons of plastic waste was seized, audit did not come across any instance of these seized plastic waste being transmitted by ULBs to any Road Development Authority/Agency for usage in laying roads. In this regard, the Government also did not give any directions to reuse the plastic waste in road formation.

Thus, failure of the ULBs to perform the prescribed responsibilities and devise methods of utilisation of plastic in roads resulted not only in mismanagement of plastic waste but also in environmental degradation and death of cattle.

The State Government stated (May 2018) that usage of plastic waste in formation of roads would be examined positively. It also stated that provisions were made in the DPRs to collect the plastic waste separately and sell these as RDF after being baled.

Recommendation 17: The State Government may promote use of plastic waste in laying of both urban and rural roads as this enables reduction of considerable amount of waste reaching the landfill and lessens the expenditure on maintenance of roads. It may also explore other areas where plastic can be used.

8.2 Bio-medical waste

GoI notified (July 1998) the Bio-medical Waste (Management and Handling) Rules, 1998, which provided a regulatory framework for management of BMW generated in the country. This was replaced by the Bio-medical Waste Management Rules, 2016 (BMW Rules, 2016) notified (March 2016) by GoI.

KSPCB is the authority designated for implementation of the provisions of these rules. Every occupier or operator handling BMW, irrespective of the quantity should obtain authorisation from KSPCB and shall hand over segregated waste to a common bio-medical waste treatment facility (CBMWTF) for treatment, processing and final disposal. Disposal by deep burial is permitted only in rural or remote areas where there is no access to CBMWTF and needs to be carried out with prior approval from the prescribed authority and as per the Standards specified.

8.2.1 Status of authorisation of Health Care Establishments in the State

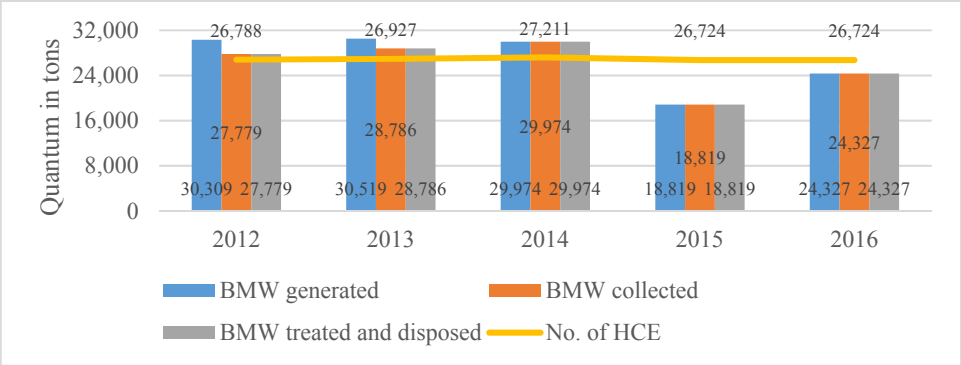
There are 29,874 Health Care Establishments (HCE) functioning in Karnataka, which include hospitals, nursing homes and other units such as veterinary institutes, diagnostic laboratories, clinical research and industry with medical officer for emergency. There are 25 CBMWTF functioning in the State.

As of December 2017, nine *per cent* of HCE (2,595) were functioning without a valid authorisation from KSPCB. While 17 *per cent* of HCE (5,061) followed deep burial system, 18 *per cent* of HCE (5,427) were disposing BMW without authorisation.

8.2.2 Status of Bio-medical waste in Karnataka

The quantum of BMW generated and disposed in the State during the period 2012 to 2016 is given in **Chart 8.1**.

Chart 8.1: Status of Bio-medical waste generation in Karnataka



Source: Information furnished by KSPCB

As depicted in **Chart 8.1**, data available with KSPCB indicates that the quantum of waste generated and the number of HCEs remained more or less the same during the period 2012 to 2014 and that the entire BMW generated was collected, treated and disposed of during the period 2014 to 2016. The data furnished by KSPCB was incorrect, as we noticed during JPV that BMW was mixed with MSW and BMW was burnt within the hospital premises as detailed in subsequent paragraphs.

The drastic fall in the quantum of waste generated (37 *per cent*) during 2015 was not commensurate with the decrease in the number of HCE (2 *per cent*) and the reasons for the decrease were not explained by KSPCB. There was an increase in the number of HCEs functioning in the State during 2016 whereas the quantum of waste generated did not increase proportionally and remained lower than the quantum generated during the period 2012 to 2014.

8.2.3 Status of authorisation for Bio-medical waste management in test-checked government and veterinary hospitals

All Government (36) and Veterinary (34) hospitals within the jurisdiction of 33 ULBs[52] were test-checked in audit. The status of authorisation of these hospitals by KSPCB for BMW is given in **Table 8.2**:

Table 8.2: Status of authorisation of 70 Government/Veterinary hospitals

Sl. No.	Category	Details of authorisation for BMW		
		Obtained	Not obtained	Data not furnished
1	Government hospitals	14	21	01
2	Veterinary hospitals	08	19	07

Source: Information furnished by test-checked ULBs

Thus, 58 *per cent* of the government hospitals and 56 *per cent* of veterinary hospitals test-checked were functioning without the required authorisation as of March 2017. This is bound to render the compilation of data (BMW generated, treated, *etc.*) at KSPCB incomplete and the monitoring/enforcement by KSPCB ineffective.

[52] In one ULB (TP, Gudibande), there was no Government/Veterinary hospital and in another ULB (TMC, Ugar Khurd), the only Veterinary hospital was found closed.

8.2.4 Role of Urban Local Bodies in management of Bio-medical waste

As per Rule 6(6) and Rule 14 of BMW Rules, 1998, amended in 2000 and Schedule III (7) to BMW Rules, 2016, ULBs shall

(a) provide or allocate suitable land for development of CBMWTF in their respective jurisdictions as per the guidelines of CPCB.

In all the test-checked ULBs, we observed that the government hospitals have entered into agreement with CBMWTF and these facilities were located at places away from urban limits. CC, Ballari and CMC, Bagalkote have provided place for CBMWTF in their MSW landfill site.

(b) collect other solid waste (other than BMW) from the health care facilities.

Eight[53] ULBs were not collecting MSW from the government hospitals located within their jurisdiction. Instances of BMW mixed with MSW were noticed during JPV besides burning of the mixed waste in these eight ULBs. In CC, Tumakuru, MSW was being collected once in a week from the government hospitals. No irregularity in collection found during JPV in other ULBs. MSW was not handed over to ULBs by 15 veterinary hospitals. Traces of burning of MSW within the premises was observed during JPV in 20 hospitals.

(c) Further as per Schedule I (12) of BMW Rules, 2016, ULBs are required to collect segregated BMW generated in households and have an arrangement with the CBMWTF to collect this waste from the Material Recovery Facility or from the household directly for final disposal.

Segregation at source in the test-checked ULBs ranged[54] from zero to 55 *per cent*. Therefore, the mixed waste collected that also included household BMW was being transported and dumped in the landfill site. The ULBs did not have a mechanism to segregate BMW during the intermediary stages either. This not only violated BMW Rules but would also cause contamination of environment and public health hazard due to unsanitary conditions.

The State Government stated (May 2018) that provisions for collecting household BMW were included in the draft SWM bye-laws and KSPCB would be requested to provide guidelines for collection of domestic BMW.

8.2.5 Management of Bio-medical waste by Government hospitals

Rule 6(5) of BMW Rules, 1998 stipulate that untreated BMW shall not be kept stored for more than 48 hours.

We observed that the CBMWTF collected BMW daily from seven district hospitals and two teaching hospitals located within the jurisdiction of the test-checked ULBs. District Hospital, Karwar entered into an agreement with CBMWTF which provided for collection of BMW on alternate days. The actual frequency of collection was once in two to six days. The periodicity of BMW collection in other government hospitals ranged from daily to once in a

[53] CMC, Nanjangud; TMCs - Kakkera, Mugalkhod and T. Narasipura; TPs - Ainapura, Chinchali, Kudligi and Raibag.

[54] Zero in 7 ULBs; 1 to 25 *per cent* in 12 ULBs; 26 to 50 *per cent* in 15 ULBs and more than 50 *per cent* in 1 ULB.

week. Comparison of actual periodicity of collection with the periodicity mentioned in the agreements revealed certain variations (detailed in **Appendix 8.1**), indicating laxity on part of few hospitals to enforce proper disposal of BMW.

We observed that in respect of four[55] hospitals where the periodicity of collection of BMW was more than three days, substantial portions of human tissue was dumped/burnt in deep burial pits within the premises of the hospital.

None of the veterinary hospitals test-checked tied up with CBMWTF for disposal of BMW generated. These hospitals were resorting to deep burial for BMW within their premises (**Exhibit 8.4**).

8.2.6 Absence of liquid chemical waste treatment system

In accordance with the BMW Rules, 1998 and 2016, the occupier (HCE) shall ensure segregation of liquid chemical waste at source and ensure pre-treatment or neutralisation (disinfection using at least one *per cent* hypochlorite solution or any other equivalent chemical reagent) prior to mixing with other effluent generated from health care facilities before discharging it into the drains.

We observed that there was no system to treat the liquid chemical waste in 12 out of 36 government hospitals and 25 out of 34 veterinary hospitals. The effluent treatment plant required for treating liquid waste before letting into the drains was not working in any of the test-checked hospitals except one in Mangaluru, and untreated liquid chemical waste was being discharged directly into the drains leading to contamination of the connected watercourse.

8.2.7 Dumping and burning of Bio-medical waste in hospital premises

The provisions of the MSW/SWM Rules prohibit burning of waste in the open and mixing of different types of waste. As per Rule 4(b) of BMW Rules, 2016, it shall be the duty of every occupier (HCE) to make a provision within the premises for a safe, ventilated and secured location for storage of segregated BMW to ensure that there shall be no secondary handling, pilferage of recyclables or inadvertent scattering or spillage by animals. The BMW from such place or premises shall be directly transported in the manner as prescribed in these rules to the CBMWTF or for the appropriate treatment and disposal.

We observed during JPV that:

(a) huge quantity of BMW was scattered in a large stretch of open area within the premises of Vijayanagar Institute of Medical Sciences (VIMS), Ballari and bundles of MSW mixed with BMW were seen piled in a tractor trailer in the hospital (**Exhibit 8.5**);

(b) In Bidar Institute of Medical Sciences (BRIMS), Bidar, the container kept for collection of MSW was found mixed with BMW (**Exhibit 8.6**); and

[55] TMCs - Hiriyur, Mugalkhod, T. Narasipura and Ugar Khurd.

(c) Cases of dumping of BMW were observed in 21 hospitals and cases of burning were noticed in 36 test-checked government/veterinary hospitals (**Exhibit 8.7**).

Thus, it is evident from the above observations that compliance to BMW Rules was weak in test-checked ULBs, which would not only affect public health but also lead to contamination of environment.

8.3 E-waste

E-Waste (Management & Handling) Rules, 2011 (EW Rules, 2011) were notified in 2011 and came into force with effect from 1st May, 2012. MoEFCC, Government of India notified (March 2016) the E-Waste (Management) Rules, 2016 (EWM Rules, 2016) which came to be effective from 1 October 2016. These rules are applicable to every producer, consumer or bulk consumer, collection centre, dismantler and recycler of e-waste involved in the manufacture, sale, purchase and processing of electrical and electronic equipment or components specified in Schedule-I of these Rules.

8.3.1 Status of e-waste in Karnataka

As per the information furnished by KSPCB, the generation of e-waste in the State was estimated (March 2014) at 86,118 MT/ annum by the Environment Management Policy and Research Institute, Bengaluru. The details of e-waste generated, collected and channelised to recyclers, dismantlers or otherwise disposed of in the State during the period 2012-13 to 2016-17 was not available either with KSPCB/DMA.

As of March 2017, KSPCB issued the Consent for Establishment (CFE) to 91 units (59 dismantlers, 23 recyclers and 9 dismantlers and recyclers) for recycling/dismantling of e-waste. We observed that Consent for Operation (CFO) was issued to only 77 units and CFOs for the remaining 14 units were in process. We further observed that out of 77 units to which CFOs were issued, 17 units were yet to be commissioned, 9 units were closed and 13 units did not receive any e-waste for further processing.

8.3.2 Role of local body as bulk consumer of e-waste

Section 87 of KM Act, 1964 and Section 58(5) of KMC Act, 1976 stipulate that lighting of public streets, municipal markets, *etc.*, is one of the obligatory functions of the Corporation. ULBs are, therefore, responsible for management of tube lights in public streets, market places, *etc*. Further, EW Rules, 2011 and EWM Rules, 2016 define bulk consumer as bulk users of electrical and electronic equipment such as Central Government or State Government Departments, public sector undertakings, banks, educational institutions, multinational organisations, international agencies, partnership and public or private companies that are registered under the Factories Act, 1948 (63 of 1948) and the Companies Act, 2013 (18 of 2013) and health care facilities which have turnover of more than one crore or have more than twenty employees. The Rules, however, do not categorise ULBs as bulk consumers. As such, none of the test-checked ULBs were disposing discarded street lights in the prescribed manner.

In light of the above provisions and definition, ULBs are required to comply with the provisions in the Rules that are applicable to bulk consumers along with the provisions stipulating the responsibility of ULBs. It is also recommended to amend the extant Rules by incorporating provisions for ULBs so that such e-waste is managed/disposed effectively by ULBs.

8.3.3 Status of compliance to E-waste Management Rules

The status of compliance in the test-checked ULBs with the provisions of e-waste management rules is as discussed below:

8.3.3.1 Responsibility of Urban Local Bodies

Schedule III of EW Rules, 2011 and Schedule IV of EWM Rules, 2016 stipulates the responsibilities of municipal authorities/local bodies as

(i) to ensure that e-waste if found to be mixed with MSW is properly segregated, collected and channelised to authorised dismantler or recycler; and

(ii) to ensure that e-waste pertaining to orphan products[56] is collected and channelised to authorised dismantler or recycler.

Further, the KSPCB directed (February 2016) that local bodies shall make arrangements to separately collect e-waste from the household levels and see that arrangement is made to store them scientifically at the landfill sites and disposed to the authorised e-waste recyclers once in a while. Alternatively, municipal authorities can also establish e-waste collection centres in their towns at important locations and separately take care of the household e-wastes.

We observed that e-waste was not handed over separately by the households in any the test-checked ULBs but was mixed with MSW. The waste collectors also did not insist/direct the households regarding segregation and separate collection of e-waste. ULBs did not collect and channelise e-waste to authorised dismantlers/recyclers so far (December 2017). The JPV showed that e-waste was found mixed with MSW (**Exhibit 8.8**).

Except CMC, Hosapete, none of the other ULBs established e-waste collection centres. The centre established at CMC, Hosapete was non-functional as no e-waste was collected by ULB.

8.3.3.2 Retention of e-waste by Urban Local Body

Rule 12 of EW Rules, 2011 and Rule 15 of EWM Rules, 2016, stipulate that every manufacturer, producer, bulk consumer, collection centre, dealer, refurbisher, dismantler and recycler may store the e-waste for a period not exceeding 180 days and shall maintain a record of collection, sale, transfer and storage of wastes and make these records available for inspection.

Retention of huge quantity of e-waste would occupy more space in the premises of ULB and causes unclean/unhygienic condition in the area. Therefore, periodical disposal of e-waste was required to be done by ULBs.

[56] Orphan products mean non-branded or assembled electrical and electronic equipment as specified in Schedule-I of the Rules or those produced by a company which has closed its operations or has stopped product support.

However, huge quantity of e-waste particularly tube lights were found dumped within the premises of ULBs. The quantum of tube lights dumped in HDMC and CC, Tumakuru indicates that tube lights have not been disposed by ULBs for years (**Exhibit 8.9**).

Out of the 35 test-checked ULBs, only two ULBs (HDMC, other than tube lights as indicated above and CMC, Chintamani) disposed e-waste during the review period. In 22 ULBs, e-waste generated were kept undisposed and 11 ULBs did not furnish any information about the disposal. The retention of e-waste by ULBs for more than 180 days of generation was in contravention of the rules. Further, scrutiny of records of e-waste disposed by the two ULBs revealed that the e-waste was auctioned and handed over to the local *kabadi wallas* and not to the authorised e-waste recyclers or dismantlers. Thus, e-waste was not channelised to authorised agencies for proper disposal which contravened the norms prescribed under the rules.

The State Government stated (May 2018) that provisions have been made in DPRs and draft bye-laws to ensure e-waste is collected separately and handed over to KSPCB authorised recyclers.

8.3.3.3 Non-maintenance of e-waste record

In accordance with Rule 9 (responsibilities of bulk consumer) of EWM Rules, 2016, ULBs were required to maintain records for management of e-waste in Form II indicating the nature and quantity of e-waste generated, stored and transferred to recyclers, *etc*. We observed that the test-checked ULBs did not maintain the required records indicating the nature and quantity of e-waste generated, stored and disposed.

Therefore, ULBs did not plan or monitor management of e-waste effectively.

8.3.3.4 Non-submission of annual returns

Bulk consumers of electrical and electronic equipment shall file annual returns in Form-3 to the concerned State Pollution Control Board on or before the 30th day of June following the financial year to which that return relates in accordance with Rule 9(4) of EWM Rules, 2016. (Filing of annual returns not envisaged in 2011 rules).

Check of records showed that none of the 35 test-checked ULBs filed the annual returns for the year 2016-17 to KSPCB and hence did not comply with the requirements. The monitoring authorities concerned also failed to ensure the necessary compliance.

Thus, it is clear from the above that ULBs did not take measures to put in place the requisite mechanism resulting in deficient/improper management of e-waste.

The State Government accepted (May 2018) the audit observations and stated that necessary steps would be taken to submit annual reports henceforth.

8.4 Slaughterhouse waste

Rule 3(1) of Prevention of Cruelty to Animals (Slaughterhouse) Rules, 2001, stipulate that no person shall slaughter any animal within a municipal area

except in a slaughterhouse recognised or licensed by the concerned authority empowered under the law for the time being in force to do so.

8.4.1 Status of slaughterhouses in Karnataka

There are 23 slaughterhouses in Karnataka spread across 11 districts. All slaughterhouses in the State except the slaughterhouse at Tannery Road[57] in Bengaluru are categorised as 'small'. Ten slaughterhouses were constructed in seven of the test-checked ULBs, of which six slaughterhouses located in four[58] ULBs were functioning. The other four[59] though constructed (July 2012 to June 2014) at a cost of ₹1.44 crore have not been put to use due to opposition from public, *etc*. Thus, absence of slaughterhouses in 28 ULBs and non-functioning of the four constructed would only provide more scope for activities such as illegal slaughtering within the urban limits.

8.4.2 Operation of slaughterhouses without authorisation

Section 25 and 26 of the Water (Prevention and Control of Pollution) Act, 1974 (Water Act, 1974), stipulate that any industry, operation or process, or any treatment and disposal system or any extension or addition thereto, which is likely to discharge sewage or trade effluent into a stream or well or sewer or on land is required to obtain CFE and CFO from KSPCB. Accordingly, slaughterhouses were also required to obtain the consent of KSPCB.

We observed that the five slaughterhouses were functioning without obtaining consent (authorisation) from KSPCB. Though CC, Mangaluru and HDMC obtained consents up to 30.6.2014, the same were not renewed. The other units did not obtain CFO of slaughterhouse so far. Operation of slaughterhouses without authorisation of KSPCB amounted to illegal slaughtering of animals in the urban limit. This implies that the compliance criteria were not adhered to, which would result in hazards to public health as well as contamination of the environment.

The State Government assured (May 2018) that authorisation would be insisted upon.

8.4.3 Construction of slaughterhouse in landfill site

KSPCB notified (February 2014) guidelines for siting of slaughterhouse according to which the slaughterhouses shall be located preferably at an aerial distance of one kilometre away from SWM processing facility/landfill site.

We observed that DC, Raichur approved (September 2014) construction of slaughterhouse in MSW landfill site of TMC, Manvi for an estimated cost of ₹33.33 lakh under Backward Regions Grant Fund scheme (**Exhibit 8.10**). Accordance of approval by district authority for construction of slaughterhouse in a landfill site violated the guidelines of KSPCB. Further, it was observed that the constructed slaughterhouse was not put to use (September 2017).

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[57] **Slaughterhouse at Tannery Road**, **Bengaluru** still continues to exist despite being pointed out in Paragraph 4.1.13 of Audit Report-2013 (Report No.5 of the year 2014).

[58] CC, Ballari – 2; HDMC – 2; CC, Mangaluru – 1 and TMC, Manvi – 1.

[59] CMC, Nanjangud - 1; TMC, Magadi – 1; TMC, Manvi – 1 and TMC, T. Narasipura -1.

8.4.4 Management of slaughterhouse waste

Waste material produced in the slaughterhouses is of three types: solid, liquid, and gas. Solid waste is generated from manure, intestinal contents, hair, horns, hooves, trimmings, internal organs, condemned carcasses or body parts, carton, and plastics. Liquid wastes of slaughterhouses come from urine, blood, and waste water from the slaughter processes. Gaseous waste materials (odour and emissions) are also produced in the operations.

These waste materials if not handled and managed properly pose a hazard to the health and environment. High concentration of animal blood and fat, dirt, and other pollutants in slaughterhouse effluent renders it very toxic to the receiving water bodies. Hence, scientific processing and disposal of slaughterhouse waste is essential to recover useful fractions and for safe disposal of residual pathogenic biological waste.

In the absence of a proper slaughterhouse waste processing or disposal facility, ULBs can practice deep burial of carcasses and animals killed in accidents with adequate precaution (Section 7.6 of MSWM Manual, 2016).

We observed that:

(i) None of the slaughterhouses had Effluent Treatment Plants to discharge the effluent except CC, Mangaluru. The liquid waste generated in other five slaughterhouses were allowed directly into the drain contravening the norms prescribed;

(ii) In all the test-checked slaughterhouses, control equipment for odour/ air emissions were not provided; and

(iii) solid waste generated in the slaughterhouses and retail mutton/chicken/fish shops, carcasses and dead animals were transported to landfill site and dumped in burial pits. In 13[60] ULBs, the slaughterhouse waste was mixed with MSW (**Exhibit 8.11**).

Thus, the ULBs failed to manage slaughterhouse waste effectively, which led to mixing of waste and unhygienic conditions, causing problems to health and contamination of the environment.

8.5 Construction and Demolition Waste

MSWM, 2000 stipulates that C&D waste, being predominantly inert in nature does not create chemical or biochemical pollution. Hence maximum effort should be made to reuse and recycle them. It was only in 2016 that separate rules for C&D waste was notified by Government of India. In the meantime, KSPCB issued (February 2014) guidelines for construction debris management and its disposal.

[60] CCs - Ballari and HDMC; CMCs -Bagalkote, Hiriyur, Hosapete, Nanjangud and Sagar; TMCs – Bhatkal, Maddur, Manvi and T. Narasipura; TPs - Honnavara and Kudligi.

8.5.1 Status of generation of construction and demolition waste

MoEFCC has admitted that there is no systematic database on C&D waste. According to the Technology Information, Forecasting and Assessment Council, the total C&D waste generation estimated in India from buildings activities in the year 2013 was 530 million tons. The information on quantum of C&D waste generated in the State and in ULBs (other than BBMP) is not available with KSPCB and DMA. Similarly, test-checked ULBs also do not have the data on C&D waste generation in their jurisdiction. However, the DPRs prepared for 20 test-checked ULBs, estimated C&D waste generated at 138 TPD in the year 2016. C&D waste generated was not quantified in the DPRs of 10 ULBs. DPRs for five newly upgraded ULBs were not prepared.

8.5.2 Non-identification of site for disposal of construction and demolition waste

In accordance with KSPCB guidelines, debris shall be removed within 48 hours from the place of construction by ULBs, by engaging debris contractor and transported to a place designated by ULB for its disposal preferably an abandoned quarry away from city/town with prior authorisation from KSPCB. The guidelines also state that ULBs shall constitute a separate squad to ensure timely lifting, transporting and disposal of debris in the designated place.

We observed that except HDMC, CC, Mangaluru and CC, Tumakuru, none of the other ULBs identified the site for disposal of C&D waste. In HDMC, an abandoned quarry at Adargunchi village (seven kilometres from Hubballi) was notified only in September, 2017. In CC, Mangaluru, two acres of quarry land identified was taken up with concerned Tahsildar during 2015 and the proposal was yet to be approved. In respect of CC, Tumakuru, though the proposal was sent (January 2016) to DC seeking approval, the same was yet to be accorded (July 2017).

Thus, failure to identify the site for disposal of debris by test-checked ULBs, and delay in according approval for C&D disposal sites, denied ULBs of separate disposal area for C&D waste. In the absence of debris disposal site, public were allowed to dump C&D waste in low-lying areas, roadsides and near water bodies which is evident from the JPV conducted in the test-checked ULBs. Separate squads were also not identified by the test-checked ULBs.

Case study of TP, Raibag

The joint physical verification conducted (7 June 2017) by audit with the officials of TP, Raibag showed heaps of C&D waste dumped across various parts of the town (**Exhibit 8.12**). Public Works Department (PWD) was the major generator of C&D waste as it took up works of road widening and demolition of buildings.

The TP stated (January 2018) that immediate action to clear the waste was difficult till the road widening work was completed by PWD. The reply was not consistent with the KSPCB guidelines as it mandated removal of debris within 48 hours.

The State Government stated (May 2018) that instructions had been issued to all ULBs to identify suitable land for disposal of C&D waste.

8.5.3 Non-levy of charges for management of construction and demolition waste

The provisions of MSWM, 2000, C&D Rules, 2016 and KSPCB guidelines authorise local bodies to levy charges from the debris generators and make use of this money for lifting, transporting and disposal of C&D waste.

We observed that other than CMC, Nanjangud and TP, Kudligi, none of the other test-checked ULBs fixed any charges of management of C&D waste. CMC, Nanjangud and TP, Kudligi collected ₹4.17 lakh and ₹1.40 lakh respectively during the period 2012-13 to 2016-17. We observed that despite collecting charges, CMC, Nanjangud did not lift C&D waste. TP, Kudligi was collecting the waste but dumping in low-lying areas.

Thus, despite the enabling provisions, ULBs failed to augment this source of revenue.

8.5.4 Non-levy of penalty for illegal dumping of debris

KSPCB guidelines (February 2014) for C&D waste in ULBs stipulate that ULBs shall introduce penalty clause in their bye-laws for stocking/dumping of debris illegally by the construction agencies and shall enforce the same. The quarterly report of violation/penalty shall be furnished to KSPCB for monitoring. Further, as per Section 431 A of KMC Act, 1976 (Schedule XIII) applicable for CCs, dumping of building waste irregularly attracts penalty of ₹1,000 for first offence and ₹5,000 for second and subsequent offence. KM Act, 1964 does not contain a similar provision, but Section 224 stipulates a fine of up to ₹25 for dumping of dust, dirt or other rubbish, *etc*., which is not significant in comparison with the quantum of C&D waste.

We observed that only two ULBs prescribed levy of penalty. CMC, Bagalkote prescribed (June 2016) ₹500 fine per day for dumping of debris in public places and TMC, Kumta passed (March 2017) resolution for imposing penalty of ₹1,000 for first offence and ₹5,000 for second offence onwards towards unauthorised disposal of C&D waste. None of the ULBs furnished the report on violations/penalty to KSPCB.

The State Government stated (May 2018) that as per the draft bye-laws, ULBs can fix the user fee for collection, transportation and disposal of C&D waste and provisions have also been made for levy of fine for non-compliance.

Recommendation 18: The State Pollution Control Board needs to ensure that all health care institutions, slaughterhouses, recyclers, etc., obtain necessary authorisation for their functioning and enforce adherence to prescribed standards.

Recommendation 19: KSPCB/ULBs may maintain a comprehensive database of health care institutions, slaughterhouses, recyclers, etc., and strictly enforce their adherence to BMW, plastic, e-waste, slaughterhouse and construction and demolition rules.

Recommendation 20: The State Government and ULBs may put in place suitable systems to enforce Extended Producer Responsibility for specific waste categories as per the relevant rules.

Exhibit 8.1: Animals feeding on MSW dumped on roadside (Paragraph 8.1.2.1)

HDMC (4.5.2017)

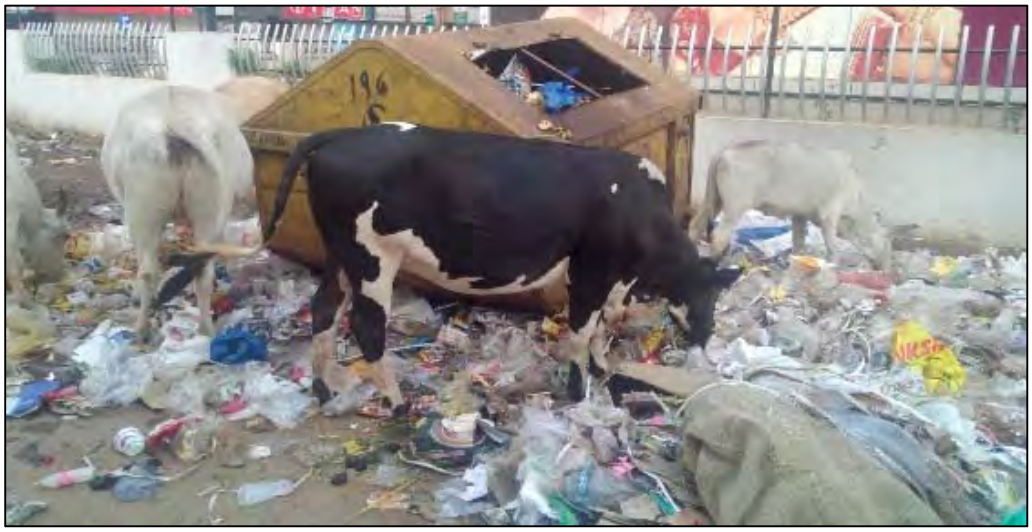


Exhibit 8.2: Surgery performed on cattle for removal of plastic (Paragraph 8.1.2.1)

CMC, Bidar

Exhibit 8.3: Death of cattle at TMC, Malur (Paragraph 8.1.2.1)

Exhibit 8.4: Deep burial pits in Veterinary Hospitals (Paragraph 8.2.5)

CC, Ballari (8.8.2017)

CMC, Nanjangud (5.7.2017)

Exhibit 8.5: Scattering and dumping of BMW in hospital premises (Paragraph 8.2.7)

VIMS, Ballari (9.8.2017)

Exhibit 8.6: BMW mixed with MSW in BRIMS, Bidar (9.8.2017)

Exhibit 8.7: Scattering and dumping of BMW in hospital premises (Paragraph 8.2.7)

General Hospital, Nanjangud (6.7.2017)

General Hospital, Malur (18.8.2017)

Exhibit 8.8: E-waste mixed with MSW (Paragraph 8.3.3.1)

TP, Kudligi (18.5.2017)

CMC, Karwar (26.5.2017)

CMC, Nanjangud (5.7.2017)

Exhibit 8.9: Dumping of Tube lights (Paragraph 8.3.3.2)

CC, Tumakuru (31.3.2017)

HDMC (27.4.2017)

CMC, Karwar (26.5.2017)

Exhibit 8.10: Slaughterhouse constructed in landfill (Paragraph 8.4.3)

TMC, Manvi (8.9.2017)

Exhibit 8.11: Slaughterhouse waste mixed with MSW (Paragraph 8.4.4)

HDMC (28.4.2017)

TMC, Bhatkal (9.5.2017)

Exhibit 8.12: Dumping of C & D waste in TP, Raibag (7.6.2017)

(Paragraph 8.5.2)

Shantinagar Ward no. 2

Chikkodi Road Ward no. 3

Chikkodi Road Ward no. 1

Chapter IX

Conclusion

The status of devolution of funds for urban governance disclosed that ULBs are dependent on Central/State Governments. In addition, the ULBs do not have powers to appoint personnel – officers/officials. The lack of capacity, both in terms of funds and functionaries, tends to affect the implementation of SWM activities.

The test-checked ULBs had not conducted any survey during the period 2010-16 but had adopted per capita estimates that had low level of reliability. The per capita estimates adopted were also not realistic. Action plans and strategy documents envisaged in the State policy formulated in 2004 was not prepared and State policy and strategy in accordance with the SWM Rules, 2016 was yet to be formulated. ULBs neither prepared short term nor long-term plans. DPRs prepared during 2016 were deficient. The State Government did not operationalise any waste minimisation strategy during the review period and ULBs did not take up initiatives to promote waste minimisation activity exclusively other than TMC, Kumta.

Though requisite committees were formed at the State level, the District and ULB level Committees were not formed in any of the test-checked districts leading to poor support for effective implementation of SWM plans.

Dedicated SWM Cell was absent at ULB level. There was shortage of manpower in all cadres *viz.* Environment Engineer (32 *per cent*); Health Inspectors (70 *per cent*) and *Pourakarmikas* (65 *per cent*).

None of the test-checked ULBs assessed the requirement of capital and revenue funds for SWM activities until the preparation of DPRs and hence, they were unaware of the resource deficit. Though DPRs prepared during 2016-17 assessed the resource deficit, these failed to address measures for bridging this deficit. But audit did not come across any instance of ULB asking for funds from the State Government.

ULBs did not utilise the funds provided for creation of capital assets by the Central and State Finance Commissions. In comparison, funds allocated for revenue expenditure were utilised in full by the ULBs. The expenditure on SWM was not commensurate with the funds available resulting in accumulation of balances to the tune of ₹93.19 crore at the end of March 2017.

There was an appreciable increase in the number of test-checked ULBs collecting SWM cess and the quantum of cess increased significantly during the period 2012-13 to 2016-17. The test-checked ULBs were not collecting cess from places of public worship, occupiers of buildings/shops owned by ULBs and Government buildings as these properties were either exempt from payment of property tax or service charges. ULBs also did not levy cess on vacant lands despite the enabling provisions. Consequently, the ULBs lost revenue of ₹3.07 crore during the period 2012-13 to 2016-17. There was short accounting of cess of ₹5.41 crore in six ULBs and HDMC alone short accounted to the extent of ₹5.11 crore.

Ten ULBs diverted funds of ₹3.81 crore for works and purchase of equipment/machinery/vehicles related to UGD purposes and other activities not connected with SWM. CMC, Sira diverted ₹15.80 lakh resulting in non-achievement of intended objective of constructing bio-methanation plant, purchasing secondary storage containers, *etc*.

The IEC activities did not specifically focus on segregation of special waste and did not emphasise 'not to bury' and 'not to burn' waste.

Segregation of waste at different levels was either absent or partial in all the test-checked ULBs. The State/District/ULBs did not notify the classification of items as domestic hazardous waste and therefore, the need to segregate them separately was not publicised. Consequently, segregation of domestic hazardous waste was not done. Similarly, sanitary waste was not collected separately. Hence, mixed waste was transported to landfills.

Ward-wise collection of waste was absent in six of the test-checked ULBs and it was partial in nine ULBs. The test-checked ULBs did not carry out street sweeping of 6,935 (83 *per cent*) out of 8,324 km of roads on daily basis. Occupational waste (cut *beedi* leaves and ash) was mixed with regular MSW during collection. Shortage of primary collection vehicles was to the extent of 57 *per cent*.

Open vehicles and vehicles without necessary partition were used for transportation of waste. Absence of functional GPS and tracking systems resulted in unauthorised dumping of waste near the bank of River Kabini in CMC, Nanjangud.

The test-checked ULBs were able to process only 26 *per cent* of waste collected during the review period. This was because of non-creation of required infrastructure and under-utilisation of infrastructure created. Eleven ULBs processed waste through composting and only three ULBs adopted bio-methanation technology.

The ULBs were operating disposal facilities without valid authorisation from KSPCB and necessary environmental clearance. The required buffer zone round the landfill sites were not maintained. Activities that do not conform to the provisions of MSW/SWM Rules were taken up in the landfill sites. Many of the landfills test-checked lacked basic infrastructure such as waste inspection facilities, weighbridge, fire-fighting equipment, toilet, *etc*. There was evidence of unscientific dumping and burning of mixed waste in the landfills.

The above lapses indicate lack of basic monitoring by ULBs and district /State level authorities to ensure compliance to statutory requirements and posed a serious threat to the environment besides leading to health hazards.

The absence of proper segregation of waste led to mixing of MSW with plastic waste, bio-medical waste, e-waste and slaughterhouse waste. The ULBs did not comply with the directions/instructions stipulated under the various acts and rules governing management of special waste.

Plastic waste, though found feasible for use in laying of roads, was not used for the purpose. This not only resulted in mismanagement of plastic waste but also in environmental degradation and death of cattle. Health care institutions were functioning without authorisation and resorting to unauthorised disposal of bio-medical waste.

Test-checked ULBs did not collect and channelise e-waste to authorised dismantlers/recyclers and e-waste was found mixed with MSW. Slaughterhouses in the test checked ULBs were functioning without authorisation and slaughterhouse waste was not managed properly. Thirty-two of the 35 test-checked ULBs were yet to identify sites for disposal of construction and demolition waste. Consequently, construction debris was dumped on roadsides, near water bodies and low-lying areas. Inefficient management of special waste would lead to environment degradation, pollution and health hazards besides affecting the aesthetics of the cities/towns.

Bengaluru
The 17 August 2018

(E P Nivedita)
Principal Accountant General
(General and Social Sector Audit)
Karnataka

Countersigned

New Delhi
The 21 August 2018

(Rajiv Mehrishi)
Comptroller and Auditor General of India

Appendices

Appendix 1.1

(Reference: Paragraph 1.3/Page 2)

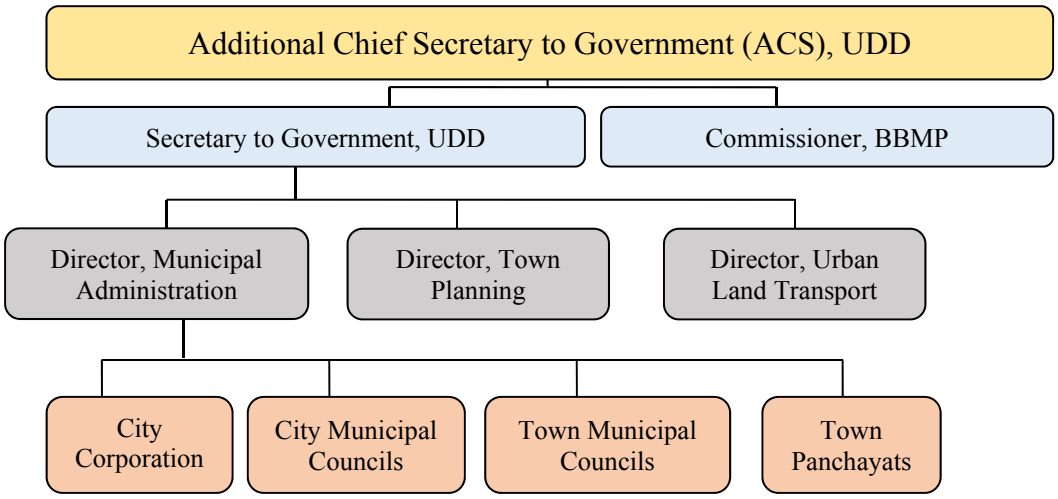
Regulatory framework governing the management of different types of waste

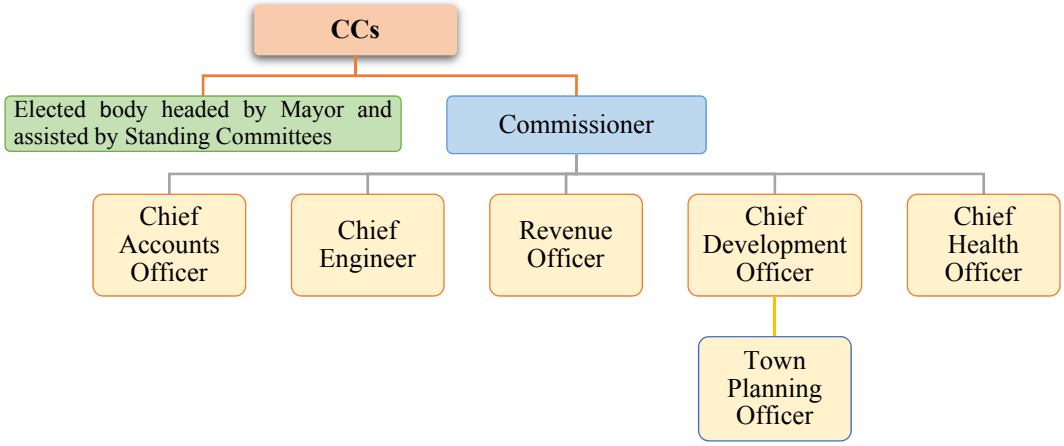
Municipal solid waste	• MSW (Management and Handling) Rules, 2000 • Manual on MSW management and handling Rules, 2000 • National Enviornment Policy, 2006 • National Mission on Sustainable Habitat, 2010 • Solid Waste Management Rules, 2016
Bio-medical waste	• The Bio-medical Waste (Management & Handling) Rules, 1998 and amended further in 2000 and again in 2003 • The Bio-medical Waste Management Rules, 2016
Plastic waste	• The Recycled Plastics Manufacture and Usage Rules, 1999 • Plastic Waste (Management & Handling) Rules, 2011 • Plastic Waste Management Rules, 2016
E-waste	• E-waste (Management & Handling) Rules, 2011 • E-waste (Management) Rules, 2016
Hazardous waste	• The Hazardous Waste (Management & Handling) Rules, 1989 • The Hazardous Waste (Management, Handling and Transboundary) Rules, 2008 • Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016
Construction and Demolition waste	• Construction and Demolition Waste Management Rules, 2016

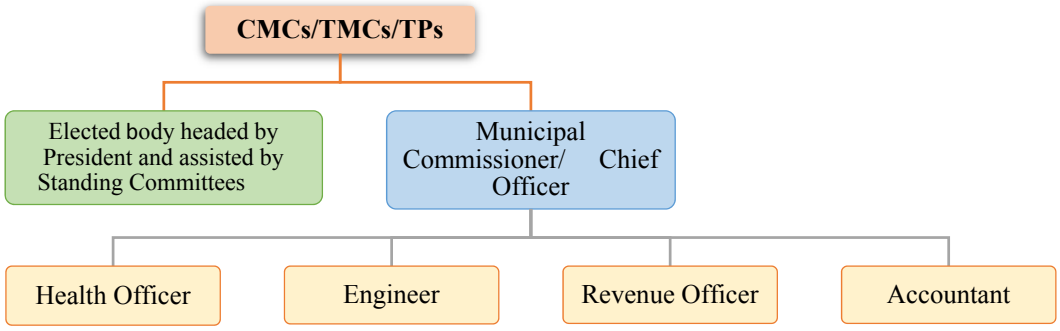
Appendix 1.2

(Reference: Paragraph 1.3/Page 2)

Organisational structure with respect to functioning of ULBs in the State







Appendix 2.1

(Reference: Paragraph 2.3/Page 6)

List of selected ULBs

Sl. No.	Division	District	Units selected for sample			
			City Corporation	City Municipal Council	Town Municipal Council	Town Panchayat
1.	Belagavi	Bagalkote		Bagalkote		
2.		Belagavi			Mugalkhod Ugar Khurd	Ainapura Chinchali Raibag
3.		Dharwad	Hubballi-Dharwad			
4.		Gadag				
5.		Haveri				
6.		Uttara Kannada		Dandeli Karwar	Bhatkal Kumta	Honnavara
7.		Vijayapura				
8.	Bengaluru	Bengaluru Rural				
9.		Bengaluru Urban				
10.		Chikkaballapura		Chintamani Shidlaghatta		Gudibande
11.		Chitradurga			Hiriyur	
12.		Davanagere				
13.		Kolar			Malur	
14.		Ramanagara			Magadi	
15.		Shivamogga		Sagar		
16.		Tumakuru	Tumakuru	Sira		
17.	Kalaburagi	Ballari	Ballari	Hosapete		Kudligi
18.		Bidar		Bidar	Humnabad	
19.		Kalaburagi				
20.		Koppal				
21.		Raichur			Manvi	
22.		Yadgir			Kakkera	
23.	Mysuru	Chamarajanagara				
24.		Chikkamagaluru				Koppa Sringeri
25.		Dakshina Kannada	Mangaluru			
26.		Hassan				
27.		Kodagu				
28.		Mandya			Maddur	
29.		Mysuru		Nanjangud	T. Narasipura	
30.		Udupi		Udupi		
Total number of ULBs selected			**4**	**11**	**12**	**8**

Appendix 2.2

(Reference: Paragraph 2.4/Page 6)

Brief profile of Mrs. Almitra Patel

Almitra Patel is an 82 years young biologist and chemist with an engineering degree and Masters from MIT, USA. After 31 years of heading a refractories firm, she has become since 1991 a self-taught garbologist.

After the Surat plague she joined the late Capt J S Velu in two Clean India Campaigns by road in 1994 and 1995. She filed a countrywide PIL to enforce hygienic waste management and was appointed to a Supreme Court Committee for Solid Waste Management that produced a comprehensive blueprint for reform. That led to the country's first Municipal Waste Management Rules 2000, which require minimising waste to landfill by recycling dry waste and stabilising wet waste to enrich Bharat's soils. For this, source-separation of dry and wet waste and daily doorstep collection of wet waste is a must and is now compulsory for all citizens in the new SWM Rules 2016.

Till date she has visited 189 Indian cities to share best practices. She also works to minimise polluting wastes and promote eco-friendly packaging. She is currently Swachh Bharat Mission National Expert. Her current passions are cleaning up old dumpsites and getting phosphorus out of waste water to save India's surface waters.

Mrs Almitra H. Patel
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Youtube Almitra Patel

Appendix 3.1

(Reference: Paragraph 3.1/Page 7)

Roles and responsibilities of different institutions in SWM

Level/Responsible Institution	Role and responsibilities in SWM
Central Government (MoEFCC, MoUD and CPCB)	Laws and Rules; Policies and Norms; Guidelines, Manuals, and Technical Assistance; Financial Support; Monitoring implementation of laws and rules.
State Government (UDD headed by ACS and KSPCB headed by Chairperson)	Monitoring implementation of laws and rules in metropolitan cities; State Policy and SWM Strategy; Guidelines, Manuals, and Technical Assistance; Financial Support; Reporting on Service Level Benchmarks to the MoUD; Capacity Building of local bodies; Granting consent to set up treatment and disposal activities.
District (DC assisted by Project Director, DUDC)	Review the performance of ULBs on waste management process; Facilitate identification and allotment of suitable land for solid waste processing and disposal facilities.
ULBs (headed by Commissioner, Municipal Commissioner or Chief Officer)	Providing MSWM services; Preparation of SWM plan; Framing byelaws; Levy and collection of fees; Financing SWM system; Creating public awareness; Involvement of informal sector in SWM.
Informal Sector (waste recyclers, NGOs, CBOs and private partners)	Resource recovery and recycling at different stages; Providing support to the local recycling industry; Involvement of community; Creating awareness; Collection and transportation of waste; Technology providers.

Source: Manuals on MSWM, 2000 and 2016

Appendix 3.2
(Reference: Paragraph 3.2/Page 8)
Variations in per capita estimates indicated by ULBs and as worked out by audit

Sl. No.	Name of the ULB	Population	Residential Refuse (0.3)	Commercial refuse (0.1)	Street sweepings (0.05)	Institutional refuse (0.05)	Total in kg/day	Total in TPD	Waste generation as per ULB (2012-13)	Difference
(a)	*(b)*	*(c)*	*(d)*	*(e)*	*(f)*	*(g)*	*(h)=d+e+f+g*	*(i)=h/1,000*	*(j)*	*(k)=h-j*
1	Ballari	4,10,447	1,23,134	41,045	20,522	20,522	2,05,223	205	145	60
2	HDMC	9,43,788	2,83,136	94,379	47,189	47,189	4,71,893	472	400	72
3	Mangaluru	4,89,488	1,46,846	48,949	24,474	24,474	2,44,743	245	212	33
4	Tumakuru	3,05,821	91,746	30,582	15,291	15,291	1,52,910	153	114	39
5	Bagalkote	1,20,000	36,000	12,000	6,000	6,000	60,000	60	35	25
6	Bidar	2,16,080	64,824	21,608	10,804	10,804	1,08,040	108	45	63
7	Chintamani	76,068	22,820	7,607	3,803	3,803	38,033	38	26	12
8	Dandeli	52,069	15,621	5,207	2,603	2,603	26,034	26	14	12
9	Hosapete	2,06,167	61,850	20,617	10,308	10,308	1,03,083	103	60	43
10	Karwar	63,755	19,127	6,376	3,188	3,188	31,879	32	20	12
11	Nanjangud	50,598	15,179	5,060	2,530	2,530	25,299	25	20	5
12	Sagar	53,660	16,098	5,366	2,683	2,683	26,830	27	21	6
13	Shidlaghatta	51,159	15,348	5,116	2,558	2,558	25,580	26	23	3
14	Sira	57,749	17,325	5,775	2,887	2,887	28,874	29	18	11
15	Udupi	1,25,306	37,592	12,531	6,265	6,265	62,653	63	55	8
16	Bhatkal	32,000	9,600	3,200	1,600	1,600	16,000	16	14	2
17	Hiriyur	56,416	16,925	5,642	2,821	2,821	28,209	28	20	8
18	Humnabad	44,483	13,345	4,448	2,224	2,224	22,241	22	14	8
19	Kumta	29,297	8,789	2,930	1,465	1,465	14,649	15	9	6
20	Maddur	28,906	8,672	2,891	1,445	1,445	14,453	14	9	5
21	Magadi	27,605	8,282	2,761	1,380	1,380	13,803	14	11	3
22	Malur	40,050	12,015	4,005	2,003	2,003	20,026	20	14	6
23	Manvi	46,465	13,940	4,647	2,323	2,323	23,233	23	16	7
24	T. Narasipura	31,498	9,449	3,150	1,575	1,575	15,749	16	2	14
25	Gudibande	9,441	2,832	944	472	472	4,720	5	3	2
26	Honnavara	19,109	5,733	1,911	955	955	9,554	10	9	1
27	Koppa	5,004	1,501	500	250	250	2,501	3	2	1
28	Kudligi	26,680	8,004	2,668	1,334	1,334	13,340	13	7	6
29	Raibag	18,736	5,621	1,874	937	937	9,369	9	4	5
30	Sringeri	3,925	1,178	393	196	196	1,963	2	4	-2

Source: Census, 2011; MSWM Manual, 2000 and information furnished by test-checked ULBs
Note: Minimum rates for refuse generation as given in Section 3.3.6.2 of MSWM Manual, 2000, are considered for calculation.

Appendix 3.3

(Reference: Paragraph 3.10/Page 15)

Status of committees prescribed to oversee the implementation of MSWM

Sl. No.	Committee (Chairperson)	Purpose	Remarks
1	State High Powered Committee (Chief Secretary)	To empanel consultants for preparation of DPRs, authorise institutes for appraisal of DPRs, approve DPR and financial model of SWM and sanction projects	-Constituted in August 2015. -Conducted eight meetings till March 2018 and approved 218 DPRs. -DPRs had shortcomings as detailed in Paragraph 3.5.
2	State Level Advisory Body (ACS, UDD)	To review the matters related to implementation of SWM rules, state policy and strategy on SWM and give advice to State Government	-Constituted in November 2016 and conducted two meetings till March 2018. -Due to overlapping functions, Empowered Committee constituted during August 2010 became non-functional.
3	State Level Technical Committee under SBM (Chief Engineer, KUIDFC)	To examine the technical feasibility of the DPR submitted by the ULBs	-Constituted in January 2016 and met nine times and technically approved DPRs of 218 ULBs. -Directive (February 2016) to address measures for managing special wastes in DPRs was not adhered to. -Due to overlapping functions, a Technical Committee constituted during November 2008 became non-functional.
4	District Level Review and Monitoring Committee (Member of Lok Sabha from the district)	To monitor the progress of SBM in the districts	-Despite a lapse of two years, District Level Review and Monitoring Committees were yet to be formed.
5	District Level Supervision Committee (Minister in-charge)	To monitor the implementation of SBM by conducting monthly/quarterly meetings, to approve the DPRs and to assist/guide ULBs	-Not constituted in any of the test-checked districts despite issue of orders in August 2015.
6	City Level Task Force (Mayor)	To review action plans and to review progress of SWM projects	-Delay of eight months by State Government in issuing (February 2017) necessary instructions -Not constituted in test-checked ULBs (December 2017).
7	Ward Committees	To monitor MSWM service provision at CC level and publicise contact details of ward committee members	-Not constituted in any of the four test-checked CCs.

Source: Information furnished by UDD and DMA

Appendix 3.4

(Reference: Paragraph 3.12/Page 17)

SLB performance indicators and benchmarks pertaining to SWM

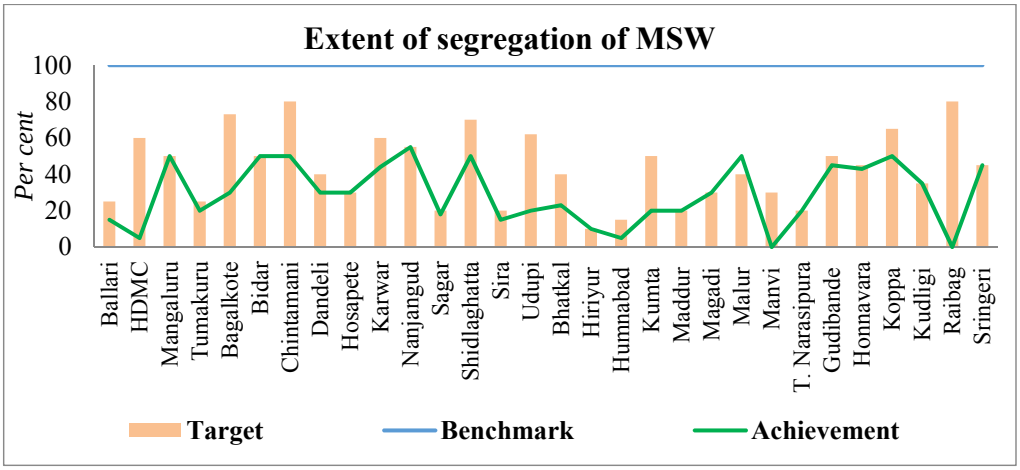
Sl. No.	Performance indicator	Unit As percentage of	Benchmark (in *per cent*)
1	Household level coverage of SWM services	households and establishments covered by daily doorstep collection system	100
2	Efficiency of collection of municipal solid waste	total waste collected against waste generated within the project area	100
3	Extent of segregation of municipal solid waste	households and establishments that segregate their waste	100
4	Extent of municipal solid waste recovered	quantum of waste collected, which is either recycled or processed	80
5	Extent of scientific disposal of municipal solid waste	waste disposed in a sanitary landfill against total quantum of waste disposed in landfills and dumpsites	100
6	Extent of cost recovery in SWM services	recovery of all operating expenses related to MSWM services that the ULB is able to meet from the operating revenues of sources related exclusively to MSWM	100
7	Efficiency in redressal of customer complaints	total number of MSWM related complaints resolved against total number of MSWM complaints received within 24 hours	80
8	Efficiency in collection of SWM user charges	current year revenues collected against total operating revenues for the corresponding period	90

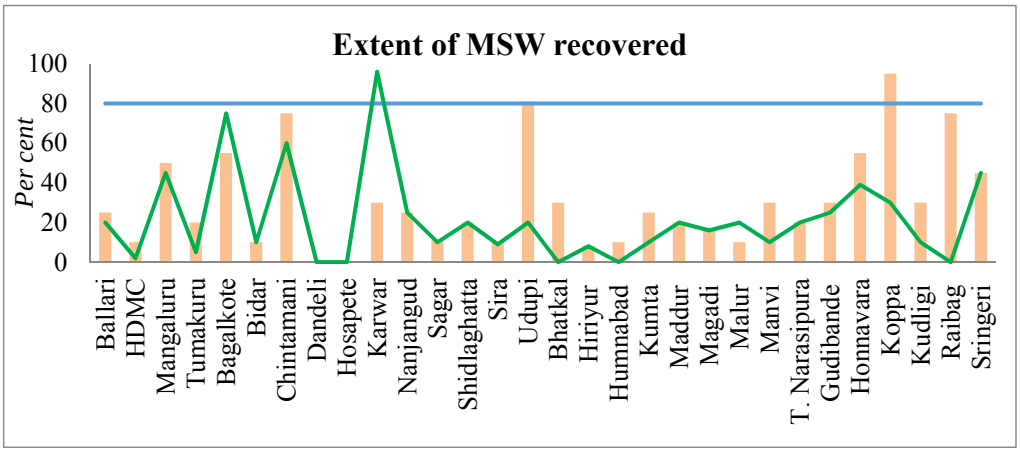
Source: MoUD website

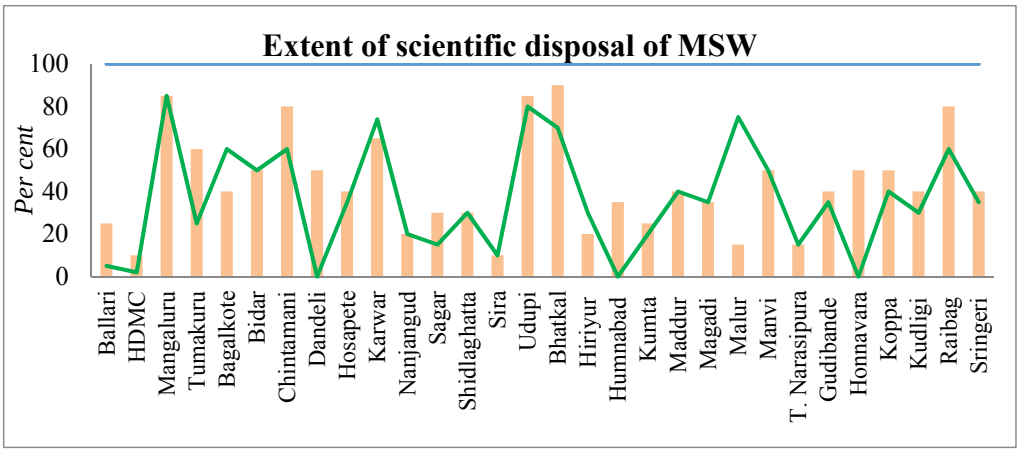
Appendix 3.5

(Reference: Paragraph 3.12.1/Page 17)

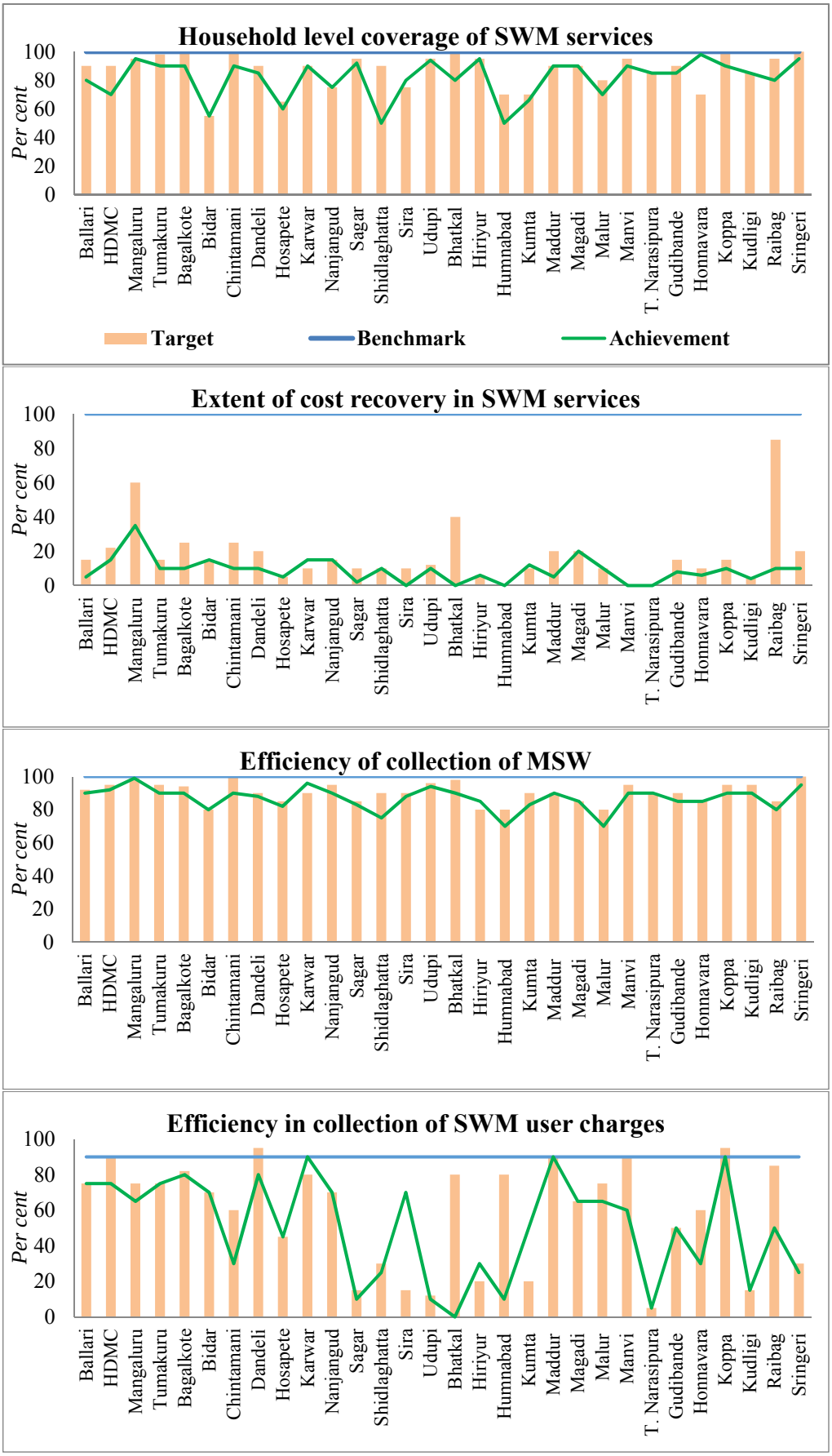
Status of achievements (2016-17) of 30 test-checked ULBs *vis-à-vis* targets fixed and benchmarks







Appendix 3.5 (concld.)



Source: Information furnished by test-checked ULBs

Appendix 3.6

(Reference: Paragraph 3.14/Page 20)

Course-wise details of training relating to SWM activities conducted during 2012-13 to 2016-17

Year	Sl. No.	Name of the course	Number of courses	Nomi-nated	Atte-nded	Per-centage	Expenditure (₹ in lakh)
2012-13	1	Job Course for Environmental Engineers	1	48	45	94	8.38
	2	Solid Waste Management	10	390	221	57	11.93
	3	Seminar on Solid Waste management	1	177	177	100	1.73
	4	Training needs analysis (TNA) for Environmental Engg, & Health Staff	1	26	14	54	0.34
	5	Workshop on Solid Waste Management / City Sanitation Plan	5	568	351	62	7.81
2013-14	6	Training of Trainers on manual scavengers	1	100	81	81	0.82
	7	Workshop on Prohibition of manual scavenging	1	150	126	84	2.16
	8	Sustainable environment management	4	160	74	46	3.01
	9	Workshop on urban sanitation	1	142	118	83	0.96
	10	Water & sanitation system in urban India (Jn-NURM)	1	38	29	76	7.14
2014-15	11	Climate Change	1	35	17	49	0.46
	12	Sustainable Environment Management	5	203	122	60	7.93
	13	Water and Waste Water Management	6	271	139	51	4.74
	14	Pourakarmika Training	25	1,252	1,133	90	8.77
	15	Prohibition of Manual Scavengers	2	397	261	66	0.69
2015-16	16	SWM Act – 2000, Bio methanisation, DEWATs	5	234	100	43	2.87
	17	UGD Safety Manual	2	90	40	44	0.89
	18	Urban Lake Management	2	147	52	35	0.85
	19	Waste to Energy Concepts	5	234	98	42	0.97
	20	Sustainable Environment Management	1	45	16	36	1.23
2016-17	21	Workshop on Animal Birth Control (Dogs) Rules 2001 and its implementation	2	140	42	30	0.76
	22	Foundation Course for Environment Engineers	1	38	36	95	7.71
	23	Urban Lake Management	1	82	19	23	0.30
	24	Green Building Concepts	3	150	65	43	2.03
	25	Climate Change	1	100	66	66	0.35
	26	Orientation Programme under AMRUT including TNA for Environmental Engineers of ULBs	1	30	24	80	3.02
	27	Capsule-II Training for Environmental Engineers	1	21	13	62	2.06
	28	Capsule -III Training for Environment Engineers	1	21	13	62	2.07
	29	Orientation Programme under AMRUT including TNA for Senior Health Inspectors of ULBs	3	90	63	70	6.12
	30	Capsule-II Training for Health Inspectors	2	63	46	73	4.45
	31	Capsule - III Training for Health Inspectors	1	46	36	78	3.01
Total			**97**	**5,488**	**3,637**	**66**	**105.56**

Source: Information furnished by SIUD

Appendix 4.1

(Reference: Paragraph 4.3/Page 23)

Details of utilisation of funds in test-checked ULBs during the period from 2012-13 to 2016-17

(₹ in crore)

Sl. No.	Name of the ULB	13th Finance Commission				14th Finance Commission			SFC-Entry tax devolution		
		OB	R	E	Unspent amount	R	E	Unspent amount	R	E	Unspent amount
City Corporations											
1	Ballari	0.14	9.64	3.17	6.61 (**68**)	4.06	0.00	4.06 (**100**)	1.15	0.00	1.15 (**100**)
2	HDMC	0.08	13.90	4.35	9.63 (**69**)	9.18	0.00	9.18 (**100**)	1.20	0.00	1.20 (**100**)
3	Mangaluru	0.18	4.59	2.09	2.68 (**56**)	3.58	0.00	3.58 (**100**)	1.15	0.00	1.15 (**100**)
4	Tumakuru	0.08	6.15	5.41	0.82 (**13**)	3.23	1.55	1.68 (**52**)	0.76	0.26	0.50 (**66**)
City Municipal Councils											
5	Bagalkote	0.25	3.06	2.77	0.54 (**16**)	0.70	0.55	0.15 (**21**)	0.41	0.04	0.37 (**90**)
6	Bidar	0.28	1.28	1.21	0.35 (**22**)	1.87	0.18	1.69 (**90**)	0.76	0.11	0.65 (**86**)
7	Chintamani	0.00	1.47	1.27	0.20 (**14**)	0.81	0.43	0.38 (**47**)	0.66	0.49	0.17 (**26**)
8	Dandeli	0.11	1.43	0.73	0.81 (**53**)	0.50	0.00	0.50 (**100**)	1.16	0.00	1.16 (**100**)
9	Hosapete	0.01	2.02	1.14	0.89 (**44**)	2.21	0.00	2.21 (**100**)	4.14	0.00	4.14 (**100**)
10	Karwar	0.00	1.72	1.16	0.56 (**33**)	0.66	0.20	0.46 (**70**)	0.56	0.51	0.05 (**9**)
11	Nanjangud	0.07	2.02	1.31	0.78 (**37**)	0.51	0.00	0.51 (**100**)	0.15	0.00	0.15 (**100**)
12	Sagar	0.00	1.71	1.71	0.00 (**0**)	0.91	0.50	0.41 (**45**)	0.71	0.36	0.35 (**49**)
13	Shidlaghatta	0.32	0.89	1.09	0.12 (**10**)	0.51	0.00	0.51 (**100**)	0.15	0.06	0.09 (**60**)
14	Sira	0.13	1.09	0.85	0.37 (**30**)	0.65	0.24	0.41 (**63**)	0.61	0.00	0.61 (**100**)
15	Udupi	3.48	2.86	5.88	0.46 (**7**)	1.26	0.00	1.26 (**100**)	0.61	0.61	0.00 (**0**)
Town Municipal Councils											
16	Bhatkal	0.00	1.62	1.53	0.09 (**6**)	0.23	0.23	0.00 (**0**)	0.25	0.16	0.09 (**36**)
17	Hiriyur	0.00	0.80	0.64	0.16 (**20**)	0.42	0.17	0.25 (**60**)	0.20	0.00	0.20 (**100**)
18	Humnabad	0.00	1.07	1.07	0.00 (**0**)	0.34	0.11	0.23 (**68**)	0.25	0.25	0.00 (**0**)
19	Kakkera	0.00	0.00	0.00	0.00 (**0**)	0.20	0.00	0.20 (**100**)	0.00	0.00	0.00 (**0**)
20	Kumta	0.00	1.03	0.24	0.79 (**77**)	0.39	0.21	0.18 (**46**)	0.75	0.00	0.75 (**100**)
21	Maddur	0.09	1.21	0.96	0.34 (**26**)	0.25	0.19	0.06 (**24**)	0.25	0.00	0.25 (**100**)
22	Magadi	0.00	1.23	1.08	0.15 (**12**)	0.27	0.00	0.27 (**100**)	0.20	0.18	0.02 (**10**)
23	Malur	0.00	0.93	0.91	0.02 (**2**)	0.36	0.16	0.20 (**56**)	0.15	0.00	0.15 (**100**)
24	Manvi	0.45	1.67	1.42	0.70 (**33**)	0.25	0.25	0.00 (**0**)	0.25	0.00	0.25 (**100**)
25	Mugalkhod	0.00	0.00	0.00	0.00 (**0**)	0.30	0.05	0.25 (**83**)	0.00	0.00	0.00 (**0**)
26	T. Narasipura	0.00	0.69	0.69	0.00 (**0**)	0.10	0.10	0.00 (**0**)	0.15	0.00	0.15 (**100**)
27	Ugar Khurd	0.00	0.00	0.00	0.00 (**0**)	0.20	0.00	0.20 (**100**)	0.00	0.00	0.00 (**0**)
Town Panchayats											
28	Ainapura	0.00	0.00	0.00	0.00 (**0**)	0.17	0.17	0.00 (**0**)	0.00	0.00	0.00 (**0**)
29	Chinchali	0.00	0.00	0.00	0.00 (**0**)	0.16	0.00	0.16 (**100**)	0.00	0.00	0.00 (**0**)
30	Gudibande	0.13	0.67	0.77	0.03 (**4**)	0.06	0.04	0.02 (**33**)	0.20	0.00	0.20 (**100**)
31	Honnavara	0.02	0.87	0.82	0.07 (**8**)	0.27	0.09	0.18 (**67**)	0.15	0.15	0.00 (**0**)
32	Koppa	0.00	0.45	0.32	0.13 (**29**)	0.04	0.02	0.02 (**50**)	0.30	0.16	0.14 (**47**)
33	Kudligi	0.36	0.89	0.74	0.51 (**41**)	0.39	0.34	0.05 (**13**)	0.20	0.00	0.20 (**100**)
34	Raibag	0.00	0.82	0.82	0.00 (**0**)	0.27	0.27	0.00 (**0**)	0.15	0.09	0.06 (**40**)
35	Sringeri	0.22	0.51	0.69	0.04 (**5**)	0.04	0.04	0.00 (**0**)	0.16	0.10	0.06 (**38**)
Total		**6.40**	**68.29**	**46.84**	**27.85 (37)**	**35.35**	**6.09**	**29.26 (83)**	**17.79**	**3.53**	**14.26 (80)**

OB: Opening balance; R: Receipts; E: Expenditure

Source: Information furnished by test-checked ULBs

Appendix 4.2

(Reference: Paragraph 4.4/Page 24)

Increase/decrease in resource-expenditure gap in test-checked ULBs

(₹ per ton)

Sl. No.	Name of the ULB	Resource-expenditure gap		Increase /Decrease (-)
		2012-13	2016-17	
City Corporations				
1	Ballari	1,010	1,655	645
2	HDMC	2,614	3,920	1,306
3	Mangaluru	844	1,806	962
4	Tumakuru	1,755	3,131	1,376
City Municipal Councils				
5	Bagalkote	933	800	(-)133
6	Bidar	1,081	1,441	360
7	Chintamani	747	2,162	1,415
8	Dandeli	917	671	(-)246
9	Hosapete	501	661	160
10	Karwar	990	1,282	292
11	Nanjangud	167	1,771	1,604
12	Sagar	1,045	1,853	808
13	Shidlaghatta	404	907	503
14	Sira	1,085	1,024	(-)61
15	Udupi	1,268	1,690	422
Town Municipal Councils				
16	Bhatkal	80	104	24
17	Hiriyur	2,258	3,158	900
18	Humnabad	547	704	157
19	Kumta	357	463	106
20	Maddur	2,433	3,047	614
21	Magadi	998	1,993	995
22	Malur	761	554	(-)207
23	Manvi	225	144	(-)81
24	T.Narasipur	4,119	2,944	(-)1,175
Town Panchayats				
25	Gudibande	2,040	2,121	81
26	Honnavar	239	1,197	958
27	Koppa	2,634	4,187	1,553
28	Kudligi	1,936	2,035	99
29	Raibhag	738	1,585	847
30	Sringeri	699	1,670	971

Source: Information furnished by test-checked ULBs

Appendix 4.3

(Reference: Paragraph 4.5.1/Page 26)

ULB-wise details of SWM cess collected and foregone, and revenue expenditure incurred during the period 2012-13 to 2016-17

(₹ in crore)

Sl. No.	Name of the ULB	SWM cess collected	SWM cess foregone	Revenue expenditure for the test-checked ULBs
City Corporations				
1	Ballari	3.51	0.00	59.18
2	HDMC	27.13	0.00	236.47
3	Mangaluru	19.37	3.12	106.40
4	Tumakuru	5.44	0.00	55.09
City Municipal Councils				
5	Bagalkote	0.32	1.32	17.74
6	Bidar	0.42	2.60	25.69
7	Chintamani	0.00	1.99	11.28
8	Dandeli	0.39	0.46	6.83
9	Hosapete	2.05	2.70	29.01
10	Karwar	0.43	0.68	11.47
11	Nanjangud	0.18	0.48	8.73
12	Sagar	0.26	1.43	12.58
13	Shidlaghatta	0.06	0.60	4.71
14	Sira	0.42	0.00	8.87
15	Udupi	0.00	3.86	19.76
Town Municipal Councils				
16	Bhatkal	0.00	0.39	3.75
17	Hiriyur	0.42	0.57	16.06
18	Humnabad	0.01	0.43	5.12
19	Kakkera	0.00	0.04	0.10
20	Kumta	0.28	0.30	3.14
21	Maddur	0.16	0.13	6.40
22	Magadi	0.14	0.09	4.57
23	Malur	0.23	0.40	4.30
24	Manvi	0.28	0.46	2.68
25	Mugalkhod	0.00	0.05	0.11
26	T. Narasipura	0.03	0.34	3.35
27	Ugar Khurd	0.00	0.07	0.20
Town Panchayats				
28	Ainapura	0.00	0.07	0.09
29	Chinchali	0.00	0.08	0.14
30	Gudibande	0.03	0.10	1.79
31	Honnavara	0.01	0.35	2.97
32	Koppa	0.02	0.04	1.66
33	Kudligi	0.00	0.63	3.53
34	Raibag	0.00	0.24	2.42
35	Sringeri	0.00	0.11	1.19
Total		**61.59**	**24.13**	**677.38**

Source: Information furnished by test-checked ULBs

Appendix 4.4

(Reference: Paragraph 4.6/Page 27)

Statement showing the details of diversion of funds allocated for SWM

(₹ in lakh)

Sl. No.	Name of the ULB	Name of the fund	Name of the item	Estimated cost	Amount	Date of payment
1	CC Ballari	2012-13 13th FCG	Open *nala* de-silting machine	42.00	41.90	27.02.14
2			Sewer Suction cum jetting machine	40.00	35.25	27.12.13
3			Power radar for cleaning UGD	5.00	5.00	27.02.13
4			Man hole de-silting machine	3.50	3.50	21.01.14
5			Hand held non-motorised cleaners	1.50	0.00	-
6			Truck-mounted water tanker	8.00	7.90	14.06.16
7		2013-14 13th FCG	Purchasing of 4,000 litres capacity sucking cum jetting machine	28.97	0.00	-
8	HDMC	2012-13 13th FCG	4,000 litre capacity Suction cum Jetting machine (2 Nos)	52.00	52.51	15.12.14
9			Manhole Desilting Machine	8.50	7.35	09.05.16
10	CC Tumakuru	SFC 2012-13	Purchase of Sucking & Jetting vehicle for UGD Purpose	24.82	0.00	-
11			Purchase of fogging machine	25.00	23.80	01.06.15
12			Purchase of Manhole De-silting Machine	25.00	29.80	23.05.14
13		SFC 2014-15	Yearly cleaning solution using of Microbial infusion in STP Unit	40.00	40.00	NA
14			Purchase of 2 vehicles of 6,000 litre capacity Suction & Jetting machine for UG complaint Reliefs	25.00	25.00	NA
15			Purchase of Mobile Toilet	12.00	11.50	NA
16			Purchase of Corpse Vehicle	20.00	12.50	NA
17		SFC 2015-16	Purchase of Sucking & Jetting vehicle for UGD Purpose	12.00	10.25	NA
18	CMC Karwar	2013-14 13th FCG	Purchase of De-silting Machine	14.00	10.26	NA
19			Purchase of fogging machine	4.00	0.96	NA
20	CMC Chintamani	2012-13 13th FCG	Truck mounted Suction cum Jetting machine having 4,000 litre capacity	28.00	24.88	28.09.13
21	CMC Dandeli	2012-13 13th FCG	Purchase of vehicle mounted fogging machine	5.00	4.92	NA
22	CMC Sira	2013-14 13th FCG	Purchase of land for STP Unit	14.40	14.40	31.10.15
23		2014-15 13th FCG	Purchase of De-silting Machine	13.00	0.00	-
24	TMC Bhatkal	2012-13 13th FCG	Purchase of auto mounted fogging machine	2.00	2.00	NA
25	TMC Humnabad	2012-13 13th FCG	Purchase of jetting machine	5.20	5.20	11.02.13
			Purchase of drain cleaning machine	7.50	7.50	11.02.13
		2016-17 14th FCG	Purchase of fogging machine	3.00	0.00	-
26	TMC Kumta	2012-13 13th FCG	Purchase of water tanker	3.00	3.00	NA
			Purchase of fogging machine	3.54	1.80	17.01.17
Total				**475.93**	**381.18**	

Source: Information furnished by test-checked ULBs

Appendix 4.5

(Reference: Paragraph 4.6/Page 28)

Statement showing the diversion of funds in CMC, Sira

(₹ in lakh)

Year of action Plan	Name of the originally approved work	Estimated Amount	Name of the work now approved	Estimated Amount	Expenditure	Date of payment
2009-10 SFC	Purchase of Twin container Dumper placer	10.50	Construction of CC drain near St. Anns school in ward no.2	4.00	10.23	27.09.16 27.10.16 17.02.17
			Construction of additional Room for Home Guard office	1.50		
			Construction of Anganwadi building at Kalidas nagar in ward no.8	5.00		
	3 cum secondary storage container-2	0.90	Laying of interlock pavers from Canara bank to Swathi Hospital in ward no.29	3.40	3.25	27.10.16
	4.5 Cum secondary storage container-4	2.20				
	Construction of SWM platform	0.30				
2011-12 SFC	Purchase of Sucking and Jetting machine	5.11	Construction of CC drain in Jyothinagar in ward no.3	3.50	2.32	20.07.16
			Iron Grill work for Social Welfare department in ward no.2	1.61		
2012-13 SFC	Construction of Bio-methanation plant	23.00	Laying Bituminous road from NH 47 to Morarji Desai residential school	11.00	00	
			Bituminous road for cross roads in Mallikapura region in ward 26	4.00		
			Construction of CC drain in wards 19 and 20	8.00		
	Total	**42.01**		**42.01**	**15.80**	

Source: Records of CMC, Sira

Appendix 5.1

(Reference: Paragraph 5.2/Page 29)

Statement showing details of modes of communication used for IEC activities

Sl. No.	ULB	Audio	Video	Mass communication	Wall Paintings	Schools	Hoardings	Street *Jathas*	Pamphlets
City Corporations									
1	Ballari	Yes	No	No	Yes	Yes	Yes	NA	No
2	HDMC	Yes	Yes	No	No	No	No	NA	Yes
3	Mangaluru	Yes	Yes	TV Channel	Yes	Yes	Yes	Yes	Yes
4	Tumakuru	Yes	Yes	TV Channel	Yes	Yes	Yes	Yes	Yes
City Municipal Councils									
5	Bagalkote	No	Yes	Newspaper	No	No	Yes	No	Yes
6	Bidar	No	No	Newspaper	No	No	Yes	No	Yes
7	Chintamani	No	No	No	No	No	No	No	Yes
8	Dandeli	No	No	Newspaper	No	Yes	Yes	No	Yes
9	Hosapete	Yes	Yes	TV Channel	Yes	Yes	Yes	No	Yes
10	Karwar	Yes	Yes	No	No	No	Yes	No	Yes
11	Nanjangud	NA	NA	NA	NA	NA	NA	NA	NA
12	Sagar	Yes	Yes	TV Channel	No	Yes	Yes	Yes	Yes
13	Shidlaghatta	No	No	No	No	No	No	No	No
14	Sira	Yes	No	Newspaper	Yes	No	No	Yes	Yes
15	Udupi	Yes	No	No	No	Yes	No	No	Yes
Town Municipal Councils									
16	Bhatkal	Yes	Yes	No	No	No	No	No	Yes
17	Hiriyur	No	No	No	No	No	No	No	Yes
18	Humnabad	No	No	No	No	Yes	No	Yes	No
19	Kakkera	No	No	No	No	No	No	No	Yes
20	Kumta	Yes	Yes	TV Channel	Yes	Yes	Yes	Yes	Yes
21	Maddur	NA	NA	NA	NA	NA	NA	NA	NA
22	Magadi	No	No	No	No	No	No	No	Yes
23	Malur	No	No	No	No	No	No	No	Yes
24	Manvi	No	No	No	No	No	No	No	Yes
25	Mugalkhod	No	No	No	No	No	No	No	No
26	T.Narasipura	Yes	No	No	No	No	No	Yes	Yes
27	Ugar Khurd	NA	NA	NA	NA	NA	NA	NA	NA
Town Panchayats									
28	Ainapura	No	No	No	No	No	No	No	Yes
29	Chinchali	No	No	No	No	No	No	No	Yes
30	Gudibande	No	No	No	No	Yes	No	No	No
31	Honnavara	No	No	No	No	No	No	No	No
32	Koppa	No	No	No	No	Yes	No	Yes	No
33	Kudligi	Yes	Yes	TV Channel	Yes	Yes	Yes	No	Yes
34	Raibag	No	No	No	No	No	No	No	Yes
35	Sringeri	No	No	No	No	Yes	No	No	No

Source: Information furnished by test-checked ULBs NA: Not available

Appendix 8.1

(Reference: Paragraph 8.2.5/Page 61)

Statement showing the actual periodicity of collection of BMW in Government hospitals compared with that prescribed in the agreements

Sl. No.	Name of the ULB	Periodicity as per agreement	Actual periodicity
1	HDMC	Not available	Not available
2	CMC, Chintamani	3 days in a week	Daily
3	CMC, Dandeli	Not specified	Alternate days
4	CMC, Hosapete	Daily	Daily
5	CMC, Nanjangud	Not specified	Alternate days
6	CMC, Sagar	2 days in a week	Once in 3 days
7	CMC, Shidlaghatta	3 days in a week	Daily
8	CMC, Sira	Daily	Alternate days
9	TMC, Bhatkal	Alternate days	Alternate days
10	TMC, Hiriyur	Daily	Once in 3 days
11	TMC, Humnabad	Not available	Not available
12	TMC, Kakkera	Not available	Once in a week
13	TMC, Kumta	Not specified	Alternate days
14	TMC, Maddur	Not specified	Alternate days
15	TMC, Magadi	Except Sunday	Once in 3 days
16	TMC, Malur	Thrice a week	Thrice a week
17	TMC, Manvi	Not specified	Alternate days
18	TMC, Mugalkhod	Daily	Once in a week
19	TMC, T. Narasipura	Not specified	3-7 days
20	TMC, Ugar Khurd	Daily	Once in a week
21	TP, Ainapura	Daily	Alternate days
22	TP, Chinchali	Not specified	Weekly twice
23	TP, Honnavara	Alternate days	Alternate days
24	TP, Koppa	Daily	Alternate days
25	TP, Kudligi	Daily	Alternate days
26	TP, Raibag	Regularly	Daily

Source: Information furnished by test-checked ULBs

Appendix 11

Compilation of Good practices

1. Municipal Solid Waste Management Plan (Paragraph 3.3/Page 9)

Ahmedabad Municipal Corporation (AMC)

AMC developed (March-May 2012) a road map for zero waste city, which consists of ten focal areas and 34 strategic actions, to guide AMC to introduce and implement policies and strategies, and to raise awareness amongst private, business, industrial, scientific and research communities in Ahmedabad to work together towards a resource efficient and zero waste society. The road map for zero waste provided a conceptual framework to address SWM issues in the city. AMC engaged a non-profit organisation to prepare a master plan for SWM. The methodology adopted for preparing the master plan included the following:

- Developing a city profile;
- Assessment of existing waste management practices;
- Stakeholder consultations;
- Future population and waste generation projections;
- Developing alternate scenarios for strengthening SWM;
- Drafting key recommendation for strengthening municipal SWM services;
- Institutional arrangements and human resource requirements; and
- Capital investment plan and potential funding sources.

Along with devising a SWM master plan that guides policy decisions and investments in the sector, AMC has framed public health bye-laws for creating standards and norms at the local level, for various SWM processes.

The Health bye-laws are applicable to every public and private space, commercial centres, residences and all other premises and include detailed regulations on waste management process, prevention of waterborne, vector borne and food borne diseases, offences under the bye-laws, general offences which are applicable to all the citizens within city limit, enforcement of the provisions and schedule of fines.

Apart from the above, AMC initiated IEC campaign and established mobile courts to address violations.

Source: Compendium of Good Practices under Urban Solid Waste Management in India Cities - National Institute of Urban Affairs (2015)

Appendix 11 (contd.)

2. Integration of informal waste collector in waste management (Paragraph 3.9/Page 14)

Pune Municipal Corporation

Pune Municipal Corporation (PMC) launched (2005-06) a pilot program for door-to-door collection in partnership with *Kagad Kach Patra Kashtakari* Panchayat (KKPKP). PMC played the role of enabler and facilitator and provided equipment, infrastructure and management support. KKPKP trained 1500 waste pickers in door-to-door collection to provide service to 1.25 Lakh households in exchange of a user fee. The pilot proved to be a success, as it offered a sustainable mechanism for institutionalizing door-to-door collection in Pune and improved the working conditions for the waste pickers.

The pilot project continued for two years from 2006-2008 after which PMC decided to scale up the initiative to cover the whole city. The waste picker members of KKPKP came together to form SWaCH (Solid Waste Collection and Handling or, officially SWaCH *Seva Sahakari Sanstha Maryadit*, Pune) a co-operative of self-employed waste pickers to provide front-end waste management services to the citizens of Pune.

Today SWaCH provides door-to-door waste collection services to 4 lakh households in the city and covers 60 *per cent* of PMC's geographical area. Remaining 40 *per cent* households are dependent on PMC's trucks or community bins for disposal. Out of 144 municipal wards, SWaCH covers 122 wards.

Source: Compendium of Good Practices under Urban Solid Waste Management in India Cities - National Institute of Urban Affairs (2015)

3. Constitution of Ward Committees (Paragraph 3.10/Page 15)

- The Corporation of Cochin, in its endeavor (2007) to ensure source segregation of MSW and its institutionalisation at Kochi, formed, *inter alia*, Ward level Sanitation Committees with the respective ward Councilor as Chairman and Junior Health Inspector, representatives of RWAs, Confederation of Real Estate Developers Association of India (CREDAI), NGOs, *etc*., as members for each ward. As a result, institutional and managerial models were established. Intensive interactive meetings on the overall concept of segregation with residents and citizens of wards were held by the Ward Council, Corporation officials, Councilors as well as representatives of NGOs and Sanitation committees.
- The Government of Andhra Pradesh, while formulating (February 2014) Integrated Municipal Solid Waste Management Strategy, 2014, included greater emphasis on civic engagement by involving NGOs, women community groups, Ward Committees/Sabhas, Area Sabhas, *etc.*, in awareness generation as one of the guiding principles of the SWM strategy.

Source: Manual on MSWM, 2016

Appendix 11 (contd.)

4. Good practices in segregated collection of MSW (Paragraph 6.1.1.1/Page 34)

CMC, Dandeli has an arrangement for collecting waste from 27 out of 31 wards. Other four wards come under West Coast Paper Mills (Organisation) area and the door-to-door collection of waste and its disposal are managed by the Organisation itself.

Exhibit 11.1: Collection of waste (27.04.2017) **Vermicomposting (27.04.2017)**

Source: Joint Physical Verification

CMC, Kolar - The door-to-door waste collection is carried out by *pourakarmikas* who come by each street with a cart carrying four bins each. A single cart is managed by 2 municipal sweepers provided with all safety and hygiene equipment including gloves, masks and coats. They also carry with them a weighing scale in order to weigh each batch of waste they collect. This helps in monitoring the system, finding discrepancies in segregation as well as serves as a continuous waste audit of the city. At each collection point, bins are offloaded and fresh bins are placed at the site for the next round of collection. A municipal truck collects waste from the collection point. The municipal corporation has tied up with local waste dealers, itinerant buyers (*raddi wallah*) and larger waste traders to whom all dry recyclables are sold.

Exhibit 11.2: Neatly segregated wet waste in CMC, Kolar

Source: An Inclusive Swachh Bharat through the Integration of the Informal Recycling Sector: A Step by Step Guide

Appendix 11 (concld.)

5. Usage of Plastic waste in road formation by KRRDA (Paragraph 8.1.3/Page 57)

Use of plastic waste for laying of roads under Pradhan Mantri Gram Sadak Yojana (PMGSY) and Namma Grama Namma Rasthe Yojane (NGNRY)

Karnataka Rural Road Development Agency (KRRDA), as part of promoting cost effective and fast construction technology focused on use of locally available marginal materials for construction of rural roads in the State. Use of waste plastic was one of the technology adopted. The extent of length of plastic road sanctioned and completed during the period 2012-13 to 2016-17 is indicated below.

Details of sanctioned and completed length of plastic roads by KRRDA

(in kilometres)

Sl. No.	Scheme	Year of sanction	Sanctioned length	Completed length
1	PMGSY II	2013-14	129.74	121.37
2	NGNRY II	2012-13	3.73	6.75
3	NGNRY III	2014-15	200.22	177.09
4	NGNRY IV	2016-17	96.18	-
Total			**429.87**	**305.21**

The performance studies carried out indicated satisfactory performance with good skid resistance, good texture value and stronger road.

Source: Information furnished by KRRDA

Glossary	
3R	Reduce, Reuse and Recycle
ACS	Additional Chief Secretary to Government
AFR	Alternative Fuel and Raw Material
AIILSG	All India Institute of Local Self Government, Pune
AMC	Ahmedabad Municipal Corporation
AMRUT	Atal Mission for Rejuvenation and Urban Transformation
BBMP	Bruhat Bengaluru Mahanagara Palike
BMW	Bio-medical Waste
BRIMS	Bidar Institute of Medical Sciences
C&D	Construction and Demolition
CBMWTF	Common Bio-medical Waste Treatment Facility
CBO	Community-based organizations
CC	City Corporation
CCTV	Closed Circuit Television
CD	Compact Disc
CEERA	Centre for Environmental Education, Research and Advocacy
CFC	Central Finance Commission
CFE	Consent for Establishment
CFL	Compact Fluorescent Lamp
CFO	Consent for Operation
CMAK	City Managers' Association, Karnataka
CMC	City Municipal Council
CMSWMF	Common Municipal Solid Waste Management Facility
CPCB	Central Pollution Control Board
CREDAI	Confederation of Real Estate Developers Association of India
DC	Deputy Commissioner
DEWATs	Decentralised Waste Water Treatment Systems
DMA	Director of Municipal Administration
DPRs	Detailed Project Reports
DUDC	District Urban Development Cell
EPR	Extended Producer Responsibility
EW Rules, 2011	E-Waste (Management and Handling) Rules, 2011
E-waste	Electronic waste
EWM Rules, 2016	E-Waste Management Rules, 2016
FC	Finance Commission
GoI	Government of India
GPS	Global Positioning System
HCE	Health Care Establishment
HDMC	Hubballi-Dharwad Municipal Corporation
HDPE	High Density Polyethylene
IEC	Information, Education and Communication
JPV	Joint Physical Verification
KKPKP	*Kagad Kach Patra Kashtakari Panchayat*
KM Act, 1964	Karnataka Municipalities Act, 1964
KMAM	Karnataka Municipal Accounting Manual

Glossary	
KMC Act, 1976	Karnataka Municipal Corporations Act, 1976
KRRDA	Karnataka Rural Road Development Agency
KSPCB	Karnataka State Pollution Control Board
KUIDFC	Karnataka Urban Infrastructure Development and Finance Corporation
MoEFCC	Ministry of Environment, Forest and Climate Change
MoUD	Ministry of Urban Development
MSW	Municipal Solid Waste
MSW Rules, 2000	Municipal Solid Waste (Management and Handling) Rules, 2000
MSWM	Municipal Solid Waste Management
MT	Metric ton
NGNRY	Namma Grama Namma Raste Yojane
NGO	Non-Government Organisation
NGT	National Green Tribunal
O&M	Operation and Maintenance
OB	Opening Balance
PIP	Persons in position
PMC	Pune Municipal Corporation
PMGSY	Pradhan Mantri Gram Sadak Yojana
PRIs	Panchayat Raj Institutions
PW Rules, 2011	Plastic Waste (Management and Handling) Rules, 2011
PWD	Public Works Department
PWM Rules, 2016	Plastic Waste Management Rules, 2016
RDF	Refuse-derived Fuel
RPCB	Regional Pollution Control Board
SBM	Swachh Bharat Mission
SEIAA	State Environment Impact Assessment Authority
SFC	State Finance Commission
SHG	Self Help Group
SIUD	State Institute of Urban Development, Mysuru
SLB	Service Level Benchmark
SS	Sanctioned strength
SWaCH	Solid Waste Collection and Handling or, officially *SWaCH Seva Sahakari Sanstha Maryadit*, Pune
SWM	Solid Waste Management
TMC	Town Municipal Council
TNA	Training needs analysis
ToR	Terms of Reference
TP	Town Panchayat
TPD	Tons per day
UDD	Urban Development Department
UGD	Underground Drainage
ULB	Urban Local Body
VIMS	Vijayanagar Institute of Medical Sciences
Water Act, 1974	Water (Prevention and Control of Pollution) Act, 1974
WP	Writ Petition

Definitions

Bio-medical waste - Any waste, which is generated during the diagnosis, treatment or immunisation of human beings or animals or research activities pertaining thereto or in the production or testing thereof.

Bio-methanation - Anaerobic (in the absence of air or free oxygen) digestion of biodegradable organic waste in an enclosed space under controlled conditions of temperature, moisture, pH, *etc*.

Compactor vehicle - Collection vehicle using high-power mechanical or hydraulic equipment to reduce the volume of solid waste.

Composting - Controlled aerobic process of biologically "digesting" the MSW.

Construction and demolition (C&D) waste - Waste materials generated by the construction, refurbishment, repair and demolition of houses, commercial buildings and other structures. It mainly consists of earth, stones, concrete, bricks, lumber, roofing materials, plumbing materials, heating systems and electrical wires and parts of the general municipal waste stream, but when generated in large amounts at building and demolition sites, it is generally removed by contractors for filling low-lying areas and by urban local bodies for disposal at landfills.

Domestic hazardous waste - Hazardous waste generated in the households and includes items such as batteries, shoe polish, paints, thinners, medicated shampoos, light bulbs, Compact Fluorescent Lamp (CFLs), cosmetic products, *etc*.

E-waste or electronic waste - Electrical and electronic equipment, whole or in part discarded as waste by the consumer or bulk consumer as well as rejects from manufacturing, refurbishment and repair processes.

Incineration - Waste treatment process that involves combustion of waste at very high temperatures in the presence of oxygen, resulting in the production of ash, flue gas, and heat.

Plastic waste - Any plastic product such as carry bags, pouches or multilayered packaging discarded after use or after their intended use is over.

Primary collection - Process of collecting waste from households, markets, institutions and other commercial establishments and taking the waste to a storage depot or transfer station or directly to the disposal site.

Processing - Any scientific process by which segregated solid waste is handled for the purpose of reuse, recycling or transformation into new products (Rule 3(35) of SWM Rules, 2016).

Refuse Derived Fuel - The high calorific non-recyclable combustible fraction of processed MSW, which is used either as a fuel for steam and electricity generation or as alternate fuel in industrial furnaces and boilers. The composition of RDF is a mixture that has higher concentrations of combustible materials than those present in the parent mixed MSW (Section 4.3.6 of MSWM Manual, 2016 -Volume I).

Sanitary waste - Waste comprising of used diapers, sanitary towels or napkins, tampons, condoms, incontinence sheets and any other similar waste (Rule 3(41) of SWM Rules, 2016).

Secondary collection - Picking up waste from community bins, waste storage depots or transfer stations and transporting it to waste processing sites or final disposal site.

Slaughterhouse - A place where 10 or more than 10 animals are slaughtered per day and is duly licensed or recognised under a Central, State or Provincial Act or any rules or regulations made thereunder.

Special waste - Any solid waste or a combination of solid wastes that requires special handling and disposal because of its quantity, concentration, physical and chemical characteristics, or biological properties, in order to protect human health, as well as the environment and to exploit its potential for recycling.

Transportation - Conveyance of solid waste, either treated, partly treated or untreated from a location to another location in an environmentally sound manner through specially designed and covered transport system to prevent the foul odour, littering, and unsightly conditions.

Treatment - The method, technique or process designed to modify physical, chemical or biological characteristics or composition of any waste so as to reduce its volume and potential to cause harm (Rule 3(53) of SWM Rules, 2016).

Vermi composting - A process of conversion of bio-degradable waste into compost using earthworms.

Waste to Energy - Where material recovery and composting from MSW is not possible or desirable due to local conditions or because of the nature of waste, recovery of energy from MSW is suggested as a feasible alternative. When high calorific value fractions of MSW are either incinerated (thermal process) or biodegradable fraction of MSW is processed anaerobically (bio-methanation), the resultant energy, either as heat (incineration) or biogas (methane) can be reused either directly or converted to electricity using appropriate generators (Section 4.3.3 of MSWM Manual, 2016 -Volume I).

Windrow composting - A process of placing the pre-sorted feedstock in long narrow piles called windrows that are turned on a regular basis for boosting passive aeration.