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REPORT OF THE COMPTROLLER AND AUDITOR GENERAL OF INDIA ON WASTE MANAGEMENT IN URBAN LOCAL BODIES

SUPREME AUDIT INSTITUTION OF INDIA

लोकहितार्थ सत्यनिष्ठा

Dedicated to Truth in Public Interest

Government of Kerala

Report No. 9 of the year 2022

Presented to the Legislature
on 14 September 2023

REPORT OF THE COMPTROLLER AND AUDITOR GENERAL OF INDIA

ON

WASTE MANAGEMENT IN URBAN LOCAL BODIES

GOVERNMENT OF KERALA
Report No. 9 of the year 2022

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PREFACE

1. This Report of the Comptroller and Auditor General of India for the year ended 31 March 2021 has been prepared for submission to the Governor of the State of Kerala under Article 151(2) of the Constitution of India for being placed in the State Legislature.
2. The Report covering the period 2016-21 contains the results of Performance Audit of 'Waste Management in Urban Local Bodies'.
3. The audit was conducted in conformity with the Auditing Standards issued by the Comptroller and Auditor General of India.

EXECUTIVE SUMMARY

Executive Summary

Municipal Solid Waste Management in urban areas has emerged as one of the biggest challenges the country faces today. Rapid urbanization has aggravated the complexities of the situation. Inadequate management of waste would have significant negative impact on public health and environmental outcomes.

Considering the significance of waste management in urban areas, the Comptroller and Auditor General of India took up this performance audit, covering the period 2016-2021, with an objective to assess whether the strategy and planning of waste management in ULBs was in accordance with extant provisions and supported by adequate institutional mechanism. Audit also proposed to analyse whether the tasks and projects associated with management of waste (all through the stages of segregation, collection, transportation, processing and disposal) in ULBs were planned, implemented and maintained in an effective manner. Care was also taken to examine the extent to which the risks to environment posed by waste were identified and minimised.

The 22 test-checked ULBs adopted per capita estimates of waste generation without conducting any survey, during the audit period 2016-2021. We observed that this method had low level of reliability. No scientific study has so far been conducted to assess the quantity, composition and physical and chemical characteristics of the waste generated in the State.

There was delay of over two years in the preparation of the State Policy and over four years in the formulation of State Strategy on waste management. The test-checked ULBs did not prepare short term or long-term plans. Byelaws were either not prepared or not approved by Government.

Preparation of several Detailed Project Reports over a very short period without proper gap analysis of institutional capacity resulted in non-incorporation of comprehensive data regarding the existing waste management system. Due to non-preparation/delay in preparation of DPRs by eleven ULBs in the State, ULBs lost Central assistance to the tune of ₹ 45.82 crore.

Audit noticed rampant use of banned plastic carry bags in all test-checked ULBs and low utilization of shredded plastic in road construction works. Material Collection Facilities and Resource Recovery Facilities were either not installed or non-functional in the ULBs. Informal waste collectors/waste pickers were not seen integrated into the formal waste management system.

Implementation of Solid waste management projects in ULBs was undertaken utilising funds received from Central/ State Governments as well as Own funds. Test-checked ULBs utilised only 0.48 to 1.66 *per cent* of Development fund for waste management, which was much lower than the prescribed 10-15 *per cent*. While fourteen ULBs did not utilise Own funds for implementing any SWM project

during the five-year audit period, the percentage of utilisation by the remaining eight was only upto 5.34 *per cent*.

Low priority was accorded to Information, Education and Communication activities as reflected in absence of Strategy/Plan/targets at State/District/ULB level, besides poor utilisation of funds.

Incomplete segregation of waste at source and secondary levels resulted in flow of mixed waste to processing sites. Colour coded bins were not provided to households in all test-checked ULBs. Disposal of huge quantity of rejects by ULBs was noticed due to improper segregation at source level and secondary stage. Very few restaurants/community halls in test-checked ULBs had source level treatment facilities. Though installation of source level treatment facility was mandatory in apartments, only 52 *per cent* (286 out of 548) of apartments had the facility. Only three test-checked ULBs had a system for collection of poultry waste, and food waste was seen disposed by restaurants to pig farms. The test-checked ULBs did not have a system for collection of domestic hazardous waste, sanitary waste and horticulture waste. Test-checked ULBs were far from achieving 100 *per cent* door-to-door collection of waste. Besides, the State has no landfill facility for disposal of waste. The only landfill site in the State at Ambalamedu for disposal of hazardous waste is being used for disposal of mixed/ non-hazardous waste.

The ULBs used open vehicles or vehicles without partition for waste transportation, which was against the Rules. In Kochi and Thiruvananthapuram Corporations, vehicles owned by the local bodies were off the road for want of timely repair and receipt of fitness certificates, while private vehicles continued to be hired for waste transportation.

Audit observed huge accumulation of wastes in the Centralised processing plant of Kochi Corporation at Brahmapuram which has been functioning without the authorisation of Pollution Control Board for several years. Leachate treatment plant was non-functional at the processing facilities in Brahmapuram and Njaliyanparamba. Out of the 14 dumpsites in test-checked ULBs, remediation works had not commenced in any of the Municipalities.

The absence of proper segregation of waste led to mixing of solid waste with plastic waste, bio-medical waste and e-waste. Several Healthcare institutions were functioning without authorisation and resorting to unauthorised means of disposal of bio-medical waste, thereby endangering the environment. Though bio-medical waste is to be treated and disposed within 48 hours, there was a huge backlog at the IMAGE facility at Palakkad due to insufficient disposal capacity. The KEIL facility on the other hand, handled only 6.2 tonnes, despite capacity to handle 16 tonnes per day.

Test-checked ULBs did not collect or channelise e-waste to authorised dismantlers/recyclers and e-waste was found mixed with municipal solid waste.

None of the test-checked ULBs had a system in place for accounting, collecting and disposing Construction and Demolition waste.

Recommendations

I Planning and Financial Management

- ***Government must ensure that scientific estimation of quantity and composition of waste generated in Urban Local Bodies are taken up on priority basis to establish adequate treatment and disposal facilities of all categories of waste. Waste moving through the system needs to be quantified at multiple locations in different seasons, to assess the actual quantities of waste available for processing and disposal, so as to identify and plan for innovative and efficient treatment technologies.***

  (Recommendation 1)

- ***Government must ensure that Urban Local Bodies formulate Municipal Solid Waste Management Plans and have approved Byelaws in place for effective management of waste. The waste management plans formulated may also provide for integration of informal waste pickers into the formal system of waste management.***

  (Recommendation 2)

- ***Government must promote Information, Education and Communication (IEC) campaign by ULBs in a sustained manner by formulating yearly plans and targets for effective utilisation of available funds. Government must undertake IEC campaign through its Public Relations wings and other agencies, to create public awareness among waste generators on the need to minimise waste generation, re-use waste to the extent possible, practise segregation of waste and desist from littering in public spaces.***

  (Recommendation 3)

- ***Government must ensure that ULBs enhance the extent of utilisation of Central/State funds and Own Revenue allocated for waste management. They may take earnest efforts to step up collection of Service Cess and User fee, so as to contribute to expenditure on waste management activities.***

  (Recommendation 4)

- ***Government must consider fixing a mandatory minimum percentage of expenditure to be incurred exclusively on solid waste management by the Local Self Government Institutions.***

  (Recommendation 5)

II SEGREGATION, COLLECTION AND TRANSPORTATION OF WASTE

- ***Government must ensure that ULBs adopt effective strategies for segregation of waste at various levels, viz. source/ household, centralised sorting facility and waste processing sites, door-to-door collection of domestic hazardous waste and sanitary waste and providing separate colour coded bins at public places to enable effective segregation and collection of waste.***

(Recommendation 6)

- ***Government/ULBs must ensure that a realistic assessment of vehicles used by ULBs for transportation of waste is undertaken. Urgent action needs to be initiated for executing maintenance/repair works of vehicles to limit hiring of vehicles while keeping own vehicles off the road for prolonged periods.***

(Recommendation 7)

III PROCESSING AND DISPOSAL OF WASTE

- ***Government/ULBs must ensure adequate resources to implement source level treatment facilities for processing of biodegradable waste and handhold households/institutions for effective utilisation of the facilities provided. Government must also set up adequate number of community level facilities for processing spillover waste from all sources.***

(Recommendation 8)

- ***Government must ensure that mixed waste generated gets segregated at source points itself and biodegradable waste alone reach the Centralised processing plants at Brahmapuram and Njaliyanparamba. Government must also urge the Corporations to set up Leachate treatment plants to treat the leachate generated, thereby preventing pollution of nearby water bodies and farmlands.***

(Recommendation 9)

IV MANAGEMENT OF PLASTIC WASTE, BIO-MEDICAL WASTE, E-WASTE AND CONSTRUCTION AND DEMOLITION WASTE

- ***Government must direct State Pollution Control Board to establish a mechanism by which Producers, Importers and Brand owners of products fulfill their Extended Producer Responsibility (EPR) obligation under Plastic Waste and E-waste Management Rules 2016.***

(Recommendation 10)

- ***With a view to maximise the possibility of reduction, reuse and recycling (3R strategy) of waste generated, Government must ensure that ULBs effectively implement ban on single use plastic, promote substitutes for***

plastic carry bags, use non-recyclable shredded plastic in roads, operationalise Waste-to-energy plants, etc.

(Recommendation 11)

- ***Government must ensure that ULBs set up Material Collection Facilities (MCF) in all wards to facilitate proper segregation of recyclable portion of plastic waste.***

(Recommendation 12)

- ***Government must initiate urgent steps for establishing Common Bio-medical Waste Management Facilities at regional level to ensure disposal of bio-medical waste within the time limit and distance specified in the Rules. Government and the State Pollution Control Board must oversee that Health care facilities (HCFs) are functioning with proper authorisation and that solid/liquid bio-medical waste generated in these HCFs are treated effectively.***

(Recommendation 13)

- ***ULBs must place appropriate containers for collection of Construction and Demolition (C&D) waste and identify land for establishing processing plant for C&D waste generated within their jurisdiction.***

(Recommendation 14)

V MONITORING

- ***Government and the State Pollution Control Board must jointly establish an effective mechanism for monitoring the performance of solid waste management system, complying with extant Rules. Government must also operationalise computerised Management Information System (MIS) and resort to stringent action to curb instances of violation of Waste Management Rules.***

(Recommendation 15)

Brahmapuram dumpsite,
Kochi Corporation
November 2021

CHAPTER I

INTRODUCTION

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INTRODUCTION

Waste comprise of materials which a generator has no further use of in production, transformation or consumption, and which is required to be disposed of. Wastes are generally classified as Municipal Solid Waste (MSW), Bio-medical Waste (BMW), Construction and Demolition (C&D) waste, E-waste, Plastic 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. Proper waste management presents an opportunity not only to avoid the detrimental impacts associated with waste, but also to recover resources, realise environmental, economic and social benefits and take a step on the road to a sustainable future. Scientific disposal of solid waste through segregation, collection, transportation, processing and disposal in an environmentally acceptable manner minimises its adverse impact on public health and environment.

1.1 Solid Waste Management in Kerala

Kerala, with a total population of 3.34 crore[1], urban population of 1.59 crore (47.70 *per cent*) and annual urban population growth of 6.50 *per cent*, has been urbanizing at a rapid pace. The total solid waste generation in Kerala is estimated at 3.70 million tonnes annually, of which 2.17 million tonnes (59 *per cent*) are contributed by Urban Local Bodies (ULBs). Of the total waste generated in the State, the share of biodegradable and non-biodegradable waste is at 69 *per cent* and 31 *per cent* respectively. The scientific processing and disposal of waste including the development of infrastructure for collection, storage, segregation, transportation, processing and disposal of MSW is an obligatory duty of the ULBs. Currently, the waste management system in the State focuses on the citizens' responsibility to manage biodegradable waste at source, under the campaign 'My waste, my responsibility', thereby instilling a sense of ownership and duty with regard to waste management.

1.2 Organisational set up

The Additional Chief Secretary, Local Self Government Department is the head of the administrative department of ULBs. The Municipal Secretary of each Corporation/Municipality is the administrative head of the ULB and is assisted by the Health Officer/Health Supervisor/Health Inspector in the management of MSW.

1.2.1 Responsibilities of different departments and agencies

The Kerala Municipality Act, 1994 (KM Act), promulgated in line with the 74th Constitution Amendment, provides the legal framework which enables the ULBs to function as the third tier of Government. ULBs are thus empowered to perform functions and implement schemes in relation to 18 subjects specified in the Twelfth schedule, which includes Solid Waste Management. The departments and agencies involved in waste management in the State and the roles assigned to them are represented in **Table 1.1**:

[1] As per 2011 census

Table 1.1: Departments and agencies involved in waste management in the State and the roles assigned to them

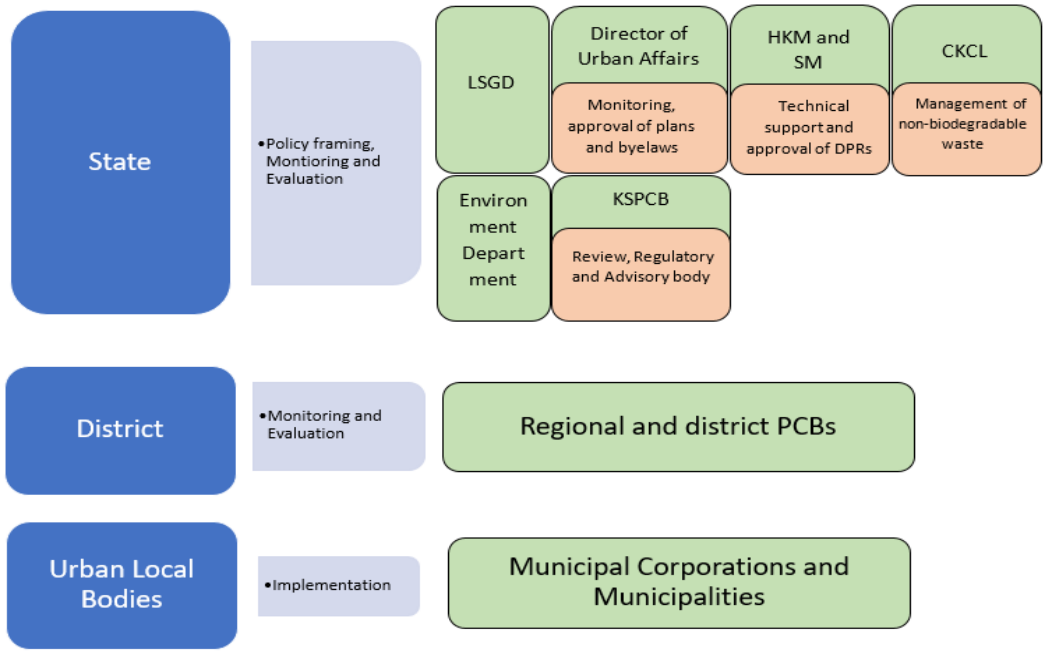
Department / Agency	Roles
Local Self-Government Department (LSGD)	Formulation of policies, overseeing of various service delivery and regulatory agencies associated with decentralised governance, monitoring of performance of local governments in their regulatory and service delivery functions, standardisation of planning processes, technical norms and financial integrity through guidelines issued from time to time.
Environment Department	Nodal department for planning, promotion, coordination, and overseeing the implementation of Central/State environmental protection and conservation policies/programmes and issue of directions to implement the Plastic Waste Management Rules, 2016.
Kerala State Pollution Control Board (KSPCB)	Implementation of various rules in the State under Environment (Protection) Act, 1986. The principal agency for monitoring and controlling waste management, enforces the Solid Waste Management Rules, 2016 and related rules, monitors compliance of Extended Producer Responsibility for E-waste and environmental standards, with strict adherence to the conditions specified for waste processing and disposal sites.
Suchitwa Mission (SM)	Technical Support Group in the waste management sector under LSGD. Responsible for providing technical and managerial support to Local Self Governments of the State.
Haritha Keralam Mission (HKM)	An umbrella mission combining three subsidiary missions of hygienic waste management, water conservation and agricultural development.
Clean Kerala Company Limited (CKCL)	Comprehensive management of all harmful rejections in the state, management of plastic waste and e-waste, establishing Material Collection Facility (MCF) and Resource Recovery Facility (RRF) in ULBs by

Department / Agency	Roles
	arranging shredding machines, bailing machines etc. and their maintenance.

(Source: Official websites of the Departments/Agencies)

Chart 1.1 depicts the authorities at different levels in the management of MSW in the State.

Chart 1.1: Various authorities involved in the management of Municipal Solid Waste



1.3 Audit Objectives

The Performance Audit was conducted to assess whether:

- the strategy and planning of waste management in ULBs was in accordance with extant provisions and supported by an adequate institutional mechanism
- the tasks and projects associated with waste management (segregation, collection, transportation, processing and disposal) in ULBs were planned, implemented and maintained in an effective, efficient and financially sustainable manner and were adequate to meet the requirements of the ULBs and
- the risks to environment posed by waste were identified and minimised.

1.4 Audit Criteria

The observations in the report were benchmarked against criteria derived from:

- Kerala Municipality Act and Rules, 1994
- Solid Waste Management Rules, 2016
- Manual of Municipal Solid Waste Management, 2016

- State Policy on Solid Waste Management, 2018
- Waste Management Rules, 2016 with respect to E-waste, Plastic waste, Construction and Demolition waste and Bio-medical waste
- The Environment (Protection) Act and Rules, 1986
- Orders/judgements of National Green Tribunal
- Instructions, guidelines and policies issued by Central Pollution Control Board, Kerala State Pollution Control Board, Government of India/Government of Kerala, various parastatal agencies, etc. on solid waste management from time to time.

1.5 Audit Scope, Methodology and Sampling

A Performance Audit (PA) on Solid Waste Management in Urban Local Bodies was included in the Report of the Comptroller and Auditor General of India on Local Self-Government Institutions for the year ended 31 March 2010, which was discussed (January 2022) by the Local Fund Accounts Committee. The recommendations of the Committee are awaited. The present PA examined the efficacy of system of management of waste including solid waste, Plastic waste, Bio-medical waste, E-waste and C&D waste in the selected ULBs, covering the period from 2016-17 to 2020-21. The Entry conference of the PA was held on 23 June 2021 with the Additional Chief Secretary, Local Self Government Department (ACS LSGD), in which the audit methodology, scope, objectives and criteria were explained and agreed upon. The Exit Conference was held on 12 May 2022 with ACS LSGD, wherein the audit findings in the PA report were discussed in detail. The audit methodology involved scrutiny of records, analysis of responses to audit queries, joint physical verifications with municipal staff and collection of photographic/videographic evidence.

For selection of units, the 14 districts in the State were ranked based on the risk criteria *viz*., expenditure incurred by the ULBs for waste management activities, population of ULBs and quantity of waste generated. Three districts from high-risk category and two from low-risk category were selected to get a representative sample of five districts, by simple random sampling methodology using IDEA software. The districts selected were Thiruvananthapuram, Alappuzha, Ernakulam, Malappuram and Kozhikode. All the Municipal Corporations in the selected districts, *viz*., Thiruvananthapuram, Kochi and Kozhikode Corporations and 40 *per cent* of the Municipalities in the selected districts (19 Municipalities[2]) were selected for audit based on simple random sampling using IDEA Software.

1.6 Acknowledgement

Audit acknowledges the cooperation and assistance extended by the Local Self-Government Department, Government of Kerala, Directorate of Urban Affairs, Suchitwa Mission and all test-checked ULBs in the smooth conduct of the PA.

[2] Thiruvananthapuram - Neyyattinkara, Nedumangad;
Alappuzha - Alappuzha, Kayamkulam, Mavelikkara;
Ernakulam - Angamaly, Muvattupuzha , Aluva, Eloor, Kothamangalam, Maradu;
Malappuram - Malappuram , Parappanangadi, Perinthalmanna, Nilambur, Manjeri;
Kozhikode - Koyilandy, Feroke, Vadakara

Palayam Market,
Thiruvananthapuram Corporation
July 2021

CHAPTER II

PLANNING AND FINANCIAL MANAGEMENT

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PLANNING AND FINANCIAL MANAGEMENT

The quantity and composition of Municipal Solid Waste (MSW) generated in the ULB determine the collection, processing and disposal options that could be adopted for waste management. ULBs did not conduct any survey to assess the quantity of waste generated in its jurisdictional area. They did not maintain data on quantum of various categories of waste generated within their jurisdiction. The ULBs adopted per capita generation/ population estimation method for assessing the extent of waste generated. Comparison of details of composition of solid waste as per three different sources of data revealed significant variations in the share of components involved.

The ULBs did not prepare Solid Waste Management (SWM) Plans, Contingency Plans and Byelaws as prescribed in the SWM Rules. There were many deficiencies in the Detailed Project Reports prepared by the test-checked ULBs, which necessitated their revision. Eleven ULBs did not receive Central share worth ₹45.82 crore, due to non-preparation and timely submission of DPRs. The ULBs did not conduct a realistic assessment of performance against Service Level Benchmarks. The Information, Education and Communication activities undertaken by ULBs were not adequate to ensure sustained behavioural change in the local population towards waste management.

The financial management of ULBs with respect to SWM indicates scope for improvement in utilisation of Own funds, Development (General) fund, SBM-Urban fund and Service Cess. The ULBs also need to ensure collection of User fee from public/institutions, for services rendered through Haritha Karma Sena.

The ULBs need to attend on priority basis, to the issue of effective estimation of quantity of waste generated. IEC activities need to be strengthened and financial management made more effective, to ensure efficient utilisation of available sources of funds.

2.1 Strategy and Planning for Waste Management

2.1.1 Generation and assessment of waste

The Municipal Solid Waste Management (MSWM) Manual lays down that the quantity and composition of Municipal Solid Waste (MSW) generated in the ULB determines the collection, processing and disposal options that could be adopted for waste management. 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 to be collected continuously over seven days at multiple representative locations, in summer, winter and rainy seasons. Waste should be aggregated over the seven-day period, weighed and averaged[3].

[3] For short term planning, waste generated in at least 100 representative sampling locations per 1,00,000 population were to be collected to assess the waste composition. The figures were to be extrapolated to the entire ULB and divided by the population to arrive at the per capita waste generation rates.

Details of MSW generated in all 93 ULBs in the State and test-checked 22 ULBs during 2016-17 to 2020-21 are given below:

Table 2.1: Solid waste generation in ULBs

(Weight in tonnes)

	2016-17	2017-18	2018-19	2019-20	2020-21
Quantity of waste generated in 93 ULBs	Certified data not furnished	3831.55	3903.02	3521.00	3543.00
Quantity of waste generated in 22 test-checked ULBs (SPCB data)	Certified data not furnished	1584.03	1684.74	1610.00	1564.00
Quantity of waste generated in 22 test-checked ULBs (as reported by ULBs)	1278.04	1286.65	1293.75	1298.79	1307.10

Audit scrutiny revealed that the ULBs did not conduct any survey to assess the quantity of waste generated in its jurisdictional area. They did not maintain data on quantum of E-waste, Bio-medical waste, Construction and Demolition (C&D) waste and domestic hazardous waste generated. The ULBs adopted per capita generation/population estimation method for assessing the extent of waste generated. The per capita generation of waste reckoned by Local Self-Government Institutions (LSGIs) was 240-350 grams/day and 300-400 grams/day for Municipalities and Corporations respectively. However, based on the survey conducted (1999-2000) by the Central Pollution Control Board (CPCB), per capita generation of waste was assumed in 2018-19 as 500g in Million Plus cities[4] and 400 g in Class I towns[5], whereas the Report on Strategic Environmental Assessment of Waste Management in Kerala prepared by Suchitwa Mission for Kerala Solid Waste Management Project (KSWMP) estimated (2020) per capita waste generated in Municipalities and Municipal Corporations as 419 and 545 g/day respectively.

Audit observed that none of the ULBs had followed a systematic procedure of estimation of average amount of waste generated based on samples collected in seven days each in three seasons from multiple representative locations. In the absence of a scientific estimation of waste generation as prescribed in MSWM Manual, the current planning in SWM was not adequate. Further, under-estimation of quantum of waste generated may lead to construction of facilities with inadequate capacities to meet performance standards.

Composition of solid waste

Composition of waste would determine the applicability of waste processing technology. None of the test-checked ULBs assessed composition of solid waste generated. Audit attempted a comparison of details of composition of solid waste as per WSP[6]-SWM sector assessment Report (2007), State Policy on SWM (2018) and KSWMP Report (2020) as shown in **Table 2.2:**

[4] Cities with population of one million and above
[5] Towns with population of one lakh and more
[6] Water and Sanitation Programme of World Bank

Table 2.2: Details of composition of solid waste as per WSP-SWM sector assessment report, KSWMP report and State Policy

Type of solid waste	Percentage as per WSP - SWM Sector Assessment Report	Percentage as per KSWMP Report	Percentage as per State Policy
Organic waste	62	79	77
Plastics	8.69	11	4
Paper	6.94	4	6
Rag/cloth	6.73	Not mentioned	Not mentioned
Glass	3.25	0	1
Metals	2.2	0	1
Other waste	10.10	6	6
Inert	Not mentioned	Not mentioned	5

Unless a scientific assessment undertaken during a period of seven days at multiple representative locations in each of the three main seasons is adopted, inconsistencies in estimation of composition of waste would continue.

Physical and chemical characteristics of waste

Critical parameters for selecting the appropriate processing technology are quantity and characteristics *viz*., density, moisture, calorific value, toxicity, etc. of waste. Bio-chemical characteristics of waste determine the suitability of specific treatment processes. The calorific value of garbage will help to select the treatment technologies like Waste-to-Energy and other thermal processes. However, the 22 test-checked ULBs have not assessed the physical and chemical characteristics of waste generated by them. Even Suchitwa Mission, the State nodal agency for SWM, vested with the responsibility to extend technical and financial assistance to Local Bodies for handling solid/special waste, has not conducted any study so far, to assess the quantity as well as physical and chemical characteristics of waste generated in the State.

Accepting the observation, Government replied (May 2022) that though Suchitwa Mission entered into agreement with the Socio Economic Unit Foundation (SEUF) in December 2019 to conduct such a study, the study has been put on hold due to outbreak of COVID-19 pandemic.

2.1.2 Delay in preparation of State Policy and strategy

The Secretary, Urban Development Department was to prepare a Policy and a Solid Waste Management Strategy within one year from the date of notification of SWM Rules[7]. The Hon'ble Supreme Court imposed (July 2018) a penalty of ₹1,00,000 on Government of Kerala (GoK) for failure in framing the State Policy. Subsequently, GoK notified the State Policy in September 2018. Delay also occurred in the formulation of Solid Waste Management Strategy, issued in May 2020. Delayed formulation of Policy (2018) and Strategy (2020) adversely impacted the efficacy in planning process, as detailed below:

[7]As per Rule 11(a) of SWM Rules, 2016 issued by Ministry of Environment, Forests and Climate Change

2.1.2.1 Preparation of Municipal Solid Waste Management plan

Every ULB is to prepare a Solid Waste Management Plan[8], within six months from the date of notification of State policy. The Manual also emphasised the need to prepare a detailed SWM plan comprising long term plans of 25 years which are divided into short term plan periods of five years.[9]

The test-checked ULBs did not prepare SWM plans in the manner prescribed in the Rules. In the absence of long term/short term action plans specifying goals to be achieved, the ULBs were implementing waste management projects to address a scenario prevailing at a particular point of time or issues demanding short term remedial measures. Despite the existence of a technical support agency Suchitwa Mission, to handhold and assist ULBs in evolving a well-formulated SWM plan, the test-checked ULBs failed to formulate SWM plan to provide a framework for implementation of appropriate systems and technologies for processing and disposal of waste.

The Manual also stipulated that ULBs were to prepare contingency plans for appropriate storage of waste, to tide over situations of non-performance of processing/treatment/disposal facilities. None of the test-checked ULBs had prepared a contingency plan so far.

Government replied (May 2022) that analysis of the existing waste management system was being done based on a scientific study so as to identify the gaps in collection, storage, transportation, processing, disposal, vehicles, Operation and Maintenance, etc. It was also stated that all ULBs had approved the SWM Action Plan by the respective Councils and that SWM Action Plan and approved time schedule were being reviewed by district committees. However, no records pertaining to the scientific study were furnished to Audit. Further, the test-checked ULBs replied to Audit that no long term/ short term SWM plans have been prepared by them so far (March 2021).

2.1.2.2 Preparation of Byelaws on waste management

It is the duty of the local authority to frame Byelaws[10] incorporating provisions of Waste Management Rules within one year from the date of notification of the Rules. Local authorities were to prescribe criteria for levying spot fine and delegate powers to officers or local bodies to levy spot fines on violators. Also, all waste generators shall pay such user fee for solid waste management as specified in the Byelaws of local bodies.

As per Section 572 of KM Act, 1994, no Byelaw shall have effect without Governmental confirmation[11]. Thirteen out of the 22 test-checked ULBs did not frame Byelaws. Five ULBs framed integrated Byelaw on solid and plastic waste management. Four ULBs framed separate Bye laws on solid and plastic waste

[8] As per Rule 15 of the SWM Rules, 2016

[9] The five year short term plan was to be broken up into specific action plans covering aspects of institutional strengthening, community mobilisation, waste minimisation initiatives, waste collection and transportation, treatment and disposal, financial outlay, etc. to facilitate achievement of targets in the long term plan. The short term plan was to be reviewed every two or three years, to ensure mid-course correction and ease of implementation.

[10] vide Rule 15 of Solid Waste Management Rules, 2016, Rule 6.4 of Plastic Waste Management Rules, 2016 and Rule 4(3) of SWM Rules

[11] the Byelaw shall come into operation on the date of its publication in the Gazette

management. Three[12] ULBs forwarded the Byelaws to Government for approval, which is still awaited (March 2022). As such, the delay in issuing model Byelaws[13]/ approving the Byelaws by Government would contribute to the inability of ULBs in enforcing rates of penalty prescribed in the Byelaws, and their timely revision. Further, the penalty even if imposed, had no legal validity.

Government replied (May 2022) that 40 and 60 ULBs have approved Solid Waste and Plastic Waste Management Byelaws respectively. Further, ₹49.97 lakh has been collected as spot fine (2020-21) and 120 cases registered against violators. However, the reply did not indicate Government approval/ gazette publication of the Byelaws.

Delayed/ Defective preparation of Detailed Project Reports

Government of India (GoI) launched Swachh Bharat Mission-Urban (SBM-U) in October 2014; SWM was one of its components. ULBs were to prepare Detailed Project Reports (DPRs)[14] for SWM in consultation with the State Government. The Government would handhold ULBs in preparing DPRs without delay, by shortlisting/identifying private or government agencies. Suchitwa Mission was the nodal agency for implementation of the scheme in the State. Audit observed the following deficiencies in the process of formulation of DPRs:

- The State High Powered Committee (SHPC)[15]was constituted in October 2015, one year after issue of SBM-U Guidelines. The first SHPC (February 2016) decided in favour of individual DPRs. The State Level Empowered Committee (SLEC)[16] constituted in March 2017 entrusted Suchitwa Mission with the task of technical and economic appraisal of DPRs for SWM, before submission to SLEC. DPRs approved by SLEC were to be recommended to MoHUA[17]. Only five meetings were held for approving DPRs. The first SLEC convened in July 2017 decided to invest GoI funds in common infrastructure[18] for ULBs and entrusted Suchitwa Mission with the preparation of DPRs for setting up sanitary landfill in four districts. Based on the feedback from districts[19], it was decided to prepare DPRs for individual projects so as to avoid lapse of funds; the first batch of 57 DPRs were approved by SLEC in April 2018[20], following which the first instalment of funds was released (June 2018) by GoI. Thus, there was procedural delay of over three years in formulation/approval of DPRs of SWM projects.

[12] Thiruvananthapuram, Kozhikode Corporations, Nedumangad Municipality
[13] Model byelaw on SWM Rules 2016 approved by GoK in April 2022
[14] As per Paragraph 7.2 of SBM-U Guidelines
[15] vested with the responsibility to evaluate, scrutinise and approve DPRs
[16] SLEC was designated as the State High Powered Committee in January 2017
[17] Ministry of Housing and Urban Affairs
[18] like sanitary landfill and recycling industries
[19] which revealed that the process of identification of land for sanitary landfill and execution of infrastructure required time and might not be completed during the Mission period
[20] The preparation of DPRs commenced only in January 2018

- Eighty six out of 93 ULBs prepared their DPRs and got them approved by SLEC during the period 2018-2021. Of these, 82 DPRs received funds from GoI. Thus, 11 ULBs did not receive Central share worth ₹45.82 crore[21].

- Preparation of DPRs within short duration (12 DPRs prepared by single agency[22] in 50 days) resulted in non-adherence to preparation of comprehensive data regarding the existing source level waste processing facilities in ULBs, quantification of waste in three different seasons, analysis of physical and chemical characteristics of waste generated, etc. envisaged in the SWM Rules and Manual, besides necessitating revision of 31 DPRs (out of 86 DPRs approved by SLEC).

- An important step in planning process is the critical assessment of current scenario of waste management in the ULB and identification of gaps that need to be bridged. Gaps with respect to human resources, institutional capacity, infrastructure, financial resources, availability of essential data, land availability, stakeholder willingness as well as Information, Education and Communication (IEC) needs of the community were to be identified and addressed.

  Audit observed that the test-checked ULBs had not assessed the existing waste management system to identify the above gaps. Though GoI issued (November 2017) a separate template for gap analysis for detecting lacunae in existing system of waste management, Suchitwa Mission did not issue instructions to the empanelled agencies to adhere to the template, while preparing DPRs. Audit scrutiny of DPRs of test-checked ULBs revealed deficiencies such as non-preparation of comprehensive data regarding the existing source level waste processing facilities in ULBs, non-conduct of gap analysis in institutional capacity, infrastructure, IEC, etc. Assessment of generation of C&D waste, domestic hazardous waste, etc. was not included in the DPRs.

The DPRs of Eloor and Angamali Municipalities had exactly similar data for road length and beat allocation of sweeping staff. Even the name of the former Municipality was seen printed in place of the latter in its DPR. Kayamkulam Municipality included eight projects for construction of Thumboormuzhi[23] units in its DPR whereas these projects had already been completed in previous years. Such instances strongly suggest that the DPRs were hastily prepared without gap analysis, possibly to avoid lapse of funds earmarked.

- Though guidelines for preparation of DPR issued by Suchitwa Mission envisaged identification of suitable land for setting up infrastructure units like Material Collection Facility (MCF), Material Recovery Facility (MRF), decentralised waste treatment units, Thumboormuzhi model aerobic bins, etc. at the time of formulation of DPRs, DPRs were approved by SLEC without ensuring land availability. Thiruvananthapuram Corporation's project for the construction of 154 Thumboormuzhi aerobic bin units and

[21] Loss of funds to seven ULBs was on account of non-preparation of DPRs. In the case of four ULBs delay in preparation of DPRs resulted in GoI declining payment and directing to submit fresh proposals under SBM-U 2.0, to be launched in October 2021

[22] Socio Economic Unit Foundation (SEUF)

[23] Aerobic compost unit known after the name of the place Thumboormuzhi in Thrissur district

Kayamkulam Municipality's project for MCF, aerobic compost and windrow compost included in the DPR without ensuring the availability of land could not be proceeded with, as no land was identified (November 2021).

- As per SBM-U Guidelines, litter control interventions and dumpsite remediation and Operation and Maintenance arrangements should necessarily be integrated in the DPR. However, these were not included in the DPRs prepared by 20[24] test-checked ULBs. Though Kayamkulam Municipality included project for dumpsite remediation in the DPR, no detailed plan was prepared and action initiated so far (January 2022). Eight community level biogas plants installed by Thiruvananthapuram Corporation turned defunct as O&M arrangements were not taken care of.
- Though District Level Monitoring and Review Committees (DLMRCs) were constituted (December 2015), the Committees in the five districts[25] in which test-checked ULBs were located, never met. Key responsibilities entrusted *viz*., ensuring the implementation of programmes in accordance with the guidelines, monitoring of physical/ financial progress, reviewing bottlenecks and suggesting solutions, etc. remained unattended.

Government responded (May 2022) that owing to the need for early submission of DPRs, ULBs prepared DPRs on the assumption that they could identify/purchase land within the mission period. However, several roadblocks occurred which resulted in non-implementation of such projects. The reply is suggestive of the lax approach of the ULBs and Suchitwa Mission in timely preparation of DPRs. Undue delay reflected adversely upon timely discharge of core tasks from segregation till disposal of waste. Government also informed that O&M arrangements as required in all projects would be followed up and incorporated in new DPRs.

2.1.3 Institutional setup

2.1.3.1 Non-constitution of SWM Cell

For planning an effective and advanced Municipal SWM system, it is essential to have an efficient institutional structure along with adequate infrastructure and equipment. Section 1.4.5.4 of MSWM Manual, 2016 strongly recommends that ULBs should have SWM Department/Cell having staff with technical and managerial skills specific to Municipal SWM.

Contrary to the above, none of the test-checked ULBs had a dedicated SWM Department/Cell with staff possessing technical and managerial skills specific to MSW management. In all the ULBs, the Health wing, headed by the Health Officer who was a Doctor/Health Supervisor/Health Inspector managed SWM activities, over and above the health related responsibilities assigned to him. Though Thiruvananthapuram and Kochi Corporations had engaged an Environmental Engineer each on contract basis, they were not assigned managerial functions. An exclusive SWM Cell endowed with adequate staff

[24] Kochi and Kozhikode Corporations did not prepare DPRs

[25] Thiruvananthapuram, Alappuzha, Ernakulam, Malappuram, Kozhikode

skilled in SWM, could attend to the functions and responsibilities wrt. implementation of waste management in a professional and obligated manner.

Government replied (May 2022) that KSWMP would provide qualified waste management professionals in every ULB.

2.1.3.2 Service level benchmarks

The 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. A common minimum framework was prescribed for monitoring and reporting on performance indicators, of which eight performance indicators pertained to SWM. Analysis of SLB declarations (2018-19) by 22 test-checked ULBs *vis-à-vis* targets and benchmarks in respect of these performance indicators and assessment by Audit on the basis of details furnished by ULBs (2020-21) are shown in **Appendix 1.** The results flowing from the above analysis were as follows:

- In accordance with the State policy of source level treatment of waste, the test-checked ULBs[26] did not collect biodegradable waste from households. They declared their SLBs on daily door-to-door collection and efficiency of collection of Municipal Solid Waste on the basis of extent of collection of plastic waste from households. Audit observed that actual door-to-door collection of plastic waste and efficiency of collection in respect of most of the ULBs were significantly low compared to their declared levels.
- Though SLB on extent of segregation of waste were declared by test-checked ULBs, Audit noticed that these ULBs did not record the quantum of waste segregated.
- Despite the State not possessing scientific landfill to dispose the inert waste, the test-checked ULBs declared SLB on the disposal of waste in landfills.
- The test-checked ULBs declared to have achieved 70 to 100 *per cent* target against SLB on complaint redressal. However, Audit observed that only Thiruvananthapuram Corporation had an online system in place to receive complaints. The remaining ULBs did not even maintain separate registers to record the complaints relating to waste management.

As such, there was no verifiable data to substantiate the SLB scores recorded by ULBs, raising concerns regarding the veracity of scores assigned. During the exit conference (May 2022), it was stated that Government have taken note of the discrepancy in SLB declarations by ULBs, for rectification.

2.1.4 Role of informal waste collectors in waste management

The MSWM Manual, 2016 and SWM Rules, 2016 acknowledged the primary role played by the informal sector of waste pickers, waste collectors and recycling industry in reducing waste. The State Policy (2018) stipulated that LSGIs shall establish a system to recognise organisations of waste pickers or informal waste collectors and provide for integration of these workers into the formal SWM system, to enable reduction of overall system costs, provide support to the local recycling industry, and create new job opportunities.

[26] Other than Kochi and Kozhikode Corporations, Perinthalmanna and Aluva Municipalities

However, Audit observed that the State Government has neither addressed the need for integrating the informal sector with waste management system in the Strategy document issued in 2020, nor issued any guidelines in this regard till date.

The following observations were made by Audit on the functioning of the informal system of waste collection:

- There was no system in place to monitor the quantity and type of waste handled by scrap dealers or to ensure their proper storage and disposal. During joint physical verifications in 42 scrap shops in 15 test-checked ULBs, Audit noticed that 31 unauthorised scrap dealers were functioning in eight[27] ULBs, and that the ULBs could not furnish any details regarding the nature of waste collected by them, mode of transportation and disposal sites. As the waste collected by these scrap dealers include hazardous objects and harmful elements which are not environment-friendly, negligence in their mode of storage and disposal may cause health hazards. Further, Audit also noticed instances of scrap material collected by the scrap dealers being transported out of the State, which was not being monitored by ULBs.

- Implementation Guidelines for E-waste (Management) Rules, 2016 state that loading, transportation, unloading and storage of end of life product should be carried out without any damage to health, environment and to the product itself.[28] However, joint physical verification with officials of ULBs at scrap dealer shops in Thiruvananthapuram and Kozhikode Corporations and Koyilandy, Kayamkulam, Mavelikkara, Angamaly, Aluva and Vadakara Municipalities revealed e-waste requiring careful handling such as computer monitors, television sets, refrigerators, electricity cable/wires, etc. lying scattered in the open among collected scrap items, without any environmental or health safeguards. An adverse impact of collected e-waste/hazardous waste left exposed without mandated safeguards at Killippalam in Thiruvananthapuram Corporation was that, the accumulated quantity of plastic/hazardous waste by unauthorized scrap dealer led to a fire outbreak in January 2022.

Debris of plastic/hazardous waste after a fire outbreak in January 2022 at an unauthorised collection centre of a scrap dealer at Thiruvananthapuram Corporation (April 2022)

[27] Vadakara, Koyilandy, Malappuram, Neyyattinkara and Feroke Municipalities and Kozhikode, Kochi, Thiruvananthapuram Corporations

[28] The collection centres were to ensure that the e-waste collected by them was stored in a secured manner till it was sent to authorised dismantler or recycler. Cathode Ray Tubes, LCD/LED/ Plasma Televisions, Air Conditioners, fluorescent and other mercury containing lamps needed to be handled with special care to avoid breakage. Further, no damage was to be caused to the environment during storage and transportation of e-waste.

- While issuing Dangerous and Offensive (D&O) trade licence to scrap dealers, the test-checked ULBs did not specify the nature of waste the dealers were authorised to collect, nor ensure that they had a formal agreement with an authorised recycler/dismantler/refurbisher. The ULB or Pollution Control Board did not prohibit scrap dealers from collecting e-waste which led to these dealers collecting and storing e-waste without authorisation of PCB and in violation of E-Waste Management Rules, 2016. Suchitwa Mission/ ULBs/ PCB did not take any action to prevent illegal scrap dealing and transporting and to organise the scrap dealers under the SWM system, to ensure scientific management of waste.

During the exit conference (May 2022) Government informed that it had taken note of the audit finding, and decided to initiate the process of registration of informal sector and to bring into effect, regulatory intervention.

2.1.5 Information, Education and Communication activities

In accordance with the provisions of SWM Rules, 2016 and Manual on MSWM, 2016, Information, Education and Communication (IEC) activities were to be undertaken by Government/ULBs to make people understand the concept and need for segregation and storage at source, role of citizens in primary collection and handing over of waste for reuse, recycle or recover, need for paying user fee for collection/disposal services and mitigating the impact of solid waste on public health and environment. The State policy envisaged for preparation of IEC plan at the State, district and LSGI level, towards educating the citizens on areas of key behavioural change. However, the State/district/ULB level IEC strategy or plan has not been prepared so far.

Under SBM-U, Suchitwa Mission transferred ₹1.57 crore to 22 test-checked ULBs during the period from 2015-16 to 2019-20, for conducting IEC activities. However, test-checked ULBs spent only ₹64.49 lakh (41 *per cent*) till March 2021, indicating the low priority assigned to IEC activities.

Audit noticed the following deficiencies in IEC activities in test-checked ULBs:

- Thirteen out of 22 test-checked ULBs have not conducted any IEC activity on importance of source level segregation and source level processing of biodegradable waste.
- Test-checked ULBs neither notified nor publicised the list of domestic hazardous waste which included both toxic and bio-medical waste.
- No specific IEC activities were planned or conducted on e-waste segregation or Extended Producer Responsibility (EPR) by test-checked ULBs. This resulted in e-waste reaching the processing facilities/hands of scrap dealers and consequent unauthorised dismantling of the same.
- Seventeen test-checked ULBs did not create awareness on provisions regarding levy of penalty[29] for littering/dumping of waste in public places and water bodies.
- No IEC activities enlightening the public on the hazards of burning and burying solid waste were seen undertaken by 15 out of 22 test-checked ULBs.

[29] Section 334 of KM Act, 1994 and Executive Directive No.9/2016 of the Police Department issued on 04 November 2016

Good Practices

Eloor and Parappanangadi Municipalities promoted awareness on not to burn, not to litter through murals and advertisements exhibited on the body of buses

Government replied (May 2022) that all ULBs have conducted IEC activities by direct intervention through ward level sanitation committees, people's campaign, seminars, video programmes, signboards, advertisements in bus shelters, etc.

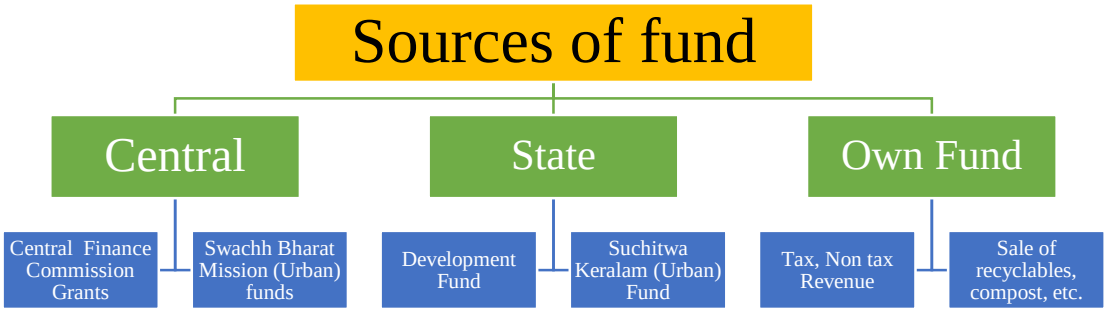
However, Audit observed that the State had not set any targets for IEC, either in terms of activities to be undertaken or allotment of funds. IEC campaign is not to be restricted to a single time activity, as constant communication with the community and all relevant stakeholders is necessary to bring about a sustained behavioural change among the citizens in managing their waste. Rampant use of banned plastic carry bags, burning of waste even by ULB staff, littering and dumping of waste in public places, poor segregation of waste, etc. underscore the need to intensify IEC activities.

2.2 Financial Management

2.2.1 Source of funds for waste management

The resource base of LSGIs consists of Own revenues, Central Finance Commission (CFC) grants, Central Government grants and funds devolved by State Government for traditional functions (General Purpose Fund), maintenance of assets (Maintenance Fund) and development purposes (Development Fund) as per the recommendations of State Finance Commissions. Various sources of funding for Waste management in ULBs are depicted in **Chart 2.1**:

Chart 2.1: Sources of funding for Waste Management in ULBs

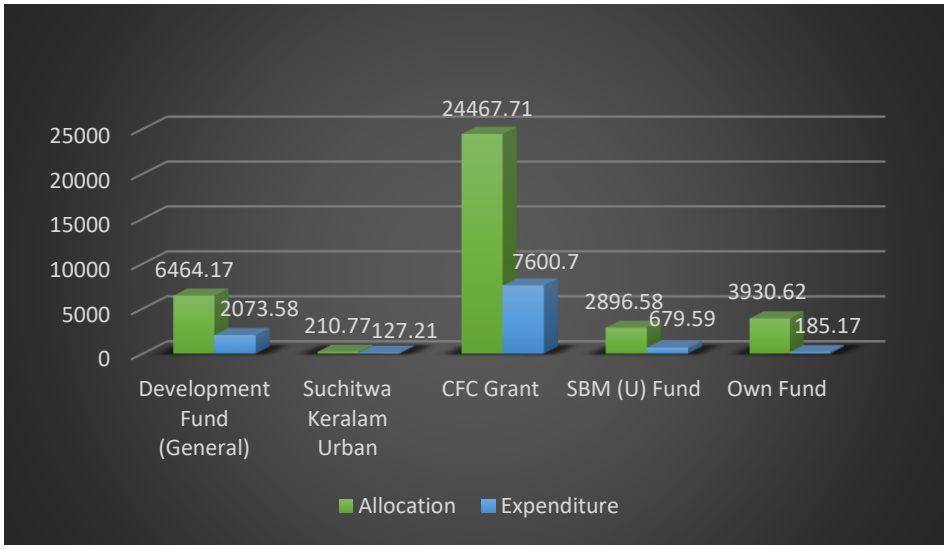


Scrutiny of financial statements of 22 test-checked ULBs revealed that ULBs depended mostly on Government grants for meeting their expenditure on waste management with respect to cost of land, Plant and machinery, daily expenses on MSWM, Operation and Maintenance cost, refurbishment cost, contingent expenditure, etc. The dependency on Government grants to meet expenses on waste management ranged from 94 to 100 *per cent* (**Appendix 2**).

2.2.2 Expenditure on Waste Management by test-checked ULBs

Allocation and expenditure of various funds for SWM during 2016-2021 are depicted in **Chart 2.2:**

Chart 2.2: Allocation and expenditure incurred by test-checked ULBs on Waste Management during 2016-2021 (₹ in lakh)



It is evident that ULBs are completely dependent on Central and State assistance for executing the mandatory functions relating to Solid Waste Management (SWM). The spending efficiency out of central and state assistance was 30.79 *per cent* only, which was significantly low. Of ₹ 244.68 crore of CFC grant allocated during 2016-21, only ₹ 76.01 crore (31.07 *per cent)* could be spent. There is an urgent need for ULBs to step up the utilisation of Central/State funds and own funds allotted for waste management activities.

2.2.3 Allocation and Utilisation of funds for SWM

2.2.3.1 Development fund

Government of Kerala issued orders (June 2016) for mandatory allocation of 10 *per cent* of Development Fund (General) for waste management activities. However, the Government lifted (April 2017) the mandatory clause and directed local bodies to allocate 15 *per cent* of Development Fund (General) to Haritha Keralam Mission projects, by assigning priority to waste management. In February 2018, ULBs were further directed to mandatorily allocate 20 *per cent* of Development Fund (General) for LIFE[30] Mission projects and at least 15 *per cent* of the remaining fund for Haritha Keralam Mission projects for waste management and water conservation.

Actual expenditure incurred (2016-21) on waste management by the test-checked ULBs was very low, as against the above stipulations of Government, the details of which are shown in **Table 2.3**:

Table 2.3: Expenditure for waste management by test-checked ULBs out of Development fund (General) during 2016-2021

Year	Total Development fund (General) available (₹ in lakh)	Percentage to be expended on waste management	Fund to be allocated (₹ in lakh)	Actual allocation (₹ in lakh)	Actual expenditure incurred (₹ in lakh)	Percentage of actual expenditure out of total fund available
2016-17	31365.17	10	3136.52	1630.26	198.04	0.63
2017-18	35858.52	15	5378.78	1560.30	498.82	1.39
2018-19	41437.45	12	4972.49	1351.07	325.28	0.78
2019-20	30780.39	12	3693.65	568.87	146.65	0.48
2020-21	54412.87	12	6529.54	1353.67	904.79	1.66

(Source: Data from test-checked ULBs)

Against the mandatory utilisation of 10-15 *per cent* of funds, test-checked ULBs utilised only 0.48-1.66 *per cent* for waste management. The number of ULBs with zero allocation of Development fund (General) ranged from one to six each year. The meagre amount expended on a core function devolved to ULBs is indicative of the reluctance of ULBs to take up new projects for waste management.

2.2.3.2 Utilisation of SBM (Urban) fund

During the period 2018-21, 22 test-checked ULBs received fund amounting to ₹28.97 crore as first instalment for implementation of projects under SBM-U. Utilisation by test-checked ULBs are detailed in **Table 2.4:**

[30] Livelihood Inclusion and Financial Empowerment, the flagship housing project of Government of Kerala

Table 2.4: Receipt and utilisation of SBM-U Fund during 2018-21

(₹ in lakh)

Year	Amount received			Corresp-onding ULB share (41.7%)	Total Receipt	Expenditure out of				
	Central share (35%)	State share (23.3%)	Total Central and State share (58.3%)			Central share	State Share	Total Central and State share	ULB share	Total Expenditure
2018-19	665.4	442.97	1108.37	792.78	1901.15	2.55	1.69	4.24	3.01	7.25
2019-20	111.81	74.43	186.24	133.21	319.45	64.15	94.4	158.55	41.49	200.04
2020-21	961.74	640.24	1601.98	1145.84	2747.82	317.31	199.49	516.8	708.59	1225.39
Total	**1738.95**	**1157.64**	**2896.59**	**2071.83**	**4968.42**	**384.01**	**295.58**	**679.59**	**753.09**	**1432.68**

(Source: Data from test-checked ULBs)

Though SBM-U guidelines envisaged preparation of DPRs and availing funds for implementation of DPR components within the Mission period[31], ULBs could spend only 23.46 *per cent*[32] of the State and Central share, as of 31 March 2021. Lapses in timely preparation and approval of DPRs which eventually resulted in loss of central assistance of ₹ 45.82 crore have been commented upon in this Report. As the projects approved were mainly capital in nature, reduced expenditure and delayed implementation of projects would adversely affect long term sustainable solutions for SWM.

2.2.3.3 Meagre Utilisation of Own funds for SWM Projects

Own funds consist of tax and non-tax revenue collected by ULBs as per provisions of Kerala Municipality Act, 1994 and allied Rules. Of the total Own funds amounting to ₹ 39.31 crore allocated for SWM during the audit period, the test-checked ULBs utilised ₹ 1.85 crore only, which was a meagre 4.71 *per cent*. Audit observed that the test-checked Municipalities[33] had Own fund balance above ₹ one crore whereas test-checked Corporations had Own funds ranging from ₹13.75 crore to ₹259.26 crore during the audit period. However, 14 ULBs did not utilise any amount from their Own funds for implementing SWM projects during the audit period. Percentage of utilisation of the remaining eight ULBs[34] was only up to 5.34. Despite being endowed with sufficient own funds, these ULBs were lackadaisical in allocating and utilising enhanced share of funds for effective management of waste.

2.2.3.4 Poor utilisation of Service Cess

Rule 27 of Kerala Municipality (Property Tax, Service Cess and Surcharge) Rules, 2011 allows Council of the Municipality to levy four *per cent* Service Cess on property tax for providing services including general sanitation and safe removal of solid waste such as rubbish, carcasses of animals, etc. provided the buildings assessed were not otherwise exempted under section 235 of KM Act. It was seen that only 14 ULBs collected Service Cess for SWM among the test-checked ULBs. The ULBs did not maintain separate account for depositing

[31] ending on 02 October 2019

[32] 679.59/2896.59

[33] Other than Aluva

[34] Thiruvananthapuram Corporation, Nedumangad, Eloor, Maradu, Parappanangadi, Perinthalmanna, Nilambur, Feroke Municipalities

Service Cess collected and deposited the amount in its Own fund account along with other receipts. Audit observed that even the extent of utilisation of Own fund for SWM projects was significantly lower than the amount collected as Service Cess, during the audit period.

The extent of utilisation of Own funds for SWM projects as against Service Cess collected by 14 test-checked ULBs is shown in **Table 2.5**:

Table 2.5: Collection and utilisation of Own Funds as against Service Cess collected by 14 test-checked ULBs

Year	Service Cess collected for sanitation and waste management (4 *per cent* of property tax) (₹ in lakh)	Own fund utilised for SWM (₹ in lakh)	Percentage of utilisation of Own fund for SWM as against Service Cess collected
2016-17	78.80	0.98	1.24
2017-18	103.74	0.01	0.01
2018-19	421.99	1.38	0.33
2019-20	396.82	86.88	21.89
2020-21	444.73	95.93	21.57
Total	**1446.08**	**185.18**	**12.81**

(Source: Data from 14 test-checked ULBs)

As against the Service Cess amounting to ₹14.46 crore collected by 14 ULBs towards general sanitation and waste management during the audit period, the total expenditure on SWM projects out of Own funds was ₹1.85 crore (12.81 *per cent)* only. The remaining eight ULBs[35] did not even collect Service Cess. This indicates the lack of priority given to tapping of additional funds for waste management by ULBs.

2.2.3.5 User fee

The MSWM Manual defines user fee as a fee imposed through a Byelaw by the ULB on the waste generator. Haritha Karma Sena (HKS)[36] was entrusted with the responsibility of collecting user fee from individual households/institutions for the services offered to them. The LSGI, in consultation with the Community Development Society (CDS) of Kudumbashree, was to fix the rate of user fee to be collected by HKS. The fee was to be deposited in HKS Consortium account and used along with other funds[37], for meeting expenses in connection with various activities undertaken, including collection of bio/non-biodegradable waste, beautification of premises, etc. It was observed that HKS in test-checked ULBs did not collect user fee on a regular basis from households and institutions in their jurisdiction. The percentage of collection of user fee in these ULBs ranged from zero[38] to 35.89[39] only.

[35] Kochi, Kozhikode Corporations and Angamali, Malappuram, Koyilandy, Kothamangalam, Manjeri, Feroke Municipalities

[36] formed (July 2017) by Government of Kerala as a decentralised solution to the problem of waste management

[37] Income generated from sale of non-biodegradable waste to agencies, conduct of festivals/celebrations, sale of bio compost, kitchen bins, etc.

[38] Mavelikkara Municipality

[39] Feroke Municipality

Audit attempted to roughly estimate the potential revenue that could be generated, if ULBs ensured collection of user fee as directed by Government (**Appendix 3**). It was observed that, in prompt collection of user fee at prescribed rates lay a major untapped source of funds for execution of waste management activities.

Government stated in the exit conference (May 2022) that it was intervening significantly in this area by providing Viability Gap Funding to ensure that the waste collectors in field were able to sustain themselves. Government have also conducted an assessment of how much income was generated on a monthly basis by HKS and observed mixed results with respect to revenue collection. It was also informed that there were many instances wherein people refused to pay user fee even when waste was being collected from them. The reply of Government underscores the need to instill favourable attitude in public towards payment of user fee for services availed.

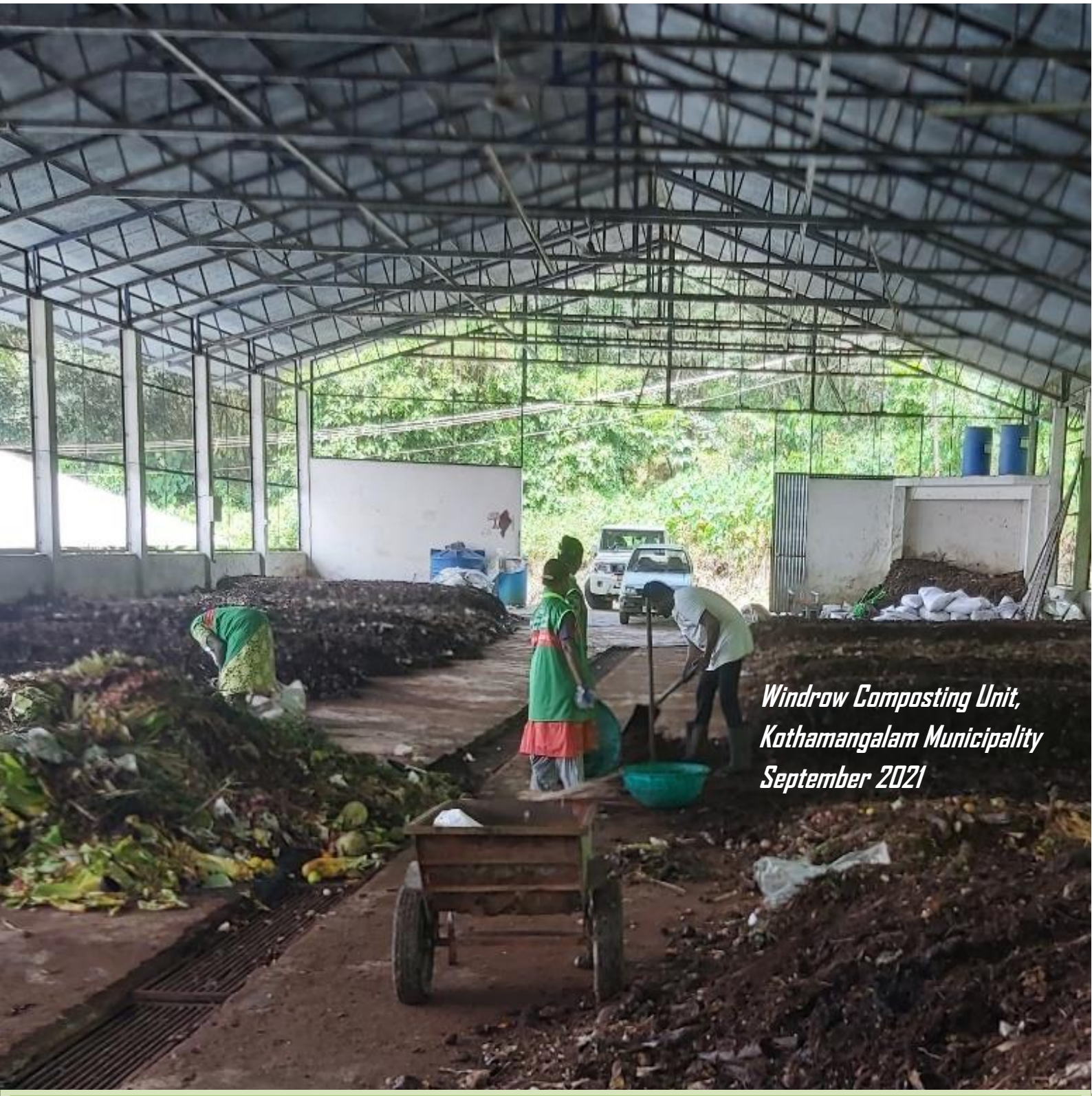
Recommendation 1: Government must ensure that scientific estimation of quantity and composition of waste generated in Urban Local Bodies are taken up on priority basis to establish adequate treatment and disposal facilities of all categories of waste. Waste moving through the system needs to be quantified at multiple locations in different seasons, to assess the actual quantities of waste available for processing and disposal, so as to identify and plan for innovative and efficient treatment technologies.

Recommendation 2: Government must ensure that Urban Local Bodies formulate Municipal Solid Waste Management Plans and have approved Byelaws in place for effective management of waste. The waste management plans formulated may also provide for integration of informal waste pickers into the formal system of waste management.

Recommendation 3: Government must promote Information, Education and Communication (IEC) campaign by ULBs in a sustained manner by formulating yearly plans and targets for effective utilisation of available funds. Government must undertake IEC campaign through its Public Relations wings and other agencies, to create public awareness among waste generators on the need to minimise waste generation, re-use waste to the extent possible, practise segregation of waste, desist from littering in public spaces, etc.

Recommendation 4: Government must ensure that ULBs enhance the extent of utilisation of Central/State funds and Own Revenue allocated for waste management. They may take earnest efforts to step up collection of Service Cess and User fee, so as to contribute to expenditure on waste management activities.

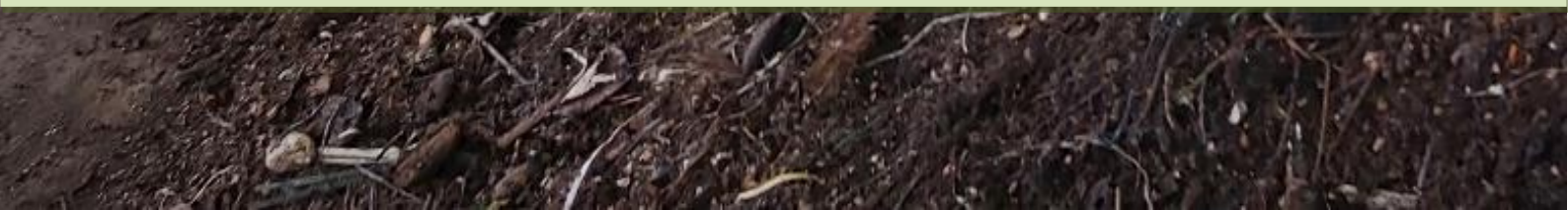
Recommendation 5: Government must consider fixing a mandatory minimum percentage of expenditure to be incurred exclusively on solid waste management by the Local Self Government Institutions.



Windrow Composting Unit,
Kothamangalam Municipality
September 2021

CHAPTER III

SEGREGATION, COLLECTION AND TRANSPORTATION OF WASTE



CHAPTER III

SEGREGATION, COLLECTION AND TRANSPORTATION OF WASTE

ULBs did not have an effective mechanism to check whether the waste generators segregated waste into biodegradable, non-biodegradable, sanitary and domestic hazardous categories. We observed that colour coded bins were not provided by ULBs to households or placed at Government Offices and hospitals visited, as a preliminary step in segregation of waste generated. Non-adherence to extant provisions resulted in unsegregated waste reaching processing sites and landfills meant for hazardous waste. Extent of door-to-door collection of waste from households and from restaurants and chicken stalls/ meat stalls in selected ULBs ranged from 16.13 *per cent* to 54.72 *per cent*. Food waste and poultry waste was collected by unauthorised agencies and disposed as feed to pigs. As collection of biodegradable waste from households was not effective, waste generated was dumped in water bodies, public places, road sides, etc. The ULBs could not ensure segregation of waste by waste generators due to which biodegradable waste mixed with non-biodegradable waste reached processing sites.

The system of segregation and collection of waste was not functioning as envisaged and needed to be strengthened. Open vehicles and vehicles without partition were used for waste transportation. In the test-checked Corporations, we noticed that own vehicles purchased were idling, yet private vehicles were hired and utilised for waste transportation. Delay occurred in conducting timely repair and maintenance of vehicles purchased by the Corporation.

The waste generated in a ULB pass through various stages, *viz*., segregation, collection, transportation, processing and disposal. The overall functioning of the system of waste management in a ULB could be termed satisfactory, only if each of these tasks is performed in a scientific and sustainable manner. Audit analysed the effectiveness of field level execution of various municipal tasks associated with waste management.

3.1 Segregation

Segregation refers to the process of separation of municipal solid waste into four groups - organic, inorganic, recyclables and hazardous waste. Segregation is a critical requirement since it enables reuse, recycling, treatment and scientific disposal of different components of waste. Segregation takes place at different levels such as source/household, centralised sorting facility and waste processing sites and leads to minimisation of waste and reduction in landfill space for final disposal.

3.1.1 Inadequate segregation of waste at source

As per SWM Rules, 2016, every waste generator was to segregate and store the waste generated by him in separate streams, *viz*., biodegradable, non-biodegradable and domestic hazardous waste in suitable bins and hand over to authorised waste collectors. Used sanitary waste like diapers and sanitary pads as well as Construction and Demolition waste and Horticulture and garden

waste were to be stored separately by the waste generator and disposed of as per direction of local bodies.

The details of segregation of waste by households, Government offices and commercial establishments in test-checked ULBs, are presented in **Table 3.1**.

Table 3.1: Segregation of waste by households, Government offices and commercial establishments in 21 test-checked ULBs[40]

Type of waste generator	Households	Government offices	Commercial establishments
Total number	1075820	2426	180130
Number of waste generators segregating waste at source as claimed by ULB	507470	1468	61607
Percentage of waste generators segregating waste at source	47.17	60.51	34.20

(Source: Data furnished by test-checked ULBs)

Though the ULBs furnished number of households and institutions wherein waste was stated as segregated at source, Audit observed that the ULBs were accepting the number of households/institutions as furnished by Haritha Karma Sena, which collected waste from these units. The ULBs did not have any mechanism to check whether the waste generators segregated waste into prescribed streams of biodegradable, non-biodegradable, sanitary, domestic hazardous, etc. Thus, the data provided by the ULBs did not inspire confidence regarding the exact number of waste generators segregating waste at source, as envisaged in SWM Rules/Manual. The ULBs, through periodic inspections, need to gather reliable data regarding the actual number of units segregating waste into stipulated streams.

Audit analysed the details of segregation of waste as furnished by 21 test-checked ULBs (**Appendix 4**). Except one ULB (Alappuzha), the percentage of segregation of the remaining 20 ULBs ranged between 0.41 and 72.72. Non-adoption of effective methods of segregation at source contributed to substantial amount of mixed waste reaching centralised waste processing facilities, resulting in components of waste being classified as 'rejects'.

3.1.2 Issue of Bins

Swachh Bharat Mission (Urban) Guidelines envisaged ULBs to distribute two colour coded bins, one in green and the other in blue per household, such that waste is segregated into wet (biodegradable) and dry (non-biodegradable) respectively, at source itself. Audit observed that none of the test-checked ULBs provided colour coded bins to households for segregation of waste. Koyilandy Municipality was the only test-checked ULB which provided litter bins in public places. Thiruvananthapuram Corporation had set up Dry waste

[40]One test-checked ULB, Perinthalmanna Municipality, had entrusted SWM to an agency named Jeevanam solutions. The agency had not furnished the details of status of execution to the ULB. Despite Audit seeking details directly from the agency, the agency did not furnish the same

segregated collection hubs at various locations for collection of non-biodegradable waste.

Segregation of household waste into biodegradable and non-biodegradable at source using bins would reduce the extent of secondary segregation at Material Recovery Facility (MRF) where secondary storage and sorting of recyclable materials are done. Lack of effective IEC activity on importance of segregation of waste at source might have contributed to low segregation of waste by households.

During joint physical verification (JPV) at Government offices and hospitals, Audit observed that separate bins were not allotted and all the waste were collected in single bins as mixed waste, making segregation difficult and time consuming. Instances of burning mixed waste were noticed in four Government offices[41] and seven Government hospitals[42] which would cause hazardous impact on human health and environment.

Burning of Mixed Waste at Cheruvannur CHC, Kozhikode Corporation (October 2021)

Open burning of plastic waste at Municipal office, Aluva (July 2021)

3.1.3 Segregation of Domestic hazardous waste

Domestic hazardous waste such as used batteries, expired medicines, discarded paint drums, CFL bulbs, etc. required special handling and disposal. None of the test-checked ULBs published the list of domestic hazardous waste and 18 ULBs did not conduct any IEC programme, so as to make public aware of the types of domestic hazardous waste likely to be generated by them and the need for segregation of such waste. During JPV at Kochi Corporation, Audit noticed that non-segregation of waste resulted in mixing of domestic hazardous waste

[41]Civil Station, Kozhikode, Mini Civil Station, Kayamkulam, Taluk Office, Ambalapuzha, Aluva Municipal Office

[42]Taluk hospital, Feroke, ESI dispensary, Eranhipalam, ESI Hospital, Thiruvananthapuram, District Hospital, Nedumangad, General Hospital, Neyyattinkara, CHC Cheruvannur and District Hospital,Vadakara


Burning of Waste by Thumboormuzhi workers in Thiruvananthapuram Corporation (August 2021)

with other waste which reached the processing site. This resulted in accumulation of rejects containing such waste at processing sites, which would necessitate additional financial commitment for segregation and disposal.

3.1.4 Segregation of Sanitary Waste

The SWM Rules, 2016 stipulated that waste generators shall wrap the used sanitary waste like diapers, sanitary pads, etc. securely in pouches provided by the manufacturers/brand owners of these products and place them in the bin meant for non-biodegradable waste. However, in 16 test-checked ULBs, sanitary waste was seen mixed with other non-biodegradable waste, thereby contributing to the reluctance of ULB staff to segregate them manually. Instances of ULB staff themselves burning mixed waste containing sanitary waste were noticed in Thiruvananthapuram Corporation, which was hazardous to environment and public health. In 115 households visited, 75 households in 16 ULBs reported that they burnt sanitary waste generated within their premises.

Kochi Corporation - Mixed waste dumped as rejects at the Brahmapuram processing site (November 2021)

Government stated (May 2022) that a pilot project for disposal of household sanitary waste, bio-medical waste and hazardous waste has been taken up by the State with the support of KEIL[43] and that in the initial phase it is proposed to implement the project in seven ULBs located in the vicinity of KEIL.

[43] Kerala Enviro-Infrastructure Limited, the only Hazardous Waste landfill facility in the State at Ambalamedu, Kochi.

Audit observed that defective source segregation in test-checked ULBs resulted in ineffectual utilisation of centralised and decentralised processing facilities as detailed in subsequent paragraphs.

3.1.5 Segregation of waste at processing site

As the ULBs could not ensure segregation of waste by waste generators, biodegradable waste mixed with non-biodegradable waste reached the processing site. Audit noticed that nine[44] out of 22 test-checked ULBs had centralised/community level facilities[45] for processing biodegradable waste. However, JPV conducted in these nine facilities revealed that only partial segregation was performed at four[46] sites. As such, recovery of recyclable items became difficult which also affected the quality of compost produced. For want of effective segregation at source, ULBs had to incur substantial amount for disposal of waste generated in their jurisdiction.

Four ULBs[47] disposed 1313.21 tonnes of mixed waste as rejects during 2020-21 through Clean Kerala Company Ltd. (CKCL) to KEIL for land filling, thereby committing payment of ₹156.14 lakh. Thiruvananthapuram Corporation as part of converting dumping yard at Erumakkuzhi into a garden, transferred (October 2020) 62.61 tonnes of unsegregated waste to KEIL. As per SWM Rules, 2016, only the non-usable, non-recyclable, non-biodegradable, non-combustible and non-reactive inert waste and pre-processing rejects and residues from waste processing facilities were to be sent to sanitary landfill. Audit observed that ULBs/CKCL violated these Rules by sending unsegregated waste to landfill.

During the exit conference (May 2022), Government accepted that mixed waste generation was indicative of failure of ULBs in ensuring proper segregation and that once mixed waste was generated, the sole option was to treat it as inert waste and dispose of in scientific landfills. Further, the efforts of the State to purchase land to set up landfill facility have not succeeded yet, due to which mixed waste had to be disposed of in the hazardous waste landfill facility of KEIL.

The reply is not acceptable as waste management should necessarily be made a part of urban planning and suitable methods of segregation evolved, to minimise mixed waste generated. Utilising hazardous waste landfill facility for disposing solid waste whenever mixed waste is generated, is not a viable solution.

3.2 Collection

Collection of segregated waste was essential to ensure that waste stored at source was not disposed of in streets, drains, water bodies, etc. The ULBs were to arrange for door-to-door collection of segregated solid waste from all

[44]Kochi, Kozhikode, Thiruvananthapuram Corporations and Perinthalmanna, Kothamangalam, Alappuzha, Eloor, Neyyattinkara, Nedumangad Municipalities

[45]Facilities adopting aerobic composting (windrow, thumboormuzhi), vermi composting, bio-methanation technologies for processing biodegradable waste

[46] Kochi, Kozhikode,Thiruvananthapuram Corporations and Neyyattinkara Municipality

[47] Thiruvananthapuram Corporation and Alappuzha, Malappuram, Kayamkulam Municipalities

households including slums and informal settlements, commercial, institutional and other non-residential premises[48].

3.2.1 Collection of Biodegradable waste

The SWM Rules encourage households to process biodegradable waste at source. However, ULBs are mandated to collect biodegradable waste in a segregated manner and set up common processing facilities, so as to treat spill over waste from establishments and households where there is no available space for setting up individual processing units.

Audit observed that among the test-checked 22 ULBs, 13 ULBs did not collect biodegradable waste from generating units as the State policy advocated source level processing of such waste. Five[49] ULBs collected biodegradable waste from households and markets. The extent of door-to-door collection of waste from households, restaurants and chicken stalls/meat stalls in these ULBs ranged from 16.13 *per cent* to 54.72 *per cent*. The remaining four ULBs[50] collected market waste and deposited in thumboormuzhi bins.

Quantity of biodegradable waste generated and collected in test-checked ULBs is shown in **Table 3.2** below:

Table 3.2: Table showing quantity of biodegradable waste generated and collected in 18 test-checked ULBs[51]

	2016-17	2017-18	2018-19	2019-20	2020-21
Generated (tonne)	2,97,615.28	3,04,634.17	3,12,051.82	3,17,848.10	3,03,507.05
Collected (tonne)	1,20,297.58	1,24,696.97	1,30,114.37	1,31,906.35	1,16,097.30
Percentage of collection	40.42	40.93	41.70	41.50	38.25
Percentage of waste not collected	59.58	59.07	58.30	58.50	61.75

(Source: Data furnished by test-checked ULBs)

On an average, 58 to 62 *per cent* of biodegradable waste generated was not being collected in 18 test-checked ULBs. There was no system in place for the assessment of generation and collection of horticulture/garden waste generated in the ULBs.

As substantial quantity of biodegradable waste was to be segregated at source, the ULBs had the responsibility to ensure that the individual waste generating units managed their waste at source itself and that dumping/littering in public places, water bodies, etc. is avoided at all costs. However, Audit observed biodegradable as well as non-biodegradable waste being dumped in public

[48] According to Rule 15 (b) of SWM Rules, 2016

[49] Kochi, Kozhikode Corporations and Kothamangalam, Perinthalmanna (data not available), Aluva Municipalities

[50] Nedumangad, Neyyattinkara, Feroke and Vadakara Municipalities

[51] Four ULBs (Maradu, Mavelikkara, Kayamkulam and Perinthalmanna Municipalities) did not furnish details

places[52], road sides[53], water bodies[54], etc. as evident from photographs presented below.

Littering/dumping of waste in water bodies

Aamayizhanjan thodu near KSRTC Central bus stand, Thiruvananthapuram Corporation (July 2021)

Killi River, Thiruvananthapuram Corporation (August 2021)

The Sustainable Development Goal (SDG) 11.6 prescribed reduction in adverse per capita environmental impact of cities by paying special attention to air quality and municipal and other waste management by the year 2030. One of the targets to be achieved to attain the above goal was 100 *per cent* door-to-door collection of waste. Instances as revealed above, in addition to distancing the State from achieving the SDG goals, raise serious concern regarding the efficacy of ground level execution of the State campaign 'My Waste My Responsibility'.

3.2.1.1 Collection of waste from Community halls, restaurants, etc.

Government of Kerala instructed (July 2017) ULBs to issue directions to establishments generating biodegradable waste such as community halls, hotels, restaurants, etc. to set up suitable facilities like biobin, aerobin, biogas plant, etc. for processing biodegradable waste at source, before 15 September 2017. However, 18 test-checked ULBs had not complied with the above order. Of 3131 restaurants/ community halls in 21 test-checked ULBs, only 292 (9.32 *per cent*) possessed source level treatment facilities. Audit conducted JPV in 171

[52]Thiruvananthapuram, Kochi Corporations and Aluva, Alappuzha, Perinthalmanna Municipalities
[53] Mavelikkara, Aluva, Muvattupuzha, Kayamkulam Municipalities and Kochi Corporation
[54] Thiruvananthapuram, Kochi Corporations and Kayamkulam, Mavelikkara Municipalities

restaurants which revealed that 154 restaurants (90 *per cent*) did not have source level treatment system. Waste from restaurants were collected by unauthorized agencies and transferred to pig farms in 20[55] out of 22 ULBs. It is pertinent to note that disposal of waste as feed to pigs is not an authorized method of waste disposal as per SWM Rules, 2016 and as per Section 435 of KM Act.

Joint physical verification with municipal staff revealed that 139 of the 171 test-checked restaurants (81 *per cent*) did not have facility to treat waste water and resultantly, the waste water generated was routed to drains in the vicinity. Audit observed that 14 ULBs had not conducted inspections in the establishments periodically or during renewal of licence, to ensure proper disposal of solid/liquid waste by these establishments. During December 2020 to March 2021, the District Pollution Control Board (DPCB), Kozhikode issued notices to 51 establishments (29 hotels) which discharged untreated water to common drain causing pollution of Canoli canal in Kozhikode city. However, no follow up action was taken by DPCB Kozhikode to ensure that the establishments resorted to corrective action.

Waste dumped in open drain alongside National Highway in Thiruvananthapuram Corporation (August 2022)

Government stated in the exit conference (May 2022) that it would ensure that the institutions responsible for managing waste execute their functions and open drain discharge gets regulated and checked through stern action.

3.2.1.2 Collection of waste from Poultry stalls/Slaughter houses

As per SWM Rules 2016, daily collection of poultry waste was the responsibility of local bodies. However it was observed that only three test-checked ULBs[56] had a system in place for collection and disposal of poultry waste. During JPV conducted in 25 poultry stalls, 14 meat stalls and two slaughter houses, Audit noticed that poultry waste was given to private agencies/pig farms in 13 ULBs[57]. In three ULBs, the collection of poultry waste by authorized agencies was only up to 50-60 *per cent* of daily generation. Rest of the poultry waste was either collected unauthorisedly by pig farms or was being dumped in public places or water bodies. Audit scrutiny of log books of JCBs owned by Thiruvananthapuram Corporation revealed that poultry waste dumped in public places were buried at the spot using JCBs, in 49 instances during 2020-21. This would degrade the environment and cause health hazards

[55]Thiruvananthapuram, Kozhikode, Kochi Corporations, Kayamkulam, Mavelikkara, Neyyattinkara, Vadakara, Koyilandy, Angamaly, Aluva, Maradu, Kothamangalam, Eloor, Muvattupuzha, Manjeri, Malappuram, Parappanangadi, Nilambur, Nedumangad and Feroke Municipalities

[56] Thiruvananthapuram and Kozhikode Corporations and Feroke Municipality

[57]Kayamkulam, Mavelikkara, Parappanangadi, Nilambur, Manjeri, Eloor, Angamaly, Aluva, Kothamangalam, Maradu, Muvattupuzha, Neyyattinkara, Nedumangad

to residents in the vicinity. Further, supply of waste containing untreated meat products to pigs could result in creating potential health hazards to the animals as well as risk of transmission of foreign animal diseases and other pathogens to human beings.

Though Government stated in reply (May 2022) that arrangements with animal farms, fish food manufacturing units, chicken rendering plants, etc. have been made to remove biodegradable waste in the case of markets without composting facilities, no documentary evidence for the same was furnished to Audit by the selected ULBs.

Defective monitoring of functioning of poultry stalls by Pollution Control Board

As per the guidelines issued (October 2021) by GoK for licensing of poultry stalls, poultry/meat stalls shall enter into agreement with licensed/authorised rendering plants[58] existing within the district or in the nearby district, if plants are not available in the district.

Audit noticed that District PCBs, while granting consent to operate chicken stalls did not ensure that the occupier has valid agreement with licensed rendering plants. The poultry units were classed under orange category of classification of Industrial sectors, which made it mandatory for PCB to conduct inspection of these units at least once in a year. The PCB, without conducting any periodical inspection to ascertain the quality of waste disposal mechanism in these poultry stalls, renewed their consent for five years. During JPV in 16 ULBs, in the absence of liquid waste treatment facility, untreated liquid waste was seen discharged directly to soil and nearby public drains. Such instances of unhygienic disposal of poultry waste could have been arrested by timely interventions of authorities.

At present, there are only 12 rendering units in the State, with an overall capacity of 372 TPD, which is sufficient to process only 34 *per cent* of total poultry waste generated.

Government accepted the audit observations and informed during the exit conference (May 2022) that strict instructions have been given to local bodies to insist that poultry stalls enter into agreement with rendering plants. It was also stated that action was afoot to set up rendering plants in all districts.

Slaughter house waste

Rule 3(1) of Prevention of Cruelty to Animals (Slaughter house) Rules, 2001, stipulates that no person shall slaughter any animal within a Municipal area except in a slaughterhouse recognized by the authority concerned. The Kerala Municipality Act stipulates that every Municipality shall provide sufficient number of places for Municipal slaughter houses and make necessary arrangements to maintain the municipal slaughter houses in hygienic manner.

[58] Anaerobic digestion of poultry related waste consume time and some waste materials like feathers could not be processed in the system. Rendering is the approved technology for processing slaughter waste and poultry waste including feathers.

As per data furnished by the District Animal Husbandry Officers, there were 72 slaughter houses in the 22 test-checked ULBs, of which none had authorisation of PCB to function. Average production of slaughter waste in the test-checked ULBs was 6.12 tonnes per day. Absence of authorised slaughterhouses in the ULBs would provide scope for illegal slaughtering in unhygienic manner within the urban limits.

Visceral waste from slaughterhouse discharged into drains in Neyyattinkara Municipality (September 2021)

3.2.2 Collection of domestic hazardous waste

As per Rule 15(i) of SWM Rules, ULBs shall establish waste deposition centres for domestic hazardous waste[59] and issue direction to waste generators to deposit domestic hazardous waste at these centres to enable their safe disposal. Bio-medical Waste Management Rules, 2016 stipulate that ULBs shall have tie up with the Common Bio-medical Waste Treatment and Disposal Facility to collect domestic hazardous waste from waste deposition centres/Material Recovery Facility (MRF) or directly from the households for final disposal.

- It was noticed that local bodies render palliative home care services to persons with complex, chronic or acute, life-threatening/life-limiting health conditions as well as bedridden persons. During the period 2016-2021, test-checked ULBs spent ₹13.50 crore towards implementation of palliative care projects for 14185 patients, which included purchase of equipment and medicines, disposable items such as catheters, urine bags, syringes, gloves, ryles tubes, etc. As such ULBs were aware of the significant load of bio-medical waste generated in palliative care households. However, no action was seen taken by 13 test-checked ULBs[60] to collect bio-medical waste generated from such households. The remaining ULBs replied to Audit that they handed over such waste to hospitals in the vicinity for onward transmission to processing sites.
- The test-checked ULBs did not establish waste depositing points/centres to enable depositing and collection of domestic hazardous waste. Consequently, instances of dumping of domestic hazardous waste on road sides and public places were noticed during JPVs in test-checked ULBs[61], which contributed to environmental and health hazards.

[59]Domestic hazardous waste includes discarded paint drums, pesticide cans, CFL bulbs, tube lights, expired medicines, broken mercury thermometers, used batteries, used needles and syringes, contaminated gauze, etc. generated at the household level.

[60]Kozhikode, Thiruvananthapuram Corporations, Vadakara, Eloor, Aluva, Maradu, Kothamangalam, Angamaly, Muvattupuzha, Mavelikkara, Kayamkulam, Nedumangad and Neyyattinkara Municipalities

[61] Kochi Corporation and Neyyattinkara, Eloor, Aluva Municipalities

3.2.3 Collection of sanitary waste

Sanitary waste comprises of used diapers, sanitary towels or napkins, tampons, condoms, incontinence sheets and any other waste of similar nature. Audit observed that the test-checked ULBs did not collect sanitary waste or set up community level disposal facility for sanitary waste. In the absence of a system in place for regular collection of sanitary waste, instances of mixing of sanitary waste with solid waste occurred, which made segregation extremely difficult, besides contributing to open burning of plastic and sanitary waste, which was environmentally hazardous.

During the exit conference (May 2022), Government accepted the audit finding and stated that at present there is no system or strategy for management, collection and disposal of domestic hazardous waste and sanitary waste. A pilot study has been conducted in some panchayats in and around Ernakulam, based on which guidelines for collection and disposal of domestic bio-medical waste including sanitary waste have been issued (May 2022).

Urgent action needs to be initiated to facilitate collection and disposal of sanitary waste in ULBs.

Environmental pollution due to non-collection of waste from Railway Station

Thiruvananthapuram Central Railway Station entered (September 2020) into Memorandum of Understanding with CKCL for operation and maintenance of Resource Recovery Facility for waste treatment and disposal at the railway station. As the bio-composter machine was not functional, the segregated biodegradable waste was bundled and dumped outside the Facility, which led to foul smell and oozing of leachate from the heaped waste. The Railway authorities stated that these biodegradable waste would be lifted and transferred to the landfill of KEIL by CKCL. However, verification of records in CKCL revealed that the waste was buried by CKCL in private lands at Paliyode in Thiruvananthapuram district[62]. The agency which was entrusted with effective management of waste itself resorting to such unscientific methods of disposal, was not justifiable.

Further, Audit observed that the work of the Effluent treatment plant to process the liquid waste generated in the railway station and depot area has not been completed. As the plant has not been made functional yet, liquid waste generated is being drained into the Amayizhanjan Thodu, a canal passing underneath the Railway compound. The draining of liquid waste along with plastic waste thrown into the canal, has polluted the water body, besides posing risk of urban flooding during rainy season.

3.3 Transportation

The MSWM Manual stipulates a well synchronized primary and secondary collection and transportation system, with regular and well communicated

[62] The MSWM Manual requires the Municipal authorities to direct waste generators not to litter/throw/dispose any waste or burn or bury waste on streets, open public spaces, drains, etc. and to segregate waste at source and hand over segregated waste to authorised waste pickers/waste collectors

intervals of operation to avoid overflow and littering of waste. Further, the vehicles for transport are to be easy to maintain and compatible with the equipment design at the waste storage depot and capable of transporting segregated waste. Audit observed that as the ULBs did not attempt a scientific assessment of generation and collection of waste, no realistic assessment of requirement of vehicles could be made by the ULBs.

The vehicles used for transportation were to be covered and waste not made visible to public. Proper care should be taken to prevent spillage of waste and leachate en-route to the processing or disposal facility. Depending on the local conditions and location of processing site, ULBs use different types of vehicles such as pushcarts, auto tippers, tipper trucks and compactors for collection and transportation of waste.

3.3.1 Use of vehicles without partition/open vehicles

Source segregation would be successful only when the segregated streams of waste do not mix with each other at any stage of transportation, while being taken to the respective processing or disposal facility. In test-checked ULBs, open vehicles were used for transporting waste in seven ULBs[63], leading to spillage and littering en-route. Out of the different types of vehicles used for waste transportation in the selected ULBs, only 35.24 *per cent* of vehicles had partition and 58.13 *per cent* of vehicles were not in operation due to various reasons such as repair works, loss of fitness, etc.

In reply, Government stated (May 2022) that existing open vehicles were being replaced with covered vehicles and that availability of GPS will be ensured in vehicles engaged in transportation of waste.

3.3.2 Idling of own vehicles and hiring of private vehicles for transportation of waste

- Kochi Corporation is in possession of 97 vehicles for waste removal. Of these, 66 vehicles[64] were kept off road during the five year period covered in Audit. The prime reason for the idling of vehicles was delay in obtaining fitness certificates, which ranged from four to 74 months. Audit observed that in addition to procedural delays, there was considerable time lag in receiving approval from Health Standing Committee/Council of the ULBs, rectification of defects by the contractor, etc. As of March 2022, the period of delay in the case of Covered tippers ranged upto 15 months, Compactors upto 23 months, JCB upto 41 months, Mini JCB upto 62 months and Ape trucks upto 74 months. These vehicles still continue to be off road for want of clearance regarding fitness. The Corporation incurred ₹27.53 crore during 2017-2021, towards hiring of vehicles for waste transportation.

  Concurrently, the Corporation hired on an average 44 vehicles until July 2020, by executing agreement for payment ranging from ₹450/tonne to ₹2100/tonne for solid/plastic waste. The agreement was modified with

[63]Kochi, Thiruvananthapuram Corporations and Aluva, Kothamangalam, Muvattupuzha, Nedumangad, Neyyattinkara Municipalities

[64] Nine compactors, three JCBs, 14 Covered tippers, 37 Ape trucks, one Open tipper and two Vans

effect from July 2020 and each vehicle was hired by paying upto ₹4850/vehicle/day.

Government replied (May 2022) that procedures adopted for obtaining fitness such as approval of Standing Committee/Council, inviting quotation for repair of vehicles, obtaining approval of Committee and Council for making payment, etc. resulted in the delay in obtaining fitness clearance. The reply is not justifiable as Corporation could have proactively intervened to minimise procedural delays, which resulted in keeping vehicles off the road for a considerable period. Also, ULBs incurring substantial amount of funds for hiring vehicles while their own vehicles were kept off the road due to avoidable administrative delay is not an acceptable trend.

- Thiruvananthapuram Corporation owned 120 vehicles, of which 107 vehicles were purchased during the period from 2006 to 2010 for door-to-door collection and transport of biodegradable waste to Vilappilsala windrow composting plant. Since the closing down of the plant in December 2011, the Corporation promoted source level processing of biodegradable waste and utilised vehicular transport only for street sweepings and littered waste and for shifting plastic waste from MCFs to RRFs. Audit observed that of the 29 tipper lorries purchased by the Corporation within five years of closure of Vilappilsala plant, 13 tippers were not utilised from March 2015 till March 2022. Of the remaining 16 tippers, only three were utilised regularly, thereby leading to nil/underutilisation of 26 vehicles. Of these, 13 vehicles were not used for a period of seven to 10 years. The average yearly utilisation of the remaining vehicles ranged from seven to 44 days during the five-year audit period. The Corporation conducted (April 2022) auction of 12 tippers of which only eight tippers could be disposed of, fetching around ₹ two lakh/tipper.

  The Corporation, instead of retaining nearly 26 vehicles without actual use, could have handed over these vehicles to ULBs like Kochi Corporation, where 40-50 tippers were being hired per day. This would have avoided idling of vehicles and loss of public money.

Recommendation 6: Government must ensure that ULBs adopt effective strategies for segregation of waste at various levels, viz., source/ household, centralised sorting facility and waste processing sites, door-to-door collection of domestic hazardous waste and sanitary waste and provide separate colour coded bins at public places to enable effective segregation and collection of waste.

Recommendation 7: Government/ULBs must ensure that a realistic assessment of vehicles used by ULBs for transportation of waste is undertaken. Urgent action needs to be initiated for executing maintenance/repair works of vehicles, to limit hiring of vehicles while keeping own vehicles off the road for prolonged periods.

Thumboormuzhi unit,
Nedumangad Municipality
September 2021

CHAPTER IV

PROCESSING AND DISPOSAL OF WASTE

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PROCESSING AND DISPOSAL OF WASTE

There was gap in coverage among the households provided with biodegradable waste management facilities, which ranged from 59.79 *per cent* to 99.94 *per cent*. Waste processing units supplied to households were not utilised effectively in many places. Infructuous expenditure on purchase and distribution of bio-composter bins due to inadequate utilisation by beneficiaries resulted in unfruitful expenditure of ₹3.35 crore. Source level treatment facilities were not provided in all apartments visited. Incinerators/ burners were installed in apartments without authorisation of Pollution Control Board.

The bio-methanation units installed in markets were defective and Liquid waste treatment facility was not installed in any of the markets visited. Thumboormuzhi units and bio-gas plants installed were not functional due to improper maintenance.

We noticed that 3.86 lakh tonnes of waste reached the centralised processing plant at Brahmapuram in Kochi Corporation during 2016-2021. As the plant had a capacity to process only 250 tonnes/day of biodegradable waste, around 2.85 lakh tonnes became rejects. Leachate treatment plant was not installed which led to oozing leachate polluting nearby water bodies. An unjustifiable clause in the agreement between the local body and contractor, linking payment of tipping fee to the total quantum of waste brought into the treatment plant resulted in excess payment of ₹11.72 crore by the Corporation. In Kozhikode Corporation, the work of Leachate treatment plant at Njaliyanparamba was not yet completed, resulting in mixing of leachate with rain water, which flowed into drains.

Of the 14 dumpsites in the test-checked ULBs, unsegregated mixed waste was still being dumped in five sites and remediation work had commenced only in three Corporations. Sanitary landfill for disposal of rejects/residual waste was not set up in the State till date.

The source level processing units installed in households were not functioning effectively, leading to unscientific methods of processing of waste. We observed deficiencies in the functioning of processing plants at Kochi and Kozhikode Corporations. Scientific remediation of dumpsites was not undertaken by ULBs on priority.

4.1 Processing and Treatment

According to Rule 15 (v) of the Solid Waste Management Rules, 2016, ULBs shall facilitate construction, operation and maintenance of solid waste processing facilities and associated infrastructure for optimum utilisation of various components of solid waste. The ULBs were to adopt suitable technology such as bio-methanation[65], microbial composting, vermin-composting, anaerobic digestion or any other appropriate processing technology for bio-stabilisation of biodegradable waste.

[65] Process entailing enzymatic decomposition of organic matter by microbial action to produce methane rich biogas

4.1.1 Status of processing of biodegradable waste

The biodegradable waste shall be processed, treated and disposed of through composting or bio-methanation within the premises as far as possible by resident welfare and market associations, apartments, hotels and restaurants. As part of promoting decentralised system of waste management, the State policy issued in September 2018 prescribed source level processing of biodegradable waste. Details of biodegradable waste generated, collected and processed in the State during the audit period are shown in **Table 4.1**:

Table 4.1: Details of biodegradable waste generated, collected and processed by test-checked ULBs during 2016-2021

	2016-17	2017-18	2018-19	2019-20	2020-21
Generated (tonne/day)	2,97,615.28	3,04,634.17	3,12,051.82	3,17,848.10	3,03,507.05
Collected (tonne/day)	1,20,297.58	1,24,696.97	1,30,114.37	1,31,906.35	1,16,097.30
Processed	1,18,710.20	1,29,748.10	1,39,808.40	1,53,879.50	1,50,329.30
Percentage of processing	39.89	42.59	44.80	48.41	49.53

(Source: Data from test-checked ULBs)
As biodegradable waste processed through source level processing facilities were also considered, the total quantity of processing outweighed that of collection.

In test-checked ULBs, the percentage of biodegradable waste processed ranged from 39.89 to 49.53 only. Audit observed that inadequate infrastructure, low utilization of available infrastructure, etc. led to non-processing/inadequate processing of waste collected, as detailed in subsequent paragraphs:

4.1.1.1 Inadequate infrastructure for managing household biodegradable waste

With the exception of Kochi Corporation where household biodegradable waste was collected and transported to disposal site, the test-checked ULBs provided various systems like pipe composting, bio bins, biogas, kitchen compost, etc. to ensure source level processing of waste by households.

Audit observed inadequate infrastructure contributing to significant gap in coverage ranging from 59.79 *per cent* to 99.94 *per cent* among the households provided with biodegradable waste management technologies in the 21 test-checked ULBs[66] (**Appendix 5**). Joint physical verification was conducted at five[67] randomly selected households supplied with decentralised processing technologies in each test-checked ULB. Of the 107 households visited, only 54.24 *per cent* of waste processing units were being utilised effectively. Reasons for poor utilisation included improper technology (in the case of pipe compost), lack of awareness regarding usage of processing facilities, inadequate service by agencies of biogas plants, irregular/lack of supply of inoculum[68] for treatment of waste in kitchen bin, irregular service by HKS, etc. It was seen that no other ULB except Thiruvananthapuram Corporation supplied inoculum to households. However, the extent of supply of inoculum in this ULB ranged from 3.69 to 17.33 *per cent* only, which is suggestive of the

[66]Except Kochi Corporation which transported biodegradable waste to Brahmapuram
[67]The covid restrictions then prevailing in the State did not permit extensive coverage of households by audit team
[68] Population of micro-organisms introduced into a suitable medium

probability of non-functioning of 82 to 96 *per cent* household waste processing facilities. Despite GoK designating HKS to visit each household and impart awareness in using waste processing facilities, the percentage of facilities supplied and put to use by households was observed to be low, as presented in **Table 4.2**.

Table 4.2: Status of utilisation of waste processing facilities supplied in test-checked ULBs

Total number of households	Number of households provided with facilities	Percentage of households provided with facilities	Number of facilities actually in use	Percentage of facilities in use	Percentage of households processing waste at source
1107006	206535	18.66	81674	39.54	7.38

(Source: Data from test-checked ULBs)

Low source level treatment clubbed with low door-to-door collection of biodegradable waste resulted in littering of waste in public places, water bodies, etc. Further, instance of private agencies collecting waste from households which were already provided with facilities was also noticed.

Infructuous expenditure on purchase and distribution of bio-composter bins in Thiruvananthapuram Corporation

As part of decentralised waste management, Thiruvananthapuram Corporation purchased and distributed 46,492 bio-composter kitchen bin units at ₹1800/unit in two phases (15,833 bins in the first phase and 30,659 bins in the second phase) during the period from 2016-17 to 2020-21. The expenditure incurred (until December 2022) by the ULB amounted to ₹5.96 crore, with a committed liability of ₹8.37 crore. As per Corporation records furnished to Audit, 14,505 beneficiaries (31.2 *per cent*) were using bio-composter bins for processing of waste (October 2021).

The status of utilization furnished by the ULB could not be regarded as true to facts, as Audit observed that only an average of 3627 bags of inoculum were supplied to the households per month in 2020-21. Further, private agencies entrusted with the collection of non-biodegradable waste collected biodegradable waste unauthorisedly even from households supplied with bio-composter bins. This resulted in non-utilisation of bio-composter bins supplied to the beneficiaries. Thus unauthorised collection of biodegradable waste by service providers, absence of regular supply of inoculum and lack of monitoring by the Corporation contributed to idling of 70 *per cent* of bins distributed. This would tantamount to unfruitful expenditure of atleast ₹ 3.35 crore.

Accepting the observation, Government stated in the exit conference (May 2022) that shortage of inoculum and improper management had led to non-usage of source level composting facilities. As regards non-usage of bio-composter bins leading to infructuous expenditure by Thiruvananthapuram Corporation, it was stated that the ULB had relied on service providers and monitoring and supervision had been an issue. Government assured that steps have been taken to assess the functioning of existing household waste processing systems through site verification by HKS.

4.1.1.2 Source level treatment of waste in Apartments

Apartments and houses having floor area 400 m^2 or above should establish necessary facilities for treatment and disposal of waste at source. It was mandatory to include waste processing facilities in buildings at the time of construction itself and within one year, for existing buildings. The Secretary of the ULB was to cancel the licence of buildings which did not have such facilities and those who violated the Rule were to be penalised by levying fine not below ₹ 10,000 or imprisonment upto six months, or both. It was observed that only 286 (52.19 *per cent*) of 548 apartments in test-checked ULBs had source level treatment facilities. During JPV in 21 apartments in five[69] test-checked ULBs, it was seen that source level treatment facilities were not provided in 11 apartments. In 14 apartments, incinerators/burners were installed without authorisation of PCB.

4.1.1.3 Inadequate Source level treatment of waste in markets and other places

According to SWM Rules, 2016, the local bodies were to set up decentralised compost plant or bio-methanation plant in markets and other suitable locations for processing the waste generated, ensuring hygienic conditions. As per data furnished by ULBs, of the 118 markets in 20[70] test-checked ULBs, 33 markets (28 *per cent*) had source level waste treatment facilities. Joint Physical Verification conducted by Audit in 23 of these markets revealed that composting/ bio-methanation units to treat market waste were installed only in 19 markets, of which 11 were functioning. Liquid waste treatment facility was not installed in any of the markets visited by Audit.

Audit observed that the source level treatment facility installed in the markets and other locations in test-checked ULBs had deficiencies as detailed below:

- **Aerobic Bin (thumboormuzhi) units**

Thumboormuzhi is a type of Aerobic Bin Composting unit for converting biodegradable waste into compost using inoculum. Usage of inoculum is essential for providing bacterial consortium for aerobic composting. Equal layers of biodegradable waste and dry leaves are placed with the help of wooden frame and inoculum is sprayed on top. Composting takes place in a period of 90 days. Details of thumboormuzhi units installed in test-checked ULBs are given in **Appendix 6**. The following deficiencies were noticed:

- Thiruvananthapuram Corporation employed 350-396 workers (with two persons per location for fixed units and one person per location for portable units) for managing thumboormuzhi units at 99[71] locations. This resulted in employing an additional 252-298 workers against the actual requirement of 98 workers[72], which led to extra expenditure of ₹41.28 lakh per month. Interestingly, despite employing excess personnel, only 73 *per cent* of units installed remained functional. Fifty three workers were engaged in two circles and Main office where no thumboormuzhi units were installed. In

[69] Thiruvananthapuram, Kochi Corporations and Mavelikkara, Aluva, Maradu Municipalities
[70] No markets function in Eloor and Mavelikkara Municipalities
[71] 52 (fixed units) and 47 (portable units)
[72] Manpower required in 99 locations (151) – Manpower allotted to non-functional units and Main office (53) = 98

13 locations though the units were defunct the workers continued to be engaged.

- Two hundred and seventy three thumboormuzhi units in six ULBs[73] were not functional due to improper maintenance and short supply of inoculum. The non-functional units were used for storing plastic waste in some places. Audit also observed the units in poorly maintained and unhygienic conditions converting the area into breeding ground for black soldier larvae and rodents. The manure produced from the units was not regularly sold/disposed which resulted in accumulation of manure and non-use of the units.

Thumboormuzhi unit stacked with plastic and other waste in Thiruvananthapuram Corporation (July 2021)

- No leachate treatment facilities were provided in the units which led to untreated slurry contaminating the soil. During JPV in 10 locations at Alappuzha Municipality, Audit noticed that leachate collection tanks were not provided, causing leachate generated to seep into the ground.

Koyilandy Municiapality: Thumboormuzhi units not functional and filled with plastic waste (July 2021)

Thumboormuzhi aerobic compost unit at Civil station Koyilandy Municipality (July 2021)

The Chairman, KSPCB stated (June 2022) that periodic inspections were not possible due to shortage of technical staff and that inspections were conducted on receipt of complaints and necessary action taken. Government informed (May 2022) that Thiruvananthapuram Corporation has approved an estimate to revive all thumboormuzhi units.

[73] Thiruvananthapuram, Kozhikode Corporations and Nedumangad, Alappuzha, Koyilandy, Vadakara Municipalities

- **Non-functioning of Community Level Biogas plants**

Seven test-checked ULBs[74] installed biogas plants for treatment of waste in markets and of the 16 plants installed, 14 were found non-functional due to improper maintenance, technical reasons, etc. **(Appendix 7**). Audit observed that community level biogas plants require dedicated manpower for their proper management and Annual Maintenance Contracts (AMC) so that non-degradable waste do not get fed into the plants.

Unfruitful expenditure on a biogas plant

Manjeri Municipality formulated (2010-11) a project for installation of a 1000 kg capacity biogas plant at market premises. The Municipality entrusted (March 2010) the works relating to design, supply, erection and commissioning of the plant to M/s Integrated Rural Technology Centre (IRTC) Palakkad at a cost of ₹19.88 lakh with the stipulation to complete the work within six months. However, the agency completed the work only in December 2016, after a prolonged interval of six years, reportedly due to public protest. Though the Municipality took over the plant from IRTC in February 2018, it did not ensure fruitful utilisation of gas generated in the market premises. Moreover, the slurry accumulated in the plant could not be removed which led to the closing down of the plant within days after taking over of the plant. This led to inability to dispose of market wastes at source level, thereby defeating the purpose of installation of the biogas plant, in addition to unfruitful expenditure of ₹19.88 lakh.

Government informed (May 2022) that Manjeri Municipality has given strict directions to IRTC to carry out the maintenance works without delay. However, JPV conducted by Audit in August 2022 revealed that the biogas plant remained dysfunctional and removal of biodegradable waste was entrusted to a private agency.

Infructuous expenditure on Annual Maintenance Contracts

Thiruvananthapuram Corporation installed 10 community level biogas plants having capacity of one or two tonnes per day in public markets during the period from 2011-12 to 2015-16. Audit observed that though the ULB spent ₹19.50 lakh for the maintenance of five[75] community level biogas plants and ₹11.31 lakh towards AMC for five plants[76] during 2019-20 and 2020-21, eight out of the 10 biogas plants were not functioning (October 2021). In Manacaud market, which was a dedicated market for sale of bananas, the biogas plant installed remained underutilised as little bio-waste was produced and fed to the plant. Audit observed that non-engagement of dedicated personnel/absence of regular awarding of AMC for management of the biogas plants resulted in closing down of the plants. In Vallakkadavu market, plastic waste was fed into the plant leading to its closing down. The Health and Engineering wings awarded AMC without assessing the requirements to make a plant functional,

[74]Thiruvananthapuram, Kozhikode Corporations, Nedumangad, Neyyattinkara, Nilambur, Parappanangadi and Manjeri Municipalities

[75] In markets at Palayam, Manacaud, Kalladimughom, Perunelli and Sreekandeswaram

[76] In markets at Vattiyoorkavu, Vallakkadavu, Perunelli, Women and Child Hospital, Thycaud and Main office of Thiruvananthapuram Corporation

which resulted in failure in operationalising the plant within the AMC period. This led to infructuous expenditure and resultant loss to the exchequer.

In the exit conference (May 2022), Government assured to take corrective action with respect to the absence of source level treatment facilities in apartments and markets and non-functioning of biogas plants.

4.1.2 Functioning of Centralised processing plants

Of the 22 test-checked ULBs, Kochi and Kozhikode Corporations and Perinthalmanna Municipality had centralized processing facilities. Audit analysed the functioning of these plants and noted deficiencies in the working of the plants at Kochi and Kozhikode Corporations as detailed below:

4.1.2.1 Faulty operation of Brahmapuram centralised processing facility

Scan the QR code to view

Kochi Corporation executed agreement (January 2012) with M/s. Environ Green for O&M of solid waste disposal facility at Brahmapuram. As per the agreement, the contractor had to procure all materials and equipment required for composting and also meet the requisite charges for supply of electricity, water, etc. The following shortcomings were noticed in the operation of Brahmapuram plant:

- The agreement between the Corporation and contractor stipulated that both the parties should jointly fix the permissible amount of rejects in the collected waste, every three months. However, no such fixing of quantity was done during the audit period. Of the 3,85,555 tonnes of waste which reached the Brahmapuram processing site during 2016-17 to 2020-21, only 1,00,138 tonnes were processed. Unprocessed quantity of 2,85,417 tonnes turned into rejects.

  The agreement executed by Kochi Corporation with the neighbouring local bodies specified that only biodegradable waste were to be transported to Brahmapuram. However, the local bodies transported 79,996 tonnes of unsegregated mixed waste to the facility. Had the local bodies effectively segregated waste at source point itself, there would have been considerable drop in the quantum of rejects which reached the centralised facility.

- Audit observed that leachate oozed underground from the waste heaped in plant premises, polluting nearby water bodies like Kadambrayar and Chitrapuzha. The failure of the Corporation to install leachate treatment plant for treatment of leachate generated, led to KSPCB assessing the Environmental compensation amounting to ₹1.12 crore on the Corporation from 22 November 2018 to 30 November 2019. The leachate treatment plant has not been made functional yet.

- As per clause in the agreement executed, the Corporation had to pay tipping fee to the contractor @ ₹550 per tonne of solid waste (biodegradable and RDF[77]) except plastic waste received in the plant. Though the plant claimed to have capacity to process 250 tonnes of waste per day and received 211 tonnes/day, the contractor processed only around 69 tonnes/day. The dilapidated windrow composting plant was the root cause of

[77] Refuse Derived Fuel

malfunctioning of the waste management facility. Inadequate spot treatment of fresh biodegradable waste brought into the plant led to its accumulation over and above the deposited legacy waste. Though the contractor processed only 33 *per ce*nt of the waste, Corporation made payment for the entire quantity of waste reaching the plant. Despite the agency having no role in transportation of waste from the ULBs to the treatment plant, payment of tipping fee was linked in the contract to the total quantum of waste brought into the treatment plant and not to the waste processed by agency. Excess payment attributable to this unjustifiable clause amounted to ₹11.72 crore.

- Government directed (November 2015) all departments and local bodies to adhere to e-tender procedure while awarding works with estimated cost of ₹ five lakh and above. In violation of the above, Kochi Corporation selected the same contractor from 2012 till 2021, by extending the period of contract and not uploading e-tenders. Audit observed that e-tender was conducted only thrice during the period from 2015 to 2021. The action of the Corporation in awarding work to the same contractor who failed to work in the best interest of the Corporation was objectionable.
- The National Institute of Technology, Kozhikode (June 2021) estimated the quantity of legacy waste at Brahmapuram as 325816 cu.m above ground level and 226087 cu.m below ground level. The Corporation had a committed liability of ₹55 crore to remove the huge volume of legacy waste in the plant premises.
- The Brahmapuram plant has been functioning without authorisation of State PCB since 2010. Though PCB issued notice to Kochi Corporation (July 2021), the plant continues to function without authorisation.

In reply, Government stated (May 2022) that issues related to dilapidated condition of the existing windrow compost plant have resulted in reducing the processing of bio waste into compost at Brahmapuram. Chairman, KSPCB replied to Audit (June 2022) that the Technical Committee meeting for finalising the implementation of Bio-mining held in January 2022 had observed that the contractors were unable to dig and carry out clearing of deposited waste due to water interference and that the total quantum of legacy waste assessed did not include the waste deposited in the dilapidated windrow sheds. In the exit conference (May 2022), Government assured to look into specific issues such as faulty agreement conditions, non-functioning of leachate treatment plant, etc.

4.1.2.2 Shortfalls in processing of biodegradable waste at Njaliyanparamba Treatment plant in Kozhikode Corporation

Biodegradable waste generated in Kozhikode Corporation was collected by sanitary workers/Kudumbashree members and transported to the treatment plant at Njaliyanparamba. As per agreement executed (June 2008) for O&M service of the plant with M/s. IL&FS Environmental Infrastructure and Services Ltd., the firm had to meet the running cost of the plant and remit royalty amount of ₹ 48,400 to the Corporation. The agreement also stipulated that the agency shall ensure an overall compost recovery rate of 20-25 *per cent.* Citing low level of achievement in production of compost and non-payment of royalty, the

Corporation terminated the agreement with the Company (July 2019) and took over the management of the plant. As of March 2022, the firm was obliged to pay ₹ 17 lakh to the Corporation.

The following shortcomings were noticed in the functioning of the plant during the audit period:

- During 2017-2021, against the total quantity of 84317.70 MT waste reaching the plant, the total compost production was 5233.17 MT (6.2 *per cent*). The MSWM Manual, 2016 stipulates typical efficiency of 18-20 *per cent* for organic solid waste input and 10-15 *per cent* for mixed waste input for a windrow compost plant. Reckoning compost production at 15 *per cent*, total biodegradable waste processed would be 34887.73 MT. As such, only 41 *per cent* of waste brought to the plant was being processed.

Kozhikode Corporation - Mixed waste processed at treatment plant, Njaliyanparamba

- Reduced processing resulted in accumulation 3000 MT of backlog waste at the plant site. Low processing of waste also resulted in approximate revenue loss to the tune of ₹48.69 lakh, which would have accrued from sale of compost during 2019-20 and 2020-21.
- The Audit Report of Comptroller and Auditor General of India for the year ended March 2010 had pointed out the need for installing leachate treatment plant at Njaliyanparamba. Even after passage of 12 years, the situation has not changed. The Project Manager, KSUDP entered into an agreement (January 2016) with Ionex Envirotech Pvt. Limited for the construction of leachate treatment plant of capacity 75 cu.m per day in Kozhikode Corporation. The Chief Environmental Engineer, KSPCB Regional Office, Kozhikode inspected the treatment plant (October 2016) and reported that the majestic flow meter for the measurement of flow was not installed, anaerobic reactor was found open with aeration and sludge drying beds were not constructed. Though the ULB incurred an expenditure of ₹54.96 lakh on the plant, the plant has not been commissioned yet.
- Due to failure in completion of all items of work specified in the agreement, KSPCB did not grant Consent To Operate to the plant.
- During JPV (March 2022), Audit noticed that leachate generated in the compost plant got mixed with rainwater and was discharged into nearby drains. The KSPCB conducted site verification and reported (November

2019 and June 2022) that untreated leachate mixed with rain water flowed into the nearby stormwater drainage and farmlands.

- The KSPCB collected and tested (October 2021) well water samples in the area and found that the leachate content reduced the potability of well water.

Government replied (May 2022) that due to inefficiency and non-functional machinery, processing of biodegradable waste dumped in the windrow compost has been reduced and compost production decreased to seven tonnes per day. Regarding non-functioning of Leachate treatment plant, it was stated that Corporation has initiated legal action against the contractor. It was also informed that the Corporation has entered into an agreement to establish a Waste to Energy Plant at Njaliyanparamba, on completion of which all the problems related to leachate flow, water quality in the region, etc. would be permanently solved.

4.1.3 Street sweeping/street cleaning

As per SWM Rules, 2016, it is the responsibility of local authorities to collect sweeping waste separately on alternate days or twice a week depending on the density of population, commercial activity and local situation. The MSWM Manual prescribed that in small towns and medium cities, one sweeper per 300-350 running meters of road length was required for sweeping high density roads. Likewise, in the case of medium density roads, one person per 500 running meters of road length and in low density roads, one person per 750-1000 meters of road length was mandated for street sweeping. An analysis of the length of road required to be swept daily as against the manpower available for street sweeping in the test-checked ULBs revealed that the existing staff could cover only 888 km out of 7692 km length of road per day. The distance to be swept daily by a sweeper ranged from one km to 23 km in test-checked ULBs, due to which cleaning and sweeping of streets could not be undertaken effectively. There was an urgent need to increase the strength of the sweeping staff in ULBs to attend to the collection and processing of sweeping waste.

4.1.3.1 Processing of sweeping waste

Street sweeping waste predominantly comprises horticulture type waste (leaves, twigs), inert materials (sand and grit), and biodegradable and non-biodegradable waste from littering. As per SWM Rules, 2016, it is the duty of local authorities to direct street sweepers not to burn tree leaves collected from streets and to set up covered secondary storage facility for temporary storage of street sweepings and silt removed from surface drains, wherever direct collection of such waste into transport vehicles is not convenient. However, 21 of 22 test-checked ULBs have not provided temporary storage facility for street sweepings. Thiruvananthapuram Corporation which generated 71 tonnes of sweeping waste daily, had temporary storage facility for one tonne of waste only, whereas in the absence of storage facility, Kochi and Kozhikode Corporations and Aluva and Angamaly Municipalities transported the sweeping waste to Brahmapuram.

As per the MSWM Manual, street sweeping waste and silt derived from drains are to be separated from household waste streams, since street sweeping and drain silt could be infiltrated with significant amount of toxic substances and may contaminate waste streams envisaged for composting and recycling.

Therefore, street sweepings and silt from the drains are to be landfilled. However, in the absence of landfills, 12 of the test-checked ULBs deposited sweeping/drain waste in dumping yards. Burning of sweeping waste was noticed in Thiruvananthapuram and Kochi Corporations. Three ULBs[78] utilised the sweeping waste for processing of food/biodegradable waste in thumboormuzhi units, violating Rules.

Government replied (May 2022) that there was shortage of workers to cover the entire urban area on daily basis and that proposal for engaging Self help groups/ Non-Governmental Organisations/agencies for street sweeping was under consideration. As regards disposal of sweeping waste, it was stated that the collected waste would be categorized and only dry leaves would go to thumboormuzhi.

4.1.3.2 Infructuous expenditure on purchase of Mechanised Road Sweeping machine[79]

Thiruvananthapuram Corporation purchased a road sweeping machine in 2010 from M/s Roots Multi Clean Company Limited, Coimbatore (Company), incurring ₹ 73.50 lakh. As the Corporation lacked technical expertise to operate the machine, its O&M was entrusted to the same company for three years, for which an additional ₹ 99.69 lakh was paid. Though the Company submitted proposal for renewal of O&M in September 2013, O&M was not renewed by the Corporation. The machine was left idling since the expiry of O&M agreement (June 2013), at the garage of the Corporation.

In August 2021, the Corporation requested the Company to inspect the machine and prepare an estimate for necessary repairs to make it functional. However, the Company, after inspecting the machine, reported (November 2021) that as the machine was kept idle for over eight years, its parts had got rusted and damaged and technology turned obsolete. The repair of the machine would not be economical as its parts were to be imported from abroad. Further, RTO norms have been changed and currently, public vehicles were to adhere to BS-VI standards.

Audit observed that the laxity on the part of Thiruvananthapuram Corporation to renew O&M or impart technical expertise to personnel during the three operational years, led to the idling and consequent damage of the machine since 2013, not to mention the infructuous expenditure of ₹ 73.50 lakh, for which responsibility needs to be fixed.

Government stated that the Corporation has requested (January 2022) the Mechanical wing of Public Works Department to ascertain the feasibility of utilising the chassis of the vehicle after removing sweeping kit. The reply does not provide any assurance regarding the scope of utilisation of the machine for the purpose envisaged.

4.1.4 Authorisation of Urban Local Bodies

As per Rule 15 of SWM Rules, local bodies shall make an application to the KSPCB or the Pollution Control Committee for grant of authorisation for

[78] Thiruvananthapuram Corporation, Alappuzha and Eloor Municipalities

[79] The irregularity was pointed out in the Audit Report 2013-14 of Kerala State Audit Department. Audit has updated the present status of utilisation of the machine in this report

setting up waste processing, treatment or disposal facility, if the volume of waste exceeds five metric tonnes per day, including sanitary landfills. The KSPCB was to examine the proposal received from local bodies, make necessary inquiries and issue authorisation within a period of sixty days.

On scrutiny of records at KSPCB to check extent of compliance of the above, it was seen that of the 22 test-checked ULBs, only one Corporation (Kozhikode Corporation) and five Municipalities[80] have received authorisation of KSPCB. Five ULBs[81] had submitted applications for receipt of authorisation, which were under scrutiny. The KSPCB had issued show cause notices to five ULBs[82] for not complying with the provisions of SWM Rules, 2016. Though directions were issued to six ULBs[83] to apply for authorisation, the ULBs have not responded favourably. Audit noticed that the instructions of KSPCB were not complied with and no pro-active action initiated by the ULBs to secure authorisation.

Audit also observed that KSPCB issued notices on the basis of Environment Protection Act, 1986 and directions of National Green Tribunal and worked out Environmental Compensation for non-compliance with the provisions of the Act to Thiruvananthapuram Corporation (₹14.59 crore), Aluva Municipality (₹2.13 crore) and Kochi Corporation (₹14.92 crore). Thiruvananthapuram and Kochi Corporations obtained stay from Hon'ble High Court against the levy of Environmental Compensation whereas Aluva Municipality has not initiated any action so far.

The KSPCB, in the process of issuing authorisation to local bodies, ensures that the waste management mechanism adopted by local bodies is in compliance with accepted health and environmental standards. Therefore, local bodies need to assign priority to secure authorisation from KSPCB.

Government accepted the observations and replied (May 2022) that necessary directions have been issued to local bodies to obtain authorisation from KSPCB.

4.2 Disposal

4.2.1 Status of Dumping Yards

A Dumpsite is a land utilised by the local body for disposal of solid waste without following the principles of sanitary land filling. The SWM Rules, 2016 stipulate that bio-remediation or capping of old and abandoned dump sites is to be done within five years from the date of notification of the Rules. Remediation work on all other dumpsites was to be commenced from 01 November 2019 and completed preferably within six months and in no case beyond one year.

As per records in KSPCB/ULBs, there are 43 dumpsites in the ULBs in the State, of which eight are in Municipal Corporations and 35 in Municipalities. Status of dumpsites in selected ULBs is given in **Appendix 8**. It was seen that of the 14 dumpsites in the test-checked ULBs, unsegregated mixed waste was

[80] Neyyattinkara, Alappuzha, Mavelikkara, Kayamkulam, Vadakara
[81] Malappuram, Manjeri, Parappanangadi, Perinthalmanna, Feroke Municipalities
[82] Thiruvananthapuram and Kochi Corporations, Aluva, Angamali, Maradu Municipalities
[83] Kothamangalam, Muvattupuzha, Eloor, Nedumangad, Nilambur, Koyilandy Municipalities

still being dumped in five sites[84] and remediation work has commenced only in Thiruvananthapuram, Kochi and Kozhikode Corporations. It was evident that the test-checked local bodies were yet to investigate and analyse all old open dumpsites and existing operational dumpsites for their potential of biomining and bio-remediation, and to undertake necessary action wherever feasible.

It is perturbing to note that despite the passage of five years since the notification of SWM Rules and National Green Tribunal's ultimatum for completion of remediation work within a year, the test-checked ULBs had not bestowed attention on the closing/rehabilitation of existent dumpsites to evade potential risks of environmental hazards.

Government replied (May 2022) that remediation of 34 dumpsites would be undertaken through KSWMP.

Legacy waste dumped at Njaliyanparamba dumping site (October 2021)

Brahmapuram dumpsite at Kochi Corporation (November 2021)

4.2.2 Status of Landfills

Sanitary landfilling is the final and safe disposal of residual solid waste and inert waste in a facility designed with protective measures against pollution of ground water, surface water and fugitive air dust, fire hazard, animal menace, greenhouse gas emissions, etc. The SWM Rules, 2016 mandated that only the non-usable, non-recyclable, non-biodegradable, non-combustible and non-

[84] Kozhikode, Kochi Corporations, Kayamkulam, Mavelikkara, Muvattupuzha Municipalities

reactive inert waste and pre-processing rejects and residues from waste processing facilities, were to be sent to sanitary landfill.

Audit observed that sanitary landfill for disposal of rejects/residual waste has not been set up in the State so far. In the absence of sanitary landfill, test-checked ULBs dumped rejects and street sweepings at the dumpsites and centralised/community level processing facilities. Instances of dumping inert sweeping waste and drain silt in private lands and land owned by the ULB were noticed in Thiruvananthapuram and Kozhikode Corporations. Mixed waste including plastic bottles, e-waste, etc. were sent by local bodies to the landfill facility of KEIL. Imprudent utilisation of the only hazardous landfill facility in the State for disposing unsegregated and non-hazardous waste would lead to dearth of space for hazardous waste disposal in future.

Government informed in the exit conference (May 2022) that efforts of the State to purchase land to set up landfill facility have not yet succeeded, due to the difficulty in identifying suitable land for the purpose, on account of the density and spread of population in the State. The reply is not acceptable as the delay in identification of land to establish scientific landfills atleast at regional levels, would contribute to unscientific and non-sustainable disposal of waste as observed by Audit.

Unsegregated waste dumped at processing centre

Brahmapuram (November 2021)

Erumakuzhy, Thiruvananthapuram (July 2021)

Recommendation 8: Government/ULBs must ensure to provide adequate resources to implement source level treatment facilities for processing of biodegradable waste and handhold households/institutions for effective utilisation of the facilities provided. Government must also set up adequate

number of community level facilities for processing spill over waste from all sources.

Recommendation 9: Government must ensure that mixed waste generated gets segregated at source points itself and biodegradable waste alone reach the Centralised processing plants at Brahmapuram and Njaliyanparamba. Government must also urge the Corporations to set up Leachate treatment plants to treat the leachate generated, thereby preventing pollution of nearby water bodies and farmlands.

CHAPTER V

MANAGEMENT OF PLASTIC WASTE, BIO-MEDICAL WASTE, E-WASTE AND CONSTRUCTION AND DEMOLITION WASTE

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MANAGEMENT OF PLASTIC WASTE, BIO-MEDICAL WASTE, E-WASTE AND CONSTRUCTION AND DEMOLITION WASTE

Insufficient collection of plastic waste from households, institutions and commercial establishments resulted in burning of plastic waste and dumping in public places. Shredding machines and bailing machines were not functional in several ULBs. Poor segregation of recyclable waste resulted in disposal of plastic waste as rejects. There were incidents of fire outbreaks caused by improper management and open burning of plastic waste. Extended Producer Responsibility (EPR) based plastic waste management system was yet to be established in test-checked ULBs. Kochi Corporation incurred an expenditure of ₹14.16 crore for transportation of 1,69,293 tonnes of plastic waste towards hiring charges of tipper lorries/JCBs etc.

The Corporation incurred an expenditure of ₹836 towards transportation of one tonne of plastic waste. We also noticed an instance of Kozhikode Corporation entrusting a Haritha Sahaya Sthapanam with the disposal of rejects, without even ensuring the mode or site of disposal chosen by the agency. The ULBs in the State were yet to achieve the target of utilising shredded plastic in 30 *per cent* of roads constructed in their jurisdiction. Rampant usage of banned single use plastic carry bags were noticed in test-checked ULBs as well as failure in implementation of projects on manufacturing substitutes for plastic carry bags.

Bio-medical waste reaching the IMAGE plant was much in excess of its processing capacity and resulted in accumulation of highly infectious waste which was left exposed without any safeguards in the plant premises. Lack of adequate Governmental intervention in distributing the load of bio-medical waste among the two common bio-medical treatment facilities, IMAGE and KEIL, resulted in underutilisation of capacity of one plant and inability to process the overload of waste in the other plant.

Medical College Hospital, Institute of Maternal and Child Health and Institute of Chest Diseases, at Kozhikode liquid waste generated drained directly to ground, polluting nearby water bodies. As regards e-waste management, there was no mechanism in place to ensure EPR, and records relating to waste generation were not seen maintained. Facility for processing, recycling and disposing Construction and Demolition waste was not established. The Government and ULBs need to comply with extant Rules/Manual provisions to ensure proper implementation of waste management at various stages and for each category of waste generated.

Special waste comprises of any solid waste that requires special handling and disposal because of its quantity, concentration, physical and chemical characteristics or biological properties, in order to protect human health and environment. Plastic Waste, Bio-medical waste, E-waste, etc. fall under the category of Special waste. Audit analysed the efficacy in management of the above Special wastes and Construction and Demolition waste in test-checked ULBs.

5.1 Plastic Waste

The Plastic Waste Management Rules, 2016 (PWM Rules, 2016) stipulated that every local body shall be responsible for development and setting up of infrastructure for segregation, collection, storage, transportation, processing and disposal of plastic waste either on its own or by engaging agencies or producers. According to Annual Report 2018 of Central Pollution Control Board (CPCB), approximately 9.4 million tonnes per annum (TPA) of plastic waste was generated in the country, which amounted to 26000 tonnes per day (TPD). As per the Annual report 2019-20 of Kerala State Pollution Control Board (KSPCB), 360 TPD of plastic waste is generated in the State.

5.1.1 Status of compliance with Rules on Plastic Waste Management

Clauses 5 and 6 of PWM Rules, 2016, State Policy, SWM Rules, 2016, etc. spell out the responsibility of the local bodies for plastic waste management. The status of compliance to the provisions related to plastic waste management by the test-checked ULBs is shown in **Appendix 9**.

5.1.2 Transportation, processing and disposal

According to PWM Rules, 2016, plastic waste, which can be recycled, shall be channelised to registered plastic waste recycler. As per the SWM Strategy issued by GoK, the non-recyclable plastic waste from the transfer stations shall either be shredded and used for road construction or be bailed and sent to cement plants for heat recovery. It can also be converted to Refuse-derived fuel along with other flammable waste and sold to cement plants or such other places for use as alternative fuel. It is the responsibility of Haritha Karma Sena (HKS) to sort and store the non-biodegradable waste in Material Collection Facilities (MCF) and hand over the segregated non-biodegradable waste to CKCL or other authorised agencies for disposal. However, it was seen that in the absence of proper segregation by HKS, 25 to 100 *per cent* of plastic waste collected was mixed up with other waste and was disposed as rejects (**Appendix 10).**

Audit observed the following with regard to management of plastic waste in the test-checked ULBs:

- Kochi Corporation is incurring huge expenditure towards hiring charges of tipper lorries, Hitachi/JCB, etc. for the transportation of plastic waste. Quantity of plastic waste collected, expenditure borne by the Corporation towards hiring charges and revenue fetched during the period 2017-2021 are shown in **Table 5.1:**

Table 5.1: Expenditure borne by Kochi Corporation for transportation of plastic waste and revenue earned

(in Rupees)

Year	Tipper lorry rent (West zone)	Tipper Lorry rent (East zone)	Hitachi Hiring charges	Total amount	Amount received through sale of recyclable plastic
2017-18	87,04,589	1,58,68,814	35,25,400	2,80,98,803	4,48,803
2018-19	1,65,15,873	2,24,54,219	1,03,79,320	4,93,49,412	3,92,433

Year	Tipper lorry rent (West zone)	Tipper Lorry rent (East zone)	Hitachi Hiring charges	Total amount	Amount received through sale of recyclable plastic
2019-20	1,77,00,497	2,32,46,896	70,33,286	4,79,80,679	3,12,667
2020-21*	34,33,645	35,79,336	91,18,038	1,61,31,019	Not furnished
Total	**4,63,54,604**	**6,51,49,265**	**3,00,56,044**	**14,15,59,913**	**11,53,903**

**Until June 2020*

(Source: Data segregated by Audit on the basis of recordings in registers maintained by Kochi Corporation)

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- As per the data extracted by Audit from the registers maintained at Brahmapuram processing facility, the total quantity of plastic waste collected and transported to Brahmapuram plant during 2017-2021 was 1,69,293 tonnes. The total expenditure incurred towards transportation and hiring of Hitachi/ JCB was ₹14.16 crore. Among the unloaded plastic waste, recyclable plastic waste was sold by the Corporation @ ₹1.50 per kg to a contractor. However, only 769.3 tonnes (0.45 *per cent*) of recyclable plastic were recovered and revenue to the tune of ₹11.54 lakh alone fetched during the above period. Thus, on one tonne of plastic waste collected, the Corporation was incurring an expenditure of ₹836 towards transportation and hiring charges. The remaining waste was dumped at the site as rejects. During JPV of the site with the municipal staff, Audit observed that the total quantity of waste unloaded at the site was not properly segregated and included other waste such as leather, clothes, e-waste, etc.

  Government responded (May 2022) that strict instructions would be given to the Corporation to ensure that segregation of waste takes place before transporting waste to the processing facility at Brahmapuram.

- Kozhikode Corporation (Corporation) entrusted (April 2017) Niravu, a Haritha Sahaya Sthapanam (HSS)[85], with the disposal of rejects collected at various wards of the Corporation under monthly agreements. But while executing the agreement, the Corporation did not ensure the mode of disposal of waste by Niravu. As per Corporation records, the rejects collected from Corporation wards were stated to have been removed to the processing plant of Niravu at Mandya in Karnataka. However, the Corporation stated to Audit that there was no such approved plant for Niravu at Mandya. Incidentally, Karnataka PCB wrote (January 2020) to Kerala PCB that there was illegal inter-state transportation of mixed solid waste from Kerala to Karnataka.

  Despite the above, the Corporation further executed (June 2020) agreement with Niravu for a validity period of 36 months for the disposal of plastic waste collected from the Njaliyanparamba MCF. As per agreement conditions, plastic waste was to be sold to Niravu at the rate of ₹ four per kg and the reject waste to be taken away on payment of ₹4.90 per kg by the ULB. Accordingly, the Corporation handed over 31.13 tonnes of non-recyclable waste during the period from July 2020 to December 2021 to Niravu, with a financial commitment of ₹152.52 lakh, of which ₹55 lakh was paid till December 2021. Thus, the Corporation had incurred expenses

[85]Agency to provide technical assistance to HKS in waste management activities

for the disposal of waste in another State, without even ensuring the mode or site of disposal chosen by the agency entrusted with the task.

- Audit observed that higher percentage of rejects was due to improper secondary segregation of waste. Huge quantities of rejects lying heaped at processing facilities resulting in fire outbreaks in three ULBs, *viz.*, Kochi Corporation (2019, 2020, 2021), Perinthalmanna Municipality (2019) and Alappuzha Municipality (2022). Had effective segregation taken place at source/MCF/MRF/processing sites, such enormous quantity of mixed waste including recyclable plastic would not have accumulated at the facility.

Government stated (May 2022) in the exit conference that directions have been issued to strictly regulate interstate transfer of waste and to use GPS[86] enabled vehicles for transportation of waste and for tracking the movement of waste. Regarding fire outbreaks, it was stated that ULBs have now been directed to obtain Fire NOC[87] for MCFs.

5.1.3 Usage of shredded plastic in road work

In line with the Guidelines issued by Government of India[88] encouraging use of plastic waste in the construction of rural roads, GoK directed[89] LSGIs to use shredded plastic along with bitumen in the works relating to 30 *per cent* of the roads constructed in their jurisdiction. As per data furnished by CKCL, the State Public Works Department utilized 877.32 tonnes of plastic waste and constructed 877.32 km length of road. The Local Self-Government Institutions in the State constructed 2801.68 km of roads using 1120.69 tonnes of plastic waste during the period from 2016-17 to 2020-21. It was seen that the test-checked ULBs utilized 37.24 tonnes of plastic in constructing 93.09 km of road during the audit period. Seven[90] ULBs did not use any quantity of shredded plastic for road works during the period.

The details of quantity of plastic waste utilised and length of road constructed in test-checked ULBs are given in **Table 5.2.**

Table 5.2: Details of usage of plastic waste in construction of roads in test-checked ULBs during 2016-2021

Year	Quantity of plastic waste used (tonne)	Length of road constructed (km)
2016-17	0.48	1.19
2017-18	1.81	4.53
2018-19	2.46	6.15
2019-20	5.11	12.77
2020-21	27.38	68.45
Total	**37.24**	**93.09**

(Source: Data from Clean Kerala Company Limited)

[86] Global Positioning System
[87] No-Objection Certificate
[88] National Rural Roads Development Agency, Ministry of Rural Development
[89] 2016-17 and 2017-18:10 *per cent*, 2018-19:25 *per cent*, 2019-20:20 *per cent*, 2020-21:30 *per cent*
[90] Kochi Corporation, Mavelikkara, Muvattupuzha, Aluva, Maradu, Parappanangadi and Koyilandy Municipalities

Audit noticed that ULBs started using shredded plastic in road works only when its usage was made mandatory (2020-21) by Government in re-construction of roads affected by the great flood in 2018.

The efforts of State Government towards utilisation of plastic waste for road construction is commendable. However, ULBs in the State are yet to achieve the target of utilising shredded plastic in 30 *per cent* of roads constructed in their areas of jurisdiction.

5.1.4 Usage of banned plastic

As per PWM Rules, 2016, carry bags made of virgin or recycled plastic shall not be less than 50 microns in thickness. Government of India imposed prohibition on usage of carry bags below 50 microns from 2016 onwards and GoK banned[91] single use plastic items from January 2020. The violators were to be fined ₹10,000, ₹25,000 and ₹50,000 in the first, second and third instances respectively and their licences cancelled in subsequent violations.

Audit observed that the test-checked ULBs conducted only 6638 inspections during the audit period (2016-2021) to detect violation of the above instructions. Considering the fact that there were 2,54,491 shops/hotels/restaurants in the test-checked ULBs, it was evident that only six to seven shops had been inspected in a month on an average, which was grossly insufficient. An amount of ₹ 24.44 lakh was seen collected as fine towards non-compliance. During JPV in 20 test-checked ULBs, it was noticed that plastics with thickness below 50 microns were being rampantly used in shops, hotels, markets, fish/vegetable stalls, etc. Banned plastic waste collected and deposited in bulk at the MCF/MRF in the 22 test-checked ULBs reflects the laxity on the part of ULBs to implement the ban. Plastic waste left scattered without organised collection methods cause fatality among cattle and other animals which consume them. As per the status report furnished by the Directorate of Animal Husbandry, of the 143 cattle died due to consumption of waste during 2016-2021 in the State, 47 had devoured plastic waste.

5.1.5 Extended Producer Responsibility

According to Rule 9 of PWM Rules, 2016, the primary responsibility for collection of used multi-layered plastic sachet or pouches or packaging is of the Producers, Importers and Brand Owners who introduce the products in the market. They need to establish a system for collecting back the plastic waste generated on account of their products. This plan of collection is to be submitted to the KSPCB while applying for Consent to Establish or Operate or Renewal. Government directed (2018) Suchitwa Mission to facilitate local governments to implement Extended Producer Responsibility (EPR) for applicable special waste in consultation with KSPCB. However, the State has not implemented EPR so far.

Audit noticed that companies who obtained registration from Central PCB have not furnished quarterly or annual progress reports on collection of plastic waste from the State to KSPCB. Consequently, KSPCB was unable to assess the

[91] Ban on the manufacture, storage, transport and sale of single use plastic items *viz*., plastic carry bags (irrespective of thickness), plastic sheets, cups, plates, flex, PET bottles of drinking water less than 300 ml, etc.

quantity of plastic waste taken back by the brand owners or verify any system for collection arranged by brand owners. Government replied (May 2022) that steps were being taken for the implementation of EPR in accordance with the Guidelines issued by GoI.

5.1.6 Strategy for implementation of 3R approach

The Integrated Solid Waste Management (ISWM) aims at maximising resource conservation and resource efficiency, while reducing the amount of waste being disposed. It is closely linked to the 3R (Reduce, Reuse and Recycle) approach, which helps to reduce the quantity of waste, cost associated with its handling and its environmental impacts. One of the objectives of State policy too, was to maximize the possibility of reduction, reuse and recycling of waste generated.

Audit analysed the extent of compliance of ULBs to the above approach as shown in **Table 5.3:**

Table 5.3: 3R strategy adopted and shortcomings noticed

	3R strategy adopted by the State	Deficiencies noticed in implementation
Reduce	Ban on plastic carry bags below 50 microns from 2016 and ban on single use plastic from 01 January 2020	Rampant usage of banned single use plastic carry bags noticed during JPV in shops and markets in all test-checked ULBs and usage of plastic carry bags below 50 microns, in 20 test-checked ULBs.
Reduce	Promotion of substitutes for plastic carry bags	Thiruvananthapuram Corporation incurred ₹45.06 lakh on construction, maintenance and purchase of raw materials for five cloth/paper bag manufacturing units during 2017-2021. Though the units commenced operation and manufactured 96,814 cloth bags, they were closed down (April 2020) in the Covid scenario. The Corporation stated that units were not revived till date, as they could not be run as business model.
Reuse	Utilisation of non-recyclable shredded plastic in roads to promote reuse of plastic.	Seven out of 22 test-checked ULBs did not utilise non-recyclable shredded plastic in roads during the audit period.
Reuse	Energy recovery from waste	Of the two Waste to Energy (WtE) projects proposed (June 2018) in the test-checked ULBs, no project has been initiated so far (March 2022). Though Perinthalmanna Municipality

	3R strategy adopted by the State	Deficiencies noticed in implementation
		constructed (January 2021) Bioshakthi biomethanation plant to generate electricity from bio-waste, the plant could not be made functional due to inadequacy of waste brought in for energy recovery.
	Construction of Resource Recovery Facility (RRFs) with shredding and bailing machines for recovery of plastic	Sixteen out of 22 ULBs constructed RRFs with shredding/bailing machines, of which eight ULBs[92] failed to utilise the facilities because of non-availability of electricity, delay in repairing machinery, etc.
	Conduct IEC activity for waste minimization through 3R concept	Nineteen test-checked ULBs have not prepared specific action plan for implementation of 3R strategy and 18 ULBs did not conduct any IEC activity for creating awareness on the importance of 3R concept.
	State designated Suchitwa Mission as a scientific advisory for technical and financial assistance for managing special waste	Suchitwa Mission did not offer assistance to ULBs in managing special waste other than plastic.
	Implementation of EPR based plastic waste management	The State has not implemented EPR system.

(Source: SWM Rule, State Policy, Government orders)

The National indicators of Sustainable Development Goal (SDG) 12.5 aims to substantially reduce waste generation through prevention, reduction, recycling and reuse by the year 2030. For the year 2020-21 the target set for the quantity of plastic waste to be generated per 1000 population is 1.27 tonnes per annum. As per KSPCB data pertaining to 2021, plastic waste generated per 1000 population in State was 3.5 tonnes per annum. In the test-checked ULBs, plastic waste generated ranged between 5.15[93] and 68.12[94] tonnes per annum for 1000 population. The trend is not appreciative, as it indicates that the efforts towards reduction of plastic waste in the State were not adequate enough to help the State achieve the SDG by 2030.

Government informed in the exit conference (May 2022) that the State had achieved considerable progress in prohibiting the usage of banned plastic carry

[92] Thiruvananthapuram Corporation, Nedumangad, Kayamkulam, Mavelikkara, Muvattupuzha, Eloor, Angamaly and Vadakara Municipalities
[93] Neyyattinkara Municipality
[94] Kochi Corporation

bags during the second half of 2019 and that Covid had undone all progress attained until then. The reply is not convincing because even as the usage of plastic below 50 microns was banned by GoI in 2016 itself, Audit had noticed rampant usage of plastic carry bags of the banned category during field verifications in 2021-22. This points to the insufficiency of action taken by GoK over the years to prohibit the manufacture, transport, storage and sale of banned carry bags.

Accepting the audit observation on non-functioning of cloth bag manufacturing units in Thiruvananthapuram Corporation, Government replied (May 2022) that the ULB Council has decided to revive all the defunct units. Government also stated that steps are being taken for the implementation of EPR.

5.2 Bio-medical waste

Bio-medical waste (BMW) includes 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 of biological or in health camps. The KSPCB is the authority designated for implementation of the provisions of these rules in the State.

Kerala has the highest number (about 27 *per cent*) of health care facilities (HCF)/institutions in India and the total bed strength of hospitals in Kerala is 1,19,762. However, there are only two Common Bio-medical Waste Treatment and Disposal Facilities (CBWTF) in the State, *viz*., IMAGE[95] having installed capacity of 55.8 tonnes/day and KEIL with an installed capacity of 16 tonnes/day. Also, 51 HCFs are having captive facility for processing BMW, with an installed capacity of 3.4 tonnes/day.

Audit analysed the issues associated with the management of BMW in test-checked ULBs.

5.2.1 Non assessment of quantity of Bio-medical waste generated

In order to implement and enforce Bio-medical Waste Management Rules, 2016 effectively, authentic and accurate data of BMW generated in the State is necessary. However, KSPCB has not so far assessed the quantity of BMW generated in the State. It was seen that KSPCB depended on the annual reports furnished by HCFs for assessing waste generated in a year in the State. However, all HCFs did not submit annual reports regularly to KSPCB. Of the 17,122 HCFs in the State, only 2,487 HCFs had submitted annual reports to KSPCB during 2020. The quantity of BMW generated in the State during the period from 2016-17 to 2020-21 as estimated by KSPCB ranged from 37.81 to 42.93 tonnes/day. In the absence of regular submission of annual reports by HCFs to KSPCB, Audit could not ascertain the veracity of the estimated value of generation of BMW in the State.

5.2.2 Status of authorisation of Health Care Establishments in the State

According to Rule 10 of BMW Management Rules, 2016, every occupier or operator handling BMW shall make an application to the KSPCB for grant of

[95] Indian Medical Association Goes Eco-friendly, established by Kerala State branch of Indian Medical Association in 2003

authorisation. The details of HCFs identified by KSPCB and those functioning without authorisation from KSPCB are given in **Table 5.4.**

Table 5.4: HCFs identified/functioning without authorisation

Year	Total number of HCFs identified by KSPCB	Number of HCFs functioning without authorisation
2016	9154	5401
2017	9628	4785
2018	12668	5806
2019	13869	7108
2020	17122	3708

(Source: Annual Reports of KSPCB)

As of December 2020, 3708 HCFs were functioning without authorisation in the State. It was also seen that of the 17,122 HCFs identified by KSPCB, only 16,602 HCFs had registered with IMAGE for collection of BMW generated. As such KSPCB/Government had no mechanism to ascertain the nature of disposal of BMW by the unauthorised HCFs in ULBs.

5.2.3 Functioning of Common Bio-medical Waste Treatment and Disposal Facility

5.2.3.1 IMAGE

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There was only one Common Bio-medical Waste treatment and Disposal Facility (CBWTF) in the State *viz*., IMAGE till May 2021[96] and the entire BMW in the State was being transported to the facility. As per BMW Management Rules, CBWTF located within the respective State/UT was allowed to cater to healthcare units situated at a radial distance of 75 km. However, in a coverage area where 10,000 beds are not available within a radial distance of 75 km, existing CBWTF could cater to the healthcare units situated upto 150 km radius, provided the BMW generated was collected, treated and disposed of within 48 hours. The above stipulation was not adhered to, as the BMW generated in HCFs in southern and northern tips of the State had to cover 400 km and 380 km respectively to reach the common facility.

IMAGE was having treatment capacity of 49 tonnes/day, which was enhanced to 55.8 tonnes/day as the waste generation increased significantly amidst Covid-19 pandemic. IMAGE informed (May 2021) the Environmental Engineer, PCB, Palakkad that 58 tonnes of waste (COVID and non-COVID) reached the plant daily. Audit observed during JPV that, regular collection of covid/non-covid waste was not undertaken by IMAGE from the Medical Colleges at Thiruvananthapuram and Kozhikode. Laxity on the part of Government in setting up regional BMW treatment facilities resulted in BMW reaching the IMAGE plant in excess of its processing capacity. This resulted in accumulation of highly infectious waste which was left exposed without any safeguards in the plant premises.

Categorisation of bio-medical waste

The BMW Management Rules, 2016 prescribe yellow, red and white coloured bags for the treatment and disposal of human/animal anatomical waste,

[96] KEIL started functioning from May 2021

recyclable contaminated waste and sharp waste including metals, respectively. Yellow bags were to be disposed by Incineration or Plasma Pyrolysis or deep burial, and red and white bags by Autoclaving followed by shredding or mutilation.

The BMW Management Rules, 2016 stipulated that untreated human/animal anatomical waste, soiled waste and biotechnology waste shall not be stored beyond a period of 48 hours. Joint physical verification at IMAGE (December 2021) revealed that BMW in red/yellow/white bags were left without disposal for several months in violation of Rules. Further, yellow bags enclosing body parts of humans/animals were seen scattered and dumped negligently, which was a serious offence on the part of IMAGE authorities. Further, such instances also point to the lack of effective monitoring by KSPCB. It was stated by the IMAGE authorities that the boundless increase in BMW due to the spread of the pandemic had resulted in the backlog. Audit observed that accumulation of huge quantity of BMW at IMAGE resulted in a major fire outbreak in January 2022. It was estimated that 2000 tonnes of waste was burnt during the incident, causing irreparable damage to the ambient air. Such instances causing potential threat to environment calls for fixing of responsibility so as to curb lapses in effective monitoring and supervision.

Bio-medical waste dumped at IMAGE (December 2021)

5.2.3.2 KEIL

Though KEIL had a capacity to process 16 tonnes/day, only 6.2 tonnes of waste reached KEIL, whereas IMAGE received waste in excess of its capacity. Despite KSPCB, directing (August 2021) all HCFs in the five districts[97] to

[97] Alappuzha, Kottayam, Ernakulam, Pathanamthitta, Idukki

provide BMW (covid and non-covid) to KEIL, the direction was not complied with by the HCFs in the districts. In reply, KEIL stated that the HCFs in the said districts have not registered themselves with KEIL and still rely upon IMAGE for processing their BMW. Lack of adequate Governmental intervention in distributing the load of BMW among the two Facilities has resulted in underutilisation of capacity of one plant and inability to process the overload of waste in the other plant.

5.2.4 Waste management in Government Health Care Facilities/Institutions

- Health Care Facilities (HCF) being centres where diagnosis, treatment or immunisation of human beings or animals is provided, were to be registered with CBWTF. As per information exhibited on the website of the Directorate of Health Services Kerala, the number of HCFs in Kerala under the Government Sector was 6691, out of which only 2190 (32.73 *per cent*) HCFs were registered with CBWTF.

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- The BMW Management Rules, 2016 stipulated that BMW was to be segregated at the point of generation in designated colour coded bins by the person who is generating the waste. However, it was seen during JPV in three Medical Colleges[98] that segregation of waste was not done properly and solid waste got mixed with BMW.

- Scrutiny of the records/JPV of 23 HCFs and 38 Veterinary hospitals in the test-checked ULBs revealed that 12 HCFs and 17 Veterinary hospitals were functioning without the authorisation of KSPCB. It was also seen that 34 HCFs/Veterinary hospitals have not obtained registration of IMAGE/KEIL for disposal of BMW generated. The authorities in four Veterinary Hospitals stated that surgical waste was being taken away by the owners/care takers of the animals as the hospitals did not have disposal facility. Used syringes along with needles, gloves, etc. were seen scattered/buried/burnt in the premises of seven Veterinary institutions in violation of BMW Management Rules.

Kochi Corporation District Veterinary Hospital - Bio-medical waste mixed with other waste (December 2021)

Lack of organized system of disposal of BMW generated by households/institutions rendering palliative home care services have already been mentioned in paragraph 3.2.2 of this report. Instances of improper segregation and dumping of BMW captured during joint physical verifications

[98] Medical College Hospitals at Thiruvananthapuram, Kozhikode and Alappuzha

are presented below:

Improper Segregation and Dumping of bio-medical waste

Medical College, Thiruvananthapuram (November 2021)

Bio-medical waste dumped in Kozhikode Medical College for transportation to IMAGE (September 2021)

Mixed waste dumped near parking ground in Thiruvananthapuram Medical College (November 2021)

Bio-medical waste dumped for incineration at Kozhikode Medical College (September 2021)

5.2.5 Inadequate Liquid waste treatment posing risks to environment

Kochi Corporation Palluruthy Taluk Hospital - Bio-medical liquid waste is let out directly to drainage (November 2021)

According to BMW Management Rules, 2016, the occupier of HCF shall ensure segregation of liquid chemical waste[99] at source and pre-treatment or neutralisation prior to mixing with other effluents. A separate collection system leading to effluent treatment system was to be installed for treatment of liquid waste generated. Audit conducted JPV in 66 HCFs in 22 test-checked ULBs and observed that 35 of them did not have Effluent Treatment Plant (ETP) installed to treat bio-medical liquid waste generated. In seven hospitals[100] bio-medical liquid waste mixed with other liquid waste was directly disposed to common drain/canals after chlorination and without any prescribed treatment procedures, polluting water bodies and endangering the health of humans/animals in the vicinity.

Medical College Hospital (MCH), Institute of Maternal and Child Health and Institute of Chest Diseases at Kozhikode with total bed strength of 2405 generated four million litres per day (mld) of liquid waste. However, capacity of the Sewage Treatment Plant (STP) installed in the HCF was only two mld. During JPV, it was noticed that treated liquid waste from the two mld plant was being routed to the nearby Kanoli canal. The remaining quantity of waste water generated was directly drained to ground from the hill top area where the MCH was situated. In the course of JPV, Audit entrusted sample testing of drinking water collected from four wells and one pond in the vicinity to

[99]Used or discarded disinfectants, Silver X-ray film developing liquid, discarded formalin, infected secretions, aspirated body fluids**,** liquid from laboratories and floor washings, cleaning, house-keeping and disinfecting activities

[100]Koyilandy Taluk Hospital, Government Beach Hospital, Kozhikode, Women and Child Hospital Kozhikode, Palluruthi Taluk Hospital, Kochi, Karuvelippadi Taluk Hospital, Kochi, Mattanchery Taluk Hospital, Alappuzha Medical College Hospital

District PCB. The sample testing revealed high content of different types of chemicals rendering the water unpotable for use.

- In the three Government MCHs[101] visited by Audit, no ETPs to treat bio-medical liquid waste were seen installed. As per BMW Management Rules, 2016, sludge from ETP was to be supplied to CBWTF for incineration or to Hazardous waste treatment, storage and disposal facility for disposal. However, Government Medical College Hospital and Korambayil hospital at Manjeri were using this sludge containing hazardous chemical elements as manure, which would harm plant and animal health.

5.2.6 Unauthorised operation of incinerators in hospitals

The BMW Management Rules, 2016, do not permit installation of in-house incinerators. However, in case there is no common bio-medical facility nearby, the same could be installed by the occupier after taking authorisation from KSPCB. The BMW Management Rules, 2016 prescribed standards for incinerators so that emission of harmful chemicals like Dioxin and Furan could be limited to minimum. All incinerators installed were directed to comply with the above standards within a period of two years from the date of notification.

The District PCBs in Kozhikode, Malappuram and Alappuzha replied to Audit that they have not noticed any instance of unauthorised incinerators being operated in HCFs in their jurisdiction. However, JPV conducted by Audit alongside PCB staff revealed that 20 out of 50 test-checked hospitals had installed incinerators without obtaining authorisation from PCB. These incinerators were used for treating huge quantities of both solid and bio-medical waste generated in these hospitals. That the hospitals were operating incinerators which were not subject to mandated checks by PCB is a matter of concern.

Accepting the audit findings, Government stated in reply (May 2022) that the issue of BMW would be taken up separately on high priority and that the matter would be discussed and resolved at the earliest.

5.3 E-waste

E-waste refers to electrical and electronic equipment**,** whole or in part discarded as waste by the consumer as well as rejects from manufacturing, refurbishment and repair processes. The presence of elements like lead, mercury, arsenic, cadmium, selenium, and hexavalent chromium and flame retardants beyond threshold quantities in e-waste classifies it as hazardous waste. As e-waste dismantling or incineration is considered toxic, they are targeted for reuse, recovery or hazardous waste disposal.

5.3.1 Status of e-waste generation

There are no specific estimates on the generation of e-waste in the State despite it being a major waste stream. The quantity of e-waste collected in the State during 2019-20 and 2020-21 as per the Annual Reports of KSPCB is shown in **Table 5.5**:

[101] MCHs at Thiruvananthapuram, Alappuzha and Kozhikode

Table 5.5: Quantity of e-waste collected in the State

Year	Category wise quantity of e-waste collected per year			Total quantity of e-waste collected (tonne)
	Information Technology and Telecommunication equipment (tonne)	Consumer Electrical and Electronic items (tonne)	Other items (tonne)	
2019-20	108.356	82.244	1098.61	1289.21
2020-21	27.66	88.33	1378.06	1494.05

(Source: Data provided by KSPCB)

The 22 test-checked ULBs did not maintain any records relating to the quantum of e-waste generated/collected from their areas.

5.3.2 Collection and handling of e-waste

E-waste Management Rules, 2016 stipulate that it is the responsibility of municipal authorities/ local bodies to ensure that e-waste, if found mixed with Municipal Solid Waste or pertaining to orphan products is to be properly segregated, collected and channelised to authorised dismantler or recycler. Government directed (January 2014) LSGIs to set up models for door-to-door collection, local and centralised storage facilities and arrangements with registered recyclers for transportation and disposal of e-waste in their jurisdiction. It was seen that the test-checked ULBs have not set up a mechanism for collection of e-waste from households so far. As a result, e-waste generated in households was found mixed with solid waste.

The collection centres were to store e-waste category-wise and maintain the records of e-waste collected and account the same to respective producers. The storage space for refrigerators and air conditioners required adequate facilities for managing leakage of compressor oils, coolant/refrigerant gases, mercury, etc. Audit, along with ULB staff visited 42 scrap dealer shops which collected e-waste unauthorisedly. It was observed that these scrap dealers did not adhere to prescribed methodology of assessment, storage and processing of e-waste, raising concerns regarding the safeguards to be complied with. Lack of awareness imparted to public on the proper disposal of e-waste, absence of door-to-door collection facilities, shortage of collection centres, etc. contributed to substantial quantities of e-waste reaching the hands of informal waste pickers and scrap dealers.

During JPV, Audit noticed instances of accumulation of e-waste such as refrigerators, television sets, etc. dumped in open space as well as unauthorised dismantling of Television sets by scrap dealers in six ULBs[102] in violation of CPCB guidelines.

5.3.3 Role of local body as bulk consumer

The CPCB guidelines envisaged bulk consumers to ensure that e-waste generated by them was handed over only to producer take back/channelisation system. Government of Kerala directed (January 2014) Government Departments, Public Sector Undertakings, Boards and Corporations to incorporate the buy back/take back system of electronic goods like Compact

[102]Thiruvananthapuram, Kozhikode Corporations, Koyilandy, Kayamkulam, Mavelikkara and Vadakara Municipalities

Fluorescent Lamps (CFL) and Fluorescent Tube Lights (FTL), Computer systems, etc. by the producer as a mandatory condition in all the tenders floated by them. The test-checked ULBs purchased laptops/computers/UPS/street lights, etc. for ₹8.18 crore and awarded Annual Maintenance Contract (AMC) for ₹62.84 crore during the audit period.

Despite being aware of the potential load of e-waste to be generated, none of the test-checked ULBs included the clause on buy back/take back system in the tenders floated. The ULBs, by excluding the above clause, could not ensure that the onus of recycling of e-waste was vested in the producers. This would result in ULBs facing practical difficulties in disposing of e-waste in an environmentally sound manner.

E-waste dumped at Pottakuzhi in Kochi Corporation (December 2021)

Audit observed that two ULBs[103] disposed e-waste through scrap dealers and four ULBs[104] could not dispose the e-waste generated, leading to its accumulation.

5.3.4 Collection of e-waste by Clean Kerala Company

Government of Kerala permitted (March 2016) CKCL to collect E-waste generated in Government offices, institutions, public sector undertakings, etc. and dispose them of by handing over to authorised e-waste collectors/recyclers. It was seen that only 60 local bodies in the State handed over E-Waste (tube light, CFL, etc.) to CKCL during the period from 2016-17 to 2021-22 (upto December 2021) and only 35.24 tonne of e-waste were collected. None of the test-checked ULBs handed over e-waste to CKCL indicating that there was no system in place for effective management of e-waste.

5.4 Construction and Demolition Waste

Construction and Demolition (C&D) waste means the waste comprising of building materials, debris and rubble resulting from construction, re-modelling, repair and demolition of any civil structure. According to Rule 6 (4) of Construction and Demolition Waste Management Rules, 2016, local bodies shall make arrangements and place appropriate containers for collection of C&D waste and the collected waste shall be transported to appropriate sites for processing and disposal, either through own resources or by appointing private operators.

5.4.1 Status of generation of Construction and Demolition waste

Specific estimates of quantity of C&D waste generated in their jurisdiction were not available with any of the 22 test-checked ULBs. Based on the waste generation data of Technology Information Forecasting and Assessment Council (TIFAC) and extent of demolished area in ULBs during the period from 2016-17 to 2020-21, Audit estimated the approximate quantity of C&D waste

[103] Vadakara and Perinthalmanna Municipalities
[104] Kozhikode, Kochi Corporations and Neyyattinkara, Nedumangad Municipalities

generated in 16 ULBs[105] as 77,598.47 tonnes. It was observed that though these ULBs generated on an average, 42.52 tonnes of C&D waste per day, they did not adopt prescribed methods of disposal of C&D waste generated in their jurisdiction.

5.4.2 Collection and processing of C&D waste generated in the ULBs

According to C&D Waste Management Rules, 2016, ULBs were to place appropriate containers for collection of waste which shall be removed at regular intervals and collected waste was to be transported to appropriate sites for processing and disposal, either through own resources or by appointing private operators. However, the test-checked ULBs did not make arrangements for collecting C&D waste generated. As such the waste generators were compelled to dispose of the C&D waste emanating from construction/demolition activities. During JPV in four ULBs[106] ,Audit noticed instances of dumping of C&D waste in marshy lands, roadsides, markets, etc.

As per C&D Waste Management Rules, 2016, local bodies were to identify land for collection and processing of C&D waste within 18 months from the date of notification of the Rules. They were to establish and make C&D waste processing plant functional within 24 months for cities with population of five lakh to 10 lakh, and within 36 months for cities with population below five lakh. However, none of the local bodies in Kerala have established C&D waste processing/recycling/disposal facility so far. This is indicative of the laxity of ULBs in effectively establishing a system for management of C&D waste.

Government stated during the exit conference (May 2022) that draft guidelines on the processing and disposal of C&D waste were under consideration of Government.

Reclamation of water body using C&D waste

C&D waste dumped in water body in Maruthankuzhy, Thiruvananthapuram (August 2021)

[105] Of the remaining ULBs, Alappuzha, Kayamkulam and Feroke Municipalities calculated property tax on the basis of Annual Rental Value, based on which floor area and extent of demolished area could not be reckoned. Kochi Corporation, Aluva and Parappanangadi Municipalities did not furnish data to Audit

[106] Kozhikode, Thiruvananthapuram Corporations and Vadakara, Angamaly Municipalities

5.4.3 Improper disposal of demolition debris

Based on the judgement of Hon'ble Supreme Court, four apartments[107] in Maradu Municipality were demolished (January 2020) through controlled explosion method. The processing and disposal of C&D waste generated was entrusted to M/s. Prompt Enterprises, a Land developer, which claimed to have removed 69,606 tonnes of debris from sites, by 18 June 2020. As per Rule 6(5) of Construction and Demolition Waste Management Rules, 2016, the local body was to transport the collected waste to appropriate sites for processing and disposal either through own resources or by appointing private operators. The C&D waste could be utilised in sanitary landfill for municipal solid waste, drainage layer in leachate collection system, daily cover over fresh waste in the landfill, paving blocks in pedestrian areas, etc.

Audit noticed that the agreement executed between the ULB and selected agency did not specify the locations to which the waste was to be transported or the proposed method for reuse/recycle/disposal of waste. Consequent upon receipt of direction from NGT Monitoring committee, the agency submitted a plan of action indicating 11 sites in Ernakulam and Alappuzha districts to which waste would be transported. Though Maradu Municipality stated that major part of the demolition waste (37,441 tonnes) was transported to Kumbalam and Varapuzha Grama Panchayats and KSIDC[108], Pallippuram, the GPs/KSIDC replied to Audit that they had not given any sanction to the agency for dumping of demolition waste in their jurisdictional area. No records were furnished to Audit by the ULB/agency in proof of the quantum of waste transported to the locations cited or method of processing and disposal of the massive quantity of the C&D waste resulting from the first major demolition activity undertaken in the State.

Recommendation 10: Government must direct State Pollution Control Board to establish a mechanism by which Producers, Importers and Brand owners of products fulfill their Extended Producer Responsibility (EPR) obligation under Plastic Waste and E-waste Management Rules, 2016.

Recommendation 11: With a view to maximise the possibility of reduction, reuse and recycling (3R strategy) of waste generated, Government must ensure that ULBs effectively implement ban on single use plastic, promote substitutes for plastic carry bags, use non-recyclable shredded plastic in roads, operationalise Waste-to-Energy plants, etc.

Recommendation 12: Government must ensure that ULBs set up Material Collection Facilities in all wards to facilitate proper segregation of recyclable portion of plastic waste.

Recommendation 13: Government must initiate urgent steps for establishing Common Bio-medical Waste Management Facilities at regional level to ensure disposal of bio-medical waste within the time limit and distance specified in the Rules. Government and the State Pollution Control Board must oversee that Health care facilities (HCFs) are functioning with proper

[107] H_2O Holy faith, Alpha Serene Towers, Jain Coral Cove and Golden Kayaloram
[108] Kerala State Industrial Development Corporation

authorisation and that solid/liquid bio-medical waste generated in these HCFs are treated effectively.

Recommendation 14: ULBs must place appropriate containers for collection of Construction and Demolition (C&D) waste and identify land for establishing processing plant for C&D waste generated within their jurisdiction.

CHAPTER VI

MONITORING

CHAPTER VI

MONITORING

Management Information System for effective monitoring of waste management activities was not made functional in the State. Though Suchitwa Mission accorded Technical sanction to the projects, no further follow up/monitoring/independent assessment of projects were seen initiated by the Mission. Monitoring of SWM by Kerala State Pollution Control Board was also not adequate and effective. Social Audit Committees were not constituted by test-checked ULBs for evaluating waste management activities. The ULBs were lax in dealing with violations of SWM Rules and levying penalties as an effective deterrent.

Effective and accurate monitoring systems of waste management are to be in place at various levels of Government and monitoring needs to be done at regular intervals throughout the life of the waste management initiative or process.

Audit analysed the efficacy in monitoring of SWM activities undertaken by Suchitwa Mission, State and District Pollution Control Boards and ULBs themselves. The observations are detailed below:

6.1 Monitoring by Suchitwa Mission

6.1.1 Ineffective Management Information System

As per State Policy on Solid Waste Management, Suchitwa Mission was to monitor the progress in implementation of solid waste management activities through appropriate Management Information System (MIS) and assist the Government for taking corrective measures wherever required.

As requested by Haritha Keralam Mission[109], an MIS named Smart Garbage Monitoring System (SGMS) was developed by Keltron in June 2019 for monitoring waste management activities/projects implemented by local bodies. The main objective of the MIS was to aid the local bodies in technology enabled solid waste management system and to develop a centralised state online platform for local bodies for waste management.

The system was evaluated by a Technical committee constituted by Haritha Keralam Mission. The Government approved the project in October 2020 and directed Suchitwa Mission to allocate funds for meeting the cost of development of the system (₹1.71 crore). Suchitwa Mission issued work order to KELTRON in July 2021 to implement SGMS, nine months after approval of the project. Since then, no progress has been achieved in the implementation of the MIS. As such, there is no system available at Suchitwa Mission for monitoring the implementation of projects by ULBs. Consequently, effectiveness in implementation of Central/State schemes could not be assessed and

[109] A Development Mission constituted by GoK in September 2016 to enable sanitation and waste management, water conservation and agricultural expansion giving thrust to organic practices in an integrated manner

communicated to Government by Suchitwa Mission, so as to enable timely corrective measures.

Government stated in the exit conference (May 2022) that with the introduction of the Smart Garbage App, the Department would be better placed to monitor the collection of waste, effectiveness of complaint redressal mechanism, etc. It was also stated that the Smart Garbage App developed by KELTRON would be piloted shortly in some LSGIs.

6.1.2 Absence of follow-up/monitoring

A scrutiny of the projects to which Suchitwa Mission accorded technical sanction during 2016-2020 revealed that of the 220 projects, only 85 projects (38.64 *per cent*) have been completed so far. The reasons for non-completion were cited as non-availability of land, public protest, etc. Though 19 sanctioned projects have been dropped, Suchitwa Mission was unaware of the reasons which led to the dropping of 15 projects. Of the 135 incomplete projects, Suchitwa Mission could not furnish reasons in respect of 43 projects. Though Suchitwa Mission empanelled 74 service providers during 2014-2016 to extend on-site solution to the end users with respect to installation and operation and maintenance of the waste management units, a survey conducted by the Mission revealed that only 44 of the 71 service providers (61.97 *per cent*) recorded satisfactory performance and that 35.09 *per cent* of the household level composting systems were non-functional.

Further, the pipe compost technology introduced by Suchitwa Mission to facilitate source level processing of biodegradable waste in households, had to be abandoned due to issues such as inadequate diameter of pipes, generation of worms, foul smell, delay in compost generation, etc. Of 87,000 pipe compost units installed in Thiruvananthapuram Corporation during 2012-16, only 4,641 units were functioning at the time of audit.

The above aspects point towards the absence of proper follow up/monitoring/independent assessment of projects accorded with Technical Sanction by Suchitwa Mission. Government stated in reply (May 2022) that due to insufficient manpower, Suchitwa Mission could closely monitor only those projects for which it has extended financial support for implementation and that the responsibility of project formulation/implementation was fully vested in LSGIs. The justification is not acceptable as Suchitwa Mission was the nodal agency vested with the responsibility of providing technical support to the waste management initiatives in the State. During the exit conference (May 2022) Government accepted the need for institutional strengthening of Suchitwa Mission.

6.2 Monitoring by Pollution Control Board

The KSPCB is the principal agency for monitoring and controlling waste management and is vested with the responsibility to monitor compliance with relevant rules.

6.2.1 Inspections by PCB

According to the circular[110] issued by KSPCB in October 2017, Red Category

[110] KSPCB Circular PCB/HO/Circular-01/03/2017/C dated 10.10.2017

industries were to be inspected once in six months and Orange category industries, once in a year. As per data furnished by KSPCB, inspections conducted by the PCBs in selected four districts[111] ranged from 0.29 to 6.74 *per cent* in Red Category and 2.33 to 14.54 *per cent* in Orange Category institutions.

Audit observed that in the absence of adequate inspections, KSPCB could not effectively monitor compliance of proper waste management regulations by the HCFs in the State. The District PCBs opined that shortage of manpower was the cause of ineffective monitoring.

6.2.2 Deficiencies in Management Information System

The KSPCB had launched an Online Consent Management and Monitoring System (OCMMS), a portal which was developed (2014) by the National Informatics Centre, New Delhi, for consent administration and authorisation of industries in the State. Audit noticed the following deficiencies in the system:

- Inspection Management which included entering the details of inspections conducted and retrieval of data on inspections conducted was not available. As such KSPCB could not monitor the adequacy of inspections conducted by District PCBs. It was seen that the data on inspections conducted furnished by KSPCB and District PCBs did not reconcile with each other.
- Laboratory Management wherein the Board officials can view the analysis results and monitor the adequacy of samples checked was never implemented.
- There is no system to generate category wise reports of hospitals, restaurants, chicken stalls, etc. so as to obtain data on number of establishments not reviewing Consent to Operate. As such District PCBs could not monitor the compliance of the rules by various industries in test-checked districts.

6.3 Monitoring by Urban Local Bodies

6.3.1 Social Audit

Government of Kerala directed (July 2017) all local bodies to appoint three to five officers (including two officers trained by Haritha Keralam Mission) to form a Social Audit Committee for evaluating waste management activities undertaken by the local bodies. Social Audit Committee was responsible for assessing the performance of HKS, follow up action on complaints received from public and furnishing annual reports to the local body. It was seen that the test-checked ULBs did not even constitute Social Audit Committees as directed by Government. Hence, the performance of HKS was not assessed and response of the public not evaluated.

Government stated in the exit conference (May 2022) that the Kerala Institute of Local Administration (KILA) has been designated for undertaking Social Audit.

[111] Thiruvananthapuram, Alappuzha, Kozhikode, Malappuram

6.3.2 Inadequate levy of penalties for violations

According to SWM Rules, 2016 no waste generator shall throw**,** burn or bury the solid waste generated by him, on streets, open public spaces or drains and water bodies. The ULB shall frame bye-laws and prescribe criteria for levying spot fine for persons who fail to comply with the provisions of these Rules. Details of inspections conducted and penalties imposed by test-checked ULBs are given in **Appendix 11**. It was seen that average number of annual inspections conducted by test-checked ULBs ranged from one to 573 only and the average number of annual spot fines levied ranged minimally from zero to 232. The National Green Tribunal had directed (April 2019) that open burning of waste in lands and landfills should be completely prohibited and in case of default, violators shall be made liable to pay environmental compensation ranging from ₹ 5,000 to ₹ 25,000. Audit however noticed that penalty at the above rates was levied only by three[112] out of 21 test-checked ULBs.

- According to Section 334A (1) of the KM Act, commercial establishments, hospitals, slaughter houses, chicken stalls, hotels, catering establishments, apartments, auditorium etc. should establish necessary facilities for treatment and disposal of both solid and liquid waste at source. It was also made mandatory to include waste processing facilities at the time of construction itself and the Secretary of the ULB was to cancel the licence of buildings without such facilities. Violators to be penalised by levying fine not below ₹ 10,000 or imprisonment upto one year or both. As per data furnished to Audit, the Health wings of three[113] test-checked ULBs alone imposed penalties on such premises to ensure adherence to the provisions of the Act.
- Surveillance cameras were purchased by Thiruvananthapuram Corporation (15 cameras for ₹ 21 lakh), Kayamkulam Municipality (five cameras for ₹ five lakh) and Alappuzha Municipality (11 cameras for ₹ five lakh) during 2018-19 for spotting and imposing penalty for littering in public places. Though the cameras at Thiruvananthapuram Corporation enabled to impose fine amounting to ₹41,930 (October 2021), the cameras turned defective in due course and the images captured were lacking in clarity to help identify a person/vehicle. In Kayamkulam and Alappuzha Municipalities, CCTV cameras were not working due to non-provision of electric connection/supply. Responsibility needs to be fixed on erring officials who failed in ensuring effective surveillance through timely repair and maintenance of the cameras installed.

The above instances reveal that the ULBs were lax in dealing with violations of SWM Rules and in levying penalties as an effective deterrent. The failure in framing bye laws and getting them approved by GoK might also have facilitated persistent non-adherence to prompt imposition of spot fines on violators.

Government replied (May 2022) that there were limitations to take stringent steps during 2020-21 owing to Covid situation. The reply is not acceptable as the inspections conducted during the period from 2016-17 to 2019-20 by ULBs were also less, ranging from zero to 19 *per cent* only.

[112] Maradu, Parappanangadi and Manjeri Municipalities
[113] Aluva, Parappanangadi and Manjeri Municipalities

Recommendation 15: Government and the State Pollution Control Board, must jointly establish an effective mechanism for monitoring the performance of solid waste management system, complying with extant Rules. Government must also operationalise computerised Management Information System (MIS) and resort to stringent action to curb instances of violation of Waste Management Rules.

Thiruvananthapuram,
The **30 January 2023**

(**ANIM CHERIAN)**
Principal Accountant General
(Audit - I), Kerala

Countersigned

New Delhi,
The **02 February 2023**

(GIRISH CHANDRA MURMU)
Comptroller and Auditor General of India

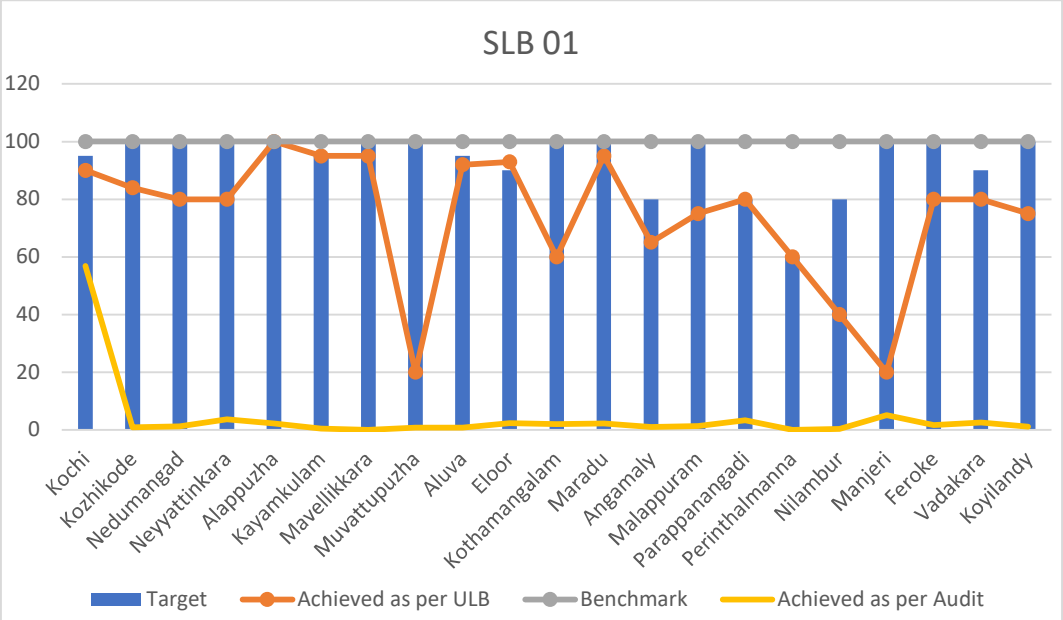
APPENDICES

Appendix 1
Service Level Benchmarking performance indicators and benchmarks pertaining to Solid Waste Management
(Reference: Paragraph 2.1.3.2, Page 12)

Sl. No.	Performance indicator	Unit as percentage of	Benchmark (in *per cent*)
1	Household level coverage of Solid Waste Management (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	Efficiency in redressal of customer complaints	Total number of SWM related complaints resolved against total number of such complaints received within 24 hours	80
7	Extent of cost recovery in SWM services	Recovery of all operating expenses related to SWM services that the ULB is able to meet from the operating revenues of sources related exclusively to SWM	100
8	Efficiency in collection of SWM user charges	Current year revenue collected against total operating revenues for the corresponding period	90

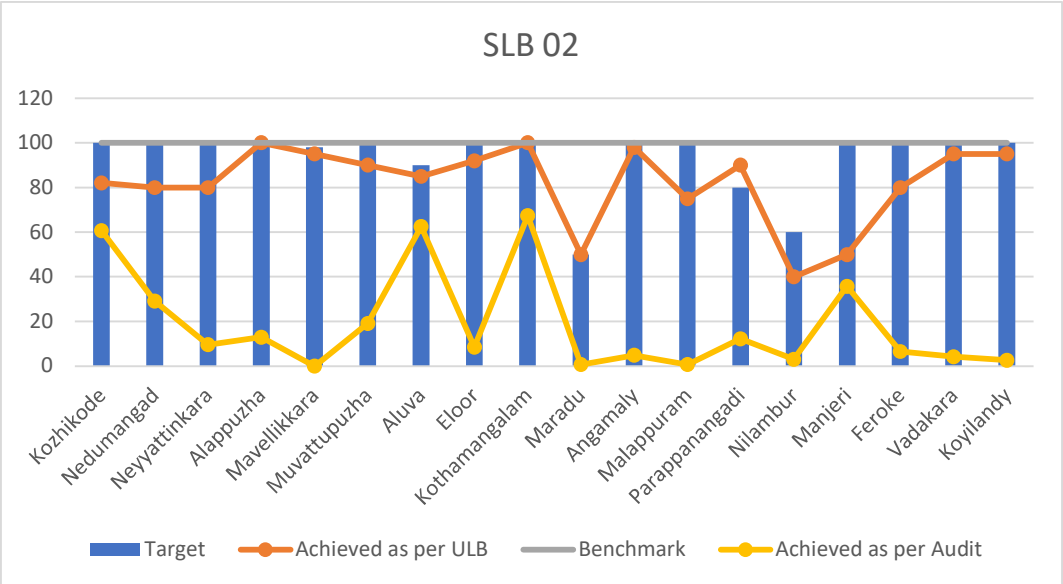
(Source: MoUD website)

I. Household level coverage of SWM services through door-to-door collection of waste



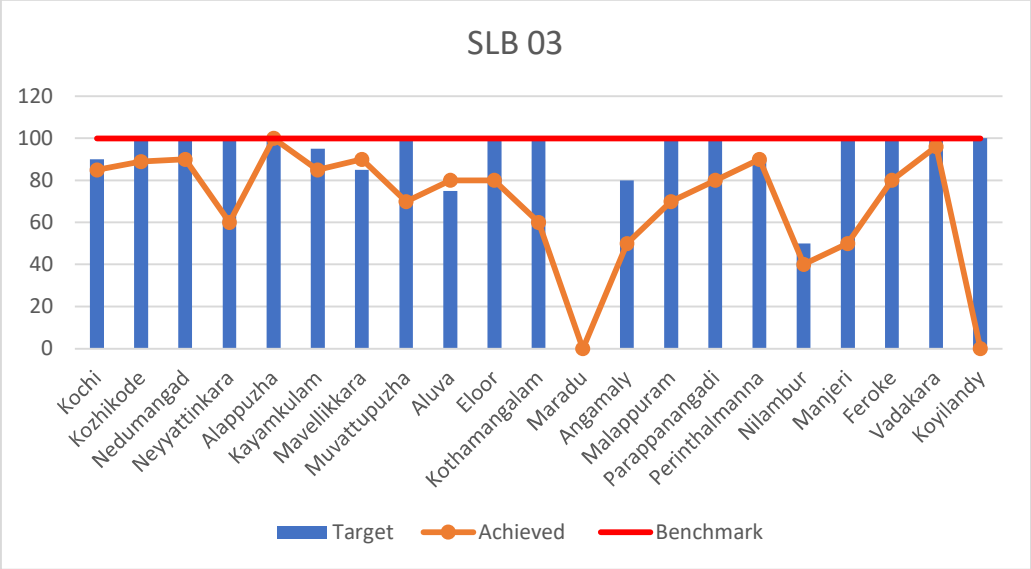
Target and achievement not declared by Thiruvananthapuram Corporation

II. Efficiency of collection of municipal solid waste



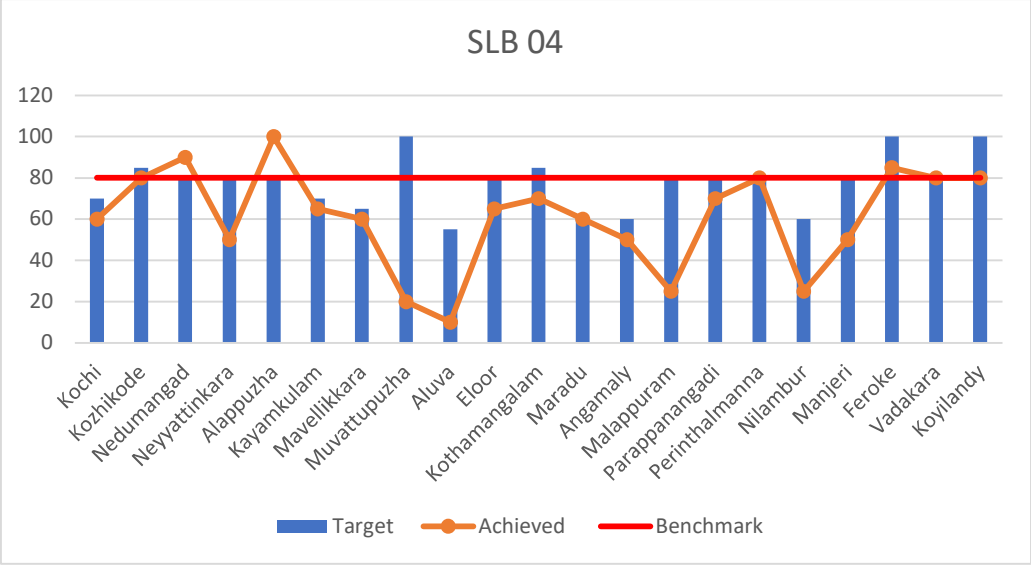
Target and achievement not declared by Thiruvananthapuram Corporation. Kochi Corporation and Kayamkulam and Perinthalmanna Municipalities did not furnish quantity of waste generated/collected.

III. Extent of segregation of waste



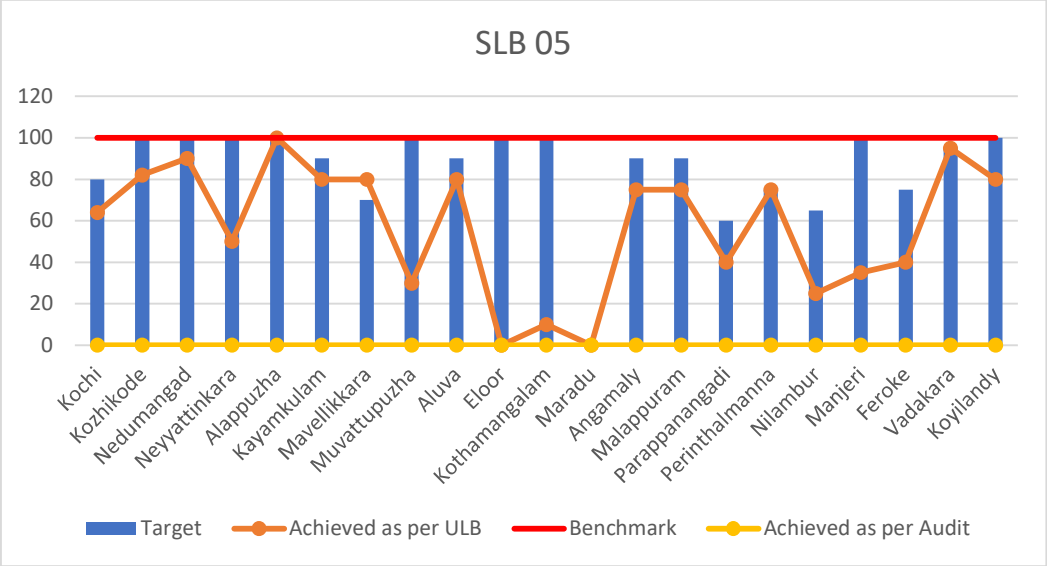
Test-checked ULBs did not record the quantity of waste segregated

IV. Extent of recovery of waste collected

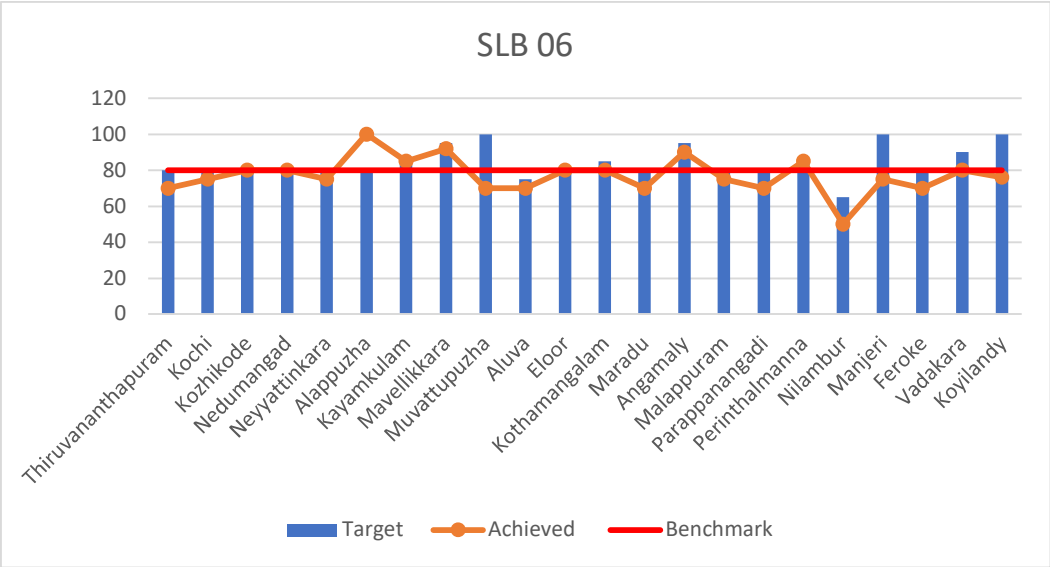


As quantity of waste processed through source level processing also has been included in the total quantity of waste processed by test-checked ULBs, Audit could not work out the extent of waste processed, out of actual waste collected by ULBs.

V. Extent of scientific disposal of waste at landfill sites

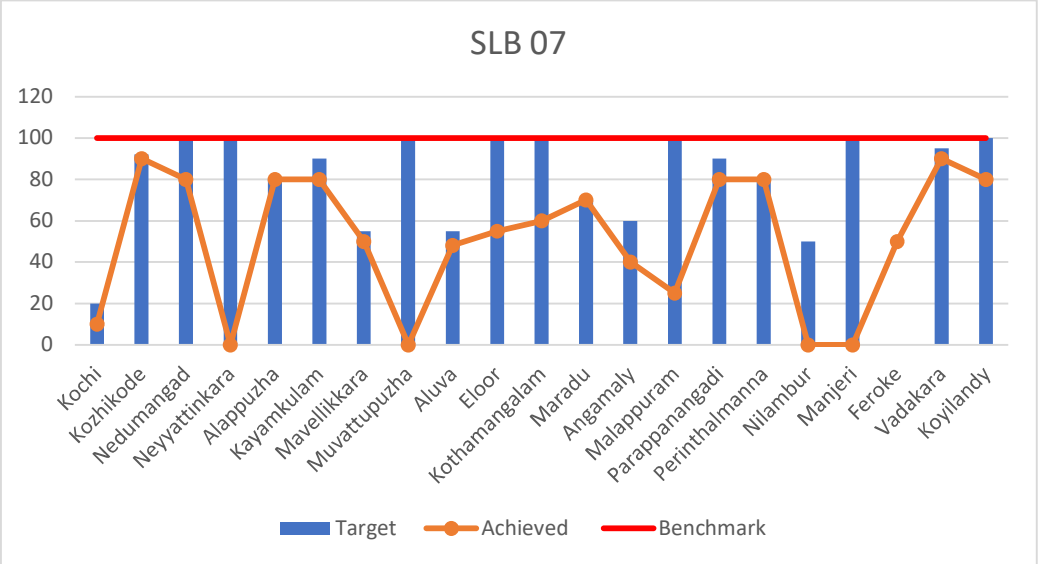


VI. Efficiency of redressal of customer complaints



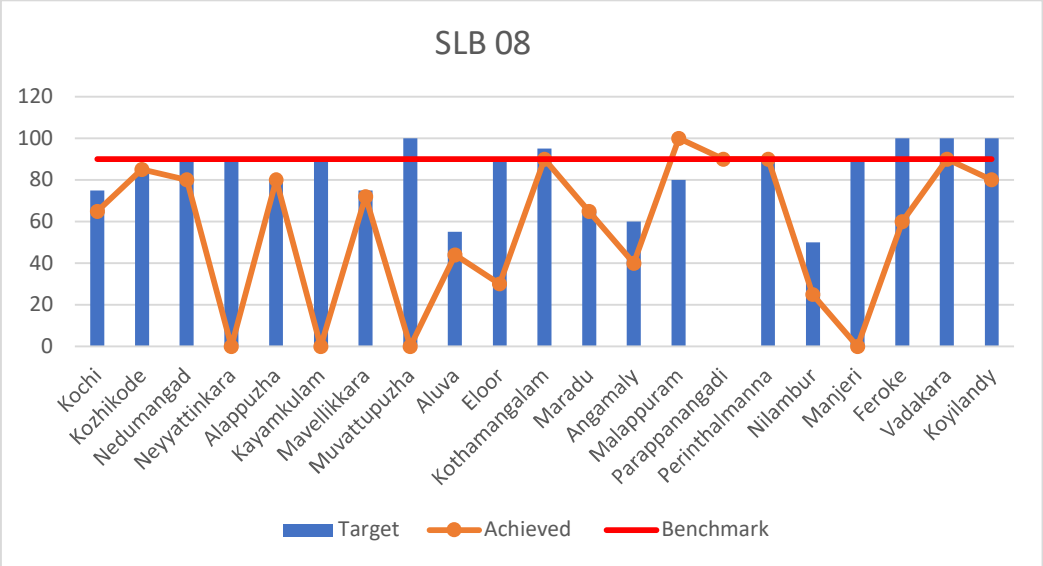
Only one test-checked ULB, Thiruvananthapuram Corporation had an online system in place to receive complaints. The remaining ULBs did not maintain separate registers to record the complaints relating to waste management.

VII. Extent of cost recovery for the ULB in SWM services



As the test-checked ULBs did not account the details of operating revenue received separately, Audit could not verify the extend of cost recovery declared by the ULBs.

VIII. Efficiency in collection of SWM user charges



Appendix 2
Allocation and Expenditure of various funds for waste management in test-checked ULBs
(Reference: Paragraph 2.2.1, Page 16)

(₹ in lakh)

Year	State fund					Central fund				Own fund		Total receipt	Total expenditure (C)	Percentage of dependency on Government grants ((A+B)/C)
	Receipt				Total Expenditure (A)	Receipt			Total Expenditure (B)	Allocated for SWM	Expenditure for SWM			
	Development Fund (General)	Suchitwa Keralam (Urban)	Others*	Total		CFC Grant	SBM (Urban) fund	Total						
2016-17	1630.26	69.80	10	1710.06	205.04	2956.79	0	2956.79	241.32	64.84	0.98	4731.69	447.34	99.78
2017-18	1560.30	3.17	0	1563.47	502	4936.62	0	4936.62	1841.59	23.41	0	6523.50	2343.59	100
2018-19	1351.07	0.80	0	1351.87	326.08	3734.93	1108.36	4843.29	1381.18	335.31	1.38	6530.47	1708.64	99.92
2019-20	568.87	0	70	638.87	146.65	5791.28	186.24	5977.52	1262.42	1884.08	86.88	8500.47	1495.95	94.19
2020-21	1353.67	137	150	1640.67	1105.06	7048.09	1601.98	8650.07	3553.79	1622.98	95.93	11913.72	4754.78	97.98
Total	**6464.17**	**210.77**	**230**	**6904.94**	**2284.83**	**24467.71**	**2896.58**	**27364.29**	**8280.30**	**3930.62**	**185.17**	**38199.85**	**10750.30**	

(Source: Data furnished by test-checked ULBs)

**Maintenance fund (non-road) and receipts from other ULBs*

Appendix 3
Statement showing potential revenue out of User fee
(Reference: Paragraph 2.2.3.5, Page 20)

Name of ULB	No. of households	Monthly user fee rate (in ₹)	Potential monthly revenue from households (in ₹)	No of establishments	Potential monthly revenue from establishments(calculated @ ₹ 100 from an establishment per month)	Total potential user fee from households and establishments (in ₹)	Average monthly expenditure of ULB on waste management (in ₹)	Percentage of expenditure on waste management on total potential user fee
Corporations								
Thiruvananthapuram	336452	100	33645200	22305	2230500	35875700	7150282	19.93
Kochi	265288	100	26528800	66884	6688400	33217200	1996340	6.01
Kozhikode	157753	60	9465180	32145	3214500	12679680	2662771	21
Municipalities								
Nedumangad	22715	60	1362900	2878	287800	1650700	808627	48.99
Neyyattinkara	23045	40	921800	2775	277500	1199300	201273	16.78
Alappuzha	49545	40	1981800	7456	745600	2727400	853974	31.31
Kayamkulam	16392	40	655680	2630	263000	918680	215690	23.48
Mavelikkara	9676	60	580560	1460	146000	726560	104895	14.44
Muvattupuzha	7414	50	370700	2003	200300	571000	135501	23.73
Aluva	5828	100	582800	2566	256600	839400	505807	60.26
Eloor	10995	50	549750	900	90000	639750	384983	60.18
Kothamangalam	10389	50	519450	2239	223900	743350	283301	38.11
Maradu	20328	60	1219680	1262	126200	1345880	146766	10.90
Angamaly	8968	50	448400	2183	218300	666700	147983	22.20
Malappuram	18977	30	569310	8026	802600	1371910	341101	24.86
Parappanangadi	15413	30	462390	6127	612700	1075090	78829	7.33
Perinthalamanna	17489	50	874450	10089	1008900	1883350	624385	33.15
Nilambur	14652	60	879120	1650	165000	1044120	76520	7.33
Manjeri	27668	50	1383400	4806	480600	1864000	231899	12.44
Feroke	13284	30	398520	1750	175000	573520	135914	23.7
Vadakara	20774	50	1038700	5200	520000	1558700	433917	27.84
Koyilandy	20264	50	1013200	2885	288500	1301700	396386	30.45

(Source: Data furnished by test-checked ULBs)

Appendix 4
Segregation of waste at source by Households, Government Institutions and Commercial establishments
(Reference: Paragraph 3.1.1, Page 22)

Sl No	ULB	Households			Government Institutions			Commercial establishments			Grand Total		
		Total	Providing segregated Waste	Percen tage	Total	Providing segregated Waste	Percen tage	Total	Providing segregated Waste	Percen tage	Total	Providing segregated Waste	Percen tage
	Corporations												
1	Thiruvananthapuram	336452	92100	27.37	475	475	100.00	22305	18225	81.71	359232	110800	30.84
2	Kochi	265288	150673	56.80	125	125	100.00	66884	12771	19.09	332297	163569	49.22
3	Kozhikode	157753	99515	63.08	168	42	25.00	32145	9144	28.45	190066	108701	57.19
	Municipalities												
4	Nedumangad	22715	7999	35.21	36	2	5.56	2878	1758	61.08	25629	9759	38.08
5	Neyyattinkara	23045	16592	72.00	33	16	48.48	2775	1149	41.41	25853	17757	68.68
6	Alappuzha	49545	45000	90.83	602	550	91.36	7456	6714	90.05	57603	52264	90.73
7	Kayamkulam	16392	2229	13.60	35	0	-	2630	357	13.57	19057	2586	13.57
8	Mavelikkara	9676	0	-	30	0	-	1460	46	3.15	11166	46	0.41
9	Aluva	5828	1344	23.06	123	0	-	2566	0	-	8517	1344	15.78
10	Angamaly	8968	4820	53.75	19	0	-	2183	1520	69.63	11170	6340	56.76
11	Eloor	10995	7785	70.80	13	0	-	900	875	97.22	11908	8660	72.72
12	Kothamangalam	10389	6440	61.99	35	23	65.71	2239	458	20.46	12663	6921	54.66
13	Maradu	20328	13475	66.29	13	13	100.00	1262	1262	100.00	21603	14750	68.28
14	Moovattupuzha	7414	1640	22.12	78	0	-	2003	0	-	9495	1640	17.27
15	Malappuram	18977	7200	37.94	250	80	32.00	8026	420	5.23	27253	7700	28.25
16	Parappanangadi	15413	11391	73.91	109	15	13.76	6127	802	13.09	21649	12208	56.39
17	Nilambur	14652	1300	8.87	85	1	1.18	1650	0	-	16387	1301	7.94
18	Manjeri	27668	7553	27.30	80	50	62.50	4806	2021	42.05	32554	9624	29.56
19	Feroke	13284	5469	41.17	16	16	100.00	1750	590	33.71	15050	6075	40.37
20	Vadakara	20774	12945	62.31	76	60	78.95	5200	3380	65.00	26050	16385	62.90
21	Koyilandy	20264	12000	59.22	25	0	-	2885	115	3.99	23174	12115	52.28
	Total	**1075820**	**507470**		**2426**	**1468**		**180130**	**61607**		**1258376**	**570545**	

(Source: Details furnished by test-checked ULBs; Details in respect of Perinthalmanna Municipality were not furnished to Audit)

Appendix 5
Inadequate infrastructure for managing household biodegradable waste
(Reference: Paragraph 4.1.1.1, Page 36)

Sl No.	Name of ULB	No. of households	No. of Pipe compost units installed	No. of Pipe compost units working	No. of household bio-gas plants installed	No. of household bio-gas plants working	No. of Kitchen Bin / biocomposter bins installed	No. of Kitchen Bin / biocomposter bins working	Other items installed	Other items working	Total items installed	Total items working	Percentage of items work Ing	Per centage of households where items installed	Percentage of household processing waste at source	Gap in coverage
1	2	3	4	5	6	7	8	9	10	11	12 (4+6+8+10)	13 (5+7+9+11)	14 (13/12 %)	15 (12/3 %)	16 (13/3 %)	17 (100-16)
	Corporations															
1.	Thiruvananthapuram	336452	87000	4641	3982	778	46492	14505	109	109	137583	20033	14.56	40.89	5.95	94.05
2.	Kochi	265288	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.	Kozhikode	157753	20867	16214	586	586	0	0	260	0	21713	16800	77.37	13.76	10.65	89.35
	Municipalities															
4.	Nedumangad	22715	0	0	250	250	2500	2500	0	0	2750	2750	100	12.11	12.11	87.89
5.	Neyyattinkara	23045	0	0	131	131	0	0	0	0	131	131	100	0.57	0.57	99.43
6.	Alappuzha	49545	0	0	1197	1197	0	0	5091	5091	6288	6288	100	12.69	12.69	87.31
7.	Kayamkulam	16392	0	0	12	12	0	0	0	0	12	12	100	0.07	0.07	99.93
8.	Mavelikkara	9676	0	0	12	12	0	0	190	190	202	202	100	2.09	2.09	97.91
9.	Muvattupuzha	7414	154	125	17	0	425	350	0	0	596	475	79.7	8.04	6.41	93.59
10.	Aluva	5828	0	0	65	15	805	85	0	0	870	100	11.49	14.93	1.72	98.28
11.	Eloor	10995	0	0	29	29	2323	2323	0	0	2352	2352	100	21.39	21.39	78.61
12.	Kothamangalam	10389	0	0	0	0	2400	2400	0	0	2400	2400	100	23.1	23.10	76.90
13.	Maradu	20328	940	310	216	216	600	600	0	0	1756	1126	64.12	8.64	5.54	94.46
14.	Angamaly	8968	0	0	38	38	354	354	0	0	392	392	100	4.37	4.37	95.63
15.	Malappuram	18977	0	0	175	175	981	981	1621	1621	2777	2777	100	14.63	14.63	85.37
16.	Parappanangadi	15413	0	0	13	13	73	73	2050	2050	2136	2136	100	13.86	13.86	86.14
17.	Perinthalamanna	17489	0	0	0	0	420	420	0	0	420	420	100	2.40	2.40	97.60
18.	Nilambur	14652	0	0	0	0	69	69	35	35	104	104	100	0.71	0.71	99.29
19.	Manjeri	27668	0	0	0	0	10000	10000	0	0	10000	10000	100	36.14	36.14	63.86
20.	Feroke	13284	0	0	50	50	527	527	133	133	710	710	100	5.34	5.34	94.66
21.	Vadakara	20774	3211	2730	160	120	973	828	742	640	5086	4318	84.9	24.48	20.79	79.21
22.	Koyilandy	20264	279	279	0	0	3852	3852	4017	4017	8148	8148	100	40.21	40.21	59.79
	Total	**1107006**	**112451**	**24299**	**6933**	**3622**	**72794**	**39867**	**14248**	**13886**	**206535**	**81674**				

(Source: Details furnished by test-checked ULBs)

Appendix 6
Details of Thumboormuzhi units installed in test-checked ULBs
(Reference: Paragraph 4.1.1.3, Page 38)

Sl. No.	Name of ULB	No. of units installed	Number of locations	Number of units damaged	Percentage of units in working condition	Reason for damage
1.	Thiruvananthapuram Corporation	474 (Fixed)	52	136	71.31	Non-maintenance, non-supply of inoculum
		214 (Portable)	47	49	77.10	Seepage of rain water, Non maintenance
2.	Nedumangad Municipality	47	4	20	57.45	Non-utilisation
3.	Neyyattinkara Municipality	20	8	0	100	-
4.	Alappuzha Municipality	349	35	43	87.68	Rodent menace and lack of maintenance
5.	Eloor Municipality	6	6	0	100	-
6.	Angamaly Municipality	3	3	3	0	Not functioning since its installation, due to litigation
7.	Nilambur Municipality	1	1	0	100	-
8.	Kozhikode Corporation	10	4	4	60	Used for dumping plastic waste
9.	Feroke Municipality	3	1	0	100	-
10.	Koyilandy Municipality	23	3	23	0	Used for dumping plastic waste
11.	Vadakara Municipality	14	5	7	50	Used for dumping plastic waste
	Total	**1164**	**169**	**285**	**75.52**	

(Source: Details furnished by test-checked ULBs)

Appendix 7
Details of community level biogas plants installed in test-checked ULBs
(Reference: Paragraph 4.1.1.3, Page 40)

Sl. No.	ULB	Number of units	Number of units not working	Reasons for non-functioning
1.	Thiruvananthapuram Corporation	10	8	Improper maintenance
2.	Nedumangad Municipality	1	1	Absence of proper maintenance and upkeep
3.	Neyyattinkara Municipality	1	1	Absence of proper maintenance and upkeep
4.	Nilambur Municipality	1	1	Absence of proper maintenance and upkeep
5.	Parappanangadi Municipality	1	1	Absence of proper maintenance and upkeep
6.	Manjeri Municipality	1	1	Technical reasons
7.	Kozhikode Corporation	1	1	Absence of proper maintenance and upkeep
	Total	**16**	**14**	

(Source: Details furnished by test-checked ULBs)

Appendix 8
Details of dumpsites in selected ULBs
(Reference: Paragraph 4.2.1, Page 47)

Sl. No.	Name of Local Body	Name of Location	Status of remediation work undertaken
1.	Thiruvananthapuram Corporation	Vilappilsala	No action taken
2.		Palayam market	Clearing of legacy waste completed
3.		Erumakkuzhy	Clearing of legacy waste completed
4.	Kochi Corporation	Brahmapuram	Biomining work awarded
5.	Kozhikode Corporation	Njaliyanparamba	Biomining in progress
6.	Vadakara	Puthiyapp	No action taken
7.	Alappuzha	Sarvodayapuram	No action taken
8.	Kayamkulam	Murukkummoodu	No action taken
9.	Mavelikkara	Puthiyakavu	No action taken
10.	Muvattupuzha	Valakkuzhi	No action taken
11.	Kothamangalam	Kumbalathumuri	No action taken
12.	Malappuram	Near Inkel City, Puliyettummal	No action taken
13.	Perinthalmanna	Kunnappalli	No action taken
14.	Manjeri	Vettekode	No action taken

(Source: Details furnished by test-checked ULBs)

Appendix 9
Status of compliance of ULBs to Rules relating to Plastic Waste Management
(Reference: Paragraph 5.1.1, Page 52)

Sl. No.	Requirement	Provisions	Status of compliance
1	Door-to-door collection of non-biodegradable waste from all households, institutions and commercial establishments.	Rule 6 (2) of PWM Rules, State policy	• Of the test checked ULBs, 21 ULBs generated 185.70 tonnes/day of plastic waste, of which 149.21 tonnes/day (80.35 *per cent*) were collected daily by 18 ULBs. • The percentage of coverage of households ranged from 0[114] to 76 *per cent* [115]. • Plastic waste was collected monthly by 14 ULBs, fortnightly by three ULBs, weekly by one ULB, daily by one ULB and yearly by one ULB from households.[116] • Except eight ULBs[117] other test-checked ULBs did not collect plastic waste from institutions and the percentage of collection ranged from 12.50 to 100 *per cent*. • Seven ULBs[118] did not collect waste from Commercial establishments and percentage of collection of plastic waste in respect of other ULBs ranged from 0.96 *per cent*[119] to 89.99 *per cent*[120]. • Absence of a proper system for collection of plastic waste from households, institutions and commercial establishments resulted in burning of plastic

[114] Mavelikkara Municipality
[115] Vadakara Municipality
[116] Plastic waste is not collected in Mavelikkara Municipality; Date not available for Perinthalmanna Municipality, where plastic waste is being collected by a private agency.
[117] Neyyattinkara, Kothamangalam, Malappuram, Parappanangadi, Feroke, Vadakara Municipalities and Kochi, Kozhikode Corporations.
[118] Mavelikkara, Maradu, Nilambur, Alappuzha, Kayamkulam, Perinthalmanna Municipalities and Thiruvananthapuram Corporation.
[119] Parappanangadi Municipality
[120] Kochi Corporation

Sl. No.	Requirement	Provisions	Status of compliance
			waste[121] and dumping of waste on road sides[122], drains, private properties,[123] water bodies[124], etc. as noticed during JPV.
2	Ensuring segregation of recyclables by setting up Material Recovery Facilities or secondary storage facilities with sufficient space	Rule 15(h) of SWM Rules, 2016	• Though GoK had directed ULBs to setup MCF in all wards, the MCF to ward ratio in the test-checked ULBs ranged from 1:2 to 1:50.
3	Establish Resource Recovery Facilities (RRF) in each urban region of 20 km^2 for sorting and facilitating, reuse and recycling of waste materials	Rule 6(2)(c) and (d) of SWM Rules, 2016, State Policy	• Of the 93 ULBs in the State, only 43 Municipalities and four Corporations have RRF facilities. • Of the 22 test-checked ULBs, 16 ULBs have installed 16 shredding machines and 18 bailing machines in the RRF, during the period from 2017-18 to 2020-21. • Eight shredding machines and four bailing machines were non-functional, resulting in infructuous expenditure to the tune of ₹ 39.02 lakh.
4	Plastic waste which can be recycled, shall be channelised to registered plastic waste recycler	Rule 5(1)(a) of PWM Rules, 2016	• The ULBs did not ensure effective segregation of recyclable waste out of the non-biodegradable waste collected, resulting in disposal of 25 to 100 *per cent* of plastic waste as rejects.
5	Ensuring that no damage is caused to the environment during the process from segregation to disposal	Rule 6(2)(b) of PWM Rules, 2016	• Improper management of plastic waste led to recurring instances of fire outbreaks at Brahmapuram dumpsite in Kochi Corporation and once in Perinthalmanna Municipality.
6	Ensuring that open burning of plastic waste does not take place	Rule 6(2)(g) of PWM Rules, 2016	• Instances of open burning of plastic waste noticed in six[125] test-checked ULBs.

[121] Kayamkulam, Mavelikkara, Alappuzha, Koyilandy Municipalities
[122] Kozhikode, Kochi Corporations and Kayamkulam Municipality
[123] Kochi Corporation
[124] Kozhikode, Kochi, Thiruvananthapuram Corporations, Kayamkulam, Mavelikkara Municipalities
[125] Thiruvananthapuram Corporation, Nedumangad, Muvattupuzha, Angamaly, Mavelikkara and Alappuzha Municipalities

Sl. No.	Requirement	Provisions	Status of compliance
7	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(3) of PWM Rules, 2016	• No test-checked ULB established an EPR based plastic waste management system.

(Source: GoI Rules and State Policy on Waste Management)

Appendix 10
Table showing details of disposal of plastic waste as rejects
(Reference: Paragraph 5.1.2, Page 52)

Sl No.	Name of ULB	Quantity of plastic waste generated (tonnes)	Quantity of Plastic waste processed/ sent to recyclers (tonnes)	Quantity of plastic disposed as rejects (tonnes)	Percentage of Plastic waste recycled/ processed	Percentage of plastic waste disposed as rejects
	Corporations					
1	Thiruvananthapuram	7665	4307	3358	56.19	43.81
2	Kochi	41009	541	40468	1.32	98.68
3	Kozhikode	5110	367	4743	7.18	92.82
	Municipalities					
4	Nedumangad	1423.5	620.5	803	43.59	56.41
5	Neyyattinkara	365	16.06	348.94	4.40	95.6
6	Alappuzha	2920	730	2190	25.00	75.0
7	Kayamkulam	383.25	4.02	379.23	1.05	98.95
8	Mavelikkara	153.3	1.72	151.58	1.12	98.88
9	Muvattupuzha	1277.5	273.75	1003.75	21.43	78.57
10	Eloor	193.45	98.55	94.9	50.94	49.06
11	Kothamangalam	1971	1095	876	55.56	44.44
12	Maradu	289.08	30.58	258.5	10.58	89.42
13	Angamaly	474.5	146	328.5	30.77	69.23
14	Malappuram	730	547.5	182.5	75.00	25.0
15	Parappanangadi	417	50	367	11.99	88.01
16	Nilambur	277.4	164.25	113.15	59.21	40.79
17	Manjeri	912.5	438	474.5	48.00	52.0
18	Feroke	1152	16.5	1135.5	1.43	98.57
19	Vadakara	470	69.37	400.63	14.76	85.24
20	Koyilandy	400	0	400	0.00	100

(Source: Details furnished by test-checked ULBs; details in respect of Aluva and Perinthalmanna Municipalities were not furnished to Audit)

Appendix 11
Details of inspections conducted and penalty imposed by test-checked ULBs during the period 2016-2021
(Reference: Paragraph 6.3.2, Page 74)

Sl No	Name of ULB	Number of inspections conducted	Average annual inspection	Penalty realised from annual inspections	Number of spot fines imposed	Average number of spot fines	Penalty realised as spot fines	Total penalty (C+F)	Average monthly penalty (Total Penalty /60 months)
		A	B	C	D	E	F	G	H
	Corporations								
1	Thiruvananthapuram	2866	573	141370	1159	232	2808033	2949403	49157
2	Kochi	1588	318	649960	737	147	1171610	1821570	30360
3	Kozhikode	456	91	350000	321	64	438920	788920	13149
	Municipalities								
4	Nedumangad	250	50	118770	0	0	0	118770	1980
5	Neyyattinkara	68	14	5000	136	27	54000	59000	983
6	Alappuzha	456	91	239430	238	48	400680	640110	10669
7	Kayamkulam	10	2	36450	95	19	236430	272880	4548
8	Mavelikkara	18	4	50571	0	0	0	50571	843
9	Angamaly	26	5	34550	3	1	12000	46550	776
10	Aluva	111	22	67220	185	37	345870	413090	6885
11	Muvattupuzha	45	9	23450	161	32	181765	205215	3420
12	Kothamangalam	189	38	214760	0	0	0	214760	3579
13	Eloor	6	1	14500	89	18	192180	206680	3445
14	Maradu	11	2	5000	6	1	10500	15500	258
15	Malappuram	42	8	64290	0	0	417750	482040	8034
16	Perinthalmanna	8	2	40000	937	187	2139635	2179635	36327
17	Nilambur	69	14	113330	0	0	0	113330	1889
18	Parappanangadi	441	88	82200	14	3	69500	151700	2528
19	Manjeri	26	5	34900	6	1	24050	58950	983
20	Feroke	9	2	12500	63	13	145000	157500	2625
21	Koyilandy	123	25	85100	42	8	21000	106100	1768
22	Vadakara	46	9	58950	266	53	307430	366380	6106

(Source: Details furnished by test-checked ULBs)

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