CHAPTER 3

Effectiveness and Efficiency in Management of Waste

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Audit noticed that the percentage of uncollected waste in the State was 41 per cent during 2021-22. 64 per cent (29 out of 45 ULBs) of the test-checked ULBs did not achieve the service level benchmark of household level coverage of collection of waste. Audit also noticed deficiency in the segregation of waste at source.

Construction and demolition waste in the State remained largely unprocessed and was disposed of by landfilling or filling of low-lying areas. 76 per cent (34 ULBs) of the test-checked ULBs were collecting bio-medical waste generated by households mixed with solid waste.

In 24 out of the 45 checked ULBs, e-waste collected was mixed with solid waste. 25 per cent of the waste collected was not processed in 45 test-checked ULBs during 2021-22. Sanitary landfills were not developed in 26 out of 45 test-checked ULBs. 13 out of 40 test-checked ULBs did not plan for bio-mining and bio-remediation or scientific capping of open dumpsites. A significant number of ULBs did not distribute various items of personal protection equipment kits to workers.

3.1 Solid waste generation

The solid waste consists mainly of solid or semi-solid domestic waste, sanitary waste, commercial waste, institutional waste, catering and market waste, street sweepings, horticulture waste, agriculture and dairy waste.

3.1.1 Trend of solid waste generation

As an essential requirement, each ULB should assess the quantity and composition of waste generated to plan for and design solid waste management system effectively. The quantity and composition of solid waste generated in the ULB determine the collection, processing and disposal options to be adopted.

The per day and total waste generation of solid waste in ULBs in the State during 2016-17 to 2021-22 is shown in **Table 3.1**.

Table 3.1: Per day and total waste generated by ULBs in the State during 2016-17 to 2021-22

Year	Per day generation in Municipal Corporations in the State	Per day generation in Municipal Councils in the State	Per day generation in Nagar Panchayats in the State	Per day generation in ULBs in the State	Total waste generation for the year
	Quantity in metric ton (percentage increase with reference to the year 2016-17)				(in lakh metric ton)
2016-17	22759	4425	651	27835	101.60
2017-18	23481 (3.17)	4531 (2.39)	666 (2.30)	28678 (3.03)	104.67
2018-19	24227 (6.45)	4640 (4.85)	681 (4.60)	29548 (6.15)	107.85
2019-20	24999 (9.84)	4751 (7.36)	697(7.06)	30447 (9.38)	111.44
2020-21	25798 (13.35)	4866 (9.96)	713 (9.52)	31377 (12.72)	114.52
2021-22	26624 (16.98)	4983 (12.61)	729 (11.98)	32336 (16.17)	118.03

Source: Information furnished by Director, Swachh Maharashtra Mission.

As seen from **Table 3.1**, per day generation of solid waste in ULBs in the State increased by 16.17 *per cent* during 2016-17 to 2021-22.

A per day generation of solid waste in the 45 test-checked ULBs during 2016-17 to 2021-22 is shown in **Table 3.2**.

Table 3.2: Per day solid waste generated in 45 test-checked ULBs during 2016-17 to 2021-22

Year	Per day generation in seven test-checked Municipal Corporations	Per day generation in 24 test-checked Municipal Councils	Per day generation in 14 test-checked Nagar Panchayats	Per day generation in 45 test-checked ULBs	Total waste generation for the year
Quantity in metric ton (percentage increase with reference to the year 2016-17)					**(in Lakh Metric Ton)**
2016-17	14271	1270	97	15638	57.08
2017-18	14714 (3.10)	1299 (2.28)	99 (2.06)	16112 (3.03)	58.81
2018-19	15172 (6.31)	1352 (6.46)	101 (4.12)	16625 (6.31)	60.68
2019-20	15644 (9.62)	1361 (7.16)	104 (7.22)	17109 (9.41)	62.62
2020-21	16132 (13.04)	1393 (9.69)	106 (9.28)	17631 (12.74)	64.35
2021-22	16636 (16.57)	1427 (12.36)	109 (12.37)	18172 (16.20)	66.33

Source: Information furnished by Director, Swachh Maharashtra Mission.

As seen from **Table 3.2**, the per day generation of waste in the test-checked ULBs showed an increasing trend registering an increase of 16.20 *per cent* from 15,638 MT in 2016-17 to 18,172 MT in 2021-22.

3.2 Implementation of waste management processes

The waste management process begins with collection of segregated waste, transportation of waste to a transfer station/central sorting facility for sorting of recyclable, processing of waste and disposal in landfills.

The third objective of the Performance Audit was to assess whether the municipal tasks performed for waste management were efficient and effective. Audit scrutinised the municipal tasks of collection of waste, segregation of waste, transportation, processing and disposal of waste. Scrutiny revealed shortfall in collection of waste, deficiencies in the collection and segregation of sanitary waste, e-waste, domestic hazardous waste and plastic waste and shortfall in processing solid waste. Audit also noticed non-development of sanitary landfill and non-capping of dumpsite, as discussed in subsequent paragraphs.

3.3 Collection of municipal solid waste

Collection of segregated municipal solid waste is an essential step in municipal solid waste management. Inefficient waste collection services have an impact on the public health and aesthetics of towns and cities. Collection of wet, dry and domestic hazardous waste separately ensures maximum recovery of recyclable waste and also paves the way for cost-effective treatment of such wastes.

3.3.1 Shortfall in the collection of municipal solid waste

The waste collected *vis-à-vis* waste generated by ULBs in the State during 2016-17 to 2021-22 is shown in **Table 3.3**.

Table 3.3: Municipal solid waste collection by ULBs in the State during 2016-17 to 2021-22

Year	Generation	Collection	Uncollected	Percentage of uncollected waste
Quantity in lakh metric ton				
2016-17	101.60	55.77	45.83	45
2017-18	104.67	70.90	33.77	32
2018-19	107.85	85.93	21.92	20
2019-20	111.44	80.56	30.88	28
2020-21	114.52	68.93	45.59	40
2021-22	118.03	69.72	48.31	41
Total	**658.11**	**431.81**	**226.30**	**34**

Source: Information furnished by Director, Swachh Maharashtra Mission.

As seen from **Table 3.3**, during 2016-17 to 2021-22, the average percentage of uncollected waste was 34 *per cent* of the total waste generation in the State while during 2021-22 it was 41 *per cent.*

The waste generated and collected in the 45 ULBs during 2016-17 to 2021-22 is shown in **Table 3.4**.

Table 3.4: Municipal solid waste collection in 45 test-checked ULBs during 2016-17 to 2021-22

Year	Generated	Collected	Uncollected	Uncollected (percentage)
Quantity in lakh metric ton				
2016-17	57.08	48.21	8.87	15.54
2017-18	58.81	48.69	10.12	17.21
2018-19	60.68	48.61	12.07	19.89
2019-20	62.62	46.90	15.72	25.11
2020-21	64.35	43.78	20.57	31.97
2021-22	66.33	44.57	21.76	32.80
Total	**369.87**	**280.76**	**89.11**	**24.09**

Source: Information furnished by Director, Swachh Maharashtra Mission.

As seen from **Table 3.4**, the percentage of uncollected municipal solid waste showed an increasing trend during 2016-17 to 2021-22 in the 45 test-checked ULBs.

Ministry of Urban Development, GoI launched (2008) the Service Level Benchmarking initiative covering municipal solid waste and defined performance indicators for assessing the performance of solid waste management. Current service level benchmarks and future targets for improved service levels are to be furnished annually by the ULBs to the concerned department in States and notified in the Gazettee.

The Urban Development Department, Government of Maharashtra (GoM) issues notification every year indicating ULB-wise performance against these performance indicators. As per the SLB fixed by GoI, the efficiency in collection of municipal solid waste, measured as a percentage of total waste collected by ULB versus the total waste generated within the ULB, should be 100 *per cent*. As per the notification issued (April 2023) by GoM for the year

2021-22, the efficiency in collection of municipal solid waste in the test-checked ULBs is shown in **Table 3.5**.

Table 3.5: Efficiency in the collection of municipal solid waste in the test-checked ULBs for the year 2021-22

Collection efficiency of municipal solid waste	No. of ULBs
100 *per cent*	35
More than 80 *per cent* but less than 100 *per cent*	8
More than 70 *per cent* but upto 80 *per cent*	2
Total	45

Source: Information compiled from notification issued by UDD, GoM in April 2023

As seen from **Table 3.5**, 35 ULBs achieved 100 *per cent* collection efficiency, while in 10 ULBs[13], the collection efficiency was less than 100 *per cent* during 2021-22. However, as per data furnished by Director, Swachh Maharashtra Mission for the year 2021-22, none of the ULBs achieved 100 *per cent* collection efficiency (**Appendix 3.1**).

Photograph No.1 and 2: Uncollected waste lying at Brihanmumbai Municipal Corporation area (August 2024)

The data furnished by Director, Swachh Maharashtra Mission with respect to efficiency of collection of waste was further verified by Audit by visiting eight[14] out of the 45 test-checked ULBs. However, the information furnished by these eight ULBs was found in variance with the information provided by Director, Swachh Maharashtra Mission. Further, information provided by three out of these eight ULBs also differed from the data of SLB notified by UDD. Thus, there was discrepancy in the information provided by the Director, Swachh Maharashtra Mission with the data of SLB notified by UDD and data furnished by these eight ULBs (**Appendix 3.2**).

Further, while verifying the data in the eight ULBs, discrepancy in figures provided by Director Swachh Maharashtra Mission and the ULBs with respect

[13] Amravati MC: 76 per cent; BMC: 93 *per cent*, Chhatrapati Sambhajinagar MC: 96 *per cent*; Ballarpur MC: 93 *per cent*; Jalna MC: 77 *per cent*; Malegaon NP: 98 *per cent*; Malshiras NP: 92 *per cent*; Wardha MC: 96 *per cent*; Gondia 84 *per cent* and Washi NP: 97 *per cent*.

[14] Brihanmumbai Municipal Corporation, Bhusawal Municipal Council, Navi Mumbai Municipal Corporation, Chhatrapati Sambhajinagar Municipal Corporation, Ambernath Municipal Council, Malkapur Municipal Council, Vadgaon Maval Nagar Panchayat, Malshiras Nagar Panchayat.

to the quantity of waste generated, collected and treated was also noticed (**Appendix 3.3**). The issue of discrepancy noticed in the data on collection efficiency was raised (October 2023, August 2024 and October 2024) with the UDD, however, Audit is yet to receive any reply on this (November 2024).

Audit further noticed that Schedule I-B (iv) of the Solid Waste Management Rules, 2016 provides for installation of weighbridges at landfill sites to measure the quantity of waste brought in. As of March 2022, out of 45 test-checked ULBs, 20 test-checked ULBs had functional weighbridges installed at the landfill sites, 13 ULBs used private weighbridges for weighing the waste collected and the remaining 12 ULBs[15] did not install weighbridges and therefore, measured the quantity of waste on estimation basis or based on the volumetric capacity of vehicles engaged for the collection of waste. Further, out of 13 ULBs where the waste was measured on private weighbridges, it was done on regular basis in eight ULBs only.

Photograph No. 3: Non-existence of weighbridge at the entry point of dumping ground in Jalna MC (March 2021)

Photograph No. 4: Weighbridge at the entry point of dumping ground in Malkapur MC (February 2021)

The practice of measuring the quantity of waste on volumetric capacity of vehicles is not reliable as many times, trucks carrying waste are half-full or carry light material.

Recommendation 5: The State Government may ensure that ULBs install weighbridges for weighment of solid waste.

The Government while accepting (February 2024) the recommendation stated that in Swachh Bharat Mission (U) 2.0, DPRs are proposed with weighbridge for waste quantification on top priority.

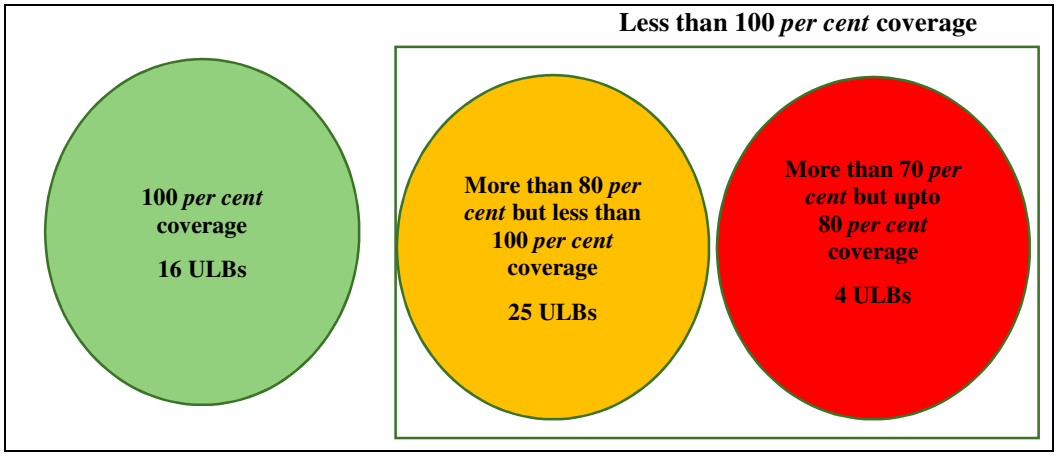
3.3.2 Door-to-door coverage of waste

As per Rule 15(b) of SWM Rules, it was the responsibility of the ULBs to arrange for door-to-door collection of segregated municipal solid waste from all households including slums and informal settlements, commercial, institutional and other non-residential premises. From multi-storage buildings, large commercial complexes, malls, and housing complexes collection could be done from the entry gate or any other designated location.

[15] Achalpur, Beed, Gondia, Jalna, Kaij NP, Lakhandur, Muktainagar, Nandurbar, Narkhed, Nashik, Nipad, Washi

As per the Service Level Benchmark fixed by GoI, the household level coverage of municipal solid waste which is measured as a percentage of households and establishments covered by daily doorstep collection system, should be 100 *per cent*. The status of door-to-door coverage for collection of municipal solid waste in the 45 test-checked ULBs during 2021-22, as notified by UDD, GoM is detailed in **Appendix 3.4** and shown in **Chart 3.1**.

Chart 3.1: Household level coverage of municipal solid waste during 2021-22 in 45 test-checked ULBs



Source: Information compiled from notifications issued by UDD, GoM in April 2023

As seen from **Chart 3.1**, 64 *per cent* of the test-checked ULBs (29 out of 45 ULBs) did not achieve the service level benchmark of 100 *per cent* coverage. Of these 29 ULBs, the coverage in four ULBs (Ashti in Beed, Nagpur, Nashik and Palus) was only upto 80 *per cent*.

Photograph No. 5: Door-to-door coverage for collection of waste in Kalamb Municipal Council (August 2021)

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

Rule 15(c) of SWM Rules fixes responsibility on the local authorities for establishing a system to recognise organisations of waste pickers or informal waste collectors and promote/establish a system for integration of these authorised waste pickers and waste collectors to facilitate their participation in solid waste management, including door-to-door collection of waste. Rule 15(d) of SWM Rules also required the ULBs to facilitate the formation of Self-Help Groups (SHGs) of waste pickers, provide identity cards and, thereafter, encourage integration in solid waste management, including door-to-door collection of waste.

Audit noticed that 36 *per cent* of test-checked ULBs (16 out of 45 ULBs) had not taken action for issue of identity cards to waste pickers and involving them for door-to-door collection of waste **(Appendix 3.5)**. Out of the 29 ULBs which had issued identity cards, only 12 ULBs had involved waste pickers in door-to-door collection of waste.

Audit also observed that SHGs were not formed in 62 *per cent* of the test-checked ULBs (28 out of 45 ULBs). In the remaining 17 ULBs where SHGs were formed, 12 had integrated their services for door-to-door collection of waste. Only seven ULBs (Ballarpur, Beed, Bhusaval, Brihanmumbai Municipal Corporation (BMC), Kaij, Narkhed and Nashik) had issued identity cards to waster pickers and integrated the services of SHGs for door-to-door collection of waste.

Recommendation 6: The Government may direct the ULBs to take proactive steps for the formation of Self-Help Groups of waste pickers and encourage their involvement in solid waste management.

The Government while accepting the recommendation stated (February 2024) that ULBs were already directed to identify SHG and informal waste pickers for door-to-door waste collection and encourage their engagement in waste management.

3.4 Segregation of municipal solid waste

Segregation means sorting and separate storage of various components of municipal solid waste namely biodegradable waste including agriculture and dairy waste, non-biodegradable waste including recyclable waste, non-recyclable combustible waste, sanitary waste, and non-recyclable inert waste and domestic hazardous waste.

As per Rule 22 of SWM Rules, it was the responsibility of ULBs to enforce the practice of segregation of biodegradable, recyclable, combustible, sanitary waste, domestic hazardous and inert municipal solid waste at source within two years from the date of notification of SWM Rules *i.e.,* by April 2018.

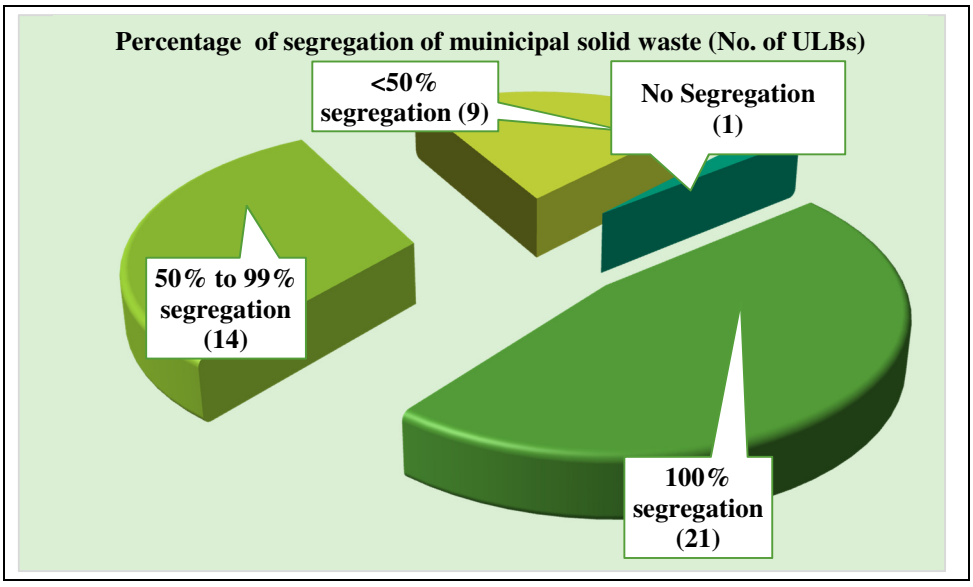
3.4.1 Shortfall in segregation of waste at source

Segregation of waste results in minimising the waste reaching the landfill for final disposal, thereby reducing the cost of solid waste management.

Rule 4(a) and 4(b) of SWM Rules, 2016 provided that every waste generator segregates the waste in three streams namely biodegradable, non-biodegradable and domestic hazardous waste and handover segregated waste to authorised waste pickers operating in ULBs.

As per the Service Level Benchmark fixed by GoI, the target for segregation of municipal solid waste at source, measured as a percentage of segregated waste collected at source from households and establishment, was 100 *per cent*. The segregation of municipal solid waste during 2021-22 in the test-checked ULBs is detailed in **Appendix 3.4** and shown in **Chart 3.2.**

Chart 3.2: Segregation of municipal solid waste in the 45 test-checked ULBs during 2021-22



Source: Information compiled from notifications issued by UDD, GoM in April 2023

As seen from **Chart 3.2**, during 2021-22, waste segregation at source was done in 44 out of the 45 test-checked ULBs while in Muktainagar ULB segregation at source was not done. Waste segregation was 100 *per cent* in the 21 test-checked ULBs while 23 test-checked ULBs (53 *per cent*) did not achieve the target of 100 *per cent* segregation of waste, one ULB did not segregate at all.

Further, Rule 15(j) of SWM Rules provided for ensuring safe storage and transportation of domestic hazardous waste to the hazardous waste disposal facility. As per the information from Swachh Maharashtra Mission, household in 21 ULBs[16] segregated 100 *per cent* domestic hazardous waste at source. However, in five out of these 21 ULBs, the collection and transportation were done along with the municipal solid waste.

Thus, in 53 *per cent* of the ULBs, waste generators failed to achieve service level benchmark of 100 *per cent* segregation of waste at source. Further, in the ULBs where generators segregated the waste, the collection and transportation of segregated waste mixed with municipal solid waste nullified the entire

[16] Achalpur, Amalner, Arni, Ichalkaranji, Kaij, Kalamb NP, Kankavli, Lakhandur, Lonavala, Mahadula, Malkapur, Murbad, Narkhed, Navi Mumbai, Palus, Parli-Vaijnath, Parola, Pune, Vadgaon-Maval, Wardha and Yavtmal.

effort made in segregation. As a result, contaminated mixed waste was reaching the landfills.

3.4.2 Segregation of e-waste by ULBs

As per Schedule IV of e-waste Management Rules (EWM Rules), it is the responsibility of the ULBs to ensure that e-waste, if found mixed with municipal solid waste, is properly segregated, collected and channelised to authorised dismantler or recycler. E-waste pertaining to orphan products[17] should also be collected and channelised to authorised dismantler or recycler.

As per information provided by the Director, Swachh Maharashtra Mission, in 21 out of 45 ULBs, segregated e-waste was handed over by all the households to the ULBs during 2021-22. In the remaining 24 ULBs, out of 56.02 lakh households, e-waste mixed with municipal solid waste was collected from 16.85 lakh households (30 *per cent*).

3.4.3 Segregation of plastic waste

Plastic Waste Management Rules, 2016 (PWM Rules) notified (March 2016) by the GoI is applicable to every waste generator, local body, manufacturer, importer and producer. Rule (6) of PWM Rules stipulates that every local body shall be responsible for the development and setting up of infrastructure for segregation, collection, storage, transportation, processing and disposal of the plastic waste either on its own or by engaging agencies or producers.

As per information provided by the Director, Swachh Maharashtra Mission during 2021-22, plastic waste was mixed with municipal solid waste in all the 45 test-checked ULBs.

Instances of plastic waste mixed with municipal solid waste noticed during joint physical verification in Amravati and Ichalkaranji is shown in in photograph No. 6 and 7.

Photograph No. 6: Plastic waste mixed with municipal solid waste in Amravati (March 2021)

Photograph No. 7: Plastic waste mixed with municipal solid waste in Ichalkaranji (February 2021)

[17] Non-branded or assembled electrical and electronic equipment as specified in Schedule I of EWM Rules, 2016 or those produced by a company which has closed its operations.

3.4.4 Bio-medical Waste

The Bio-Medical Waste (Management and Handling) Rules, 1998, provided a regulatory framework for the management of bio-medical waste (BMW) generated in the country. This was replaced by the Bio-Medical Waste Management Rules, 2016 (BMW Rules). As per the BMW Rules, every occupier i.e. a person having administrative control over the institution and the premises generating bio-medical waste including a hospital, nursing home, clinic, dispensary *etc.* was required to hand over segregated waste to a common bio-medical waste treatment facility (CBMWTF) for treatment, processing and final disposal.

3.4.4.1 Bio-medical waste generation and treatment in Maharashtra

The quantum of BMW generated and treated during the period 2016-17 to 2021-22 in the State is given in **Table 3.6.**

Table 3.6: BMW generated and treated in the State during 2016-17 to 2021-22

Year	No. of Occupiers	BMW generated (ton/day)	BMW Segregated (ton/day)	BMW treated (ton/day)
2016-17	52704	71.511	71.511	71.511
2017-18	63824	61.918	61.918	61.918
2018-19	60410	62.418	62.418	59.877
2019-20	63642	62.254	62.254	62.254
2020-21	64266	82.15	82.15	82.11
2021-22	64989	80.31	80.31	80.31
Average ton/day		70.09	70.09	69.66

Source: Annual Reports and information furnished by Maharashtra Pollution Control Board

The BMW treated was less than the generation during 2018-19 and 2020-21 indicating unscientific disposal of BMW to that extent. As of December 2021, there were 64,989 occupiers and 30 CBMWTF functioning in Maharashtra. 160 out of these 64,989 occupiers, were functioning without valid authorisation from Maharashtra Pollution Control Board (MPCB) as required under Rule 10 of BMW Rules. Information regarding the quantity of BMW generated by these 160 occupiers was not available with MPCB.

3.4.4.2 Segregation of bio-medical waste from households

As per Schedule I (12) of Bio-Medical Waste Management Rules, 2016 (BMW Rules), ULBs are required to collect segregated BMW generated in households during healthcare activities and have an arrangement with the common bio-medical waste treatment facility (CBMWTF) to collect this waste from the material recovery facilities or from the households directly for final disposal.

The information provided by the Director, Swachh Maharashtra Mission revealed the following in the test-checked ULBs.

- 34 ULBs[18] (76 *per cent*) out of the 45 test-checked ULBs were collecting BMW generated by households mixed with MSW during 2021-22 while the remaining 11 ULBs[19] collected segregated BMW from households **(Appendix 3.6)**.

Photograph No. 8 and 9: Bio-Medical waste collected in Pandharpur (August 2021)

Photograph No. 10 and 11: Bio-Medical waste collected in Jalna (March 2021)

- 37 ULBs[20] (82 *per cent*) out of the 45 test-checked ULBs did not have any arrangement with the CBMWTF during 2021-22, to collect segregated BMW from the material recovery facilities or from the households directly for final disposal **(Appendix 3.6)**.

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[18] Achalpur, Amalner, Ambernath, Amravati, Arni, Ashti (Beed), Ashthi (Wardha), Ballapur, Beed, Bhusawal, BMC Chhatrapati Sambhajinagar Gangapur, Gondia, Ichalkaranji Kalamb MC, Kalamb NP, Kaij, Karanja, Khopoli, Lakhandur, Mahadula Malegaon NP, Malshiras, Muktainagar, Murbad, Nagpur, Nandurbar, Nashik, Navi Mumbai, Niphad, Vadgaon-Maval, Washi, and Wardha.

[19] Jalna, Kankavli, Lonavala, Malkapur, Narkhed, Palus, Pandharpur, Parli-Vaijnath, Parola, Pune and Yavtmal.

[20] Achalpur, Amalner, Ambernath, Amravati, Arni, Ashti (Beed), Ashthi (Wardha), Ballarpur, Beed, Bhusawal, BMC, Gondia, Ichalkaranji, Jalna, Kalamb MC, Kalamb NP, Kankavli, Karanja, Khopoli, Lakhandur, Lonavala, Mahadula, Malegaon, Malkapur, Malshiras, Muktainagar, Murbad, Nagpur, Nandurbar, Nashik, Navi Mumbai, Niphad, Palus, Parola, Vadgaon-Maval, Washi and Wardha.

In the absence of separate arrangement for collecting non-segregated BMW directly from households, separate disposal of BMW waste could not be ensured by the ULBs. Thus, there lies the risk of dumping BMW, open burning and disposal of BMW along with municipal waste, all of which pose serious public health concerns.

In reply, UDD stated (February 2024) that State has already directed ULBs to collect segregated bio-medical waste and ULBs have also identified biomedical waste treatment facility for proper disposal of bio-medical waste. It was further stated that awareness campaigns regarding segregation of solid waste is going on at regular intervals at ULB level.

Recommendation 7: The Government may direct ULBs to give greater emphasis on segregation of waste by means of publicity and awareness campaigns and encourage segregation of waste at source. Also, arrangement with Common Bio-Medical Waste Treatment Facility may be ensured for proper disposal of collected bio-medical waste.

3.5 Transportation of municipal solid waste

Transportation plays a vital role in solid waste management services. Depending on local conditions and location of landfill sites, ULBs use different types of vehicles, such as pushcarts, auto tippers, tractors, tipper trucks and compactors for collection and transportation of waste. The deficiencies noticed in the transportation of municipal solid waste are discussed in the succeeding paragraphs.

3.5.1 Transportation of mixed waste in vehicles or in open vehicles

Paragraph 2.3.2 of Manual 2016 stipulated that vehicles used for transportation of waste should be covered so that waste is not visible to public and spillage of waste can be avoided. At source segregation would be successful only when the segregated waste is not mixed at any stage of transportation while being taken to the respective processing or disposal facility directly or through a transfer station. For this purpose, there should be either separate vehicles for transporting the segregated waste or there should be a partition for carrying different types of waste.

Instances of dry and wet waste mixed during transportation in Ichalkaranji MC though vehicles with separate chambers for dry and wet waste were available and transportation of waste in open vehicles in Chhatrapati Sambhajinagar Municipal Corporation and Washi Nagar Panchayat noticed during joint physical verification, is shown in photograph no. 12,13 and 14respectively.

Photograph No. 12: Dry and wet waste mixed during collection and transportation in Ichalkatranji MC (February 2021)

Photograph No. 13: Waste being transported in open vehicle in Chhatrapati Sambhajinagar Municipal Corporation (February 2021)

Photograph No. 14: Waste being transported in open vehicle in Washi Nagar Panchayat (March 2021)

3.6 Processing and disposal of municipal solid waste

Processing means any scientific method by which segregated municipal solid waste is handled for the purpose of reuse, recycling or transformation into new products. Rule 15(v) of SWM Rules stipulated that it is the duty and responsibility of the ULBs to facilitate construction, operation and maintenance of municipal solid waste processing facilities and associated infrastructure on their own or with private sector participation or through any agency for optimum utilisation of various components of municipal solid waste, adopting suitable technology.

3.6.1 Shortfall in processing of municipal solid waste

The status of processing of municipal solid waste by ULBs in the State during 2016-17 to 2021-22 is shown in **Table 3.7**.

Table 3.7: Shortfall in processing of municipal solid waste in the State during 2016-17 to 2021-22

Year	Municipal solid waste collected	Municipal solid waste not processed	Percentage of unprocessed waste w.r.t. collection
Quantity in lakh MT			
2016-17	55.77	26.94	48
2017-18	70.90	42.07	59
2018-19	85.93	40.04	47
2019-20	80.56	25.83	32
2020-21	68.93	15.08	22
2021-22	69.72	14.17	20
Total	**431.81**	**164.13**	**38**

Source: Information furnished by Director, Swachh Maharashtra Mission.

As seen from **Table 3.7**, there was a decline in the percentage of unprocessed waste from 2018-19 onwards.

The waste processed in the 45 test-checked ULBs during 2016-17 to 2021-22 is shown in **Table 3.8**.

Table 3.8: Shortfall in processing of municipal solid waste in the 45 test-checked ULBs during 2016-17 to 2021-22

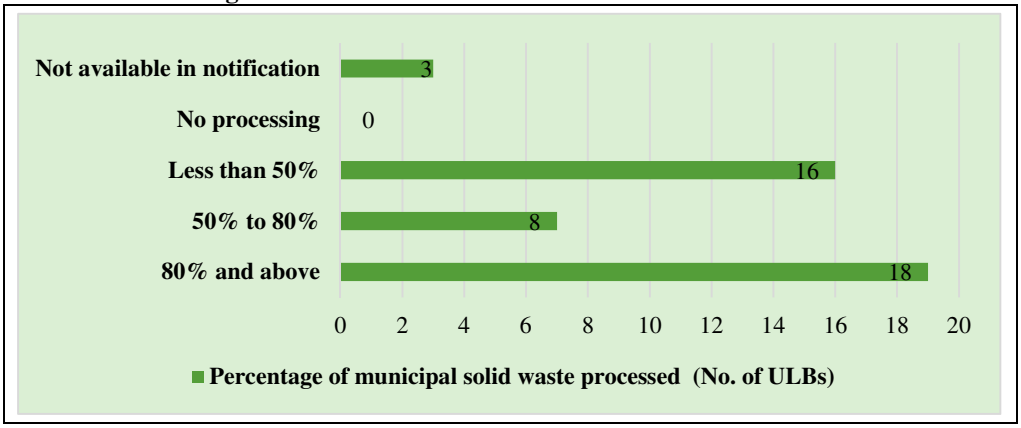
Year	Municipal solid waste collected	Municipal solid waste not processed w.r.t. collection	Percentage of unprocessed waste
Quantity in lakh MT			
2016-17	48.21	22.21	46
2017-18	48.69	19.92	41
2018-19	48.61	19.21	40
2019-20	46.90	12.75	27
2020-21	43.78	11.38	26
2021-22	44.57	11.20	25
Total	**280.76**	**96.67**	**34**

Source: Information furnished by Director, Swachh Maharashtra Mission.

As seen from the **Table 3.8**, though the percentage of unprocessed waste during 2021-22 showed a decline trend as compared to 2016-17, 25 *per cent* of the waste collected still remained unprocessed during 2021-22 in the test-checked ULBs.

As per the Service Level Benchmark fixed by GoI, the target for processing municipal solid waste with respect to collection was 80 *per cent*. The percentage of municipal solid waste processed in the test-checked ULBs during 2021-22 as per the status of achievement against service level benchmark is detailed in **Appendix 3.4** and shown in **Chart 3.3.**

Chart 3.3: Percentage of municipal solid waste processed in the test-checked ULBs during 2021-22



Source: Information compiled from notifications issued by UDD, GoM in April 2023

As seen from **Chart 3.3**, 57 *per* cent ULBs (24 out of 42 ULBs) had not achieved the benchmark target of 80 *per cent*. In 16 ULBs in which processing was less than 50 *per cent*, the percentage of processing ranged between one *per cent* (Amalner Municipal Council) and 44 *per cent* (Wardha Municipal Council).

However, a comparison of the percentage of municipal solid waste processed as per the status of achievement against service level benchmark during 2021-22 notified by UDD **(Appendix 3.1)** and the percentage of waste processed during 2021-22 with respect to collection as per the information of Director, Swachh Maharashtra Mission revealed marked discrepancies in case of 41 ULBs.

In 24 ULBs, the processing percentage as notified in service level benchmark for the year 2021-22 was less than the processing percentage provided by Director, Swachh Maharashtra Mission, while it was more in 17 ULBs.

Audit further verified the data furnished by Director, Swachh Maharashtra Mission by visiting eight ULBs[21] out the 45 test-checked ULBs. Verification of data by Audit in these eight ULBs revealed that in four ULBs the processing percentage was more than the percentage as per the information furnished by Director, Swachh Maharashtra Mission and data of SLB notified by UDD. In two ULBs, the processing percentage was less than the percentage as per the information furnished by Director, Swachh Maharashtra Mission and the data of SLB notified by UDD. In the remaining two ULBs the processing percentage was equal to the SLB notification but more than the percentage as per the information furnished by the Director, Swachh Maharashtra Mission **(Appendix 3.2)**.

The variation in the data of percentage of waste processed with respect to collection (**Appendix 3.1 and Appendix 3.2)** and the discrepancy in the quantity of waste processed (**Appendix 3.3)** was not reconciled (October 2024) by the UDD, GoM.

[21] Brihanmumbai Municipal Corporation, Bhusawal Municipal Council, Navi Mumbai Municipal Corporation, Chhatrapati Sambhajinagar Municipal Corporation, Ambernath Municipal Council, Malkapur Municipal Council, Vadgaon Maval Nagar Panchayat, Malshiras Nagar Panchayat.

3.6.2 Processing and disposal of Construction and Demolition waste

Construction and Demolition waste (C&D waste) comprises of building materials, debris and rubble resulting from construction, re-modeling, repair and demolition of any civil structure. As per Rule 6 of the Construction and Demolition Waste Management Rules, 2016 (C&DWM Rules), it is the responsibility of the ULBs to collect, transport, process and dispose of C&D waste either through own resources or by appointing private operators. The C&D waste processed by ULBs in the State during 2018-19 to 2021-22 is shown in **Table 3.9.**

Table 3.9: Construction and demolition waste processed by ULBs in the State during 2018-19 to 2021-22

Year	C & D waste generated (in lakh MT) (1)	C&D waste processed (in lakh MT) (2)	C & D waste used for landfilling or filling low lying area (in lakh MT) (3)	C & D waste disposal not known (4)=1-2-3	Percentage of C&D waste not processed (5)=(3+4)/1
2018-19	16.59	0.27	14.28	2.04	98
2019-20	47.05	0.44	46.61	0	99
2020-21	38.53	0.99	35.36	2.18	97
2021-22	63.12	1.48	21.69	39.95	98
Total	**165.29**	**3.18**	**117.94**	**44.17**	**98**

Source: Annual Reports of MPCB

Except for Thane, Pimpri-Chinchwad, Navi Mumbai and Pune Municipal Corporations, none of the ULBs in the State had developed C&D processing facility. As a result, 98 *per cent* of C&D waste generated in ULBs during 2018-19 to 2021-22 remained unprocessed of which 71 *per cent* was disposed of by landfilling and filling of low-lying areas.

3.6.3 Decentralised processing of municipal solid waste

As per Rule 11(h) of SWM Rules, local bodies should ensure that a separate space for segregation, storage, decentralised processing of municipal solid waste is demarcated in the development plan for group housing or commercial, institutional or any other non-residential complex exceeding 200 dwellings or having a plot area exceeding 5,000 square meters. Further, as per the bye-laws framed (July 2019) by UDD, GoM all bulk generators should manage the waste at their premises as per the instructions notified by the local body from time to time.

Based on the information furnished by the test-checked ULBs, Audit noticed that four ULBs (Ambernath, Lonavala, Malkapur and Navi Mumbai) had 106 complexes/ Group housing having more than 200 dwellings or plot area exceeding 5,000 square meters, out of which, 28 complexes (26 *per cent*) in Ambernath and Lonavla ULBs did not process the biodegradable waste within the premises. Out of these 28 complexes, 12 complexes (Ambernath ULB) had earmarked space, while 16 complexes (Lonavala ULB) did not have earmarked space. Further, out of 3,340 bulk generators of municipal solid waste in BMC, 1,663 bulk generators (50 *per cent*) did not process waste within the premises though instructions were issued (July 2017) by BMC to bulk generators for decentralised processing of waste. BMC stated (March 2021) that notices have been issued on defaulting bulk generators and penalty levied.

Best practice: During site visit of Navi Mumbai Municipal Corporation (NMMC), a new initiative of the Corporation was noticed wherein a plastic container was placed for collection of old shoes, small plastic pieces like wrappers, old sarees etc. under Greensole initiative. It is a new initiative of the Corporation wherein old shoes/ saree/ waste material etc. was collected for creating artefacts, Eco-friendly bags and refurbishment of old shoes which helps in reducing waste reaching landfill.

During the Exit Conference, the Principal Secretary stated (August 2022) that Swachh Bharat Mission 2.0 would be focusing on enhancing the processing capacities in the ULBs.

3.6.4 Non-availability of material recovery or secondary storage facilities

As per Rule 15(h) of SWM Rules, ULBs have to set up material recovery facilities or secondary storage facilities with sufficient space for sorting of recyclable materials to enable informal or authorised waste pickers and waste collectors to separate recyclables such as paper, plastic, metal, glass, textile from the waste before the waste is delivered or taken up for its processing or disposal.

Audit observed that material recovery facilities/secondary storage facilities were not set up in 36 *per cent* test-checked ULBs (16[22] out of 45 ULBs) as on March 2022. In the absence of material recovery facilities, the objective of reduction in the waste going to the landfill was not achieved for minimising the public health and environmental risks.

[22] Arni, Ashti (Beed), Ashthi (Wardha), Gondia, Ichalkaranji, Jalna, Kalamb MC, Kalamb NP, Kankavali, Karanja, Kaij, Malegaon, Muktinagar, Nagpur, Vadgaon-Maval and Washi.

Photograph No. 15: Material recovery facility at Malkapur MC (February 2021)

Recommendation 8: The Government may direct the ULBs to create and augment processing facilities for processing of waste and set up material recovery/secondary storage facilities in a time-bound manner.

3.6.5 Non-availability of sanitary landfills and processing facility

Dump site is the land utilised by a local body for disposal of municipal solid waste without following the principles of sanitary land filling. Sanitary land filling means the final and safe disposal of residual municipal solid waste and inert wastes on land in a facility designed with protective measures against pollution of ground water, surface water and fugitive air dust, wind-blown litter, bad odour, fire hazard, animal menance, greenhouse gas emissions, *etc.*

As per Rule 22 of SWM Rules, suitable sites should be acquired for setting up municipal solid waste processing facility and sanitary landfill facilities within two years from the notification of SWM Rules.

Audit noticed that as of March 2022, 58 *per cent* of test-checked ULBs (26 out of 45 ULBs) did not develop sanitary landfills **(Appendix 3.7)**. Out of these 26 ULBs, eight ULBs (Arni, Ashthi (Wardha), Kalamb NP, Kalamb MC, Lakhandur, Malshiras, Niphad and Washi) did not have their own land for municipal solid waste processing and development of sanitary landfill. Though these eight ULBs had identified land, the same was not acquired till March 2022, which was not only in violation of SWM Rules but also resulted in unscientific disposal of waste in the absence of adequate processing facility.

Due to non-development of sanitary landfill 33.88 lakh MT waste generated by 26 ULBs was dumped in open dump site during 2016-17 to 2021-22, which included 29.20 lakh MT of segregated waste. Further, despite the availability of sanitary landfills, waste was being dumped by 18 ULBs in open dump sites due to inadequate processing facilities. During 2016-17 to 2021-22, these ULBs had dumped 11.59 lakh MT of waste without processing in dumpsite which included 10.35 lakh MT of segregated waste which was dumped due to inadequate processing facilities.

Further, BMC had two land sites where the waste was being disposed. In Kanjurmarg site, the waste was processed and disposed in the sanitary landfill.

The site at Deonar is an open dump site and 51.28 lakh MT unprocessed waste was dumped during 2016-17 to 2021-22.

BMC had planned to mitigate the environmental issues out of open dumping at Deonar dumping ground by developing waste to energy plant. However, the commissioning of the plant was not completed till January 2024. The Executive Engineer, (SWM) project of BMC stated (January 2024) that the site development work including pile foundation, compound wall *etc.* was in progress.

The finalisation and award of the contract (August 2022) for development of Waste to Energy Project took more than four years from the date of invitation of e-tender in April 2018. The delay was mainly due to time taken in finalisation of pre-bid queries, delay in submission of geotechnical investigation report to assess the cost of removal of legacy waste and delay in issue of work order.

Thus, due to the delay in the award of the project and its completion, the municipal solid waste could not be converted into energy and the entire waste continued to be dumped in the Deonar dumping ground.

Best practice: During joint physical verification in respect of facilities of solid waste management in Malkapur Municipal Council, it was noticed that the entire energy requirement of a compost plant was met through a biogas plant that used segregated hotel wet waste for electricity generation. This practice resulted in zero external energy consumption for operating the compost plant.

Further, electricity generated from solar panels installed on a two metric ton per day mechanical composting plant was used for operating the plant thereby reducing energy charges by 68 *per cent*.

Recommendation 9: The Government may direct ULBs to develop sanitary landfills for the scientific disposal of waste.

The Government while accepting the recommendation stated (February 2024) that under Swachh Bharat Mission (U) 2.0, 411 ULBs have been sanctioned sanitary landfills and ULBs are directed to build scientific disposal facility for disposal of waste.

3.6.6 Absence of bio-mining and bio-remediation of dump site or non-capping of dumpsites

Open dumpsites pose a threat to the environment and human health. Rule 15(zj) and (zk) of SWM Rules state that ULBs should investigate and analyse all old open and existing operational dumpsites for their potential of bio-mining and bio-remediation[23] and wheresoever feasible, take necessary action for the same. In the absence of the potential of bio-mining and

[23] Remediation involves: (i) Bio-mining entails excavating legacy waste, loosening it and making windrows to dry the leachate through solar exposure. (ii) Bioremediation entails addition of composting bio-culture to speed up the decomposition and reduce the volume of waste.

bio-remediation of dumpsites, the dumpsites should be scientifically capped as per the landfill capping norms, to prevent further damage to the environment.

Audit noticed that 32 *per cent* of the test-checked ULBs (13 ULBs[24] out of 40 ULBs[25]) did not plan for assessing feasibility of open and operational dumpsites for bio-mining and bio-remediation or for scientific capping of open dumpsites, to prevent further damage to the environment. Out of the remaining 27 ULBs, which had planned for bio-mining, eight ULBs (Ballarpur, Beed, Nandurbar, Parola, Amalner, Nashik, Pune and Pandharpur) had completed bio-mining as on March 2022, while in the remaining 19 ULBs the work was in progress (March 2022).

3.6.7 Deficiencies in the work of bio-mining of dumpsite waste

Scrutiny of records in the test-checked ULBs revealed deficiencies in the work of bio-mining of dumpsite waste in three out of 19 ULBs, where the bio-mining work was in progress.

Photograph No. 16: Open dumpsite at Achalpur (March 2021)

Photograph No. 17: Open dumpsite at Amravati (March 2021)

In Amravati Municipal Corporation, Achalpur and Karanja Municipal Councils, municipal solid waste was dumped at open dumpsite and therefore, these ULBs planned to clear the waste in open dumpsites by using the bio-mining method and thereafter, establish processing plants on the reclaimed land.

The contracts were awarded by these ULBs based on the assessment of waste for DPRs 2017-18. As per the contract condition, the quantity was to be re-assessed by the contractor after the award of work and completed before starting of the work and administrative approval was to be taken for removal of further excess assessed waste. The status of award of contract, re-assessment of waste by the contractor and work completion is given in **Table 3.10**.

[24] Ashti (Beed), Ashthi (Wardha), Kaij, Kalamb NP, Lakhandur, Mahadula, Malshiras, Muktainagar, Niphad, Palus, Vadgaon-Maval, Malagaon,and Washi.

[25] In five ULBs (Navi Mumbai, Malkapur, Gangapur, Kalmb MC and Murbad), requirement of bio-mining was not assessed in DPRs.

Table 3.10: Status of work of bio-mining in Amravati, Achalpur and Karanja ULBs

Name of ULB (1)	Assessed waste put to tender based on DPRs of 2017-18 (Work order issued) (2)	Waste assessed by the contractors (quantity in excess of quantity in DPR in percentage) (3)	Work completed (completion certificate issued) (4)	Balance work (5)=(3)-(4)	Reasons for non-completion of waste assessed by the contractor
	Volume (cubic metre)				
Amravati	1,31,946 (September 2019)	5,00,000 (279) (October 2019)	1,44,467* (January 2021)	3,55,533	Delay in timely approval of proposal for grant of administrative approval to complete balance work from UDD, GoM.
Achalpur	5,279 (March 2019)	20,092 (281) (April 2019)	5,279 (December 2020)	15,013	Delay in timely approval of proposal for grant of administrative approval to complete balance work from UDD, GoM.
Karanja	24,949 (January 2020)	52,634 (111) (January 2020)	39,147* (October 2020)	13,487	No further action was initiated for taking administrative approval for completing the balance work.
Total	**1,62,174**	**5,72,726**	**1,88,893**	**3,84,033**	

Source: Information furnished by the respective ULBs

**Excess work executed due to reduced rate for the work received from the contractor vis-a-vis the estimated rate.*

Audit noticed that these ULBs could not take administrative approval for removal of excess waste assessed by the contractor. On execution of the original quantity assessed by the ULBs, work completion certificate was issued.

Thus, the entire waste could not be removed for bio-mining as the administrative approval for the actual quantity assessed on site by the contractors could not be obtained by ULBs.

Achalpur and Karanja ULBs accepted the fact and stated (March 2021 and August 2021) that the actual quantity was much more than the estimation of work as per DPR. The remaining work would be included in the revised DPR and executed after approval from the Government. The reply indicates that the ULBs failed to obtain administrative approval from the GoM immediately on assessment by the contractor.

In none of the three ULBs the work of bio-mining of legacy waste was completed as of June 2023. Due to non-removal of legacy waste these ULBs could not get clear land for the establishment of treatment plants. Consequently, the unprocessed waste continued to be disposed of in the open dumpsites.

3.7 Personal Protection Equipment

As per clause 15 (zd) of SWM Rules, local bodies shall ensure that the operator of a facility provides personal protection equipment (PPE) including uniform, fluorescent jacket, hand gloves, raincoats, appropriate footwear and masks to all workers handling solid waste and the same are used by the workforce.

The number of test-checked ULBs which did not provide PPE to its labourers during 2016-17 to 2021-22 is given in **Table 3.11**.

Table 3.11: Non-distribution of PPE in the 45 test-checked ULBs

Period	Number of ULBs which did not distribute PPE					
	Uniform	Fluorescent jacket	Hand gloves	Raincoat	Footwear	Mask
2016-17	11	11	6	10	5	8
2017-18	8	10	4	9	5	7
2018-19	7	9	7	13	6	7
2019-20	15	8	4	11	7	4
2020-21	14	11	5	12	8	5
2021-22	05	04	01	03	1	1

Source: Information compiled from data furnished by 45 test-checked ULBs and Director, Swachh Maharashtra Mission

As seen from **Table 3.11**, a significant number of ULBs did not distribute PPE kits to workers involved in the management of solid waste thereby exposing them to various kinds of infectious and airborne diseases. However, the situation improved in 2021-22 as number of ULBs not distributing PPE kits showed a decreasing trend from last year.

Joint physical verification done by Audit revealed instances of labourers handling municipal solid waste without PPE.

Photograph No. 18: Municipal solid waste being handled without personal protection equipment at Chhatrapati Sambhajinagar Municipal Corporation (February 2021)

Recommendation 10: ULBs may ensure that Personal Protection Equipment are provided and used by workers involved in handling waste.

The Government while accepting the recommendations stated (February 2024) that all the ULBs have been directed to provide all personal protection equipment to workers involved in handling waste.