

CHAPTER - V
PROCESSING AND
DISPOSAL OF
MUNICIPAL SOLID
WASTE

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Processing and Disposal of Municipal Solid Waste

5.1 Processing of Municipal Solid Waste

Clause 5 of Schedule II of MSW Rules 2000 provides that municipal authorities shall adopt suitable technology or combination of such technologies to make use of wastes so as to minimise burden on landfill. In this connection, biodegradable wastes shall be processed by composting, vermicomposting, anaerobic digestion or any other appropriate processing for stabilisation of wastes and shall ensure that compost or any other end product shall comply with standards as specified in Schedule-IV of MSW Rules 2000. The details of solid waste generated and processed by all ULBs in the State and test-checked ULBs for the period 2015-20 are given in Table below:

Table 5.1: Details of solid waste generated by all ULBs during 2015-20 (in TPD)

Particulars	2015-16	2016-17	2017-18	2018-19	2019-20	Total
Waste generated	2574.70	18.55*	539.44**	2564.43	2208.60	7905.72
Collected	2283.90	14.28	471.58	2255.32	2123.30	7148.38
Uncollected	290.80	4.27	67.86	309.11	85.30	757.34
Processed	30	0	0	91.63	202.40	324.03
Waste to landfill	2253.90	14.28	471.58	2163.69	1920.90	6824.35
Percentage of processing	1.31	0	0	4.06	9.53	4.53

(Source: Data furnished by SPCB)

(NB: * Annual Report (ARs) submitted by three ULBs, ** ARs submitted by 19 ULBs)

Table 5.2: Details of solid waste generated by test checked 21 ULBs during 2015-16 to 2019-20 (in TPD)

Particulars	2015-16	2016-17	2017-18	2018-19	2019-20
Generated	536.26	583.19	1382.25	1380.34	1439.58
Collected	484.16	543.99	1330.57	1341.04	1411.09
Un collected	52.10	39.20	51.68	39.30	28.50
Processed	10	5	7.10	7	14.00
Waste to dump	474.16	538.99	1323.47	1334.04	1397.09
Percentage of processing	2.07	0.92	0.53	0.52	0.99

(Source: - As per information provided by ULBs)

It could be seen from the above tables that only 10 *per cent* of waste was processed in ULBs of the State and only one to two *per cent* of waste was processed by test checked ULBs during 2015-20. A major portion of remaining solid waste was dumped at landfills. Low rate of processing of waste in ULBs was due to inadequate infrastructure and lack of appropriate strategies as explained in subsequent paragraphs.

While accepting the audit comments, the Government stated (May 2022) that it was decided in the year 2019 to establish decentralised plants for waste processing. After that MSW were processed in MCCs set up in the ULBs. However, Audit found that waste processing was only to the extent of 10 *per cent* as of March 2020.

5.1.1 Inadequate infrastructure for processing

Schedule I of MSW Rules 2000 provided time schedule of December 2003 or earlier for setting up of processing and disposal facilities. Clause 22 of SWM Rule 2016 read with Schedule I of MSW 2000 make ULB authorities responsible for compliance to criteria specified for timely setting up of waste processing and disposal facilities and their monitoring, improvement of existing landfill site as well as identification of landfill sites for future use and making sites ready for operation. As per Clause 15(v) of SWM Rule-2016, ULBs should facilitate construction, operation and maintenance of solid waste processing facilities and preference shall be given to decentralised processing to minimise transportation cost and environmental impacts such as bio-methanation, micro composting, vermin composting, anaerobic digestion or any other appropriate processing for bio-stabilisation of bio-degradable wastes. Audit observed the following:

5.1.1.1 Processing of Waste to Energy

As per Clause 21 of SWM Rule 2016, non-recyclable waste having calorific value²⁸ of 1,500 kilocalorie per kilogram (kcl/kg or more shall not be disposed of to landfill and shall only be utilised for generating energy either through refuse derived fuel or by giving away as feed stock for preparing refuse derived fuel. High calorific wastes²⁹ shall be used for co-processing in cement or thermal power plants. The ULBs should propose to set up waste to energy processing plant of more than five TPD.

Audit observed that there was 15,84,400 tonnes of legacy waste at Bhuasuni dumping yard of BMC. BMC made agreement (May 2014) for establishment of waste to energy plant capacity of 11.5 MW and also to maintain landfill scientifically with M/s. Essel Infra Projects for a project cost of ₹222.00 crore. The project work could not be started due to protest by local people (May 2016). The matter was not resolved as of March 2021. The other ULBs have not taken up any step for establishing waste to energy plant as of March 2021.

The Government stated (May 2022) that waste materials of ULBs were now being processed through MCC and MRFs. Moreover, Ministry of Housing and Urban Affairs (MoHUA) has also advised not to take up waste to energy projects. However, Government did not furnish the documentary evidence for the above instruction of MoHUA.

5.1.1.2 Processing Waste to Bio mining

As per Clause (15 (zj and zk)) of SWM Rule 2016, Municipal authorities should investigate and analyse all old open dumpsites and existing operational dumpsites for their potential of bio-mining and bio-remediation and wherever feasible, take necessary action to bio-mine or bio-remediate the sites. Audit observed that tender for bio mining project for legacy waste of 15,84,400 tonnes at Bhuasuni was invited (September 2019) by BMC with an estimated project cost of ₹63 crore which was not finalised as of March 2021. The reasons for non-finalisation of tender were not on record. Other ULBs have

²⁸ CV of the waste depends on the composition of the waste. Waste with a lot of Polyvinyl Chloride (PVC) has a higher calorific value than waste with less PVC and more paper

²⁹ Useless PVC sanitary pipes and fittings, used medical instruments, etc.

not taken any steps to recycle or reuse of legacy waste dumped at site for bio-mining project as of February 2021.

The Government stated (May 2022) that steps were already taken for bio-mining of legacy waste. Technical feasibility reports of nine ULBs have been submitted to GoI (December 2020) for consideration. The fact however remained that ULBs failed to establish bio mining plant even after lapse of five years of implementation of rules.

5.1.2 Infrastructure creation

5.1.2.1 Non-setting up of sanitary landfills

Schedule-I of the MSW Rules 2000 provided the time schedule of December 2001 or earlier for improvement of existing SLFs and December 2002 or earlier for identification of landfill sites for future use and making site(s) ready for operation. Clause 11 (f) and 12 (a) of SWM Rules, 2016 also provides that the State and District authorities shall facilitate identification and allocation of suitable land for sanitary landfill for setting up solid waste processing and disposal facilities to local authorities within one year from the date of notification of the Rules.

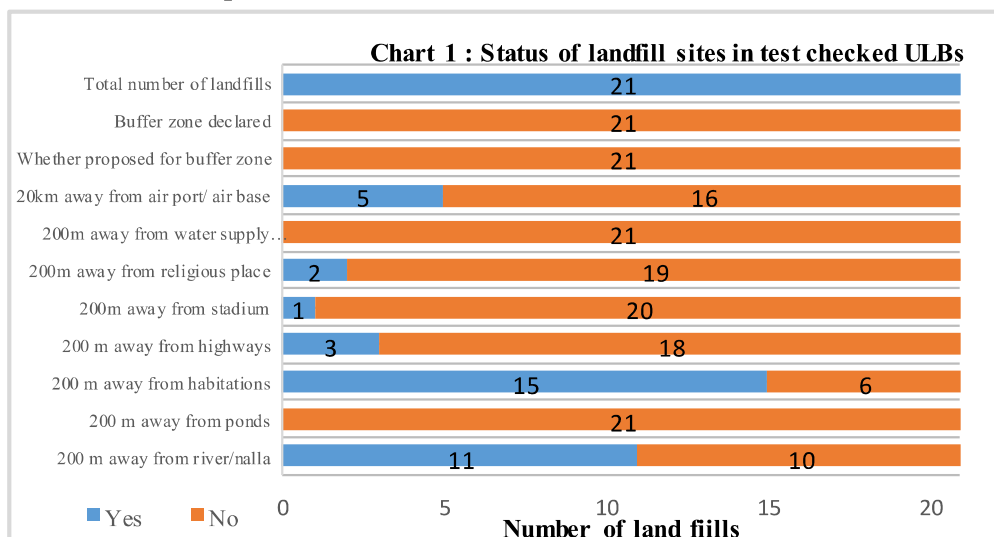
As per the Annual Report (2015-20) of SPCB, ULBs did not have sanitary landfill sites for disposal of solid waste. All ULBs used dumping yards for disposal of waste as of March 2021. ULBs were yet to identify land for setting up of sanitary landfills. Due to non-availability of sanitary landfills, ULBs disposed it on road sides of highways, river banks, and in open areas as observed during JPV causing unhygienic disposal of mixed solid waste posing health and environment hazards.

The Government stated (May 2022) that the garbage/wastes were not being disposed off on road sides of highways, river banks or open areas as all ULBs had established MCC and MRF wherein the wastes were processed/ disposed off. The reply was contrary to the findings of JPV in which it was found that waste was disposed on road sides of highways, river banks and in open areas. Moreover, MCCs/MRFs were not operational in test checked ULBs as of March 2020. ULBs failed to establish sanitary landfills even after lapse of 20 years of implementation of MSW Rules 2000.

5.1.2.2 Faulty selection and operation of landfill/ dumping yard sites

Schedule III of MSW Rules, 2000 and Schedule I (A) of SWM Rules, 2016 lay down criteria for selection of sites for landfills such as, landfill site shall be 100 meter away from river, 200 metre from a pond, highways, habitations, religious place and water supply wells and 20 km away from airports or airbase. As per Schedule I (ix) of SWM Rule 2016, a buffer zone should be maintained around solid waste processing and disposal facility, exceeding five tonnes per day of installed capacity. This will be maintained within the total area of the solid waste processing and disposal facility in consultation with SPCB. As per the SBM handbook paragraph 3.13, buffer zone should be 100 meters for sites accepting 50 tonnes waste per day, and up to 500 meters for large sites. It is necessary to prevent new residential and commercial development in a buffer zone around such locations.

As per the Clause 15(y) of SWM Rule 2016, ULBs are required to obtain authorisation from the SPCB for disposal of waste if the volume exceeds more than five tonnes per day including sanitary landfills. By using the techniques of Remote Sensing and Geographic Information System (GIS) through Google earth, audit analysed the fulfilment of compliances to above criteria in selecting landfills/dumping yards in all 21 test checked ULBs. The status of landfill sites is depicted in Chart-1.



Audit observed from the GIS data that ULBs selected landfill sites for SWM in deviation to SWM Rules which have been discussed below:

- None of the test-checked ULBs (21 landfills) declared a Buffer zone of no development around the landfills
- In 11 test checked ULBs³⁰ habitations were developed within a distance of 200 meters from landfills and in four ULBs (BMC, CMC, RMC and Puri) though the generated waste were more than 50 TPD, habitations were developed within 500 meter of buffer zone causing possible health hazards to public.
- Three ULBs had landfills located near National/State highways (Sundargarh, Chhatrapur and Bhadrak) within 200 meter.
- Eleven ULBs³¹ had landfills located within 200 meters of river/ nallah and water bodies resulting leachate flowing to water bodies during rainy seasons causing water pollution.
- Landfill of three ULBs were located within 200 meters from religious places (Chhatrapur, Ranapur and Puri) and landfill of Ranpur ULB is also located within 200 meters from a school.
- Five ULBs had landfill located within 20 kms from airport/air base (Bhubaneswar, Rourkela, Jeypore, Jharsuguda, and Sundargarh).

³⁰ Bhadrak, Baripada, Chandabali, Choudwar, Rayagada, Chhatrapur, Baragarh, Bolangir, Nuapada, Jeypore and Ranapur

³¹ Bhubaneswar, Cuttack, Sambalpur, Baripada, Chandabali, Ranapur, Hinjilicut, Baragarh, Bolangir, Puri and Sundargarh

- Landfills of the test checked ULBs were operated without authorisation from SPCB.
- Few Photographs of landfills with GIS data showing violations of SWM Rules are depicted below:

<p>Photograph-10: One Nallah passing through within 100 meters and habitations present within 200 meters</p>	<p>Photograph 11: One Nallah passing through within 100 meters and habitations present within 200 meters</p>
<p>Photograph 12: One Nallah passing through within 100 meters and habitations present within 200 meter of Baripada ULB</p>	<p>Photograph 13 : One NH 16 passing within 100 meters and habitations present within 200 meters</p>
<p>Photograph 14: One Nallah passing through within 200 meters and habitations present within 500 meters and airport within 20 kms</p>	<p>Photograph 15: One Nallah passing through within 100 meters and habitations present within 200 meters</p>

(Source: Photographs of dumping yards taken by using GIS data from Google earth)

Thus, all the landfills/dumpsites identified and operated by the test checked ULBs were susceptible to environmental hazards.

5.1.2.3 Absence of basic facilities in landfill/ dump site

Schedule III of MSW Rules, 2000 and Schedule I (B) of SWM Rules, 2016 laid down the facilities that should be available at landfill sites.

Audit checked the availability of basic facilities in landfill in 21 test checked ULBs and found the following:

- 20 landfills did not maintain any records and were not equipped with waste inspection facilities to monitor waste brought to landfill (except BMC). Hence, there was no check/preventive mechanism to reduce mixed waste brought to landfills.
- None of the landfills had leachate drains, weighbridges, approach road, fire fighting equipment, drinking water and toilet facility, and
- Only two ULBs (BMC and Chhatrapur) constructed boundary wall around the landfills in the test-checked ULBs.

The Government stated (May 2022) that action plan for bio-remediation of legacy wastes for 76 ULBs have been prepared alongwith budget plan for ₹130.15 crore and submitted to MoHUA (February 2022). However, fact remains that ULBs failed to adhere to landfill selection and operation criteria and provide the basic facilities at the landfill sites even after lapse of 20 years of implementation of the rules.

5.1.3 Non-functioning of Bio Gas cum de-composting plant

As per Clause 15(m) of SWM Rule 2016, ULB shall collect waste from vegetable, fruit, flower, meat, poultry and fish market on day to day basis and promote setting up of decentralised compost plant or bio-methanation plant at suitable location in markets or in the vicinity of market ensuring hygienic conditions.

Audit observed that MoU was signed between BeMC and Urban Development Resource Centre (UDRC) in July 2018 for operation and maintenance of Bio Gas cum de-composting plant of Mardaraj vending zone. The above MoU was valid for a period of 11 months from the date of signing of the MoU, *i.e.*, upto June 2019. Though this Bio Gas cum de-composting plant functioned from August 2018 to April 2020 (21 months) only, UDRC was paid ₹3.05 lakh for 21 months even beyond agreement period without renewal of MoU. It was noticed during JPV (August 2021) that the said plant was defunct as shown in photograph 11 since BeMC did not initiate measures for renewal of MoU with UDRC for operation and maintenance.



Photograph 16: Idle of Bio gas plant at Mardarajpur

Deputy Commissioner, BeMC stated that action would be taken for operation of the bio gas decomposing plant at Mardarajpur without explaining any reasons for non-renewal of MoU as of September 2021.

5.1.4 Issues relating to creation of infrastructure

5.1.4.1 Undue benefits extended to agency

The Berhampur Municipal Corporation (BeMC) had a Memorandum of Understanding (November 2019) with M/s AGRTA CLF (agency) for operation and maintenance of 25 composting processing units of 01 TPD capacity each for two years. An amount of ₹25 per household will be paid to SHGs as incentive per month through the agency. Accordingly, the agency collected wastes from February 2020 in three wards (Ward Nos. 01, 02 and 03) consisting 7,975 households. A survey was conducted (September 2019) by BeMC which showed that each household generates wet waste of 1.04 Kg per day. Audit observed that the said agency failed to collect and process total wet waste generated by 7,975 households of three wards. Against the target of 2,272.56 tonnes of waste to be collected, only 210.81 tonnes (being nine *per cent*) waste was collected which was three *per cent* of its processing capacity of 6,850 tonnes during February 2020 to October 2020. Despite non achievement of 100 *per cent* performance for collection and processing of waste, ULB released full amount of ₹17.94 lakh towards incentive to the agency without any deduction which led to undue benefit to agency.

The Government stated (May 2022) that the incentive was paid to CLF from February 2020 to June 2021. The reply was not acceptable since the agency had collected lesser quantity of waste than the surveyed quantity and received full amount towards incentive which led to undue benefit to the agency.

5.1.4.2 Non-recovery of liquidated damages

As per clause 15 of national competitive bidding for design-build-operate and transfer MSWM project for BeMC read with Clause 2.3.6(2) of the agreement, maximum liquidated damages for delays shall be 10 *per cent* of the design build service. It was observed that expansion of processing facility of 150 TPD capacity to 300 TPD capacity along with solid waste window compost plant including pre-sorting facility was taken up (June 2018) by BeMC for ₹42.15 crore for completion within 18 months. The agency could not complete the project within contractual period and executed work for only ₹30 crore as of January 2022. The progress of work was very slow and ULB did not recover liquidated damage amounting to ₹4.21 crore as per contract for delay in execution as of May 2021.

Deputy Commissioner, BeMC stated that SWM project would be completed by the end of August 2021 and thereafter it would be fully operational. The reply of the DC was not tenable as the agency could not complete the work as of January 2022. Further, non-recovery of liquidated damages as per the contractual clause was not explained.

5.2 Disposal of Municipal Solid Waste

5.2.1 Zero discharged of waste to landfills

As per Para 3.7 of SOP (July 2019), ULBs should make an action plan indicating street, number of households, vehicle number, time of collection of waste, delivery of waste in MCC/MRF, time and location for unloading of

saleable and non-saleable dry waste, supervision mechanism *etc.* with an ultimate objective of Zero discharging to the landfill sites.

Audit observed that none of test checked ULBs had prepared action plan for Zero discharging to landfill sites. As a result, unprocessed waste was allowed to go to landfill sites.

The Government stated (May 2022) that as per SOP 2019 for decentralised SWM, the landfill or dumping yard is no more required for waste deposition because the wet waste is being processed at MCCs and dry wastes at MRFs. The reply was not supported by any data to assure processing of all the waste generated at MCCs and MRFs.

5.2.1.1 Disposal of unprocessed waste to landfills

As per para A (iii) of Schedule I of SWM Rule 2016, waste processing facility shall be planned as an integral part of the land fill site. Audit observed that one MCC of 5 TPD constructed (March 2020) at Sarbodaya Nagar, Puri (ward 28) instead of landfill site with an expenditure of ₹53.70 lakh was closed from August 2021 due to agitation by public for odour smell and environment pollution rendering the expenditure unfruitful.



Photograph 17: Sarbodaya Nagar MCC in W. No.28 of Puri closed & locked since August 2021 for agitation by public

In other test checked ULBs, audit could not find any vermi compost or bio compost plant or bio-methanation plant in operation for processing of solid waste for vermi compost/bio- fertilizer despite availability of funds up to June 2019. As a result, solid waste was disposed off to landfills without processing in an unscientific manner affecting the environment. However, after introduction of two SOPs (July 2019/December 2020) for decentralisation of SWM, ULBs were initiating action for creation of infrastructure of MCC and MRF. As of September 2021 the above test checked ULBs had generated 913.70 quintal of bio-fertilizers (*Mo Khata*³²) and ₹18.27 lakh revenue was generated through waste processing.

The Government stated (May 2022) that the MCC of five TPD at Sarbodayanagar, Puri has been closed since August 2021 due to public agitation and now it has been transformed to MRF of 10 TPD capacity. The reply was not acceptable since MCC and MRFs were to function at the same place as per SOP.

5.2.1.2 Mixed waste received at landfills

Schedule II (6) of the MSW Rules 2000 provide that land filling shall be restricted to non-biodegradable, inert and other wastes that are not suitable either for recycling or for biological processing. It also provides that land filling of mixed waste shall be avoided unless the same is found unsuitable for waste processing and the landfill sites shall meet the specifications as given in Schedule-III of MSW Rules.

³² *Mo khata* is the name given for the bio-fertilizer converted out of decomposed wet waste of ULBs

Audit observed in test checked ULBs that landfill sites received mixed waste in violation of the above rules. The deficiencies in planning for establishment of Sanitary Landfill Sites³³ (SLFs) and their functioning are discussed below:

5.2.2 Incineration of Municipal solid waste at landfills

As per Section 17.8.4.7 of MSW Manual 2000, it is important for site operators to be aware of the dangers how to treat fires at a landfill site. All fires on-site should be treated as a potential emergency and dealt with accordingly. Further, Schedule II (I) (vii) of Rule 2000 envisages that waste garbage, dry leaves shall not be burnt. Necessary precautions shall be taken to reduce nuisance of odour, flies, rodents, birds menace and fire hazard. As per SDG-11-Sustainable Cities and Communities³⁴, open burning of uncollected waste produces pollutants that are highly damaging locally and globally.



Photograph 18: Fire at dumping yard Baliapanda on 10.12.2020 of Puri ULB



Photograph 19: Fire at dumping yard Daruthenga on 05.01.2021 of BMC

Audit noticed that ULBs had not made any provisions for treatment of fire management at landfill sites. However, Audit observed during joint field visit that solid waste were burning at landfills in all test checked ULBs. This reflected indifferent attitude of the concerned authorities in managing waste. Burning of solid waste was not only a violation of MSW Rules but was also fraught with severe environmental and health hazards like asthma, cough, malaria fever and allergic diseases as reported by public living adjoining to landfills.

The Government stated (May 2022) that actions were already taken for bio-remediation of legacy wastes. However, the reply was silent on fire management at landfill sites, posing a serious risk for environment and public health.

5.2.3 Capping layer of earth covering waste and leachate treatment

As per Schedule 1 (Clauses ii and iii of C) of SWM Rule 2016, wastes shall be covered immediately or at the end of each working day with minimum 10 cm of soil, inert debris or construction material. Prior to monsoon season, an intermediate cover of 40- 65 cm thickness of soil should be placed on landfill

³³ Disposal of non-biodegradable, inert and other waste that are not suitable either for recycling or for biological processing

³⁴ Indicator 11.6.1 measuring the progress of the performance of city's MSWM under SDG 11 – Sustainable cities and communities

with proper compaction and grading to prevent infiltration during monsoon. Proper drainage berms should be constructed to divert run-off away from the active cell of the landfill to prevent further damage to the environment.



Photograph 20 : Dumping yard at Bhuasuni , BMC



Photograph 21 : Dumping yard at Baliapanda , Puri Municipality

Audit observed (December 2020 to March 2021 and from July 2021 to September 2021) in test checked ULBs that no such capping layer of earth covering was made over waste neither daily nor prior to monsoon season to avoid erosion and collection of leachate at landfills sites.

The Government stated (May 2022) that bio mining is advantageous than bio-capping, therefore, bio mining has been preferred. The fact however remained that the government has not taken up any bio-mining projects in any of the ULBs as of March 2021.

5.2.4 Reclamation of old dumps/ closure of old landfill sites

Schedule-I (j) of SWM Rule 2016 stipulates that solid waste dumps which have reached their full capacity or those which will not receive additional waste after setting up of a new and proper landfill, should be closed and rehabilitated with any other method suitable for reducing environmental impact to acceptable level.

The H&UD department had submitted action plan for NGT compliance (2015) stipulating that ULBs shall reclaim the dump yard in a time bound manner. The SWM project also included reclamation of dump yard as a key component stipulating the following:

- The compacted old waste is loosened and scraped off in layers by a tractor-harrow.
- Composting bio-culture is sprayed from a tanker-truck with high pressure pump.
- The waste is turned weekly by JCB. At each turning, hired rag pickers retrieve buried recyclables which partly cover their labour cost.
- After three to four weeks' turnings, the waste is dry, volume reduced and ready to sieve by either manual or motorized simple portable sieves.
- The reclamation process shall be completed within one year from setting up of processing plant and scientific land fill facility.

Audit observed that no such activity was carried out by any of the test checked ULB authorities at dumping sites in response to compliance submitted to NGT as of March 2021. No periodic review was made nor was any proposal submitted to SPCB for closure of the old landfills sites resulting accumulation of huge quantity of waste at landfill sites creating environment pollution.

The Government stated (May 2022) that steps were already taken for bio-mining of legacy waste. The feasibility report for bio-mining has already been submitted (December 2020) to GoI. The fact, however, remained that GoO had not taken up any bio-mining projects in any of the ULBs as of March 2021.