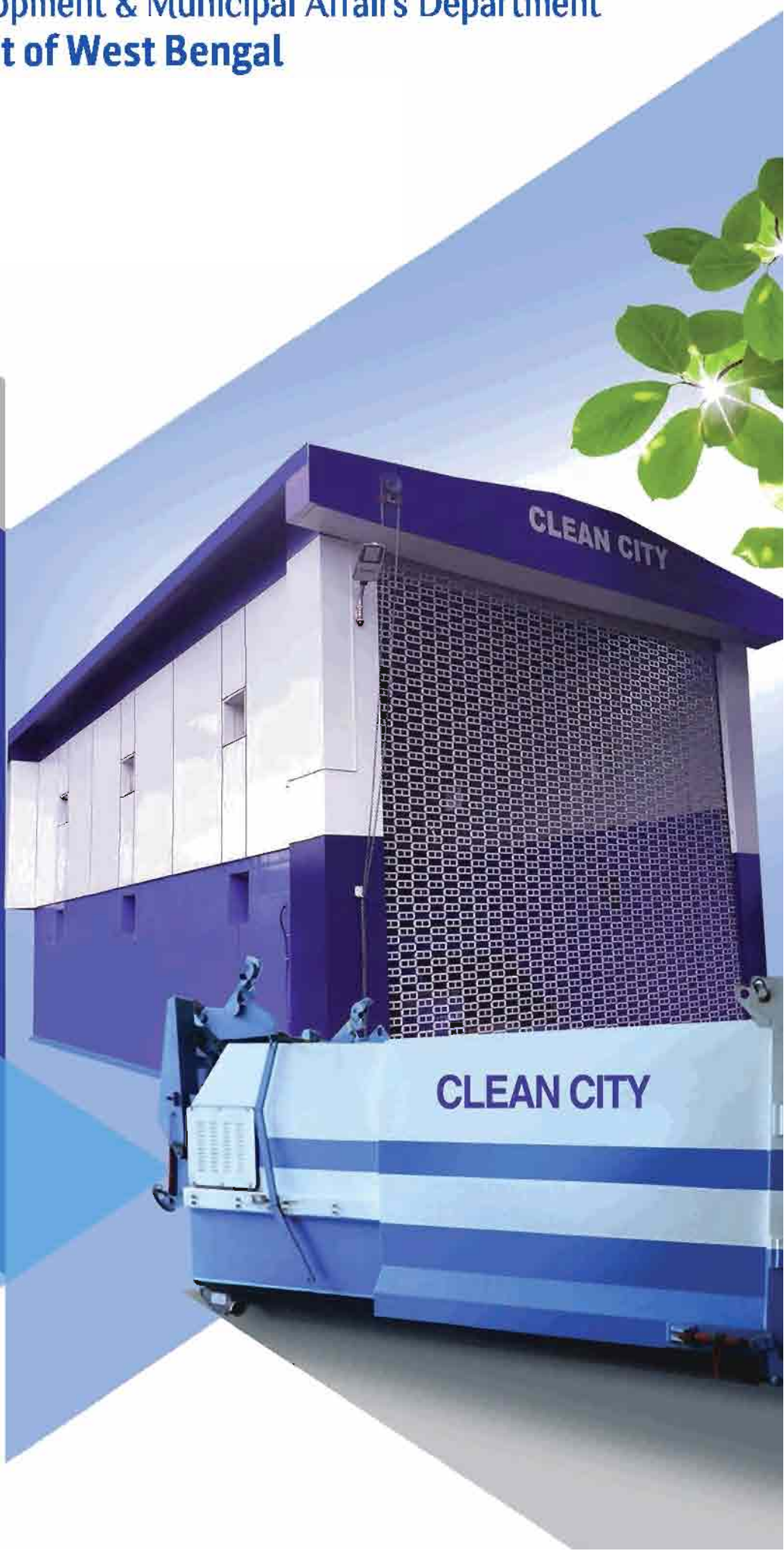
Urban Development & Municipal Affairs Department
Government of West Bengal

State Policy and Strategy on Solid Waste Management



State Policy and Strategy on Solid Waste Management for Urban Areas of West Bengal

Prepared by
Urban Development &
Municipal Affairs Department
Government of West Bengal

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DEVELOPMENT & MUNICIPAL AFFAIRS
GOVERNMENT OF WEST BENGAL

Foreword

Solid waste management is the burning challenge to the cities across the world. By and large, in cities and towns, mostly half of the solid wastes generated are collected, transported and disposed of, giving rise to insanitary conditions and diseases, especially among the urban poor who constitute about 35% of the urban population. The average annual increase in waste generation is around 5% each year.

Waste management is a mammoth task, which stands complicated with the increase in urbanization, changing lifestyles, and increase in consumer behaviour. The practice of uncontrolled dumping of waste in open areas in towns/cities creates serious environmental and public health problems. Financial constraints, institutional weaknesses, insufficient manpower and collection systems, lack of technology, and lack of awareness of common mass towards municipal solid waste have contributed to make the situation worse.

Solid waste management is one of the obligatory functions of the Urban Local Bodies. Efficient garbage collection, transportation and disposal are one of the most important functions of Urban Local Bodies. ULBs generally engage a large number of staff to discharge this function and a substantial portion of their annual budget is spent only on garbage collection, transportation and disposal. Though the issue of recycling of solid wastes has received attention to the authorities of ULBs yet it is not being implemented upto the mark due to lack of proper guidance and technology. With the solid waste generation increasing with time, the importance of recycling needs to be recognized and given due importance. On the one hand municipal waste management is capital intensive, on the other hand there are numerous alternative options that can be applied to address waste management problems.

State Government in its endeavour has taken several steps/initiatives for making all the cities Clean, Green and Beautiful with special emphasis on management of Solid Wastes in Municipal Towns of the State. All the Municipal Towns have been provided Movable/ Stationary Compactors for proper transportation and subsequent primary management of Solid Wastes to the Dumping Ground. In some ULBs, battery operated hydraulic tipper has been provided for easy collection of waste from areas having narrow roads. Simultaneously, the State Government has started preparation of DPR for Integrated Solid Waste Management of the Municipal Towns either in Standalone Mode or in Cluster Mode, considering the Components - i) Waste segregation at source in two separate litter bins for bio degradable & non bio degradable waste, ii) Door to door collection of segregated waste, iii) Transportation

of Waste to Dumping Ground through Compactor or other means, and iv) Segregation of Waste at Dumping Ground (if required) and Processing of Bio degradable Waste either to compost or energy. Special emphasis are being given on the sustainability of the projects by way of generating revenue through composting and energy (Bio Gas or other form of Fuel) generation from the Bio degradable Waste. Maintaining hygienic operational procedure in solid waste management and beautification of the dumping sites are also being taken care of. Over and above, Massive Awareness Campaign alongwith ICT Based Tools have been designed to aware and integrate the Citizen with these initiatives.

Hence to provide proper guidance to the Urban Local Bodies of West Bengal on Technical Viability, and improving Managerial, Administrative and adequate Institutional Arrangement, this State Policy & Strategy on Solid Waste Management for the Urban Areas of West Bengal is being published.

I am confident that the Urban Local Bodies and other service providers will find this policy and strategy paper very useful for discharging their functions in a more effective, efficient and sustainable manner with respect to Municipal Solid Waste Management and will be successful on the effort of creating the cities Zero Waste discharging and Vat Free through recycling of waste and deriving Energy/Compost from the waste.

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Background

1. In line with the provisions of the Environmental Protection Act, 1986 and the obligatory functions of the twelfth schedule of the Constitution of India (Article 243), the management of waste generated from households and commercial establishments remains the responsibility of the elected local self-Government. In urban areas, in line with the Municipal Solid Waste (Handling and Management) Rules of 2000 and the Solid Waste Management Rules, 2016, this responsibility lies with the concerned municipal body i.e. Corporation, Municipality or Notified Area Authority.

2. With increase in urbanisation, both in terms of newly urbanising areas as well as increase in population of existing urban areas, the volume of waste matter (excluding excreta, fecal matter or wastewater) from households and commercial establishments has increased considerably in recent times. Municipal bodies are at this time constrained as regards finding suitable options of disposing of such waste. Traditionally, waste 'management' has comprised of collecting such waste generated from households and commercial establishments, clubbed with waste material picked from streets, and disposed of (dumped) in a designated area, usually a low lying ground.

3. In 1999, anticipating the environmental impact of such practices, following a hearing of a public interest litigation bearing no. CWP 888/1996 filed by one Almitra J Patel, the Hon'ble Supreme Court of India on directed that the practice of solid waste management be regulated, leading to (i) notification of Municipal Solid Waste (Handling and Management) Rules of 2000, and (ii) the appointment of a monitoring Committee to ensure that these rules are adhered to by all municipal bodies.

4. However, even today, fifteen years later, most States and municipal bodies find themselves constrained in terms of resources - physical as well as fiscal to ensure complete compliance with the rules. This is largely on account of poor revenue bases for smaller municipalities, and a general lack of awareness and interest of municipal functionaries to deal with this issue in a scientific and organised manner. Emerging research also indicates that citizen behaviour also greatly influences the adoption of appropriate solid waste management techniques, and most local Governments find little or no incentive or resources to engage proactively with the citizenry.

5. In the case of States showing rapid urbanisation, it is increasingly being perceived that newly (and organically) urbanising areas may not be able to generate the wherewithal to manage solid waste in a scientific manner at a local level. Recognising this, the Government of India has, during the current five-year plan (2012 - 17) been promoting the 'clustering' or grouping of a number of existing and/or newly urbanising areas into a unified system for management of solid waste so that the cost incurred by these areas on certain functions within the solid waste management process, particularly treatment and disposal, can be reduced on account of sharing of such facilities between multiple municipal entities.

6. In light of this, several States have proceeded with creating 'clusters' of municipalities that can be addressed as a single serviceable 'unit' for collection, segregation, transport, treatment and disposal of municipal solid waste. These clusters are generally formed on the basis of geographical proximity, although evidence also indicates that other variables, such as amount of waste generated and type of waste generated also play an important role in determining whether it is economically viable to have 'clusters'. The Hon'ble National Green Tribunal, taking cognisance of the Almitra Patel case in a subsequent case of one Mall Singh vs the Punjab State Pollution Control Board,

has suggested to State Governments to study this model and adopt the same, and submit action plans to the Union of India in order to report compliance. Further, the Ministry of Environment, Forests & Climate Change has published the Solid Waste Management Rules 2016 and directed in Section 23 (1) that every Department in-charge of local bodies of the concerned State Government shall constitute a State Level Advisory Body and prepare a State Policy and Strategy on Solid Waste Management [Section 23 (2)] and give advice to the State Government for taking measures that are necessary for expeditious and appropriate implementation of these rules. Subsequently, the Urban Local Bodies shall prepare a Solid Waste Management Plan as per State Policy and Strategy.

Need for the Strategy

7. As with many other States, the State of West Bengal also faces similar challenges in terms of constraints of revenue adequacy, resources of land, technology, manpower and other wherewithal. There are a total of 125 Urban Local Bodies within the State, of which seven are Municipal Corporations, while the remaining are large to small categories of municipalities. Some of the areas (particularly Corporations) are also part of larger developmental areas, governed by Development Authorities, constituted under the West Bengal Town and Country (Planning & Development) Act, 1979. Four municipalities - Darjeeling, Kurseong, Mirik and Kalimpong, lie in the autonomous hill districts of Darjeeling and Kalimpong, while remaining municipal entities lie in the plains. The municipalities in the hilly areas are also tourist destinations and accordingly have a significant amount of floating population. Some of the municipalities situated in plains, such as Bolpur, Tarakeswar, Nabadwip, Krishnanagar etc. also experience seasonal increases in floating population on account of being places of religious significance, or being near to places of religious significance.

8. A rapid assessment of Urban Local Bodies has been conducted at the time of preparing this State Policy and Strategy on Solid Waste Management.

9. Following five broad categories of Municipal Solid Wastes have been observed:

   - Biodegradable waste: food and kitchen waste, green waste (vegetables, flowers, leaves, fruits), paper (can also be recycled).
   - Recyclable material: paper, glass, bottles, cans, metals, certain plastics, etc.
   - Inert waste: construction and demolition waste /debris, dirt, rocks.
   - Composite wastes: waste clothing, Tetra Packs, waste plastics such as toys.
   - Domestic hazardous waste (also called "household hazardous waste") & toxic waste: medication, e waste, paints, chemicals, light bulbs, fluorescent tubes, spray cans, fertilizer and pesticide containers, batteries, shoe polish.

10. Most municipal bodies regularly engage in collection of waste from households, markets and sweep streets on a regular basis, most of the processes are not compliant to the Rules. In addition, supplemental processes such as transport, treatment and disposal are taken up on a very ad-hoc basis, and in most instances, waste is simply 'dumped' in an uninhabited or low lying area.

11. Such unorganised disposal of solid waste in the cities and towns of West Bengal poses considerable risk to natural resources, particularly ground water. West Bengal is also largely affected with

arsenic contamination in ground water reserves, and leachate contamination from unscientific dumping poses risk to the reserves that are so far unaffected. Dumping of waste on riversides and other surface water streams also poses risk of leachate apart from chemical contamination of the water stream. Likewise, certain forms of inorganic waste that degrade over time, particularly plastics, electronic waste, ceramics, metal scrap etc. where unclaimed or not removed from land, leaves residual chemical impacts on land, often changing soil pH irreversibly, leaving the area barren and unable to support vegetation. The primary purpose of this strategy is to identify sources (in the form of practices) where such contamination occurs, and recommend measures that would lead to reduction of such instances.

12. At the same time, a rapid analysis of the waste stream indicates that there is significant diversity within the waste constituents - with large amount of inert waste that does not react with any known biological or naturally occurring agent, as well as large amount of compostable matter. Both streams offer considerable opportunities for economic activities such as filler material for construction, compost for soil remediation, wood substitutes (paddy husk) and in certain cases, feed stock for co-generation of electricity (e.g. sugarcane remnants and paddy husk). The second purpose of this strategy is to identify such opportunities and to suggest ways and means to capitalise upon them.

13. The overall management of solid waste generated from urban areas rests with municipal bodies, but with a poor revenue base and managerial capabilities, most municipal bodies treat this responsibility as an overhead and cost centre as opposed to a business opportunity. The third purpose of this strategy is to showcase the process of waste management in West Bengal as a progressive and active business opportunity, one that can be invested into not only by the municipality, but jointly and severally by private sector and community based groups alike. At this time, it can be estimated that at least 50 to 60 per cent of the cost of solid waste management can be paid for by the products that emerge out of the waste collected and appropriately treated.

14. In order to rise up to the challenges and to capitalise upon the opportunities, this strategy is hereby proposed. It enshrines four fundamental ideas:

- Reinforcement of the three 'R's - Reduce, Reuse and Recycle
- Clubbing or grouping of certain functions within the solid waste management value chain so that municipalities can share resources, leading to lower costs and an increased scale of economy
- Waste management is a service, and therefore needs being professionally managed; such expertise can come from private sector as well as civil society or community based organisations, and there is no one model that fits all such situations.
- The generation of waste has negative externalities, and therefore the 'polluter pays' principle must apply.

Current Situation

A. The existing solid waste management process

15. The processes will be taken up in the following order: (i) generation, (ii) collection, (iii) segregation at source, (iv) sorting, division and transportation, (v) treatment & recycling, and (vi) disposal.

A1. Generation of solid waste

A1.1 Existing situation

16. The 125 cities of the State are unevenly distributed in terms of population, population density, topography and location. As a result, volume and nature of generation of solid wastes varies among the ULBs. Among the Municipal Corporations, Kolkata MC, Asansol MC and Howrah MC having more than 10 lakh population generates average 3000-4000 MT wastes per day and ULBs in Kolkata Metropolitan Area generates average 150-200 MT wastes per day, whereas the small Municipalities having rural nature generates 30-50 MT wastes per day. The average estimation of waste generated between KMA and non-KMA seemed to vary between 0.35 kg/ capita/ day and 0.98 kg/ capita/ day. In the cases of category A to E, the variance is between 0.21 to 0.58 kg/ capita/ day. The upper values of figures correspond well with cities with a reasonable tourist flow.

17. The composition of municipal waste appears to be largely constant in terms of constituents, with percentages varying between smaller and larger towns. A broad understanding of the blended mix observed within the towns of KMA would be as follows:

TABLE : Physical composition and chemical parameters of waste sampled in KMA

Physical Parameters (all values in % by weight)		Chemical Parameters	
Biodegradable	41.0	pH	7.31
Green Coconut Shells	4.95	Organic Carbon (OC)%	19.58
Paper	3.18	Moisture%	42.84
Plastic	0.65	K_2O%	0.40
Metals	0.66	P_2O_2%	0.57
Glass & Crockery	0.58	N%	0.55
Spent coal/wood embers	8.08	C/N Ratio	35.6
Inert*	37.9	Calorific Value K Cal/Kg	549.32
Others**	3.00	Loss on Ignition (LOI)%	35.24

* Inert includes mud/ earth, street sweeping and waste from construction and demolition excluding steel, ceramics and polymers (plastic).

** Others include synthetic material or material resistant to biodegradation

Source: NEERI, 2009 for Kolkata and Howrah, interpolated and compiled by authors for remainder of KMA territory

18. For the rest of the State of West Bengal, the prevailing composition of waste in the State of West Bengal is similar to the trend exhibited at an all India level. It may be noted that the composition of waste in such towns are classified in a slightly different manner as compared to Kolkata Metropolitan Area. Bio-degradable matter, for instance, has been referred to a 'compostable matter', while plastics are collectively referred to under rubber, leather and synthetics.

TABLE: Waste composition from municipal bodies outside KMA

Constituent	XYV Range (no. of samples)	XYV Range (no. of samples)	XYV Range (no. of samples)	XYV Range (no. of samples)
Paper	0.04036	0.4045	0.0742	2 - 6
Rubber, Leather & Synthetics	0.00596	0.1545	0.0298	13 - 35
Glass	0.00558	0.1495	0.0285	9 - 10
Metals	0.00506	0.1424	0.0277	13 - 20
Total Compostable Matter	0.4221	1.4144	0.1766	1 - 36
Inert	0.4793	1.4979	0.0731	2 - 3

Where X ➡ mean of n observations expressed as decimals
Y ➡ transformed value of X, and
V ➡ standard deviation

Source: CPHEEO manual on solid waste management, 2006

19. At this time, construction and demolition waste in most towns also appears being mixed up with inert material, resulting in the same being deposited to the landfill site. With proper extraction of such material, the waste inventory targeted for landfill should reduce considerably.

20. In certain instances, waste from marginal and casual medical establishments such as Doctors' clinics, nursing homes, dispensaries (particularly those located in towns with a population of less than 50,000 population) also seems to get mixed into the waste stream, since there do not appear to be specialised facilities for collection or disposal of this nature of waste.

21. The concept of managing 'electronic waste' (discarded electronic items or components) separately from general municipal solid waste is well recognised at the level of the State Government, and while most municipalities appear to recognise that the nature of such waste poses separate hazards as opposed to municipal waste, no facilities exist or are proposed for collection, treatment or disposal of such waste.

22. None of the municipalities surveyed indicated instances of lead acid batteries being disposed along with waste.

23. None of the municipal bodies maintain a register or record of the source of emanation of waste on a formal basis. However, since most of the land use in municipal areas is residential, for the purpose of strategy, the all India average can be taken, since by default this does not influence the nature of waste. As a substitute or proxy, for the purpose of this strategy, the National averages as laid down in the CPHEEO manuals have been used.

TABLE: Waste disaggregated from sources

Waste from	Percentage of total waste generated (accounted for)
Households (including street sweeping)	76.13%
Markets (including street sweeping)	11.27%
Commercial activity (other than markets)	8.46%
Agricultural waste	2.63%
Others	4.97%

Source: CPHEEO guidelines, 1996

24. The distribution (in percentage of total) of various constituents of waste may be classified in terms of size class population as follows:

TABLE: Waste composition from municipal bodies, distributed across size-class

Population Range (in millions)	Paper	Rubber, Leather And Synthetics	Glass	Metals	Total compostable matter	Inert
0.1 to 0.5	2.91	0.78	0.56	0.33	44.57	43.59
0.5 to 1.0	2.95	0.73	0.35	0.32	40.04	48.38
1.0 to 2.0	4.71	0.71	0.46	0.49	38.95	44.73
2.0 to 5.0	3.18	0.48	0.48	0.59	56.67	49.07
> 5	6.43	0.28	0.94	0.80	30.84	53.90

A1.2 Forecasted situation

25. West Bengal is one of the more rapidly urbanising states of India, though the population in larger (statutory) cities has actually stabilised. Kolkata, as a matter of fact, registered a negative growth between 2001 and 2011. However, some of the smaller towns showed a rate of over 3 per cent. Given the fact that the boundaries of municipal bodies have largely remained unchanged except in the case of recent mergers, the all India average of 2.9% CAGR (which was observed between 2001 and 2011) has been adapted for the Strategy.

26. Assuming the present CAGR of 2.9% per cent in urban areas across India, by 2019, the population in the towns covered by this strategy will have increased. Accordingly, if the average waste generation per capita were to be kept constant, the waste generation would increase to due to increaser of population. However, since there seems to be a correlation between the size-class of town and the per capita waste generated, it is possible that at least half the towns that generated less than 0.3 kg/ capita/ day in 2011 would now generate close to 0.4 kg/ capita/ day, resulting in the average shifting to close to 0.42 kg/ capita/ day. Assuming this, the total waste generated would be close to 14000 MT/ day.

A2. Collection of solid waste

A2.1 Existing situation

27. The amount of waste collected was reported by all municipalities based on the capacity of their collection vehicles - specifically the ones that go to the disposal site. Assuming that there is 25% loss between first collecting the waste and the amount that is loaded on to the trucks that reach the disposal site, most cities reported this figure within the range of 50% to 85%. Bhatpara, Barasat and Titagarh municipalities reported efficiencies greater than 75%, while Chandrakona, Ramjibanpur and Uluberia reported efficiencies of less than 60%, with two not even exceeding 20%.

28. Door to door collection was found to be practiced, either partially or fully, practiced across 60% municipalities. 30% of these reported carrying out complete door to door collection. Most of the waste collection happens within the period of 0700 HRS through 1000 HRS, and the preferred modes of collection include wheelbarrows (for narrow streets), and tricycles and push-carts (for streets capable of supporting such widths). Most of these collection vessels are not compartmentalised, i.e. waste cannot be segregated and stored in a segregated manner. Each worker engaged in collection of waste from households is assigned a 'beat', or a sequence of streets which are to be covered until the vessel (tricycle, pushcart or wheelbarrow) is fully filled. The number of households covered by such a collector in one beat varies from as low as 10 households to 60 households, depending on the size of the beat. Usually, for beats as large as 60 households, the preferred vehicle is a cycle rickshaw or even a motorised cycle rickshaw, with a carriage space of about 25 cubic feet. The number of staff engaged in door to door collection varied from as low as 13% of required numbers to 90% of required capacity. The use of protective gear is also restricted largely to Municipal Corporations and municipalities of category A or B.

29. Street sweeping is carried out in most municipalities; all Corporations, and most category A through C municipalities organise street sweeping at least once a day; the others organise it about once in two days.

Street sweeping at Darjeeling Municipality

30. The waste collected from households and shops/commercial establishments is

Formal door to door collection in New Barrackpore Municipality

Informal waste collector at New Barrackpore Municipality

agglomerated at designated common points within the collection area comprising of several beats, either into a larger vehicle such as a dump truck or a tipper anchored to a tractor. At none of the points is the waste segregated.

31. In cities where municipal bodies do not have custody of roads, door to door collections is erratic and is carried out only in certain parts of the city. In the other areas, residents have engaged private individuals to collect and dispose of household waste to 'commonly accepted' (though not officially designated) places from where municipal staff picks up such waste.

32. Community bins, although provided are largely absent (stolen) and most of the informal 'agglomeration' of waste is done by citizens or private persons engaged by citizens to dump waste collected from households in open plots, which are socially and commonly acknowledged as places to dump waste. Many of these are cleaned up the subsequent morning by the municipal staff, but in many places - especially, large vacant tracts of land with shrubbery, the waste simply accumulates. The reasons for absence of community bins, as explained by municipal resources ranges from theft to vandalism and physical damage.

A2.2 Forecasted situation

33. Due to administrative and financial constraints, municipalities may be increasingly asked to resist hiring new on-rolls staff for door to door collection; and prior experience suggests that individual contractual labour often press litigations against the concerned municipal body demanding regularisation of employment. The bulk of the staff engaged in door to door collection are young staff (within the age of 30). With increase in number of households and waste generated, door to door collection efficiency will have to be increased. However, with insistence upon administrative and fiscal reforms that would essentially require municipalities to provide higher quality and more efficient services with increasingly lesser 'on-rolls' manpower, the present system of engaging a combination of contracted labour and municipal staff will eventually have to be replaced with a more robust combination of human and mechanical means of collection.

34. Within the municipal human resource framework, a person engaged in collection of waste from door to door is unlikely to have a sustainable career path, and with time, this position may eventually end up as a 'dying cadre', i.e. positions that will no longer be filled up upon superannuation of a serving incumbent. There is a need to explore the possibility of engaging community based organisations into this task, in addition to several other value added services. Community groups/Self Help Groups can provide manpower to deal with the issue of door to door collections and a number of miscellaneous other public facing services. Instead of depending on municipalities for a 'salary', an arrangement such as this presents the opportunity of having multiple channels of revenue, both from the municipality as well as citizens.

35. As municipal staff engaged in door to door collection reduce/ recede on account of retirements/ superannuation from the dying cadres, this space will be increasingly occupied by informal sector private parties which will neither be accountable to the

municipality, nor work in any structured or regulated manner unless a formal institutional mechanism is introduced.

A3. Sorting, storage and transportation of solid waste

A3.1 Existing situation

36. Informal sector rag-pickers tend to separate, at the first point of agglomeration, certain salvageable items such as plastics, metal scraps etc. However, since this is not an 'accounted for' or expected phenomena, the waste collection process does not account for the time taken to sort and sift through waste at the first point of agglomeration. The sorting and sifting usually takes place in extremely limited and sub-optimal space, leading to only a portion of recyclables being actually claimed. Lack of formal linkages between the recycling industry and the waste management process also implies that a very limited portion of recyclable matter (viz. plastic containers that are intact, metal scraps above a certain size or weight) actually ends up at recycling.

Segregated recyclable materials claimed at first point of transfer at Darjeeling Municipality

37. The system of providing two-bin systems (which are increasingly being adopted in other countries) has largely not been taken up in the State of West Bengal. Some of the municipalities, such as Budge Budge, utilise pick-up bins (designed for pick up and dumping into tipper or compactors), while some other use masonry enclosures for intermediate storage of waste, essentially with the idea that waste collected from households by local labour will be dumped in such places, and will be cleared from the same.

Compactor/tipper enabled bin at Budge Budge Municipality

Masonry enclosure for dumping waste at local level at Tamralipta (Tamluk) Municipality

38. Soil and dust are never sifted, and are invariably transported within the unsorted waste to the disposal site, as is a large portion of construction debri (construction and demolition waste). The waste is generally scooped up using shovels and dumped onto a larger vehicle such as a truck. Only in the area of Kolkata Corporation do certain trucks exist with the capability to scoop up complete containers and dump them into the hold, where there is some degree of compaction of the collected waste.

39. Transfer stations have been largely used in piecemeal manner, with municipalities within KMA showing more of them than non-KMA.

In certain cases, transfer stations have been combined with a waste processing facility. Waste compactors are present in all the municipalities mostly mobile compactors. Static compactors are installed mainly at transfer stations.

Primary collection through auto tipper at Rishra Municipality

Secondary collection through pick-up trucks, Rishra Municipality

40. ULBs indicated that the average number of trucks used for carrying collected waste to disposal sites per unit of population ranged from 1 truck per 15,000 population to 1 truck per 65,000 population (rounded off). These trucks have axle loads usually in excess of 5T, and with a capacity of about 200 cubic feet in the tipping section. However, since the waste is not compacted and open, most trucks expend the 200 cubic feet limit without actually reaching the optimal axle load of 5T. The trucks are also usually not covered, and loose earth/ materials usually slips from unsecured corners. It may be estimated that up to two per cent material loss occurs in the course of transportation.

41. On an average, where trucks are owned by municipalities, the average age of trucks is over 10 years, while contractual trucks (though while not ascertained), stood at 8 years. Under the West Bengal adaptation of the Central Motor Vehicle Rules, 1989, trucks with age of 15 years or above are liable to be phased out. Tractors, on the other hand are fairly newer.

42. Since trucks are largely confined to making one trip from any designated area, a small amount of agglomerated waste usually gets left behind. Whilst some of the municipalities set out specific routes for collection trucks, these are not designated in a scientific manner, and trucks are known to 'skip' collection points to save on time as well as fuel. There is also a problem of 'bunching', or gathering of trucks at the disposal site, leading to unstructured and haphazard unloading/ dumping of waste.

A3.2 Forecasted situation

43. A large number of municipalities surveyed desired to see a VAT-free situation, since all of them were convinced that the clearance of garbage could not be done in one day, all of them agreed that at present, a system of secondary points of collection would be required. While a two-bin system was welcomed by the respondents, a common concern raised was that of preventing the waste from being strewn by animals. Another concern was the issue of finding space at regular intervals for placement of waste bins, since most of the internal streets appeared to have widths less than 6 meters. Under these circumstances, a possibility emerges to deploy larger bins (for larger catchments), which may be kept covered, but accessible for clearance at least once a day, or once in two days.

44. If waste is segregated at source and separate waste streams such as construction and demolition waste are collected separate from the main municipal waste, transfer stations would ordinarily be required for collection catchments above 50 sq. kilometres. At present, only Kolkata, Howrah and Kharagpur have spatial extents above these; but if clustering were to be done, transfer stations would be required in nearly all municipalities within the KMA, and in all the municipalities where clustering is proposed.

45. If the waste volume were to increase, and be taken up in the same un-segregated and un-compacted manner as now, the number of trucks would have to be tripled between now and 2019, as an increasing number of existing trucks would also have to be phased out in line with motor vehicle rules and admissible emission standards. Municipalities rely on both owned as well as leased trucks, and while owned trucks may see certain relaxed applicability of MV Rules, 1989, leased trucks will not.

46. Collection to transportation efficiency (percentage of collected waste that is transported) would also drop as existing or augmented manpower would not be able to manually scoop larger volumes of collected waste into the tipper truck.

47. The lack of a monitoring mechanism for trucks and the absence of a logistics plan in most cases will cause trucks to either not efficiently collect waste from all points of primary agglomeration, or in a bid to empty their payload faster, haphazard dumping will lessen lives of dumping sites.

A4. Treatment and recycling

A4.1 Technologies for processing & treatment of municipal solid waste

The main technological options available for processing and treatment of Municipal Solid Waste for Resource/Energy Recovery/Disposal, are: 1. Composting 2. Vermi-composting 3. Anaerobic Digestion/Biomethanation 4. Incineration 5. Gasification/pyrolysis 6. Plasma Pyrolysis 7. Production of Refuse Derived Fuel (RDF)/ Palletisation 8. Sanitary Landfilling/Landfill Gas Recovery .

The first three technologies (S. No. 1-3) depend upon biological decomposition of the biodegradable organic fraction of MSW to produce compost/biogas/landfill gas. The technologies listed at S. No. 4-6 depend upon thermal decomposition of the entire organic fraction of MSW (Biodegradable as well as nonbiodegradable fraction) to produce heat energy/fuel gas/fuel oil. The technology at S. No. 7 is only a waste processing method for producing RDF Fluff/Pellets, for subsequent energy recovery through the technologies listed at S. No. 4-6. The last technology at S. No. 8 is the ultimate means of disposal of residual wastes from all sources, including those from other waste processing/ treatment plants.

Composting (wealth from waste):

The Organic fraction of municipal solid waste contains bio-degradable matter ranging from 30% to 55%, which can be profitably converted into useful products like compost (organic manure), methane gas (used for cooking, heating, lighting, production of energy) etc. through processes, such as

- Waste to Compost
  - Aerobic/Anaerobic Composting
  - Vermi-Composting

Decomposition and stabilization of solid organic waste material has been taking place in nature ever since life appeared on this planet. Composting is the process of decomposition and stabilization of organic matter under controlled condition. Waste materials that are organic in nature, such as plant material, food scraps, and paper products, can be recycled using biological composting and digestion processes to decompose the organic matter. It is a biological process in which micro-organisms, mainly fungi and bacteria, convert degradable organic waste into humus like substance. The resulting organic material is then recycled as mulch or compost for agricultural or landscaping purposes. In addition, waste gas from the process (such as methane) can be captured and used for generating electricity. The intention of biological processing in waste management is to control and accelerate the natural process of decomposition of organic matter. There is a large variety of composting and digestion methods and technologies varying in complexity from simple home compost heaps, to industrial-scale enclosed-vessel digestion of mixed domestic waste. Methods of biological decomposition are differentiated as being aerobic or anaerobic methods, though hybrids of the two methods also exist.

Organic matter constitutes 35%-40% of the municipal solid waste generated in India. This waste can be recycled by the method of composting, one of the oldest forms of disposal. Apart from being clean, cheap, and safe, composting can significantly reduce the amount of disposable garbage. Each one MT of wet garbage can yield 200 to 300 kg of organic fertilizer.

Vermi composting is very successful at community level but it is yet to develop at commercial scale. Manual composting is carried out in smaller urban centres. Although mechanical composting plants were set up in some cities but presently, only few plants out of them continues to be in operation. The high cost of mechanical composting plants and the non -utilization of by-products are among the factors which make the process an uneconomic proposition. The most critical link in the process of composting is the segregation operation. Hand sorting of garbage at the compost plant is expensive and insanitary. Depending upon the availability of land and its topography, economic viability, Types of waste, quantity of waste and social conditions; one can choose any one or more or Combination of two of the said techniques for waste disposal.

Energy recovery from municipal solid waste :

Energy can be recovered from the organic fraction of waste (biodegradable as well as non-biodegradable) basically through two methods as follows:

(i) Thermo-chemical conversion: This process entails thermal decomposition of organic matter to produce either heat energy or fuel oil or gas; and

(ii) Bio-chemical conversion: This process is based on enzymatic decomposition of organic matter by microbial action to produce methane gas or alcohol.

Municipal Solid Waste (MSW) contains organic as well as inorganic matter. The latent energy present in its organic fraction can be recovered for gainful utilization through adoption of suitable Waste Processing and Treatment technologies. The recovery of energy from wastes also offers a few additional benefits as follows:

(i) The total quantity of waste gets reduced by nearly 60% to over 90%, depending upon the waste composition and the adopted technology;

(ii) Demand for land, which is already scarce in cities, for landfilling is reduced;

(iii) The cost of transportation of waste to far-away landfill sites also gets reduced proportionately; and

(iv) Net reduction in environmental pollution.

It is, therefore, only logical that, while every effort should be made in the first place to minimize generation of waste materials and to recycle and reuse them to the extent feasible, the option of Energy Recovery from Wastes be also duly examined. Wherever feasible, this option should be incorporated in the over-all scheme of Waste Management.

The Thermo-chemical conversion processes are useful for waste containing high percentage of organic non-biodegradable matter and low moisture content. The main technological options under this category include Incineration and Pyrolysis / Gasification. The bio-chemical conversion processes, on the other hand, are preferred for wastes having high percentage of organic bio-degradable (putrescible) matter and high level of moisture/ water content, which aids microbial activity. The main technological options under this category are Anaerobic Digestion, also referred to as Biomethanation.

Incineration:

The process of burning waste in large furnaces is known as incineration. Incineration is a disposal method that involves combustion of waste material. Incineration and other high temperature waste treatment systems are sometimes described as "thermal treatment". Incineration is carried out both on a small scale by individuals and on a large scale by industry. It is used to dispose of solid, liquid and gaseous waste. Incineration facilities generally do not require as much area as landfills. Waste-to-energy or energy-from-waste is broad terms for facilities that burn waste in a furnace or boiler to generate heat, steam and/or electricity. At the end of the process all that is left behind is ash. This method produces heat that can be used as energy. Incinerators convert waste materials into heat, gas, steam, and ash. It is recognized as a practical method of disposing of certain hazardous waste materials (such as biological medical waste). Incineration of waste is a thermal process, which reduces the waste to 15-20 per cent. However, due to lower calorific value of waste, this process has not been fully exploited.

Combustion in an incinerator is not always perfect and there have been concerns about micro-pollutants in gaseous emissions from incinerator stacks. Particular concern has focused on some very persistent organics such as dioxins which may be created within the incinerator and which may have serious environmental consequences in the area immediately around the incinerator. Both the fly ash and the ash that is left in the furnace after burning have high concentrations of dangerous toxins such as dioxins and heavy metals. Disposing of this ash is a problem. The ash that is buried at the landfills leaches the area and cause severe contamination. Incineration is a controversial method of waste disposal, due to issues such as emission of gaseous pollutants.

Improperly operated incineration plants cause air pollution. Burning garbage is not a clean process as it produces tonnes of toxic ash and pollutes the air and water. Cost of incinerator and additional investment on pollution control devices make the process capital - intensive. Under Indian conditions large scale incineration plants are economically non - viable in view of their capital - intensive character and the low calorific value of city garbage available.

Sanitary land filling :

Improper and unscientific techniques adopted for MSW disposal are economically non-viable and socially unacceptable, due to this selection of proper disposal method is necessary. Quantity and characteristics of the MSW are two major factors, which are to be considered as the basis for the design of efficient, cost effective and environmentally compatible disposal method. One can choose the appropriate disposal method which is generally categorized as follows:

An alternative to landfills or modern landfill which solves the problem of leaching to some extent is a sanitary landfill which is more hygienic and built in a methodical manner. Designed "landfill" means a waste disposal site for the deposit of residual solid waste in a facility designed with protective measures against pollution of ground water, surface water and air fugitive dust, wind-blown litter, bad odour, fire hazard, bird menace, pests or rodents, greenhouse gas (Methane) emissions, slope instability and erosion. These are lined with materials that are impermeable such as plastics and clay, and are also built over impermeable soil.

Deposited waste is normally compacted to increase its density and stability, and covered to prevent attracting vermin (such as mice or rats). Many landfills also have landfill gas extraction systems installed to extract the landfill gas. Gas is pumped out of the landfill using perforated pipes and flared off or burnt in a gas engine to generate electricity. Fully operated landfills may even enhance property values. Constructing sanitary landfills is very costly and they are having their own problems. A properly-designed and well-managed landfill can be a hygienic and relatively inexpensive method of disposing of waste materials. Older, poorly-designed or poorly-managed landfills can create a number of adverse environmental impacts such as wind-blown litter, attraction of vermin, and generation of liquid leachate. Another common by product of landfills is gas (mostly composed of methane and carbon dioxide), which is produced as organic waste breaks down anaerobically. This gas can create odor problems, kill surface vegetation, and mainly is a greenhouse gas.

A4.2 Existing situation

48. While most municipalities are aware that the waste that is being dumped by them has significant recyclable matter and much of it can be turned into compost, most municipalities lack the wherewithal (especially financial) to set up such facilities. This is coupled with the fact that the land available to the municipal bodies for treatment and disposal of solid waste is limited, and waste is not segregated - therefore, there is considerable effort in setting up a compost plant locally.

49. Dedicated facilities for material recovery were found in Diamond Harbour, though this facility was found to be largely non-operational on account of non-availability of staff. None of the municipal bodies appeared to have a consistent policy with respect to setting up, operations and maintenance of any treatment facility.

Material recovery facility at Diamond Harbour Municipality

50. Compost plants have been previously attempted by several municipalities before. Some of these, for instance, at Haldia, Bally, Garulia, North Barrackpore etc., have been

constructed by private parties, with an understanding that a certain minimum volume of waste will come across to it. However, a large number of compost plants so installed were also found to be closed - particularly where these are commissioned and constructed by the municipal body, or even operated by them. The ones set up by private parties on a take-or-pay system, with no guarantee of revenue to the municipality seemed to perform relatively better than the facilities where there was no guarantee on feedstock or where the municipality is guaranteed a revenue. These conditions largely indicate inconsistencies in engaging with the private sector and contractual design flaws.

TABLE: Status of various treatment plants across the state of West Bengal

Municipality	Treatment Technology	Status
Daimond Harbour	Material Recovery Facility	Non-functional
Mahestala	Vermi compost plant	Non-functional
Barutpur	Vermi compost plant	Non-functional
Chandannagore	Vermi compost plant	Non-functional
Haldia	Windrow composting facility	Functional
Jiaganj-Azimganj	Incineration	Non-functional (fuel issues)
Khirpai	Vermi compost plant	Non-functional
Konnagar	Windrow composting facility	Non-functional
Rajpur-Sonarpur	Plastic Recovery Facility	Erratic
Dum Dum	Windrow composting facility	Non-functional
Howrah (Bally)	Windrow composting facility	Erratic - now merged with Howrah and therefore likely to be closed

51. Compost is often seen as a substitute to fertiliser, even though it is not, and farmers are often lured by cheap chemical fertilisers to increase yield as opposed to compost, which is applied mainly as a soil remediation measure and not a direct source of plant nutrition. As a result, compost often does not have an immediate proximal market, and therefore not lucrative to produce.

52. As explained previously, construction and demolition waste, which has otherwise significant value in mass concrete, road and masonry filler material and even making of filler bricks (class II or below), is often not segregated at source, and therefore it becomes increasingly difficult to sort this from inert waste at the dumping site on account of sheer volume of waste, and the necessity to clear the load before the next tranche of waste is received a day later.

53. The provisions of the West Bengal Municipalities Act, 1993 expressly mentions that waste collected by the municipality or generated within the municipal premises is property of the municipality. An express implication of this is that the municipal body can claim royalty on any supplemental use such waste material is put to. However, at this time, the absence of any proper recycling mechanism is depriving municipalities of a legitimate source of revenue.

54. Certain municipalities like Uttarpara, have attempted to engage with private sector parties, particularly non-profits for preparation of compost. It is broadly understood that the concerned private party, a not-for-profit entity engaged with the Municipalities in door to door collection, transport, sorting and preparation of compost. For this, the entity was also licensed to levy a collection charge of Rs. 20 to 30/- per household for every month of service rendered.

A4.2 Forecasted situation

55. Without segregation or recycling, the municipal body will be in contravention of the municipal solid waste (handling and management) rules of 2000 and Solid Waste Management Rules 2016, since no more than 50 per cent of waste generated is supposed to terminate inside the landfill site. With land available at a significant premium and the average life of a landfill site not being more than 12 to 15 years, it is increasingly necessary for municipalities to ensure that waste emanating from their respective jurisdictions finds other means of disposal, or rather re-use.

56. Transfer stations, although constructed in quite a few municipal bodies, are usually mandatory if the service catchment (area served by a single instance of collection, transportation, treatment and disposal) exceeds 50 sq. kilometres. At present, only Kolkata, Howrah and Kharagpur appear to pose such areas. However, in the event municipalities agree to setup clusters, the existing transfer stations in smaller municipalities can be leveraged; and new transfer stations set up in municipalities which serve a logistic role in the new cluster.

57. Certain forms of waste, if recycled properly are likely to be a source of income for the municipality as well as any investor who may wish to derive benefits from this industry. Compost, for instance, sells between Rs. 1/- and Rs. 1.50/- per kilogram, depending on the location. Assuming that a city generates 20 MT of waste a day, and of which about 40 per cent is compostable, a revenue stream of at least Rs. 8,000/- per day is potentially available to the municipality or any investor, before sharing of profits. This is comparable to the property tax base divided over a period of 365 days.

A5. Disposal

A5.1 Existing situation

58. Outside the Kolkata Metropolitan Area, there are hardly any engineered sanitary landfill sites with the exception of a cluster-based project taken up for Siliguri & Jalpaiguri and a stand-alone project taken up by Haldia. These are, however not municipal projects, and as it stands, municipal bodies have not systematically engaged in identifying or creating landfill sites, and continue to rely on crude dumping of unsegregated waste.

59. Most municipal bodies dump waste in a designated site granted to them/ purchased by them with assistance from the State Government, or which is vested with them. This site is usually low lying, though not necessarily distal from any human settlement.

TABLE: Estimated life of landfills

Name of municipality	Waste Generation (MT)	Waste Collection (MT)	Waste Collection Efficiency (%)	Area of dumping ground (in Acres)	Projected life (years)
Bhatpara	195.0	190.0	97%	20.26	5 - 10
Rajpur-Sonarpur	123.5	104.9	85%	6.61	>10
Titagarh	65.0	55.0	85%	2.26	5 - 10
Baruipur	65.0	60.0	92%	2.3	5 - 10
Dinhata	19.0	19.0	100%	0.86	>10
New Barrackpore	27.5	25.8	94%	5	6.5
Krishnanagar	95.0	70.0	79%	15.00	>20

60. None of the dumping sites are lined or engineered, essentially implying that leachate, or water content of waste, which is highly contaminated, can technically seep into ground water. During rains, most sites, being low lying areas, exhibit waterlogging, increasing the incidence of leachate, and usually in such times, waste is dumped in areas surrounding the dumping site.

61. In hilly areas, waste is usually dumped along slopes, which results in the same being washed downstream, contaminating surface water sources in the process.

Waste is dumped in a valley

Budge Budge's compost plant and partially developed landfill site

62. Assuming a depth of 5 meters and an unsegregated, non-compacted waste density of 850 kg per cubic meter (CPHEEO norms), the overall waste generated in one day would take 0.48 sq. kilometres to dispose of. In one year, 178 sq. kilometres would be consumed.

63. Municipal bodies are constantly constrained for want of land, and with no clear specifications regarding zoning or development control for dumping sites prescribed within the West Bengal Town and Country (Planning and Development) Act, 1979, municipalities are often faced with considerable public resistance to establishment of landfill sites. Many of these sites are also not clearly isolated from water bodies, and may lie in windward direction of an existing human settlement, releasing obnoxious odours towards the settlements as the waste putrefies.

Waste is burning


Waste is dumped next to a pond

A5.2 Forecasted situation

64. With limited or no control over the nature of quantum and nature of waste being dumped, municipalities are likely to face considerable issues in sourcing land for landfill and disposal sites. There is an immediate need for ensuring that no more than 50 per cent of waste actually has to be disposed of within the site, and even where it is done, there is significant compaction of the waste, so that the life of the landfill can be enhanced considerably. This percentage has to be brought down to as low as 20 per cent in the next 10 years and possibly as low as 5 per cent in the subsequent ten.

65. Public resistance to non-engineered disposal sites will also increase, unless sites achieve a formal closure and the same can be reclaimed for productive and remunerative use. Also, the insistence of a landfill site having to be 'owned' by the municipal body requires a significant upfront investment from the municipal body, since the State Government can only bear a certain portion of the cost of land at present, leaving the rest to the municipality.

66. Since there have been no real engineered landfills created by municipal bodies, there are no instances of closed and reclaimed sites as well. Potentially, even if these were to be used for creation of transport infrastructure such as bus depots, or recreational spaces such as amusement parks, they carry considerable lease potential even after their productive lives are over.

A6. Institutional establishment and management

A6.1 Existing situation

67. At this time, outside the Kolkata Metropolitan Area and where solid waste management schemes are not managed by respective development authorities, municipalities are largely responsible for managing solid waste within their own areas of jurisdictions. Typically, the operations are being supervised by Chairperson, the Municipal Engineer, a sub-assistant engineer or assistant engineer and a sanitary inspector. Waste collection personnel are usually class III or class IV employees with limited chances of career progression, or more often contractually employed through one or more contractors.

68. Cost centres are broadly static, and often 'blended' with other activities using the same resource. For instance, fuel costs are identified as a separate head, but not specifically disaggregated into usage by dump trucks for transporting waste. As a result, the identification of a true cost per every MT of waste managed has not been substantiated. Unless sponsored by development authorities, municipal bodies have never been known to associate with each other to jointly and severally set up trans-municipal projects.

69. Detailed project reports also broadly cover the capital costs of the one-time investment that is incurred in preparation of the sanitary landfill site, procurement of rolling stock, composting equipment et al, but usually not the cost of land, the cost of sourcing another land once the site capacity is exhausted and the recurring costs. This is largely because these detailed project reports are prepared with respect to Central sector schemes such as the JNNURM, SBM, which support capital costs and not operating costs. Typically, the economic life of a solid waste management project ranges from 15 to 20 years, similar to the life of the landfill.

70. Revenue streams for managing waste are not substantive. While the West Bengal Municipal Act, 1993 has provisions for levy of user charges, fees as the Municipality may deem fit, but the municipalities are not levying any specific charge towards solid waste management from residential segments. Non-residential segments, particularly commercial segments are levied a marginal user charge but this does not adequately address the recurring costs of managing solid waste.

71. Private sector participation has been by and large tried in the following areas:

TABLE: Extent of private sector participation in waste management in West Bengal

Municipality	KMA/ Non KMA	Caegory	Extent of Privitisation			
			Primary C&T	Secondary C&T	Treatment	Disposal
Bhatpara	KMA	A				✓
Burdwan	Non KMA	A		✓		
Dum Dum	KMA	C		✓		✓
Ghatal	Non KMA	D	✓		✓	✓
Haldia	Non KMA	B	✓		✓	✓
Jiaganj-Azimganj	Non KMA	D	✓			
Kanchrapara	KMA	C	✓			
Konnagar	KMA	D			✓	✓
Rajpur-Sonarpur	KMA	A			✓	

72. It is largely seen that the maximum amount of private sector participation has been in the field of treatment and disposal (albeit not very successfully), while primary and secondary collection has been attempted in a few places. It may be mentioned here that the usage of private sector participation in many cases is not an organised 'concession' with a private entity, but mere outsourcing of labour.

Proposed Policy and Strategy on Solid Waste Management for Urban Areas of West Bengal

A. Proposed action(s)

73. The processes will be taken up in the following order: (i) generation, (ii) collection, (iii) segregation at source, (iv) sorting, division and transportation, (v) treatment & recycling, and (vi) disposal.

74. For the purposes of this plan, the clustering approach has been considered with respect to three parameters, namely:

- Distance between cities
- Waste generated by cities
- Per capita waste generation

75. Based on the above, this action plan proposes the following arrangement of municipal bodies: **Total 22 Cluster Projects and 64 Standalone Projects:**

TABLE: Stand-alone and cluster oriented projects

District	Sl. No.	Name of Urban Local Body	Year of Establish-ment	Cate-gory	Population (2011 census)	No. of Ward	Area (in sq. Km)	Minimum Land Requirement for Processing & Dumping (in Acre)	Cluster/ Stand-alone mode Project
Kolkata	1	Kolkata Municipal Corporation	1876	MC	4496694	141	187.50		Stand-alone
Alipurduar	2	Alipurduar Municipality	1957	D	65232	20	9.57	4	Stand-alone
Bankura	3	Bankura Municipality	1865	C	137386	23	19.06	8	Stand-alone
Bankura	4	Bishnupur Municipality	1873	D	67783	19	22.01	4	Stand-alone
Bankura	5	Sonamukhi Municipality	1886	E	29085	15	11.65	2	Stand-alone
Birbhum	6	Suri Municipality	1876	D	67864	18	10.25	4	Cluster
Birbhum	7	Dubrajpur Municipality	1977	D	38041	16	16.84	3	
Birbhum	8	Rampurhat Municipality	1950	D	57833	17	6.25	4	Cluster
Birbhum	9	Nalhati Municipality	2001	D	41534	15	12.00	3	

District	Sl. No.	Name of Urban Local Body	Year of Establish-ment	Cate-gory	Population (2011 census)	No. of Ward	Area (in sq. Km)	Minimum Land Requirement for Processing & Dumping (in Acre)	Cluster/ Stand-alone mode Project
Birbhum	10	Bolpur Municipality	1950	D	80210	19	13.13	5	Stand-alone
Birbhum	11	Sainthia Municipality	1987	D	44601	16	10.00	3	Stand-alone
Paschim Burdwan	12	Asansol Municipal Corporation	1994	MC	791151	106	322.11	42	Stand-alone
Paschim Burdwan	13	Durgapur Municipal Corporation	1962	MC	566517	43	154.20	30	Stand-alone
Purba Burdwan	14	Burdwan Municipality	1865	A	314265	35	26.30	17	Stand-alone
Purba Burdwan	15	Kalna Municipality	1869	D	56722	18	10.10	4	Stand-alone
Purba Burdwan	16	Katwa Municipality	1859	D	81615	19	7.93	5	Cluster
Purba Burdwan	17	Dainhat Municipality	1969	E	24397	14	10.36	2	
Purba Burdwan	18	Gushkara Municipality	1988	D	35388	16	17.08	3	Stand-alone
Purba Burdwan	19	Memari Municipality	1995	D	41451	16	8.84	3	Stand-alone
Cooch Behar	20	Dinhata Municipality	1973	D	36124	15	4.55	3	Stand-alone
Cooch Behar	21	Cooch Behar Municipality	1946	D	77935	20	8.29	5	Stand-alone
Cooch Behar	22	Mathabhanga Municipality	1986	E	23890	12	3.71	2	Cluster
Cooch Behar	23	Mekliganj Municipality	1987	E	9127	9	3.88	2	
Cooch Behar	24	Haldibari Municipality	1984	E	14404	11	10.00	2	
Cooch Behar	25	Tufanganj Municipality	1983	E	20998	12	2.49	2	
Dakshin Dinajpur	26	Balurghat Municipality	1951	C	151299	25	10.56	8	Stand-alone

District	Sl. No.	Name of Urban Local Body	Year of Establish-ment	Cate-gory	Population (2011 census)	No. of Ward	Area (in sq. Km)	Minimum Land Requirement for Processing & Dumping (in Acre)	Cluster/ Stand-alone mode Project
Dakshin Dinajpur	27	Buniyadpur Municipality	2015	E	32315	17	24.49	3	Stand-alone
Dakshin Dinajpur	28	Gangarampore Municipality	1993	D	56217	18	10.29	4	Stand-alone
Darjeeling	29	Siliguri Municipal Corporation	1994	MC	513264	47	41.90	27	Stand-alone
Darjeeling	30	Darjeeling Municipality	1850	A	118805	32	7.43	7	Stand-alone
Darjeeling	31	Kurseong Municipality	1879	D	42446	20	7.50	3	Stand-alone
Darjeeling	32	Mirik Notified Area Authority	1984	E	11513	9	6.50	2	Stand-alone
East Midnapore	33	Tamralipta Municipality	1864	D	65306	20	17.86	4	Cluster
East Midnapore	34	Panskura Municipality	2002	D	57932	17	19.94	4	
East Midnapore	35	Contai Municipality	1958	C	92226	20	14.25	6	Stand-alone
East Midnapore	36	Egra Municipality	1993	E	30148	14	17.21	3	Stand-alone
East Midnapore	37	Haldia Municipality	1983	B	200827	26	109.65	11	Stand-alone
Hooghly	38	Chandannagar Municipal Corporation	1880	MC	166867	33	22.03	9	Cluster
Hooghly	39	Hooghly Chinsurah Municipality	1864	B	177259	30	17.29	10	
Hooghly	40	Champdany Municipality	1917	C	111251	22	6.59	6	
Hooghly	41	Bhadreswar Municipality	1869	C	101477	22	8.28	6	
Hooghly	42	Bansberia Municipality	1869	C	103920	22	9.07	6	
Hooghly	43	Serampore Municipality	1842	B	181842	29	17.60	10	

District	Sl. No.	Name of Urban Local Body	Year of Establish-ment	Cate-gory	Population (2011 census)	No. of Ward	Area (in sq. Km)	Minimum Land Requirement for Processing & Dumping (in Acre)	Cluster/ Stand-alone mode Project
Hooghly	44	Baidyabati Municipality	1869	C	121110	22	12.03	7	
Hooghly	45	Rishra Municipality	1944	C	124577	23	4.48	7	
Hooghly	46	Konnagar Municipality	1944	D	76172	20	4.67	5	Cluster
Hooghly	47	Uttarpara-Kotrung Municipality	1853	C	159147	24	12.56	9	
Hooghly	48	Arambagh Municipality	1886	D	66175	18	34.75	4	
Hooghly	49	Tarakeswar Municipality	1975	E	30947	15	3.88	3	Cluster
Hooghly	50	Dankuni Municipality	2008	C	94936	21	19.50	6	Stand-alone
Howrah	51	Howrah Municipal Corporation	1984	MC	1077075	66	51.74	57	Stand-alone
Howrah	52	Uluberia Municipality	1982	A	222240	29	33.72	12	Stand-alone
Jalpaiguri	53	Mal Municipality	1989	E	25218	15	7.50	2	Stand-alone
Jalpaiguri	54	Jalpaiguri Municipality	1885	C	107341	25	12.98	6	Stand-alone
Jalpaiguri	55	Dhupguri Municipality	2002	D	44719	16	14.99	3	Stand-alone
Kalimpong	56	Kalimpong Municipality	1945	C	49403	23	8.68	3	Stand-alone
Malda	57	English Bazar Municipality	1868	B	205521	29	13.25	11	
Malda	58	Old Malda Municipality	1869	D	84012	18	9.58	5	Cluster
Murshidabad	59	Berhampore Municipality	1876	B	195223	28	31.42	11	
Murshidabad	60	Murshidabad Municipality	1869	D	44019	16	16.40	3	Cluster

District	Sl. No.	Name of Urban Local Body	Year of Establish-ment	Cate-gory	Population (2011 census)	No. of Ward	Area (in sq. Km)	Minimum Land Requirement for Processing & Dumping (in Acre)	Cluster/ Stand-alone mode Project
Murshidabad	61	Jiaganj Azimganj Municipality	1896	D	51790	17	11.66	4	Stand-alone
Murshidabad	62	Kandi Municipality	1869	D	55632	17	12.97	4	Stand-alone
Murshidabad	63	Jangipore Municipality	1877	C	88165	20	8.20	5	Cluster
Murshidabad	64	Dhulian Municipality	1909	C	95706	19	6.25	6	
Murshidabad	65	Domkal Municipality	2015	C	96949	21	89.84	6	Stand-alone
Murshidabad	66	Beldanga Municipality	1981	E	29205	14	3.98	3	Stand-alone
Nadia	67	Krishnagar Municipality	1864	C	153062	24	15.96	9	Stand-alone
Nadia	68	Nabadwip Municipality	1869	C	125543	24	11.66	7	Stand-alone
Nadia	69	Santipur Municipality	1853	C	151777	24	25.88	8	Stand-alone
Nadia	70	Birnagar Municipality	1869	E	30799	14	5.52	3	Stand-alone
Nadia	71	Ranaghat Municipality	1864	D	75365	19	7.72	5	Stand-alone
Nadia	72	Chakdah Municipality	1886	C	95203	21	15.36	6	Cluster
Nadia	73	Taherpur Notified Area	1993	D	20894	13	2.01	2	
Nadia	74	Coopers' Camp Notified Area	1997	E	18843	12	1.50	2	
Nadia	75	Kalyani Municipality	1995	C	100575	20	29.21	6	Cluster
Nadia	76	Gayeshpur Municipality	1995	D	58998	18	30.00	4	
Nadia	77	Haringhata Municipality	2014	E	46236	14	27.11	3	

District	Sl. No.	Name of Urban Local Body	Year of Establish-ment	Cate-gory	Population (2011 census)	No. of Ward	Area (in sq. Km)	Minimum Land Requirement for Processing & Dumping (in Acre)	Cluster/ Stand-alone mode Project
North 24 Parganas	78	Bidhannagar Municipal Corporation	2015	MC	618358	60	60.00	33	Stand-alone
North 24 Parganas	79	Ashokenagar-Kalyangarh Municipality	1968	C	121592	22	20.64	7	Cluster
North 24 Parganas	80	Habra Municipality	1979	C	147221	24	21.80	8	
North 24 Parganas	81	Baduria Municipality	1869	D	52493	17	22.43	4	Cluster
North 24 Parganas	82	Basirhat Municipality	1869	C	125254	22	22.05	7	
North 24 Parganas	83	Taki Municipality	1869	D	38263	16	12.97	3	
North 24 Parganas	84	Baranagar Municipality	1869	A	245213	34	7.62	13	Cluster
North 24 Parganas	85	Dum Dum Municipality	1929	C	114786	22	9.73	7	
North 24 Parganas	86	North Dum Dum Municipality	1870	A	249142	31	26.45	14	
North 24 Parganas	87	South Dum Dum Municipality	1870	A	403316	35	17.96	22	
North 24 Parganas	88	Barasat Municipality	869	A	278435	32	34.50	15	Stand-alone
North 24 Parganas	89	Madhyamgram Municipality	1993	B	196127	25	21.56	11	Cluster
North 24 Parganas	90	New Barrackpore Municipality	1965	D	76846	20	6.89	5	
North 24 Parganas	91	Bhatpara Municipality	1899	A	383762	35	32.50	21	Stand-alone
North 24 Parganas	92	Naihati Municipality	1869	A	217900	31	11.81	12	Stand-alone
North 24 Parganas	93	Bongaon Municipality	1954	C	108864	22	14.27	6	Stand-alone

District	Sl. No.	Name of Urban Local Body	Year of Establish-ment	Cate-gory	Population (2011 census)	No. of Ward	Area (in sq. Km)	Minimum Land Requirement for Processing & Dumping (in Acre)	Cluster/ Stand-alone mode Project
North 24 Parganas	94	Gobardanga Municipality	1870	D	45377	17	13.50	3	Stand-alone
North 24 Parganas	95	Garulia Municipality	1904	C	85336	20	6.48	5	Stand-alone
North 24 Parganas	96	North Barrackpore Municipality	1869	C	132806	23	12.22	7	Stand-alone
North 24 Parganas	97	Halisahar Municipality	1903	C	124939	23	8.29	7	Stand-alone
North 24 Parganas	98	Kanchrapara Municipality	1917	C	120345	24	9.07	7	Stand-alone
North 24 Parganas	99	Panihati Municipality	1900	A	377347	35	19.38	20	Stand-alone
North 24 Parganas	100	Kamarhati Municipality	1899	A	330211	35	10.96	18	Cluster
North 24 Parganas	101	Khardah Municipality	1920	C	108496	22	6.87	6	
North 24 Parganas	102	Barrackpore Municipality	1916	C	152783	24	10.61	9	Cluster
North 24 Parganas	103	Titagarh Municipality	1895	C	116541	23	3.28	7	
Purulia	104	Purulia Municipality	1876	C	121067	22	14.00	7	Stand-alone
Purulia	105	Jhalda Municipality	1888	E	19544	12	3.34	2	Stand-alone
Purulia	106	Raghunathpur Municipality	1888	E	25561	13	12.95	2	Stand-alone
South 24 Parganas	107	Rajpur-Sonarpur Municipality	1876	A	424368	35	49.26	23	Stand-alone
South 24 Parganas	108	Baruipur Municipality	1869	D	53128	17	9.50	4	Stand-alone
South 24 Parganas	109	Joynagar-Mazilpur Municipality	1869	E	25922	14	5.81	2	Stand-alone

District	Sl. No.	Name of Urban Local Body	Year of Establish-ment	Cate-gory	Population (2011 census)	No. of Ward	Area (in sq. Km)	Minimum Land Requirement for Processing & Dumping (in Acre)	Cluster/ Stand-alone mode Project
South 24 Parganas	110	Diamond-Harbour Municipality	1982	D	41802	16	10.89	3	Stand-alone
South 24 Parganas	111	Maheshtala Municipality	1993	A	448317	35	47.30	24	Cluster
South 24 Parganas	112	Budge Budge Municipality	1900	D	76837	20	9.06	5	
South 24 Parganas	113	Pujali Municipality	1996	D	37047	15	8.32	3	
Uttar Dinajpur	114	Raiganj Municipality	1952	B	183612	25	10.76	10	Cluster
Uttar Dinajpur	115	Kaliaganj Municipality	1987	D	53530	17	11.67	4	
Uttar Dinajpur	116	Islampore Municipality	1988	D	54340	17	11.40	4	Stand-alone
Uttar Dinajpur	117	Dalkhola Municipality	2003	D	36930	16	15.95	3	Stand-alone
West Midnapore	118	Midnapore Municipality	1865	C	169264	25	18.36	9	Stand-alone
West Midnapore	119	Kharagpur Municipality	1954	B	207604	35	103.35	11	Stand-alone
West Midnapore	120	Ghatal Municipality	1869	D	54591	17	10.40	4	Cluster
West Midnapore	121	Chandrakona Municipality	1869	E	23629	12	16.58	2	
West Midnapore	122	Ramjibanpur Municipality	1876	E	19611	11	15.83	2	
West Midnapore	123	Khirpai Municipality	1876	E	16384	10	11.65	2	
West Midnapore	124	Kharar Municipality	1888	E	12118	10	10.26	2	
West Midnapore	125	Jhargram Municipality	1982	D	61712	18	21.40	4	Stand-alone
					20596409	2913			

Note: Subject to the suitability of Land clubbing nature of ULBs for Cluster SWM Projects may be changed.

TABLE: Minimum Owned Land available with the ULBs for Processing & Dumping

Sl. No.	ULB	District	No of Wards	Total Population (as per 2011 Census)	Category	Own land available for Processing & dumping		Minimum Land required for Processing & dumping (in Acre)
						Piece of land	Area of Land Available (in Acre)	
1	Balurghat	Dakshin Dinajpur	25	151299	C	1	10.08	9.00
2	Bankura	Bankura	23	137386	C	1	17.00	9.00
3	Bidhan Nagar	North 24 Parganas	41	618358	MC	1	138.29	19.00
4	Cooch Behar	Cooch Behar	20	77935	D	1	6.82	5.00
5	Dhupguri	Jalpaiguri	16	44719	D	1	7.51	5.00
6	Gobardanga	North 24 Parganas	17	45377	D	1	4.67	5.00
7	Haldia	Purba Medinipur	26	200827	B	1	13.47	12.00
8	Haldibari	Cooch Behar	11	14404	E	2	2.86	3.00
9	Howrah MC	Howrah	66	1077075	MC	2	17.39	9.00
10	Kurseong	Darjeeling	20	42446	D	1	5.32	5.00
11	Maheshtala	South 24 Parganas	35	448317	A	1	16.33	19.00
12	Midnapore	Paschim Medinipur	25	169264	C	1	11.3	9.00
13	Murshidabad	Murshidabad	16	44019	D	1	5.05	5.00
14	Purulia	Purulia	22	121067	C	1	10.00	9.00
15	Siliguri MC	Darjeeling	47	513264	MC	1	22.18	19.00
16	Titagarh	North 24 Parganas	23	116541	C	1	32.00	9.00

TABLE: Municipalities having no land for Dumping

Sl. No.	District	Sl. No.	Municipality
1	Alipurduar	1	Alipurduar
2	Murshidabad	2	Beldanga
		3	Domkol
3	Bankura	4	Bishnupur
4	South 24 Parganas	5	Diamond Harbour
5	Birbhum	6	Dubrajpur
6	Purulia	7	Jhalda
7	Paschm Medinipur	8	Kharagpur
8	Jalpaiguri	9	Mal
9	Malda	10	Old Malda

Except the abovementioned 25 ULBs, Kolkata MC, Asansol MC, Bhatpara, Naihati, Dum Dum, North Dum Dum, South Dum Dum, Baranagar, Garulia, Ashokmagar-Kalyangarh, Habra, Krishnagar, Nabadwip, Santipur, Jalpaiguri, Darjeeling and Kalimpong have their own land and their SWM projects are in progress, and other ULBs dispose the garbage in the lands either owned by them having insufficient for processing plant or not owned by them.

A1. Generation

A1.1 Proposed action plan

76. While it may or may not be possible to control public behaviour to an extent that it would lead to changes in consumption habits, certain social and cultural phenomena may themselves lead to overall reduction of waste material from certain sources, such as:
    - Reliance on electronic forms of communication as opposed to paper, reducing waste paper significantly;
    - Promotion of reusable bags for carrying goods, reducing the amount of polyethylene bags
    - Promotion of recycled paper bags as an alternative to polyethylene bags. At present, many stores charge a premium on polyethylene bags; under the proposed arrangement, such stores will now offer only recycled paper, reusable HDPE or cloth bags on a premium basis.
    - Promotion of at least one marketplace in each municipality which observes a no-plastic zone
    - Offset savings in processing costs for plastic waste in the form of other incentives

77. While this would not per se reduce the incidence of waste from municipal areas, efforts can be made to change the waste composition in a manner such that (i) waste can be reclaimed, and (ii) it is possible to segregate waste at source. Some of the measures to be followed are as follows:
    - Introduction of local collection/ deposition bins for vegetable waste at markets
    - Common repository for slaughterhouse waste at meat and fish markets
    - Street vendors selling food items to be clubbed together than food waste, plates and disposable items can be safely and separately stored in common bins.
    - Prominent display and announcements to guide users to use the appropriate bins for disposal of waste items.

78. Research shows that public at large participates willingly if the overall purpose of waste management is explained to them. The above processes must be supplemented by a series of ICT materials, which may be produced locally or at a State level. These materials may be used to convey the following messages:
    - "There is nothing called waste. Everything is reusable. Help us re-use everything."
    - "A small item that you throw today becomes a larger problem for all of us tomorrow"

79. Such materials could also be used as supplementary learning material for children studying at schools, particularly municipal schools. Supplementary channels and modes of dissemination may include posters (including roadside poster painting), radio jingles, strip advertising on major advertisement sites, shorts prior to exhibition of cinematic or theatrical performances, ticker advertisements on local cable television etc.

80. The Expertise and Services of State Government's in-house Departments like I&CA Department, IT Department etc./ agency will be utilized for advertising and visual publicity to develop semi-customised software (costs to be shared between State Government and municipality, plus any sponsor).

A2. Collection

A2.1 Proposed action plan

81. Collection will be carried out from specific premises in modified trolleys/ push-carts, with two or three chambers - one for biodegradable waste, the other for non-biodegradeable waste, and (preferably) a third for non-standard waste such as electronic waste or such other streams that cannot be mixed up with either of the two. While it will be desirable for citizens to keep two bins for storage of waste within premises, considerable behavioural change communication will be required for this.

82. Certain specific items, viz. electronic parts, batteries (excluding lead acid batteries) and animal carcasses/ remains (excluding slaughter house waste) will be segregated at source. A specialised collection service should be available for this at such location.

83. For larger complexes with multiple tenements, the Association of Apartment Owners (as per the provisions of the West Bengal Apartment Ownership Act, 1972), will be responsible for primary collection of the waste, and deposition of the same at a designated point of the site. Building bye-laws for such complexes will be amended to include such a facility with separate bins for biodegradable, non-biodegradable and non-standard waste.

84. Municipal bodies may be encouraged to provide two bins to poorer households, while manufacturers may be encouraged to produce two or three chamber bins for household use.

85. Planning standards and development control rules would be amended to include one pair of bins (one for biodegradable, the other for non-biodegradable waste, each with capacity of 1 cubic meter) for every 50 houses, as part of the standard street section. These community bins would be emptied at least once or even twice every day, depending on the location and usage. As a general principle, these could be affixed to bus shelters, decorative plantations and landscaping to make these look less obtrusive or offensive.

86. Secondary collection would be created, where possible, for 500 to 1000 households. These would be in the form of storage cells, each containing 8 tipping bins, which can be picked up and tipped directly into a compactor device. Four of these would be used to tip garbage from community bins containing biodegradable or compostable waste, while the rest can be used for non-biodegradable and inert waste. Door to door waste collectors would also tip their collected waste into these bins.

87. While existing municipal staff will not be removed till retirement, contractual staff will be phased out in favour of a new arrangement. As per this, self-help groups active in a ward or a group of wards may federate into a cooperative society, which may enter into a hybrid contract with the municipality. As per this:

- The society and the Municipality will work out a particular cost of operations for the month for door to door collection, segregation at source and deposition into separate secondary collection bins, using protective gear. This cost will remain active for a period of one year, following which for each year there shall be a 10 per cent increase.
- 50 per cent of the costs of the society for collection of waste will be borne out of funds of the Municipality
- 50 per cent of costs of the society may be recovered from direct door to door collection from beneficiaries.
- Members of the cooperative society may be granted license and space to engage in other community based livelihoods activities such as repair shops, ironing services, food stalls etc. Depending on the success of these activities, the society may cross subsidise the collection charges of waste from each door.

88. **Non-standard waste collectors:** For specific forms of waste, collectors, including members of the society as indicated above may be engaged to dispose of following forms of waste:
    - Construction & demolition waste (debris)
    - Animal carcasses (excluding slaughter house waste)
    - Lead acid batteries (in line with Batteries Handling and Management Rules, 2001)
    - Electronic waste
    - Bio-medical waste from small medical establishments
89. For each item or unit thereof (measured in terms of weight or number of pieces) removed from premises, a minimal fee rate may be charged by such provider, as may be determined by the municipality. For dead street animals, no specific fee may be chargeable. These items will not be allowed to be included in the waste stream that is to be transported to the treatment and disposal site.
90. Local sorting: Since the waste collected will be segregated at source itself, ragpickers will be deployed at the point of secondary collection itself to sort out the following kinds of wastes:
    - Sharps - glass and metal scraps
    - Plastic items
    - Non-standard waste items (subject to safeguards)
91. Transport to the treatment and disposal site shall be taken up only after removal of the above items. As far as possible, waste streams of non-standard waste will be subject to the following treatment:

TABLE : Waste treatment options

Waste type	Treatment
Sharps (glass)	Recycling through melting and reclamation
Sharps (metal scraps)	To be sold as scrap metal (except metals which have contaminant nature, which are to be disposed of by designated providers in line with rules for managing hazardous waste as notified by the State Pollution Control Board from time to time)
Plastic items	To be reclaimed through melting
Construction and demolition waste	For crushing and pounding at stone crushing sites and onward sale/grant to contractors engaged in public works as filler material/ to brick kiln owners
Dead animals	Rendering plant for production of rendered waste as chicken/ poultry feed
Lead acid batteries	Specialised waste facility in line with Batteries Handling and Management Rules, 2001
Electronic waste (printed circuit boards, discarded electronic items)	Specialised waste facility designated by the State Pollution Control Board
Bio-medical waste - plastic disposables	Melting and reclamation as plastics
Bio-medical waste - bandages, biological waste	Incineration at a minimum of 2,000 degrees, preferably electrical or composite fuel
Bio-medical waste - metals & sharps	Autoclaving and grinding, reclaimable as conventional sharps

A3. Transportation

A3.1 Proposed action plan

92. The present system of collecting waste in tricycles or wheelbarrows, subject to the conditions above would continue, but for transport to the waste treatment and disposal site, the following regime shall be followed:

    a. Instead of conventional tipper trucks with capacities of about 200 cu. Feet, compactor trucks with a capacity of 14/8 Cu M shall be used. Some Compactors have two distinct containers for (a) compostable waste and (b) inert material.

    b. Compostable matter will be compacted within the unit to a density of around 1.7 MT/cubic meter (twice the unsorted/uncompressed density), while inert material will be compacted to about 1.3 MT/cubic meter (subject to presence of rocks and other non-compressible matter).

93. The upgraded inventory of motorised rolling stock will therefore comprise of:

TABLE : Waste carriage vehicles

Type of vehicle and capacity	Coverage	No. of trips in one day
Tractors with a trailer capacity of up to capable of hauling secondary collection bins as a rail at about 10 to 20 km/hour	Two to three collection zones, each comprising about 1,000 different properties or doors	Eight to Ten
Mini-tipper trucks of axle load of less than 5T with a capacity of up to 200 cu. Ft with separate chambers for biodegradable and non-biodegradable waste	One transfer station, comprising of about six to eight collection zones, each comprising about 1,000 different properties or doors	Four to five
Compactor trucks with axle load of 10 T or above and a capacity of 400 cu. Ft. with separate chambers for biodegradable and non-biodegradable waste.	Three transfer stations	One to two

94. The inventory of vehicles for managing solid waste in a city with a population of 10 lakh may be considered as follow:

TABLE : Waste carriage vehicles, numbers

Tricycle Rickshaw	Tipper/LCV	RefuseCompactor	DumperPlacer
150	125	15	20

95. Likewise, the inventory of manpower for managing solid waste in a city with a population of 10 lakh may be considered as follows:

TABLE : Manpower requirements for waste management

Sr.No	Particulars	Details	Requirement
1	Primary Collection		
	Containerized Tricycles	One worker per Rickshaw plus 15% absentees	173
		Supervisors (One for 15 workers)	17
	LCV	Driver	125
		Helper /Worker (One for each)	125
		Supervisors (One for 20 Vehicles)	6

Sr.No	Particulars	Details	Requirement
2	Secondary Collection & Transportation		
	Dual Dumper Placer Vehicles	Drivers(One for each)	20
		Helper /Worker (One for each)	20
		Supervisor (One)	1
	Refuse Compactor	Drivers (One for each)	15
		Helper /Worker (One for each)	15
		Supervisor	1
		Total	**518**

96. In the case of clusters, the time taken for trucks to move between towns needs being minimised. It is proposed to utilise waiting line models in order to predict and where possible minimise the same. Typically, if a single business entity is responsible for moving the rolling stock between clusters, such a model can be applied from a common centre using GPS data from the rolling stock.

97. Gradually tracking system of Trucks using GPS device may be introduced depending on the feasibility to report real-time location of the truck and the route it follows with respect to other motorised rolling stock. The routing of trucks to the treatment and disposal site will be done to avoid bunching of trucks at the point of arrival, and direct offloading into the hopper assembly.

A4. Treatment

A4.1Proposed action plan

98. Since the waste now being transported to the site comprises of largely compostable matter as well as inert material, the following course of treatment may be followed:

TABLE : Treatment options at disposal site

Waste stream and amount	Course of treatment	Size and distribution of plant
Compostable matter, under 5 MT/day	Distributed into two to three separate sites, each with one package unit for energy based bio-conversion into compost pellets (holding time of seven days)	One unit for a population of up to 50,000, based across a 2 hectare plot of land
Compostable matter, over 5 MT per day up to 20 MT/day	Windrow based composting plant with a holding time of fourteen days	One unit for a population exceeding 50,000 but not exceeding 5 lakh souls, footprint to be decided based on actual material to be processed at the site. Each MT/ day usually requires about 0.5 hectares for processing.
Inert matter (soil, rocks and residual debri).	Isolation through sieving; stacking for use as feed stock for bricks and filler material.	One unit for a population size catchment exceeding 2 lakh and not exceeding 10 lakh

Waste stream and amount	Course of treatment	Size and distribution of plant
	Landfill site application for soil which is deemed as too amorphous or loamy to utilise as filler material.	
Compostable matter with high calorific value content such as paddy husk, sugarcane molasses, tyres, plastic scraps that are rejected by ragpickers and recyclers, total volume exceeds 10 MT/day	Pyrolysis, subject to availability of energy at the site (electrical, fossil fuel or gas); residue can be used as composite fuel (rich in carbon)	One unit for 10 lakh population.

On the basis of feasibility report the State would decide the option of technologies for treatment of wastes i.e. Waste to Energy or Waste to Compost.

Government of India is providing Rs. 1500/- per ton as subsidy for encouraging its adoption.

Further the Union Ministry for Non-conventional and Renewable Energy (MNRE) has given a directive that waste to energy tariffs are fixed for upto 2022 for a price of Rs. 6.12/- per unit for the State of West Bengal.

Duties of the industrial units located within one hundred km from the refused derived fuel and waste to energy plants based on solid waste-

All industrial units using fuel and located within one hundred km from a solid waste based refused derived fuel plant shall make arrangements within six months from the date of notification of these rules to replace at least five percent of their fuel requirement by refused derived fuel so produced.

Criteria for Duties regarding setting-up solid waste processing and treatment facility.-

(1) The department in- charge of the allocation of land assignment shall be responsible for providing suitable land for setting up of the solid waste processing and treatment facilities and notify such sites by the State Government.

(2) The operator of the facility shall design and set up the facility as per the technical guidelines issued by the Central Pollution Control Board in this regard from time to time and the manual on solid waste management prepared by the Ministry of Urban Development.

(3) The operator of the facility shall obtain necessary approvals from the State Pollution Control Board or Pollution Control Committee.

(4) The State Pollution Control Board shall monitor the environment standards of the operation of the solid waste processing and treatment facilities.

(5) The operator of the facility shall be responsible for the safe and environmentally sound operations of the solid waste processing and or treatment facilities as per the guidelines issued by the Central Pollution Control Board from time to time and the Manual on Municipal Solid Waste Management published by the Ministry of Urban Development and updated from time to time.

(6) The operator of the solid waste processing and treatment facility shall submit annual report in Form III of Solid Waste Management Rules 2016 each year by 30th April to the State Pollution Control Board and concerned local body.

Criteria for waste to energy process.-

(1) Non recyclable waste having calorific value of 1500 K/cal/kg or more shall not be disposed of on landfills and shall only be utilised for generating energy either or through refuse

derived fuel or by giving away as feed stock for preparing refuse derived fuel.

(2) High calorific wastes shall be used for co-processing in cement or thermal power plants.

(3) The local body or an operator of facility or an agency designated by them proposing to set up waste to energy plant of more than five MT per day processing capacity shall submit an application in Form-I of Solid Waste Management Rules 2016 to the State Pollution Control Board, as the case may be, for authorisation.

(4) The State Pollution Control Board, on receiving such application for setting up waste to energy facility, shall examine the same and grant permission within sixty days.

A5. Disposal

A5.1 Proposed action plan

99. It is proposed to progressively reduce waste entering the landfill site, first up to 50 per cent, thereafter reducing by 10 per cent every year until the overall material entering the landfill site does not exceed 5 per cent of the overall waste produced.

100. As a principle, all landfill sites identified and used by municipal bodies (or their designated/ delegated parties for dumping of waste material) shall be engineered, i.e. constructed with a liner at the bottom and shoring walls to clearly create a confining boundary. The average life of a site will vary between 15 years (aggressive use) and 20 years (conservative use).

101. For the overall waste volume of 14000 MT/ day is expected from the said 125 municipalities in West Bengal covered in this action plan. This may be considered as below:

Total (MT)	14000	100%
Recyclable (MT)	1400	10%
Organic (MT)	7000	50%
Inert (MT)	5600	40%

102. Inert waste (clean fill/ soil) usually has a density of 950 kg/ cubic meter. Compaction will not alter this much. Therefore, if about 5600 MT of inert waste is generated every day, each day will consume about 5895 cubic meters, or 1965 sq. meters (at about three meters depth for a 5 meter deep trench). At this rate, the consumption of space for all of West Bengal for the next twenty years will be 1965 x 365 x 20 = 14344500 square meters, or 14.34 sq. kilometres, plus around 25%, i.e. 3.58 sq. kilometres on account of circulation.

103. For organic matter, the waste density is approximately between 100 and 300 kg/ cubic meter, with compaction resulting up to two to three times the density. Even if the lower value is assumed, the compacted density will increase to about 300 kg/ cubic meter. This will, in turn imply about 25.34 sq. kilometers of disposal site, including circulation space.

104. There is, therefore a clear requirement to reduce the amount of inert waste entering the landfill site. The inert material can be used as follows:

TABLE : Isolation of waste from inert material

Component of inert material	How segregated	Use(s) proposed
Earth	Sieving at disposal site	- Substitute for fine sand - Bricks (class II or below) - Filler blocks - Mud phoska in roofing material (insulation)
Rocks	Leftover from sieving at disposal site	- Crushed aggregates for mass concrete (low load bearing toe walls, culvert parapets etc.)

105. Design considerations for Scientific landfill site cum-compost plant: In accordance with the orders of the National Greet Tribunal in the case of Mall Singh and Ors. Vs the State of Punjab, and the provisions of the Schedule-

l of Solid Waste Management Rules, 2016, the following considerations would be had with respect to siting of sites:

(A) Criteria for site selection.-

(i) The department in the business allocation of land assignment shall provide suitable site for setting up of the solid waste processing and treatment facilities and notify such sites.

(ii) The sanitary landfill site shall be planned, designed and developed with proper documentation of construction plan as well as a closure plan in a phased manner. In case a new landfill facility is being established adjoining an existing landfill site, the closure plan of existing landfill should form a part of the proposal of such new landfill.

(iii) The landfill sites shall be selected to make use of nearby wastes processing facilities. Otherwise, wastes processing facility shall be planned as an integral part of the landfill site.

(iv) Landfill sites shall be set up as per the guidelines of the Ministry of Urban Development, Government of India and Central Pollution Control Board.

(v) The existing landfill sites which are in use for more than five years shall be improved in accordance with the specifications given in this Schedule.

(vi) The landfill site shall be large enough to last for at least 20-25 years and shall develop 'landfill cells' in a phased manner to avoid water logging and misuse.

(vii) The landfill site shall be 100 meter away from river, 200 meter from a pond, 200 meter from Highways, Habitations, Public Parks and water supply wells and 20 km away from Airports or Airbase. However in a special case, landfill site may be set up within a distance of 10 and 20 km away from the Airport/Airbase after obtaining no objection certificate from the civil aviation authority/ Air force as the case may be. The Landfill site shall not be permitted within the flood plains as recorded for the last 100 years, zone of coastal regulation, wetland, Critical habitat areas, sensitive eco-fragile areas..

(viii) The sites for landfill and processing and disposal of solid waste shall be incorporated in the Town Planning Department's land-use plans.

(ix) A buffer zone of no development shall 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. The buffer zone shall be prescribed on case to case basis by the local body in consultation with concerned State Pollution Control Board.

(x) The biomedical waste shall be disposed of in accordance with the Bio-medical Waste Management Rules, 2016, as amended from time to time . The hazardous waste shall be managed in accordance with the Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016, as amended from time to time. The Ewaste shall be managed in accordance with the e-Waste (Management) Rules, 2016 as amended from time to time.

(xi) Temporary storage facility for solid waste shall be established in each landfill site to accommodate the waste in case of non-operation of waste processing and during emergency or natural calamities.

(B) Criteria for development of facilities at the sanitary landfills.-

(i) Landfill site shall be fenced or hedged and provided with proper gate to monitor incoming vehicles, to prevent entry of unauthorised persons and stray animals

(ii) The approach and/internal roads shall be concreted or paved so as to avoid generation

of dust particles due to vehicular movement and shall be so designed to ensure free movement of vehicles and other machinery.

(iii) The landfill site shall have waste inspection facility to monitor waste brought in for landfilling , office facility for record keeping and shelter for keeping equipment and machinery including pollution monitoring equipment. The operator of the facility shall maintain record of waste received, processed and disposed.

(iv) Provisions like weigh bridge to measure quantity of waste brought at landfill site, fire protection equipment and other facilities as may be required shall be provided.

(v) Utilities such as drinking water and sanitary facilities (preferably washing/bathing facilities for workers) and lighting arrangements for easy landfill operations during night hours shall be provided.

(vi) Safety provisions including health inspections of workers at landfill sites shall be carried out made.

(vii) Provisions for parking, cleaning, washing of transport vehicles carrying solid waste shall be provided. The wastewater so generated shall be treated to meet the prescribed standards.

(C) Criteria for specifications for land filling operations and closure on completion of land filling.-

(i) Waste for land filling shall be compacted in thin layers using heavy compactors to achieve high density of the waste. In high rainfall areas where heavy compactors cannot be used, alternative measures shall be adopted.

(ii) Till the time waste processing facilities for composting or recycling or energy recovery are set up, the waste shall be sent to the sanitary landfill. The landfill cell shall be covered at the end of each working day with minimum 10 cm of soil, inert debris or construction material.

(iii) Prior to the commencement of monsoon season, an intermediate cover of 40-65 cm thickness of soil shall be placed on the landfill with proper compaction and grading to prevent infiltration during monsoon. Proper drainage shall be constructed to divert run-off away from the active cell of the landfill.

(iv) After completion of landfill, a final cover shall be designed to minimise infiltration and erosion. The final cover shall meet the following specifications, namely :-

a) The final cover shall have a barrier soil layer comprising of 60 cm of clay or amended soil with permeability coefficient less than 1 x 10-7 cm/sec.

b) On top of the barrier soil layer, there shall be a drainage layer of 15 cm.

c) On top of the drainage layer, there shall be a vegetative layer of 45 cm to support natural plant growth and to minimise erosion.

(D) Criteria for pollution prevention.-In order to prevent pollution from landfill operations, the following provisions shall be made, namely:-

(i) The storm water drain shall be designed and constructed in such a way that the surface runoff water is diverted from the landfilling site and leachates from solid waste locations do not get mixed with the surface runoff water. Provisions for diversion of storm water discharge drains shall be made to minimise leachate generation and prevent pollution of surface water and also for avoiding flooding and creation of marshy conditions.

(ii) Non-permeable lining system at the base and walls of waste disposal area. For landfill receiving residues of waste processing facilities or mixed waste or waste having contamination of hazardous materials (such as aerosols, bleaches, polishes, batteries, waste oils, paint products and pesticides)

shall have liner of composite barrier of 1.5 mm thick high density polyethylene (HDPE) geo-membrane or geo-synthetic liners, or equivalent, overlying 90 cm of soil (clay or amended soil) having permeability coefficient not greater than 1 x 10-7 cm/sec. The highest level of water table shall be at least two meter below the base of clay or amended soil barrier layer provided at the bottom of landfills.

(iii) Provisions for management of leachates including its collection and treatment shall be made. The treated leachate shall be recycled or utilized as permitted, otherwise shall be released into the sewerage line, after meeting the standards specified in Schedule-II of Solid Waste Management Rules 2016. In no case, leachate shall be released into open environment.

(iv) Arrangement shall be made to prevent leachate runoff from landfill area entering any drain, stream, river, lake or pond. In case of mixing of runoff water with leachate or solid waste, the entire mixed water shall be treated by the concern authority.

Duty of manufacturers or brand owners of disposable products and sanitary napkins and diapers.-

(1) All manufacturers of disposable products such as tin, glass, plastics packaging, etc., or brand owners who introduce such products in the market shall provide necessary financial assistance to local authorities for establishment of waste management system.

(2) All such brand owners who sell or market their products in such packaging material which are non-biodegradable shall put in place a system to collect back the packaging waste generated due to their production.

(3) Manufacturers or brand owners or marketing companies of sanitary napkins and diapers shall explore the possibility of using all recyclable materials in their products or they shall provide a pouch or wrapper for disposal of each napkin or diapers along with the packet of their sanitary products.

(4) All such manufacturers, brand owners or marketing companies shall educate the masses for wrapping and disposal of their products.

106. The site has to be cleared under the following aspects:

- A change of land use as stipulated under the provisions of the West Bengal Town and Country (Planning and Development) Act, 1979 through (i) either the concerned development authority, in place, or (ii) the Directorate of Town & Country Planning, as the case may be. Such change of use must be accompanied by the due process of (i) stating the intent of changing use, (ii) statement of implications, (iii) inviting comments, objections and suggestions, and (iv) disposal of the comments, objections and suggestions.
- In-principle clearance from the State Environmental Impact Assessment Authority as regards the site;
- No-objection statements obtained from (i) water resources, (ii) land reforms and resources, (iii) public health engineering, (iv) Directorate General of Civil Aviation, (v) Revenue
- Clearance from State Pollution Control Board after determination of nature of development of the site.

107. The issue of leachate in designated landfill sites may be treated as follows:

- Gravity drainage and grading of the floor of the landfill cell to fall into a sump, located at the lowest point of the cell. The gradients shall be two per cent for main drainage with one per cent cross-fall.
- Installation of leachate drainage blanket above the basal mineral liner over the floor of each cell and partially up the side

walls, constructed of free drainage coarse granular fill comprising of graded 50 mm crushed rock laid to a depth of 400mm with a permeability of 1 x 10-4 cm/sec.

- Inclusion of perforated HDPE pipes in the drainage blanket to facilitated leachate flow with pipes laid on a typical spacing of 50m.
- Overlaying granular drainage blanket with 100m thick free draining fine granular fills of medium to coarse sand to act as a filter and protective layer.
- Removal of leachate is effected by leachate collection chambers built up with successive lifts of waste and side slope risers located on the site perimeter.
- The submersible pumps or adductor pumps should be used to remove leachate from the sumps and the collection chambers should be linked by permanent pipe work to the treatment plant.
- The precise methods and degree of treatment shall accommodate the fluctuations in leachate generation.

108. By the time the area is designated suitable for urbanisation, the landfill site should have reached closure. The compost plant can however continue to run, or be reclaimed for urban uses. Unlike the landfill site, land used for the compost plant need not be left less developed or open.

109. Land for development of composting plant and sanitary landfill site has traditionally been arranged jointly by the State Government and municipality. After the municipality identifies the site, the costs of the same are shared in the ratio of 50:50 between the State Government and the concerned municipality. In the case of a cluster project, the costs shall be shared such that 50 per cent of the cost of the site is borne by the State Government, while the remaining 50 per cent is borne by all participating municipalities in proportion to their share in the overall waste generated and reaching the site.

A6. Integrated Municipal Solid Waste Management Projects

A6.1 Proposed action plan

110. State Government has decided to Beautify the Dumping Grounds, by way of constructing boundary wall, view barrier, land scaping, plantation and energy efficient lighting.

111. State Government has decided to prepare the Integrated Municipal Solid Waste Management Projects of the ULBs at first where sufficient owned land is available for Processing Plant and Landfill site. The District Administration and the remaining ULBs shall identify land from vested land so that it can be allotted for SWM Project. The ULBs not being able to identify the vested land, shall identify land for purchase and for this State Government will provide some financial support.

A7. Management

A7.1 Proposed action plan

112. Management of MSWM will be as follows:

- State Level Advisory Committee shall take periodic review of the status of SWM of the ULBs and shall provide necessary guidance to the State Government for necessary action.
- State Urban Development Agency under UD & MA Department, Government of West Bengal shall act as the Nodal Agency for Municipal Solid Waste Management and shall provide fund to the ULBs as per directive of State Government. SUDA shall also monitor the same from State Level.
- Municipal Engineering Directorate and the Development Authorities shall provide technical support to the ULBs except Kolkata MC who have their own technical wing for this.

- ULB shall undergo all the activities of MSWM including Mass Awareness Campaign under the supervision of District Administration and the SDO Office.
- ULB may engage private entity like Self Help Groups/other active groups alongwith the existing conservancy staff for ensuring 100% door to door collection alongwith segregation at source.
- At Secondary transfer station, ULB should engage the ragpickers and similar kind of groups for segregation and selling of recyclable wastes.
- For installation and operation of Processing plants, ULB may engage Private entity.

113. The ULB may engage private entity for full or part of work, who should have the following mandates:
    - Conduct detailed technical, economic and financial feasibility of solid waste management projects, whether on stand-alone or on cluster basis; in each case it will define a service area and scope.
    - Create specific special purpose vehicles (incorporated) or strategic business units (unincorporated) for managing waste, either on its own or through one or more private parties.
    - Enter into an arrangement with one or more of its shareholders as regards establishing a handling fee per tonne of municipal solid waste, which can vary across municipal bodies. Such an arrangement may be entered into by direct negotiation and not by competition.
    - Entering into an arrangement with a private entity selected competitively for carrying out door to door collection, segregation, sorting, transport, treatment and disposal or any part(s) thereof, quoting a common handling (or tipping) fee for every metric tonne of waste processed, even in the case of a cluster.

      [Note: In a cluster approach, this will mean that while the entity created jointly by municipalities as above can levy different handling rates per MT of waste from each participating municipality within the cluster, it will seek a common, blended handling rate from any private party appointed for such purpose.]

      [It may be further noted that in a cluster, or even in a stand-alone project, the entity may enter into separate back-to-back contractual arrangements with different parties for door to door collection (e.g. with a cooperative society formed out of self-help groups, a separate vendor for transport, treatment and disposal of compostable and inert waste, and separate vendors for handling and management of specialised and non-standard waste. Since this entity is not limited to any geographical restriction such as specific municipalities, its arrangements can also span non-urban areas as regards arrangements for sale of compost, chicken feed (from rendering plant), or energy from waste to energy/ co-generation components.]

114. The following concession(s) may be granted to the entity:
    - Use of land in possession of or vested with the municipalities for waste processing, composting and/or landfill, including allowing one or more private parties to carry out operations from such site against lease or right to use.
    - Levy of a handling fee per MT of waste from each participating municipality in a cluster, or from individual municipalities in case of stand-alone projects; such fee may also include a portion of its own administrative costs.

- Access to any escrow account that may be set up by municipalities with or without the participation of the State Government in order to facilitate or service payment of such handling fees.
- Claim a portion of royalty accrued to participating municipalities on account of use of waste for preparation of compost, use as fuel for energy or bricks and filler material.
- Claim a percentage of CER (Carbon Emission Reduction) credits if any accrued on account of any practice carried out by the site

  [For CER benefits, municipal body to be primary registrant; CER benefits will be shared in the ratio of 40:60, where 40 per cent will accrue to the municipalities, the remaining 60 per cent to be divided equally between the entity and the private operator engaged in disposal operations.]

115. Private sector participation may be considered for the following modules, which may be taken up one or more at a time:

TABLE : Nature of private sector participation

Module	Nature of private entity and obligation	Concession granted
Door to door collections	self-help groups/other active groups prevailing in the area. Obligations include: - Door to door collection of waste from households, markets and commercial establishments - Street sweeping - Primary collection of non-standard waste - Segregation at source or first point of collection - Allowing rag-pickers to pick away recyclable waste - Agglomerate and provide contractors with C&D waste Appointed on nomination basis, costs to be determined based on negotiations between municipal body, common utility and society.	50 per cent of costs to be borne out of sanitation fund established by municipal body within whose area they operate 50 per cent of costs to be recovered from users Space, license and other facilitation to conduct community level services such as ironing, washing, food stalls
Transport	Private entity of any manner (body corporate). Obligations include: - Covering, collection and compaction of waste from secondary collection points/ transfer stations - Transport to disposal site Relinquishing of all rolling stock (less manpower and consumables) to the concessioning party at zero value.	Tipping fee for every tonne of waste that is transported to the mouth of the site (first weigh-bridge located at the entrance of the overall treatment and disposal site)

Module	Nature of private entity and obligation	Concession granted
Treatment and disposal	Private entity of any manner (body corporate). Obligations include: - Establishment of composting plant - Establishment of Waste to Energy Plant (Electricity/Bio Gas/Fuel) - Establishment of plants for recycling of other forms of waste (e.g. eco-bricks made from inert material) - Development of landfill site and dumping of residual waste Relinquishing of all plant, equipment and land at the end of the period of concession at zero value.	Included in tipping fee above; however, certain penal clauses would follow, such as: - Amount to be deducted for every MT of waste that is tipped in excess of 50% (or prevailing percentage at such time) into the landfill site (to be measured at second weighbridge located at the mouth of the sanitary landfill site) In addition, following revenue concessions will also be available to such party: - 70% of the sale revenue from recycled material - 30% of earnings from CER units (see para 89, point e) - Lease rights of land for leveraging of operating capital from financing institutions and/or banks
Information, Education and Communication	Separate professional services agency to be hired: - Development of communications, advertising, media and behavioural change communication strategy for various stakeholders - ICT enabled devices designing - Production of media products - Periodic review of campaign effectiveness and redesigning of strategy	Monthly/ quarterly retainer fee plus reimbursement of approved costs of produced media and broadcast airtime.

A8. Duties & Responsibilities of Different Stakeholders as per SWM Rules 2016

116. Duties of waste generators.- (1) Every waste generator shall,-

(a) segregate and store the waste generated by them in three separate streams namely bio-degradable, non biodegradable and domestic hazardous wastes in suitable bins and handover segregated wastes to authorised waste pickers or waste collectors as per the direction or notification by the local authorities from time to time;

(b) wrap securely the used sanitary waste like diapers, sanitary pads etc., in the pouches provided by the manufacturers or brand owners of these products or in a suitable wrapping material as instructed by the local authorities and shall place the same in the bin meant for dry waste or non-bio-degradable waste;

(c) store separately construction and demolition waste, as and when generated, in his own premises and shall dispose off as per the Construction and Demolition Waste Management Rules, 2016; and

(d) store horticulture waste and garden waste generated from his premises separately in his own premises and dispose of as per the

directions of the local body from time to time.

(2) No waste generator shall throw, burn or burry the solid waste generated by him, on streets, open public spaces outside his premises or in the drain or water bodies.

(3) All waste generators shall pay such user fee for solid waste management, as specified in the bye-laws of the local bodies.

(4) No person shall organise an event or gathering of more than one hundred persons at any unlicensed place without intimating the local body, at least three working days in advance and such person or the organiser of such event shall ensure segregation of waste at source and handing over of segregated waste to waste collector or agency as specified by the local body.

(5) Every street vendor shall keep suitable containers for storage of waste generated during the course of his activity such as food waste, disposable plates, cups, cans, wrappers, coconut shells, leftover food, vegetables, fruits, etc., and shall deposit such waste at waste storage depot or container or vehicle as notified by the local body.

(6) All resident welfare and market associations shall, within one year from the date of notification of these rules and in partnership with the local body ensure segregation of waste at source by the generators as prescribed in these rules, facilitate collection of segregated waste in separate streams, handover recyclable material to either the authorised waste pickers or the authorised recyclers. The bio-degradable waste shall be processed, treated and disposed off through composting or bio-methanation within the premises as far as possible. The residual waste shall be given to the waste collectors or agency as directed by the local body.

(7) All gated communities and institutions with more than 5,000 sqm area shall, within one year from the date of notification of these rules and in partnership with the local body, ensure segregation of waste at source by the generators as prescribed in these rules, facilitate collection of segregated waste in separate streams, handover recyclable material to either the authorised waste pickers or the authorizsd recyclers. The bio-degradable waste shall be processed, treated and disposed off through composting or bio-methanation within the premises as far as possible. The residual waste shall be given to the waste collectors or agency as directed by the local body.

(8) All hotels and restaurants shall, within one year from the date of notification of these rules and in partnership with the local body ensure segregation of waste at source as prescribed in these rules, facilitate collection of segregated waste in separate streams, handover recyclable material to either the authorised waste pickers or the authorised recyclers. The bio-degradable waste shall be processed, treated and disposed off through composting or bio-methanation within the premises as far as possible. The residual waste shall be given to the waste collectors or agency as directed by the local body.

117. Duties of the Secretary-in-charge, Urban Development in the States and Union territories.-

The Secretary, Urban Development and Municipal Affairs Department in the State through the Commissioner or Executive Officers of Municipal Corporations/ Municipalities shall,-

(a) prepare a state policy and solid waste management strategy for the state or the union territory in consultation with stakeholders including representative of waste pickers, self help group and similar groups working in the field of waste management consistent with these rules, national policy on solid waste management and national urban sanitation policy of the ministry of urban development, in a period not later than one year from the date of notification of these rules;

(b) while preparing State policy and strategy on solid waste management, lay emphasis on waste reduction, reuse, recycling, recovery and optimum utilisation of various components of solid waste to ensure minimisation of waste going to the landfill and minimise impact of solid waste on human health and environment;

(c) State policies and strategies should acknowledge the primary role played by the informal sector of waste pickers, waste collectors and recycling industry in reducing waste and provide broad guidelines regarding integration of waste picker or informal waste collectors in the waste management system.

(d) Ensure implementation of provisions of these rules by all local authorities;

(e) direct the town planning department of the State to ensure that master plan of every city in the State for setting up of solid waste processing and disposal facilities except for the cities who are members of common waste processing facility or regional sanitary landfill for a group of cities; and

(f) ensure identification and allocation of suitable land to the local bodies within one year for setting up of processing and disposal facilities for solid wastes and incorporate them in the master plans (land use plan) of the State or as the case may be, cities through metropolitan and district planning committees or town and country planning department;

(g) direct the town planning department of the State and local bodies to ensure that a separate space for segregation, storage, decentralised processing of solid waste is demarcated in the development plan for group housing or commercial, institutional or any other non-residential complex exceeding 200 dwelling or having a plot area exceeding 5,000 square meters;

(h) direct the developers of Special Economic Zone, Industrial Estate, Industrial Park to earmark at least five percent of the total area of the plot or minimum five plots or sheds for recovery and recycling facility.

(i) facilitate establishment of common regional sanitary land fill for a group of cities and towns falling within a distance of 50 km (or more) from the regional facility on a cost sharing basis and ensure professional management of such sanitary landfills;

(j) arrange for capacity building of local bodies in managing solid waste, segregation and transportation or processing of such waste at source;

(k) notify buffer zone for the solid waste processing and disposal facilities of more than five tons per day in consultation with the State Pollution Control Board; and

(l) start a scheme on registration of waste pickers and waste dealers.

118. Duties of District Magistrate or District Collector or Commissioner.- The District Magistrate or District Collector or as the case may be , the Commissioner shall, -

(a) facilitate identification and allocation of suitable land for setting up solid waste processing and disposal facilities to local authorities in his district in close coordination with the Secretary of UD & MA Department within one year from the date of notification of these strategy;

(b) review the performance of local bodies, at least once in a quarter on waste segregation, processing, treatment and disposal and take corrective measures in consultation with the Commissioner /Municipal Administration and Secretary of the UD & MA Development.

119. Duties and responsibilities of Urban Local Bodies shall,-

(a) prepare a solid waste management plan as per state policy and strategy on solid waste management and abiding by the Solid Waste Management Rules 2016, Plastic Waste Management Rules 2016, e-waste (Management) Rules, 2016, Bio-Medical Waste Management Rules,2016, Construction and Demolition Waste Management Rules, 2016 and Hazardous and Other Wastes (Management and Transboundary Movement)

Rules, 2016 within six months from the date of notification of state policy and strategy and submit a copy to respective departments of State Government ;

(b) arrange for door to door collection of segregated 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, housing complexes, etc., this may be collected from the entry gate or any other designated location;

(c) establish a system to recognise organisations of waste pickers or informal waste collectors and promote and 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;

(d) facilitate formation of Self Help Groups, provide identity cards and thereafter encourage integration in solid waste management including door to door collection of waste;

(e) frame bye-laws incorporating the provisions of this strategy within one year from the date of notification of this strategy and ensure timely implementation;

(f) prescribe from time to time user fee as deemed appropriate and collect the fee from the waste generators on its own or through authorised agency;

(g) direct waste generators not to litter i.e throw or dispose of any waste such as paper, water bottles, liquor bottles, soft drink canes, tetra packs, fruit peel, wrappers, etc., or burn or burry waste on streets, open public spaces, drains, waste bodies and to segregate the waste at source as prescribed under this strategy and hand over the segregated waste to the waste pickers or waste collectors authorised by the local body;

(h) setup 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 from the waste and provide easy access to waste pickers and recyclers for collection of segregated recyclable waste such as paper, plastic, metal, glass, textile from the source of generation or from material recovery facilities; Bins for storage of bio-degradable wastes shall be painted green, those for storage of recyclable wastes shall be printed white and those for storage of other wastes shall be printed black;

(i) establish waste deposition centres for domestic hazardous waste and give direction for waste generators to deposit domestic hazardous wastes at this centre for its safe disposal. Such facility shall be established in a city or town in a manner that one centre is set up for the area of twenty square kilometers or part thereof and notify the timings of receiving domestic hazardous waste at such centres;

(j) ensure safe storage and transportation of the domestic hazardous waste to the hazardous waste disposal facility or as may be directed by the State Pollution Control Board or the Pollution Control Committee;

(k) direct street sweepers not to burn tree leaves collected from street sweeping and store them separately and handover to the waste collectors or agency authorised by local body;

(l) provide training on solid waste management to waste-pickers and waste collectors;

(m) 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 locations in the markets or in the vicinity of markets ensuring hygienic conditions;

(n) collect separately waste from sweeping of streets, lanes and by-lanes daily, or on alternate days or twice a week depending on the density of population, commercial activity and local situation;

(o) set up covered secondary storage facility for temporary storage of street sweepings and silt removed from surface drains in cases where direct collection of such waste into transport vehicles is not convenient. Waste so collected shall be collected and disposed of at regular intervals as decided by the local body;

(p) collect horticulture, parks and garden waste separately and process in the parks and gardens, as far as possible;

(q) transport segregated bio-degradable waste to the processing facilities like compost plant, bio-methanation plant or any such facility. Preference shall be given for on site processing of such waste;

(r) transport non-bio-degradable waste to the respective processing facility or material recovery facilities or secondary storage facility;

(s) transport construction and demolition waste as per the provisions of the Construction and Demolition Waste management Rules, 2016;

(t) involve communities in waste management and promotion of home composting, bio-gas generation, decentralised processing of waste at community level subject to control of odour and maintenance of hygienic conditions around the facility;

(u) phase out the use of chemical fertilizer in two years and use compost in all parks, gardens maintained by the local body and wherever possible in other places under its jurisdiction. Incentives may be provided to recycling initiatives by informal waste recycling sector.

(v) facilitate construction, operation and maintenance of 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 solid waste adopting suitable technology including the following technologies and adhering to the guidelines issued by the Ministry of Urban Development from time to time and standards prescribed by the Central Pollution Control Board. Preference shall be given to decentralised processing to minimize transportation cost and environmental impacts such as- a) bio-methanation, microbial composting, vermi-composting, anaerobic digestion or any other appropriate processing for bio-stabilisation of biodegradable wastes; b) waste to energy processes including refused derived fuel for combustible fraction of waste or supply as feedstock to solid waste based power plants or cement kilns;

(w) undertake on their own or through any other agency construction, operation and maintenance of sanitary landfill and associated infrastructure as per guidance prescribed in this strategy for disposal of residual wastes in a manner prescribed hereunder.;

(x) make adequate provision of funds for capital investments as well as operation and maintenance of solid waste management services in the annual budget ensuring that funds for discretionary functions of the local body have been allocated only after meeting the requirement of necessary funds for solid waste management and other obligatory functions of the local body ;

(y) make an application in Form-I of Solid Waste Management Rules 2016 for grant of authorisation for setting up waste processing, treatment or disposal facility, if the volume of waste is exceeding five metric tones per day including sanitary landfills from the State Pollution Control Board;

(z) submit application for renewal of authorisation at least sixty days before the expiry of the validity of authorisation;

(za) prepare and submit annual report in Form IV of Solid Waste Management Rules 2016 on or before the 30th April of the succeeding year to the UD & MA Department.;

(zb) the annual report shall then be sent to the State Pollution Control Board by the 31st May of every year;

(zc) educate workers including contract workers and supervisors for door to door collection of segregated waste and transporting the

unmixed waste during primary and secondary transportation to processing or disposal facility;

(zd) ensure that the operator of a facility provides personal protection equipment including uniform, fluorescent jacket, hand gloves, raincoats, appropriate foot wear and masks to all workers handling solid waste and the same are used by the workforce;

(ze) ensure that provisions for setting up of centers for collection, segregation and storage of segregated wastes, are incorporated in building plan while granting approval of building plan of a group housing society or market complex; and

(zf) frame bye-laws and prescribe criteria for levying of spot fine for persons who litters or fails to comply with the provisions of this strategy, and

(zg) develop ICT enabled services for the citizen and create public awareness through information, education and communication campaign and educate the waste generators on the following; namely:-

(i) not to litter;

(ii) minimise generation of waste;

(iii) reuse the waste to the extent possible;

(iv) practice segregation of waste into bio-degradable, non-biodegradable (recyclable and combustible), sanitary waste and domestic hazardous wastes at source;

(v) practice home composting, vermi-composting, bio-gas generation or community level composting;

(vi) wrap securely used sanitary waste as and when generated in the pouches provided by the brand owners or a suitable wrapping as prescribed by the local body and place the same in the bin meant for nonbiodegradable waste;

(vii) storage of segregated waste at source in different bins;

(viii) handover segregated waste to waste pickers, waste collectors, recyclers or waste collection agencies; and

(ix) pay monthly user fee or charges to waste collectors or local bodies or any other person authorised by the local body for sustainability of solid waste management.

(zh) stop land filling or dumping of mixed waste soon after the timeline as specified in rule 23 for setting up and operationalisation of sanitary landfill is over;

(zi) allow 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 to go to sanitary landfill and the sanitary landfill sites shall meet the specifications as given in this strategy paper, however, every effort shall be made to recycle or reuse the rejects to achieve the desired objective of zero waste going to landfill;

(zj) investigate and analyse all old open dumpsites and existing operational dumpsites for their potential of biomining and bio-remediation and wheresoever feasible, take necessary actions to bio-mine or bio-remediate the sites;

(zk) in absence of the potential of bio-mining and bio-remediation of dumpsite, it shall be scientifically capped as per landfill capping norms to prevent further damage to the environment.

120. Criteria and actions to be taken for SWM in Hilly area:-

In the hilly areas, the duties and responsibilities of the local authorities shall be the same as mentioned in 111.A above with additional clauses as under:

(a) Construction of landfill on the hill shall be avoided. A transfer station at a suitable enclosed location shall be setup to collect residual waste from the processing facility and inert waste. A suitable land shall be identified in the plain areas down the hill within 25 kilometers for setting up sanitary landfill. The residual waste from the transfer station shall be disposed of at this sanitary landfill.

(b) In case of non-availability of such land, efforts shall be made to set up regional sanitary landfill for the inert and residual waste.

(c) Local body shall frame Bye-laws and prohibit citizen from littering wastes on the streets and give strict direction to the tourists not to dispose any waste such as paper, water bottles, liquor bottles, soft drink canes, tetra packs, any other plastic or paper waste on the streets or down the hills and instead direct to deposit such waste in the litter bins that shall be placed by the local body at all tourist destinations.

(d) Local body shall arrange to convey the provisions of solid waste management under the bye-laws to all tourists visiting the hilly areas at the entry point in the town as well as through the hotels, guest houses or like where they stay and by putting suitable hoardings at tourist destinations.

(e) Local body may levy solid waste management charge from the tourist at the entry point to make the solid waste management services sustainable.

(f) The District Magistrate & Urban Local Bodies shall identify land and District Magistrate shall allot suitable space on the hills for setting up decentralised waste processing facilities. Local body shall set up such facilities. Step garden system may be adopted for optimum utilisation of hill space.

121. Timeframe for implementation of this Policy & Strategy:-

Necessary infrastructure for implementation of these strategies shall be created by the local bodies and other concerned authorities, as the case may be, on their own, by directly or engaging agencies within the time frame specified below:

Sl. No.	Activity	Time limit from the date of notification of this strategy
1	identification of suitable sites for setting up solid waste processing facilities	1 year
2	identification of suitable sites for setting up common regional sanitary landfill facilities for suitable clusters of local authorities under 0.5 million population and for setting up common regional sanitary landfill facilities or stand alone sanitary landfill facilities by all local authorities having a population of 0.5 million or more.	1 year
3	procurement of suitable sites for setting up solid waste processing facility and sanitary landfill facilities	2 years
4	enforcing waste generators to practice segregation of bio degradable, recyclable, combustible, sanitary waste domestic hazardous and inert solid wastes at source ,	2 years
5	Ensure door to door collection of segregated waste and its transportation in covered vehicles to processing or disposal facilities.	2 years
6	ensure separate storage, collection and transportation of construction and demolition wastes	2 years
7	setting up solid waste processing facilities	2 years
8	setting up common or stand alone sanitary landfills by or for all local bodies for the disposal of only such residual wastes from the processing facilities as well as untreatable inert wastes as permitted under this strategy paper	3 years
9	setting up common or regional sanitary landfills by all local bodies for the disposal of permitted waste under this strategy	3 years
10	bio-remediation or capping of old and abandoned dump sites	5 years

122. Duties of State Pollution Control Board or Pollution Control Committee.-

(1) The State Pollution Control Board or Pollution Control Committee shall,-

(a) enforce these rules in their State through local bodies in their respective jurisdiction and review implementation of these strategies at least twice a year in close coordination with UD & MA Department and District Magistrate;

(b) monitor environmental standards and adherence to conditions as specified under the Schedule I and Schedule II of Solid Waste Management Rules 2016 for waste processing and disposal sites;

(c) examine the proposal for authorisation and make such inquiries as deemed fit, after the receipt of the application for the same in Form I of Solid Waste Management Rules 2016 from the local body or any other agency authorised by the local body;

(d) while examining the proposal for authorisation, the requirement of consents under respective enactments and views of other agencies like the State Urban Development and Municipal Affairs Department, the Town and Country Planning Department, District Planning Committee or Metropolitan Area Planning Committee, as may be applicable, Airport or Airbase Authority, the Ground Water Board, Railways, power distribution companies, highway department and other relevant agencies shall be taken into consideration and they shall be given four weeks time to give their views, if any;

(e) issue authorisation within a period of sixty days in Form II of Solid Waste Management Rules 2016 to the local body or an operator of a facility or any other agency authorised by local body stipulating compliance criteria and environmental standards as specified in Schedules I and II of Solid Waste Management Rules 2016 including other conditions, as may be necessary;

(f) synchronise the validity of said authorisation with the validity of the consents;

(g) suspend or cancel the authorization issued under clause (a) above, any time, if the local body or operator of the facility fails to operate the facility as per the conditions stipulated: provided that no such authorization shall be suspended or cancelled without giving notice to the local body or operator, as the case may be; and

(h) on receipt of application for renewal, renew the authorisation for next five years, after examining every application on merit and subject to the condition that the operator of the facility has fulfilled all the provisions of the rules, standards or conditions specified in the authorisation, consents or environment clearance.

(2) The State Pollution Control Board or Pollution Control Committee shall, after giving reasonable opportunity of being heard to the applicant and for reasons thereof to be recorded in writing, refuse to grant or renew an authorisation.

(3) In case of new technologies, where no standards have been prescribed by the Central Pollution Control Board, State Pollution Control Board shall approach Central Pollution Control Board for getting standards specified.

(4) The State Pollution Control Board shall monitor the compliance of the standards as prescribed or laid down and treatment technology as approved and the conditions stipulated in the authorisation and the standards specified in Schedules I and II of Solid Waste Management Rules 2016 as and when deemed appropriate but not less than once in a year.

(5) The State Pollution Control Board may give directions to local bodies for safe handling and disposal of domestic hazardous waste deposited by the waste generators at hazardous waste deposition facilities.

(6) The State Pollution Control Board shall regulate Inter-State movement of waste.

123. Duty of manufacturers or brand owners of disposable products and sanitary napkins and diapers.-

(1) All manufacturers of disposable products such as tin, glass, plastics packaging, etc., or brand owners who introduce such products in the market shall provide necessary financial assistance to local authorities for establishment of waste management system.

(2) All such brand owners who sell or market their products in such packaging material which are non-biodegradable shall put in place a system to collect back the packaging waste generated due to their production.

(3) Manufacturers or brand owners or marketing companies of sanitary napkins and diapers shall explore the possibility of using all recyclable materials in their products or they shall provide a pouch or wrapper for disposal of each napkin or diapers along with the packet of their sanitary products.

(4) All such manufacturers, brand owners or marketing companies shall educate the masses for wrapping and disposal of their products.

124. Duties of the industrial units located within one hundred km from the refused derived fuel and waste to energy plants based on solid waste-

All industrial units using fuel and located within one hundred km from a solid waste based refused derived fuel plant shall make arrangements within six months from the date of notification of these rules to replace at least five percent of their fuel requirement by refused derived fuel so produced.

125. Criteria for Duties regarding setting-up solid waste processing and treatment facility.-

(1) The District Magistrate and Land & Land Reforms Department shall be responsible for providing suitable land for setting up of the solid waste processing and treatment facilities and notify such sites by the State Government .

(2) The operator of the facility shall design and set up the facility as per the technical guidelines issued by the Central Pollution Control Board in this regard from time to time and the manual on solid waste management prepared by the Ministry of Urban Development.

126. Reporting:

(1) The operator of facility shall submit the annual report to the local body in Form-III of Solid Waste Management Rules 2016 on or before the 30th day of April every year.

(2) The local body shall submit its annual report in Form-IV of Solid Waste Management Rules 2016 to State Pollution Control Board and the Secretary of the Department of Urban Development and Municipal Affairs on or before the 30th day of June every year

(3) Each State Pollution Control Board or Pollution Control Committee as the case may be, shall prepare and submit the consolidated annual report to the Central Pollution Control Board and Ministry of Urban Development on the implementation of these rules and action taken against non complying local body by the 31stday of July of each year in Form-V of Solid Waste Management Rules 2016.

(4) The Central Pollution Control Board shall prepare a consolidated annual review report on the status of implementation of these rules by local bodies in the country and forward the same to the Ministry of Urban Development and Ministry of Environment, Forest and Climate Change, along with its recommendations before the 31stday of August each year.

(5) The annual report shall be reviewed by the Ministry of Environment, Forest and Climate Change during the meeting of Central Monitoring Committee.

Accident reporting-

In case of an accident at any solid waste processing or treatment or disposal facility or landfill site, the Officer- in- charge of the facility shall report to the local body in Form-VI of Solid Waste

Management Rules 2016 and the local body shall review and issue instructions if any, to the in- charge of the facility.

A9. Financing of the plan

A9.1 Proposed action plan

127. Largely, on account of the ambiguity in terms of actual costs incurred by municipalities in handling one MT of waste, it is proposed to pay a handling (or tipping fee) per tonne of waste handled to service providers. The base rate of the tipping fee will be determined through competitive bidding. While the entity may negotiate a separate handling (or tipping fee) per tonne of waste for each municipality participating in a cluster, a vendor selected for transport, treatment and disposal will quote a single fee per MT of waste for the entire cluster.

128. While capital funding may be available from State and Central sector schemes such as SBM/MNB, municipalities may be expected to factor the addition of a sanitation charge in the prevailing property taxation rates, with a variable surcharge based on the use of the property. Certain uses of property would be levied greater sanitation charge especially in commercial establishment.

129. The collected charge may be placed into a municipal sanitation fund, about 70 per cent of which will be placed in an escrow account, which may be at the disposal of private entity. Tipping fees may be paid from this escrow account.

130. By default, tipping fees will escalate by 15 per cent every two years to account for changes in fuel & establishment costs that is to be borne by the private party.

131. Status of detailed project report and its implementation is placed below:

TABLE: Status of detailed project reports in solid waste management

Sl No.	Name of ULB	Project Mode	Processing Plant	Project Status
1	Dum Dum	Cluster	Waste to Compost & Bio Gas	Initiated
2	North Dum Dum			
3	South Dum Dum			
4	Baranagar			
5	Ashoknagar-Kalyangarh	Cluster	Waste to Bio Gas	Initiated
6	Habra			
7	Jalpaiguri	Standalone	Waste to Bio Gas	Initiated
8	Krishnanagar	Standalone	Waste to Bio Gas	Initiated
9	Santipur	Standalone	Waste to Bio Gas	Initiated
10	Nabadwip	Standalone	Waste to Bio Gas	Initiated
11	Bahatpara	Standalone	Waste to Compost	Initiated
12	Naihati	Standalone	Waste to Compost	Initiated
13	Kolkata MC	Standalone	Waste to Compost	Initiated
14	Asansol MC	Standalone	No Processing	Initiated
15	Kalimpong	Standalone	Waste to Bio Gas	Initiated
16	Darjeeling	Standalone	Waste to Bio Gas	Initiated

The DPRs of Panihati, Purulia, Bankur, Englishbazar, Coochbehar, Raghunathpur and Kanchrapara are under preparation

132. The revenues are estimated as follows:

- Revenues from populace in the form of conservancy service charge estimated at Rs.0.50 per capita per day
- Heavy waste generators such as hotels, commercial establishments etc.: 20 per cent of the conservancy charge collected from households
- Viability gap from Government of India (under Swachh Bharat): 35 per cent of capital costs
- Viability gap from State Government (under Swachh Bharat): 12 per cent of capital costs

133. Municipalities need to enhance their door to door collection charges between 15% to 18% every two years in order to ensure breakeven. However, assuming that is not possible, then the following steps need to be taken:

- Reduce the amount of waste being entered for levy of tipping fee, which would imply that progressively, the amount of waste going to the landfill site must reduce by at least 15 per cent every year.
- Strengthening and organising segregation at source - particularly for plastics and other recyclables at 10% will ensure that there are fewer trips taken to the sorting/ treatment facility and landfill site, reducing the year on year impact of increasing fuel costs. The sale of recyclable material itself should yield some degree of returns on the project.
- Land may be leased in the manner instead of outright purchase, allowing some degree of revenue to be earned even after the landfill site reaches closure.
- Decreasing manpower to handle waste (except for last mile collection), and using tipper(s) instead. As and how municipal staff engaged as waste collectors retire, the posts may be abolished, allowing monies to be saved.
- Reach an agreement with West Bengal Marketing Board (as set up under the provisions of the Agriculture Agricultural Produce Marketing (Regulation) Act, 1972 for bulk purchase of compost. This agreement can also be carried out by the ULB/SUDA. For smaller municipalities, treated waste from organic waste converters may be sold directly to farmers in the hinterland.

B. Time Frame for implementation

134. The integrated solid waste management system for all of the municipalities have been started from 1st April, 2015 and will continue upto October, 2019 in 1st phase. The target for establishing the system in all the 125 ULBs is March 2025.

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