

Suggestive/Indicative

# “Action Plan for Management of Municipal Solid Waste”

[In compliance with Hon'ble National  
Green Tribunal Order Dated 5<sup>th</sup>  
February, 2015 in the Matter of OA No.  
199 of 2014, Almitra H. Patel &Anr. Vs  
Union of India &Ors.]



**CENTRAL POLLUTION CONTROL BOARD**

(Ministry of Environment, Forests and Climate Change)  
PARIVESH BHAWAN, EAST ARJUN NAGAR, SHAHDARA

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# THE NATIONAL ACTION PLAN FOR MSW MANAGEMENT

## 1.0 INTRODUCTION

It is a fact that cities and towns are littered with garbage (MSW) and present an ugly look at many places in the city / town. In most of the towns/cities, only important locations are maintained leaving many other places chocking with uncollected waste. The collected waste is disposed on un-attended land-fills and it is a long-way before the entire waste collected by a city or town is processed and only remnants disposed in landfill. Infact, remnants classified as “inert / non-recyclable have to be converted into other useable product so to realize the vision and mission of ‘Zero’ land filling.

Drawing of time-targeted action plan for management of MSW by each city and town is utmost essential, otherwise with the increasing quantities of waste and not having required waste processing and disposal facilities will lead to unhealthy environmental conditions.

## 2.0 DIRECTION OF HON'BLE NGT

Hon'ble NGT in OA No 199 of 2014 (Almitra H. Patel Vs Union of India) on 5<sup>th</sup> February, 2015 directed that “The Central Pollution Control Board shall submit its independent comment in relation to formulation of a national policy with regard to collection and disposal of a municipal solid waste as a National policy to be adopted. Let the CPCB also submit such proposal within two weeks from today and put it on their web sites so that other State Board and State Government shall also have advantage of that report and take the same into consideration while submitting status reports / suggestion in accordance with this order”

## 3.0 GENERATION, COMPOSITION AND MANAGEMENT OF MSW

3.1 It has been observed that municipalities do not keep/maintain regular data on waste generation and its composition. Only few references of National Environmental Engineering Research Institute (NEERI) on selected towns

[CPCB's study on 59 cities (2008-09)] and other institutes are available. Presently, no systematic and authentic data on MSW generation at National Level and subsequently at State, District and at city / town level is available. It is to state that quantification of MSW and assessing its composition is a systematic study with laid down procedures as prescribed in the Manual of CPHEEO, MoUD, 2000.

Based on the information collected by CPCB from time-to-time, the reported/estimated waste generation in the country is 1,43,449 tons/day and out of which 32,871 tons/day is reported to be processed. The state-wise waste generation is given in **Annexure – I**.

- 3.2 The characterization of MSW is an important aspect as the composition will determine the applicability of waste processing technology. On an average, garbage is composed of 40-45% of organic fraction and 20-30% inert fraction, rest being plastics, paper, rags and other components. The calorific value of garbage will help to identify the treatment technologies like Waste-to-Energy and other thermal processes.
- 3.3 Status of MSW Management varies from city-to-city. However, overall status is based on approach / strategy adopted by the local bodies. The general observations as applicable throughout the country are summarized as under;
- i. Segregation of MSW at source level particularly at individual resident level is not practiced. If such segregation occurs, it is in restricted words / locality.
  - ii. Bio-medical, slaughter house and other wastes get mixed with MSW at dust bins and finally at landfill sites.
  - iii. Door-to-door collection of waste is not practiced at city/town level. In cities/towns, organized and privately managed societies have segregated waste collection system but, after collection the waste is mixed in nearby community bins.

- iv) In smaller towns / or even in bigger cities, there are certain wards/locations where MSW collection and transportation services are not effective / efficient and as a result, the entire area is littered.
- v) The community bins set up are not maintained and cause public resentment. Stray cattle are attracted by such bins and foul smell make the surrounding areas suffocated.
- vi) The collected waste from bins goes to land-dumping. The dumped waste is mixed in nature. Almost, entire waste collected is dumped and only in selected cities, waste is processed biologically or thermally.
- vii) Landfill sites are not scientifically maintained and these dumps pose potential threat for ground water pollution and are likely cause deterioration of the ambient air quality.
- ix) Local bodies have not developed action plan for their city / town and the requirement are worked-out on day-to-day / Annual basis.

#### **4.0 BASIS OF CPCB FOR DRAFTING NATIONAL PLAN**

CPCB's attempt to draft action plan proposed in this document is based on;

- i) Annual reports received from SPCBs/ PCCs regarding implementation of MSW Rules
- ii) Survey carried out by CPCB for 59 cities (35 metro cities and 24 state capitals) in 2004-05 with NEERI
- iii) State wise interactions with local bodies in coordination with SPCBs/PCCs
- iv) Field visits made of landfill sites and existing waste processing facilities.

## **5.0 REFERENCES USED FOR DRAFTING NATION PLAN**

While drafting the action plan, CPCB has referred following documents and interactive experience and these include;

- i) High powered / Expert committee report (Under Chairmanship of Shri Asim Barman, Municipal commission, Kolkata) 2001. This committee was constituted by Hon'ble Supreme Court in the matter of Almitra H. Patel Vs Union of India on Solid Waste Management.
- ii) Manual on Solid Waste Management proposed by CPHEEO, Ministry of Urban Development, 2000.
- iii) Prof. Kasturirangan Report, 2014 on Waste-to-Energy (Planning Commission).
- iv) Punjab Model-Municipal Solid Waste Management Plan, 2014; with
- v) Order of Hon'ble NGT (OA Nos 40/34/38/36 and MA Nos 1082 & 232 of 2013) dated 25<sup>th</sup> November, 2014.

## **THE NATIONAL PLAN**

### **6.0 ACTION PLAN**

The National Action Plan / Policy is an outline of suggested/indicative strategy which states and UTs may refer. However, each State / UT and individual city/ town will have to draw city/town-specific action plan which has to be prepared in the form of Detailed Project Report (DPR)

The National Plan suggested in this document gives basic objectives and broad framework to derive the needs in-terms of tool and tackles, equipment and suggested technological options.

The National Plan further outlines packages and combinations based on quantum of waste generation, an approach to be adopted and environmental standards to be maintained.

## **7.0 AN APPROACH FOR ACTION PLAN**

The action plan at state level may have following approach;

### **7.1 State / UT Plan;**

Each state will have to assess the local situation and considering the preparedness of local bodies. The state plan would provide advice to local bodies and finalize modalities for setting up of individual or combined waste processing and disposal facilities. This will have to be done based on Regional / Cluster – based approach.

### **7.2 City / Town – level Action Plan**

Each municipal body will prepare action plan after assessing the status of waste generation and its composition. Local body would work-out requirement of tools and equipment to ensure proper; segregation, storage; transportation, processing and disposal of waste. This plan will meet the provisions as per Municipal Solid Wastes (Management and Handling) Rules, 2000.

## **8.0 FORMULATION AND IMPLEMENTATION OF PLAN**

The Action Plan formulation and its implementation can be achieved by dividing under followed Heads;

### **8.1 Intra-city activities**

Each Local Body may at its own level undertake segregation waste storage and transportation. These activities otherwise also are being performed by them. However in each of these activities, participation of voluntary groups, NGOs can be considered and contracting / outsourcing can also be done.

Waste after transportation should go to waste processing and disposal sites which should be developed at appropriate acceptable locations based on environmental clearances as required.

The Waste processing and disposal services can be operated with private sector participation for which proper model agreement can be entered. In this endeavor, state Govt. should facilitate local bodies.

The best suited option is to set up Regional / cluster based common waste processing and disposal facilities.

## **9.0 REGIONAL / CLUSTER-BASED APPROACH FOR COMMON WASTE PROCESSING & DISPOSAL FACILITIES.**

The cluster-based approach adopted by the state of Punjab has been examined. The Govt. of Gujarat has also attempted a similar approach.

### **9.1 The concept.**

The concept of Regional / Cluster-based approach is to discourage setting up of individual based waste processing or disposal facilities as far as possible. If individual local body set up their facilities, it will result in mushrooming of many / innumerable facilities within the state which may be difficult to monitor. However, bigger cities may set up their own facilities to avoid long distance transportation of garbage.

### **9.2 Criteria for Cluster-Regional facility:**

The following criteria may be considered for adopting cluster-based approach for setting Regional / Common waste processing and disposal facilities;

- i) A detailed survey of State / UT with positioning of city / town / village and distance between them.
- ii) Based on local condition, fixing of criteria by the local body to transport the waste for common disposal point without causing public nuisance and traffic hurdles. An indicative distance of say upto 50 km for each local body may be feasible. However smaller local bodies may difficult to arrange transportation on daily basis. For such villages / towns, alternative options can be worked-out.



- iii) An adequate size of land will have to be acquired which should be free from public objection. Common facility should not have settlement atleast 3-5 km from its periphery.
- iv) Common facility perhaps should not be designed for handling waste say less than 3000-5000 tons per day and this will be depending upon number of towns/villages covered and corresponding to waste generation. Common facility should consider giving some value back interms of end-product and also to be sustainable.
- v) Common facility should be 'integrated' with facilities for sorting, compost, RDF and energy plant and followed by inert recycling / re-use. Only a fraction of inert waste should go for land-filling.
- vi) Bigger cities generating more than 1000 tons/day should adopt combination of waste processing technologies which may include; composting, RDF, waste-to-energy (Anaerobic or thermal). Such facilities should meet existing environmental standards and even be designed with latest state-of-the-art technologies to meet stricter norms. However, State Govt. should provide proper incentives so that such plants can be sustained and techno-economically viable.
- vii) Smaller town, say generating <1000 tones, can go for composting, RDF. In further smaller town, where waste generation is less than 100-500 tonnes per day, they can compost and produce RDF and send it to common facility for power generation. Even at District and sub divisional level, centralized RDF / Compost facility can be set up.

### **9.3 How clusters can be formed**

- i) Gujarat Govt. got a study conducted through Bhaskaracharya Institute of Space Application and Geo Centre (BISAG), a State Remote Sensing Agency who surveyed the entire state and after working out travel and environmental criteria, has arrived on 28 clusters which include 159 Nagar Palika, 8 municipal corporation, 4 notified areas and one Urban Development Authority. The common facility for

establishment include; Regional landfills and compost / vermi-compost plants.

- ii) Govt. of Punjab has also evolved 8 clusters to set up common facilities.
- iii) CPCB got a study conducted based on GIS/Remote Sensing for Delhi, Andhra Pradesh and Karnataka on experimental study basis.

Based on the experience of Gujarat and Punjab Model and study of CPCB, each state can work-out clusters for setting up of common facilities. This can be done by each state within 3 months.

It is important to mention that, the common site identified for setting up of common facility should meet environment siting criteria and should be adequate for realistic time-frame.

## **10.0 SUGGESTIVE / INDICATIVE PLAN.**

The proposed action plan for formulation and implementation is based on (i) Quantum of waste generation, (ii) indicative action plan and (iii) suggested/indicative guidelines to proper DPR / Plan of implementation and accordingly estimating cost on accomplishing the targets. The suggested plan is as under;

### **10.1 Theme of action plan**

States and Union territories are required to prepare action plans for cities and towns based on the population and waste generation. Steps/action need to be taken could be indicated in a phased manner.

#### **(i) Action plan for cities generating waste >500 tonnes per day**

- Cities generating solid waste more than 500 t/d are suggested to formulate action plan which may include the following components;

- Modernization/ mechanization of waste storage and transportation facilities;
- Privatization/ contract with 'operators' for collection of waste from various sources and its transportation; and
- Seeking support of Private entrepreneurship in setting up of waste processing and disposal facility.
- The cities with estimated waste generation of more than 500 t/d includes; Ahmedabad, Agra, Bangalore, Bhopal, Chennai, Delhi, Hyderabad, Jaipur, Kanpur, Kolkata, Lucknow, Mumbai, Nagpur, Pune, Surat and other cities.

**(ii) Action Plan for cities generating waste between 100-500 t/day**

- The towns generating waste ranging between 100 and 500 tonnes per day would be required to initiate similar type of actions as suggested above to prepare action plan for improving collection system, storage, transportation, processing and disposal of waste. It may be possible that establishing one single plant for waste processing may be adequate.
- The cities generating waste between 100 and 500 TPD for indication/illustration are given in **Annexure-II**.

**(iii) Action Plan for towns generating waste less than 100 t/d**

- Towns having population more than 50,000 (class II towns) and generating waste between 50 and 100 TPD may not require high-cost waste processing and disposal technologies. Such towns can design proper system for waste collection, storage and transportation considering the local situation. Aerobic composting could be an appropriate option for these towns. Such towns can be the member of Cluster/Regional facility. The towns generating MSW between 50 and 100 TPD are given at **Annexure-III**.

**(iv) Towns having waste generation less than 50 t/d.**

- Majority of towns fall under this category. These towns would need simple technological solutions which could be managed without high skill operations. Main emphasis in such towns should be on proper collection of waste and motivating citizens for segregation of waste. Collected waste could easily be composted and used locally. Such towns located near the Regional facility, should be the part of it.

**11.0 INDICATIVE ACTION-PLAN**

Components to be covered for action plan and indicative guidelines are as under;

	<b>MSW Generation-&gt; (T/day)</b>	<b>&gt;500</b>	<b>100-500</b>	<b>50-100</b>	<b>&lt;50</b>
1	Authorization {4,(2)}, 6(3)	Should apply for authorization and seek from SPCBs/PCCs	Should apply for authorization and seek from SPCBs/PCCs	SPCBs/PCCs to prioritize based on State/ UT-specific requirement	To be perused in a phased manner
2	Collection of Waste	Comply with Schedule- II of the Rules and comply within six months	Comply with Schedule-II of the Rules and comply within six months	Comply with Schedule-II of the Rules within six months	Comply with Schedule-II within a year
3	Segregation of waste	Launch mass awareness programme	Launch mass awareness programme	Launch mass awareness programme	Launch mass awareness programme
4	Storage of Waste	Set up waste storage facilities which would be combination of conventional as well as mechanized system	Set up waste storage facilities which would be combination of conventional as well as mechanised system	Set up waste storage facilities which would be combination of conventional as well as mechanise system	Set up conventional bin system and maintaining them in hygienic manner

5	Transportation of waste	Vehicles used for transportation of waste. Storage facilities should synchronize with transportation system. Strict compliance with Schedule-II to be ensured	Vehicles used for transportation of waste. Storage facilities should synchronize with transportation system. Strict compliance with Schedule-II to be ensured	Vehicles of smaller size and easy to maintain be used	Economic type of vehicles including local means considering hygienic aspect, be preferred.
6	Processing of waste Schedule II & IV	<ul style="list-style-type: none"> <li>• Adopt combination of waste processing technologies, as single technology may not take care of such quantities of waste.</li> <li>• Processing plants should be set up as per Schedule-I</li> </ul>	<ul style="list-style-type: none"> <li>• Adopt combination of waste processing technologies, as single technology may not take care of such quantities of waste.</li> <li>• Processing plants should be set up as per Schedule-I</li> </ul>	Considering technical capabilities of local bodies and garbage quantities upto 100 t/d, aerobic process could be feasible solution with better segregation, bio-gas plants can be set up	Aerobic biological method for stabilization of waste can be a viable solution. Also, Bio-gas plants may come which can cater energy demand.
7	Disposal of waste (Schedule-III)	Rejects of waste processing plants to be disposed off as per Schedule-III of the Rules. In case of mixed waste, landfilling may be continued following specifications laid down in Schedule III of the Rules	Rejects of waste processing plants to be disposed off as per Schedule-III of the Rules. In case of mixed waste, landfilling may be continued following specifications laid down in Schedule III of the Rules	Simpler-easy to operate landfills be preferred	Simpler-easy to operate landfills be preferred

## 12.0 INDICATIVE GUIDELINE FOR FORMULATION OF ACTION PLAN

Activities	Action points	Likely Procedures / Requirements	Time-frame
DPR	Prepare a detailed project report (DPR) management of MSW in accordance with MSW Rules to cover; (i) waste segregation (ii) Collection (iii) Storage (iv) Transportation (v) Proceeding; and (vi) Disposal DPR could be prepared based on the indicative guidelines brought out by CPCB [Annexure-IV]	Municipal Authorities (MA) and State Urban Development Departments (UD)	Six months
Survey/ Assessment	Each local body to undertake assessment of quantity of MSW generation and its composition before identification of processing technology for MSW management	Municipal Authorities (MA) Private operators	Six months (metro cities + State Capitals) 8 months (Class I cities) 12 months (Class II towns + below)
Collection of waste	Making arrangements for collection of waste to cover; <ul style="list-style-type: none"> <li>• House-to-house collection</li> <li>• Slums and squatters</li> <li>• Commercial areas</li> <li>• Industrial areas</li> <li>• Horticultural waste from parks, etc.</li> <li>• Construction and demolition waste</li> <li>• Office complexes</li> <li>• Slaughterhouses, vegetable markets</li> </ul>	By engaging NGOs/ Agencies	9 months
Segregation of waste	- Mass awareness programmes for segregation of waste at; <ul style="list-style-type: none"> <li>• At school level</li> <li>• At residential level</li> <li>• At market/commercial areas</li> </ul> <i>Through :</i> <ul style="list-style-type: none"> <li>• Pamphlet</li> <li>• Interaction</li> <li>• Hoarding/newspaper/ local cable network, direct interaction, etc.</li> </ul> - Door - to - door collection of segregated waste followed by recycling/ utilization by appropriate environment friendly manner.	Through Institutions/ NGOs or Govt Departments.	6 months

Intra-city activities	<ul style="list-style-type: none"> <li>i) Regulation of stray cattle movement</li> <li>ii) Prohibiting burning of garbage, leaves, other waste.</li> <li>iii) Regular street sweepings.</li> <li>iv) Improving street sweeping on wider roads by mechanical means.</li> <li>v) Covering dusty areas/ road sides to prevent flow of dust on roads and / or sweeping of dust causing high levels of dust in ambient air.</li> <li>vi) Setting up of public complaint cell and attending them on urgent basis.</li> <li>vii) Constitution of vigilance squads to; prevent littering of waste, monitoring lifting of garbage on daily basis, maintenance of dust bins, movement of stray cattle, burning of garbage, transportation of waste in covered conditions etc.</li> </ul>	<p>Issuing notification from DM or ULBs</p> <p>-by ULBs or engaging NGOs Agencies</p> <p>By SPCBs/ ULBs</p>	6 months
Storage of waste	<ul style="list-style-type: none"> <li>i) Setting up of bins of appropriate sizes in different localities (residential, commercial, slums/ squatters)</li> <li>ii) Setting up of three bins as per Rules.</li> <li>iii) Provision of litter bins</li> <li>iv) Provisions of containers for horticulture and construction and demolition waste.</li> <li>v) Regular operation and maintenance of waste storage facilities.</li> <li>vi) Provision of bins for weekly markets, marriage halls and other functions.</li> <li>vii) Open sites to be eliminated.</li> </ul>	Procuring tools/tackles, as per DPR.	9 months
Transportation of waste	<ul style="list-style-type: none"> <li>i) Devising transportation system for congested areas.</li> <li>ii) Devising transportation system for slums and squatters</li> <li>iii) Devising transportation system for horticultural and construction and demolition waste.</li> <li>iv) Setting up of workshop facilities for O &amp; M of vehicles.</li> <li>v) Estimating requirement of transportation fleet (optimum requirement)</li> </ul> <p>Assessment of requirement of hand-cards, tricycles and other devices</p>	Procuring transport vehicles as per DPR	18 months

Processing of waste	<ul style="list-style-type: none"> <li>i) Formulation of State level plan/ policy and action plan for setting up of facilities.</li> <li>ii) Drafting terms for seeking private entrepreneurship to set up facilities.</li> <li>iii) Constitution of State level Technology Advisory Group to assist local bodies in evaluation of tenders, selection of technologies, etc.</li> <li>iv) Local bodies to initiate tendering procedures, follow up to set up requisite processing plants. Local bodies to save expenditure on waste processing and disposal by encouraging private entrepreneur to set up such facilities.</li> </ul>	<p>Site selection as per land-use plan of town &amp; country planning Deptt. Or state UDA</p> <p>Incorporating SPCB/ Local Institutions</p> <p>Inviting tender from experienced firms</p>	<p>18 months (other towns)</p> <p>36 months (Class-I cities)</p>
Disposal of waste	<p><b>New sites</b></p> <ul style="list-style-type: none"> <li>i) Identification of probable sites for operating them as waste processing-cum-disposal sites.</li> <li>ii) Identification of sites based on rapid EIA and following the criteria stipulated in the Rules.</li> <li>iii) Setting up of site clearance committee by the State Board/ Committee or State Urban Development Department for advising on suitability of site for waste processing/ disposal.</li> <li>iv) State plan for making arrangements for operation and maintenance of landfill site considering the views of local bodies.</li> </ul> <p><b>Existing site</b></p> <ul style="list-style-type: none"> <li>(i) Improvement in existing sites to include; provision of fencing entry gate, office-cum-record room, building of approach including internal roads, Installation of weigh bridges/ or making alternate arrangements and other provisions as specified under the Rules.</li> <li>ii) Operation of landfills following the provisions (18)-(21) and (22) of the Rules.</li> <li>iii) Provisions for monitoring of pollution (water quality monitoring, ambient air quality monitoring.)</li> <li>iv) Plantation at landfill site Closure of landfill site and post care.</li> </ul>	<p>As per land-use plan of town &amp; country planning or UDA</p> <p>Public hearing</p> <p>Incorporating SPCBs/ Local institutions</p> <p>To take possession immediately to avoid encroachment.</p> <p>Initiate construction work inviting tenders from experienced firms.</p>	36 months
Old dumpsites	Rehabilitation or reclamation of old dump site followed by capping & plantation.	Prepare rehabilitation plan for clearing old dump site through expert firms.	18 months



### **13.0 MONITORING IMPLEMENTATION OF PLAN**

- (i) Monitoring of implementation of action plan is required at State level, District level and at Municipal level.
- (ii) Monitoring of Action Plan at State and National level may be done on the same modal as directed by Hon'ble NGT in the matter of Ganga. State level committees are reporting to main committee at central level. The similar type of mechanism could be monitored for monitory MSW action plan.

### **14.0 FINDINGS AND CONCLUSIONS**

- (i) The contents given in the present document are based on field experiences of CPCB and interaction with SPCBs / PCCs and other institutions.
- (ii) The expressions given under Para 10, 11 and 12 are indicative in nature and these are placed with a view to give any local body and State Authority to think for devising the action plan. However, each state and local body may work out considering the local situations.
- (iii) The bigger cities having population million plus and generating waste more than 1000 tonnes per day will have to opt for higher waste consuming technologies like waste to energy so that the waste processing plants become as sustainable and economically viable.
- (iv) For waste to energy projects operating based on thermal route should ensure calorific value which can be enhanced by adopting proper segregation practices. However, mass burn technologies utilising bio mas are discouraged.
- (v) The cluster based project to cover all villages and towns should be practiced. This will eliminate the process of setting up of individual waste processing and disposal facilities which subsequently will be difficult to monitor and also may raise public objections.
- (vi) The option can also be that waste generated between 100-500 tonnes can prepare the RDF at the town level which can go to the Regional / Common facilities.
- (vii) For setting up of regional / common facilities, adequate size of land and such site meeting the environmental criteria should be identified. No settlement around such facility should be permitted to avoid the public objection.

## Annexure-I

### STATE-WISE GENERATION, COLLECTION AND TREATMENT

(As on 06.02.2015)

S.No	States	Quantity Generated (TPD)	Collected (TPD)	Treated (TPD)
1	Andaman & Nicobar	70	70	05
2	Andhra Pradesh/ Telengana	11500	10656	9418
3	Arunachal Pradesh	110	82	74
4	Assam	650	350	100
5	Bihar	1670	-	-
6	Chandigarh	340	330	250
7	Chhattisgarh	1896	1704	168
8	Daman Diu & Dadra	85	85	Nil
9	Delhi	8390	7000	4150
10	Goa	183	182	182
11	Gujarat	9227	9227	1354
12	Haryana	3490	3440	570
13	Himachal Pradesh	300	240	150
14	Jammu & Kashmir	1792	1322	320
15	Jharkhand	3570	3570	65
16	Karnataka	8784	7602	2000
17	Kerala	1576	776	470
18	Lakshadweep	21	-	-
19	Madhya Pradesh	5079	4298	802
20	Maharashtra	26,820	14900	4700
21	Manipur	176	125	-
22	Meghalaya	268	199	98
23	Mizoram	552	276	Nil
24	Nagaland	270	186	18
25	Orissa	2460	2107	30
26	Puducherry	495	495	Nil
27	Punjab	3900	3853	32
28	Rajasthan	5037	2491	490
29	Sikkim	49	49	0.3
30	Tamil Nadu	14532	14234	1607
31	Tripura	407	407	Nil
32	Uttar Pradesh	19180	19180	5197
33	Uttrakhand	1013	1013	Nil
34	West Bengal	8674	7196	1415
	Total	1,43,449	1,17,644	32,871

\*Source: Figures from EQI references & AR of SPCBs/PCCs

### Cities Generating Wastes in between 100-500 TPD

[Illustrated /Indicative]

S. No	Cities	Estimated Waste Generation (t/d)	S. No	Cities	Estimated Waste Generation (t/d)
1	Vishakhapatanam	320	36	Gwalior	210
2	Patna	350	37	Jabalpur	270
3	Vadodara	400	38	Raipur	200
4	Hubli-Dharwar	300	39	Ujjain	150
5	Kochi	360	40	Ahmadnagar	100
6	Thiruvananthapuram	360	41	Akola	100
7	Indore	400	42	Amravati	100
8	Bhubaneshwar	320	43	Aurangabad	220
9	Ludhiana	430	44	Jalgaon	230
10	Coimbatore	400	45	Kolhapur	130
11	Madurai	400	46	Latur	130
12	Allahabad	300	47	Malegaon	110
13	Varanasi	430	48	Nasik	220
14	Guntur	180	49	Solapur	180
15	Elluru	100	50	Cuttack	120
16	Kakinada	100	51	Rourkela	130
17	Kurnool	110	52	Amritsar	240
18	Nellore	130	53	Jalandhar	180
19	Nizamabad	110	54	Ajmer	210
20	Rajamundhry	160	55	Bikaner	110
21	Vijaywada	280	56	Jodhpur	260
22	Warangal	250	57	Kota	200
23	Guwahati	130	58	Trichy	240
24	Dhanbad	300	59	Thirunelveli	135
25	Jamshedpur	150	60	Aligarh	150
26	Ranchi	250	61	Bareilly	200
27	Bhavnagar	150	62	Ghaziabad	130
28	Jamnagar	170	63	Gorakhpur	170
29	Rajkot	280	64	Meerut	250
30	Faridabad	250	65	Moradabad	130
31	Belgaum	110	66	Saharanpur	120
32	Mysore	180	67	Durgapur	140
33	Kannur	180	68	Chandigarh	225
34	Kozhikode	130	69	Salem	100
35	Durg	170	70	Dehradun	140

## Cities Generating Wastes in between 50-100 TPD

[Illustrative /Indicative]

S. No	Cities	Estimated Waste Generation (t/d)	S. No	Cities	Estimated Waste Generation (t/d)
1	Anantpur	55	31	Bharatpur	50
2	Khammam	85	32	Bhilwara	55
3	Tirupati	85	33	Ganganagar	55
4	Arrah	50	34	Pali	60
5	Bhagalpur	70	35	Sikar	50
6	Bihar Sharif	60	36	Tonk	50
7	Bokaro(Steel)	80	37	Udaipur	60
8	Gaya	75	38	Dindugul	60
9	Muzaffarpur	50	39	Nagarcoil	60
10	Panipat	60	40	Thanjavur	60
11	Rohtak	65	41	Tuticorin	60
12	Bellary	80	42	Firozabad	60
13	Davengere	70	43	Jhansi	90
14	Gulbarga	80	44	Mathura	70
15	Mangalore	70	45	Muzaffarnagar	70
16	Thirussur	65	46	Rampur	60
17	Murwara(Katni)	60	47	Shahjahanpur	65
18	Ratlam	60	48	Asansol	60
19	Sagar	50	49	Bardhaman	70
20	Chandrapur	50	50	Kharagpur	50
21	Dhule	65	51	Medinipur	90
22	Ichalkaranji	85	52	Ondal	60
23	Nanded	80	53	Pondicherry	80
24	Prabhani	50	54	Jammu	90
25	Sangli	85	55	Srinagar	70
26	Bhivandi	90	56	Shimla	90
27	Berhampur	50	57	Shillong	90
28	Patiala	70	58	Aizwal	50
29	Alwar	55	59	Tirupur	60
30	Beawar	55	60	Imphal	70

**INDICATIVE FORMAT FOR  
PREPARATION OF DETAILED PROJECT REPORT (DPR)  
FOR MANAGEMENT OF MUNICIPAL SOLID WASTE**



**CENTRAL POLLUTION CONTROL BOARD**  
(Ministry of Environment & Forests)  
PariveshBhawan, East Arjun Nagar,  
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**FORMAT FOR PREPARATION OF DETAILED PROJECT REPORT (DPR) FOR  
MANAGEMENT OF MUNICIPAL SOLID WASTE  
{IMPLEMENTATION OF THE MUNICIPAL SOLID WASTES (MANAGEMENT AND  
HANDLING) RULES, 2000}**

**CHAPTER - 1: INTRODUCTION**

**Objectives/ Scope of DPR:**

The preparation of DPR includes following objectives;

**CHAPTER - 2: CITY PROFILE**

- 2.1 General Profile (including city map):
- 2.2 Historical Profile:
- 2.3 Tourist, religious or any other specific Profile of the city:

2.4 Area and Population:

Area of the city/ town (under the jurisdiction of the local body) in Sq. Km.

Details of Population

	Population			Projected population
Census Year	1981	1991	2001	2011
Population				
Decadal growth				

2.5 Slum Population (no. of slum pockets and approximate population, ward-wise list of slums and the area occupied by them, population)

2.6 Main tourist spots in the city

2.7 Climate

2.8 Political Set up of the local body (no. of election wards etc.)

2.9 Administrative Set up of the local body:

Municipal Solid Waste Management Department: (health officer, assistant health officers, details of Supervisory staff etc.)

Name of the circle/ward	No. of AHOs	No. of sanitary inspectors	No. of Supervisors	No. of Sweepers	Ward Area	Population
Total						

2.10 GENERAL INFORMATION TO BE COLLECTED AND UPDATED FROM TIME TO TIME

1. Area of the city;
2. Population of the city;
3. Decadal growth of population;
4. Number of wards, their area and population;
5. Ward-wise information in regard to:
  - Population density in different wards;
  - No, of Households, shops and Establishments
  - Vegetable/fruit/meat/fish markets
  - Number of Hotels & Restaurants
  - Number Of Hospitals and Nursing Homes
  - Number Of Industries
  - Number Of slum pockets/their population
  - Road length width wise

- Percentage of area covered with under-Ground sewage system
- Percentage of area having surface Drains
- Percentage of area having no drainage Facility
- Number of slaughter houses
- Total number of public toilets and Toilet seats.
- Number Of public urinals
- Number Of Nuisance spots

### CHAPTER - 3: PRESENT PRACTICES OF SOLID WASTE MANAGEMENT IN THE CITY

- 3.1 Waste generation rate: (MSW generated in MT per day)
- 3.2 Break-up of waste generation (domestic, markets, industrial etc.)
- 3.3 Storage of Domestic Waste at Source: (existing system of storage and segregation of waste at source at the household level)
- 3.4 Storage of market and trade waste at source: (existing system of storage and segregation of waste in the vegetable, fruit, meat or fish market)
- 3.5 Storage at slums
- 3.6 Segregation of Recyclable wastes
- 3.7 Primary Collection of Domestic, Trade and Institutional Wastes: (existing system of door-to-door collection, adequacy of community bin facilities etc.)
- 3.8 Hospital and Nursing Home Waste: (no. of hospitals and nursing homes, estimated bio-medical wastes generation, existing processing and disposal system)
- 3.9 Hotels and Restaurants waste (nos. of hotels and system of primary collection)
- 3.10 Construction Waste (system of storage and its primary collection)
- 3.11 Street Sweeping: (Work norms and frequency of street sweeping, circle/ward wise road length)

Frequency of street cleaning	Wards covered or % of street covered
Daily	
Alternate day	
Once a week	
Occasionally	



- 3.12 Tools Used: (availability of traditional/ containerized handcarts, long handled brooms etc.)
- 3.13 Waste Storage Depots: (circle/ ward wise nos. of waste storage depots, mode of transmission of waste upto depots, condition of depots, nos. of litter bins provided etc.)
- 3.14 Transportation of Waste: (frequency of transportation, mode of loading- manual/ mechanized loader, vehicles- tractor, trucks, autos etc.)

Name of the Circle/ Ward	Frequency of lifting#	Types of vehicle\$	No. of vehicles		
			Total	Functional	Out of order

# Daily, Alternate day. Once in week, Occasionally etc.  
 \$ Tractors, Tipper trucks, Loader cum excavator, Mini loaders etc.

- 3.15 Waste Processing and Disposal Facilities: (Details of waste processing and disposal facility like- year of commissioning, designed life, design capacity (Mt/ Day), operation capacity (MT/ Day), Scientifically operated or haphazard dumping in low lying areas, daily soil coverage provided or not, availability of weigh bridge facility, buffer zone, road facilities, status of authorization from SPCB etc.)

**3.16 Financial Aspects**

Years	Actual Receipt including Grant	Actual Expenditure	Expenditure incurred on MSW management department	
			Expenditure on salary	Expenditure on infrastructure
2001-2002				
2002-2003				
2003-2004				

### **3.17 GENERAL INFORMATION OF MSW TO BE COLLECTED AND UPDATED FROM TIME TO TIME**

#### **Waste generation**

1. Average quantity of waste produced each day.
2. Seasonal variations in daily waste generation.
3. Total quantity of waste produced annually during last 3 years
4. Breakup of the quantity of wastes generated
  - i Household, shops and establishment waste;
  - ii Vegetable and food market waste;
  - iii Meat, fish and slaughter house waste;
  - iv Construction & demolition waste;
  - v Hospital waste
  - vi Industrial waste
- 5 Average number of carcass removed each day

#### **Staff Position**

- 6 Number of sanitation workers deployed in the city for the collection of waste
- 7 Number of sanitation workers deployed for the transportation of waste
- 8 Ward wise allocation of sanitation workers
- 9 Sweeper population ratio in each ward
- 10 Sweeper road length ratio in each ward
- 11 Sweeper supervisor ratio in each ward

#### **Waste storage depots**

- 12 Number of sites designated/notified for temporary of waste (Dust bins)
- 13 Type and size of Dustbin provided in each ward.
- 14 Ward-wise Quantum of waste generated each day.

#### **Transportation**

- 15 Number Of vehicles available with the local body for the transportation of waste, their types, size and age.
- 16 Number of trips made by each vehicle in one shift.
- 17 Number of vehicles used in:
  - First shift
  - Second shift &
  - Third shift
- 18 Qty. of waste transported in each shift.
- 19 Total qty. of waste transported each day.
- 20 Percentage of waste transported each day.

## **Waste processing and disposal**

- 21 Number of waste processing and disposal sites in the city.
- 22 Their distances from the Centre of the city.
- 23 The area of these sites
- 24 The qty. of waste treated/disposed of at each site
- 25 The expected life of each land filled site

## **Financial aspects**

- 26 Operating cost
  - a. Cost of collection per ton/day
  - b. Cost of transportation per ton/day
  - c. Cost of disposal per ton/day

## **CHAPTER-4: PROPOSED ACTION PLAN FOR MSW MANAGEMENT (In accordance with the Municipal Solid Wastes (Management and Handling) Rules, 2000):**

### **4.1 Storage of Waste at Source:**

*No waste should be thrown on the streets, footpaths, open spaces, drains or water bodies, nallas, etc.*

*Waste should be stored at source of waste generation in two bins/ bags, one for food waste/ bio-degradable waste and another for recyclable waste such as papers, plastic, metal, glass, rags etc.*

*Waste such as used batteries, containers for chemicals plastics pesticides, discarded medicines and other toxic or hazardous household waste, if and when produced, should be kept separately from the above two streams of waste.*

The following indicative measures may be taken by the local body to meet the above;

- All the household may be directed that they shall (a) keep the food waste/ bio-degradable as and when generated, in any type of domestic waste container, preferably with a cover, and (b) keep dry/ recyclable wastes preferably in bags or sacks.
- A metal or plastic container of 15 litre capacity for a family of 5 members would ordinarily be adequate to store the waste produced in 24 hours having a spare capacity of 100% to meet unforeseen delay in clearance or unforeseen extra loads.
- In slum pockets where it may be difficult to do house-to-house collection, community bins of 80 to 100 litres capacity @ 1 community bin per 20-30 dwelling units may be placed at suitable locations to facilitate the storage of waste generated by them.

- Shops/ offices/ institutions/ workshops/ hotels/ restaurants/ meat shops/ fish shops etc. should be directed to store their waste on-site in sturdy containers of about 100 litres capacity.
- In case of large hotels/ restaurants/ commercial complexes, residential societies, vegetable markets etc., they should be directed to provide large size containers 3.0 cmt to 7.0 cmt, which should match with the transportation system of the city.

#### **4.2 Segregation of Recyclable/ non-biodegradable Waste:**

*The local body may draw up a program of conducting awareness campaign in various wards of the city utilizing the ward committees, local NGOs and resident welfare association. Simple literature may be developed for bringing in the awareness, which may be publicized through media using cable net work, and group meetings in different areas through NGOs. The sanitation supervisors may also create awareness during their field visits.*

*As soon as the awareness campaign picks up, the local body may direct households, shops and establishments not to mix recyclable waste with domestic food/bio-degradable waste and instead store recyclable/non-bio degradable wastes in a separate bin or bag at the source of waste generation.*

- The local body may mobilize NGOs or Co-operatives to take up the work of organizing street rag-pickers and convert them to door step "waste collectors" by motivating them to stop picking up soiled and contaminated solid waste from streets, bins or disposal site and instead improve their lot by collecting recyclable clean material from the doorstep at regular intervals of time.
- The upgraded rag pickers on becoming doorstep waste-collectors may be given an identity card by NGOs organizing them so that they may have acceptability in society. The local body may notify such an arrangement made by the NGOs and advise the people to cooperate.

#### **4.3 Primary collection of waste**

*The local body shall arrange for the primary collection of putrescible organic/food/bio-degradable waste from the doorstep on a daily basis. This service should be regular and reliable. Recyclable material can be collected at longer regular intervals as may be convenient to the waste producer and the waste collector, as this waste does not normally decay and need not be collected daily. Domestic hazardous waste is produced occasionally and so such waste need not be collected from the doorstep. People could be advised or directed to put such waste in special bins kept in the city for disposal of such wastes.*

### **The following arrangements may be made by the local body:**

- Garbage is to be containerized at the point of generation to reduce collection time and health hazard. The system of house-to-house collection is to be extended to all the households of all wards, slums, markets, establishments etc. either through containerized wheelbarrow (handcarts) or containerized pedal tricycles with bells or whistles or through community collection (central bin).
- Devising collection of waste from slums and squatter areas or locality including hotels, restaurants, office complexes and commercial areas.
- Modus Operandi: Each sweepers may be given a handcart or pedal tricycle having detachable containers (preferably six) of 25-30 litres capacity each and provided with a bell or whistle. Each sweeper should be given a fixed area or beat for sweeping plus a fixed number of stretch of houses from which to collect the domestic waste. The local body may, based on local conditions, fix the work norms as they deem appropriate.
- However, it is suggested that in a congested or thickly populated areas, 350 running meters of road length and the adjoining houses may be given to each sweeper, whereas in medium density areas 500 to 600 running metres of the road length with adjoining houses may be allotted to a sweeper depending upon the density of population in the given area and local conditions. In low density areas even 750 running metres of road length can be given. Normal 150 to 250 houses coupled with the above roads length may be taken as a yard stick for allotment of work to an individual sweeper.
- Motorized vehicles having unconventional horns may be deployed in highly congested areas where containers cannot be placed for the doorstep collection of waste.
- The local body should collect waste from slums either from house-to-house collection or through central bins (of about 100 litres capacity) or through community bins (3.0 to 4.5 cmtcapacity) provided @ 1 bin per 20-30 households. Residents should bring their biodegradable wastes from their houses to bins.
- Societies, complexes, market associations, hotels etc. could be advised or directed to deliver their biodegradable wastes into central bins or community bins to facilitate its easy collection by municipal staff.

### **4.3 Sweeping of Streets and Public Spaces:**

*Daily sweeping of public streets is almost becomes essential where there is habitation close by. Isolated pockets or roads with little or no habitation around are to be cleaned periodically. A schedule of streets cleaning should be prepared, assigning clearly demarcated area to each sweeper and street sweepings should be deposited in the storage containers.*

The following measures may be taken to ensure regular sweeping of streets and public places:

- Each sweeper engaged in street sweeping should be given individual containerized handcarts having 4 to 6 containers or a tricycles having 6 to 8 containers of 25 to 30 litres capacity. These containers should be detachable to facilitate the direct transfer of street sweepings and household wastes from the container into the communal waste storage bins.
- Each sweeper engaged in street sweeping should be given a metal tray, a metal plate, a long handled brooms and protective gears, etc.
- Measures should be taken to prevent burning of the leaves and other waste by sweepers on the roadside and direct sweepers to take all waste to the communal waste storage bins.
- By adopting the norms of road length for the purpose of entrusting work to the sanitation workers, the requirement of sweepers and their tools may be worked out as under;

Types of roads	High density roads	Medium density roads	Low density roads	Total
Length of roads				
No. of sweepers required @ 1 sweeper per 350Mt. in dense area, 500 Mt. in medium density areas and 750 Mt. in low density areas, coupled with 150 to 250 houses.				
No. of metal trays, metal plates, long handled brooms, pairs of protective gears etc.	No. of sweepers worked out above			

### Estimated need of the containerized handcarts and pedal tricycles for primary collection system:

S.No.	Name of Item	Nos.
<b>a)</b>	<b>Design parameters</b>	
	Base year 2004	
	Design Period 10 years	
	Population of city/ town (2001 Census)	
	Projected population 2004 (by Geometric Increase Method)	
	Projected population 2014 (by Geometric Increase Method)	
	Population considered for design (Arithmetic average of projected population for years 2004 and 2014)	<b>P</b>
	Total Waste generated (Mt/ day) = Design population x waste generated, kg/capita/day	<b>W</b>
	Volume of waste (V) (Cmt/ day) = Total waste generated (Mt/day) / density (Mt/ Cmt) {density of MSW may be taken as 0.425 Mt/Cmt}	<b>V</b>

S.No.	Name of Item	Nos.
b)	<b>Calculation for 30 litres capacity containers</b> (Sweepers are expected to make at least two trips to the temporary waste storage depots and therefore, will use the same containers at least two times a day)	
	Nos. of Containers = $\{[V \text{ Cmt} \times 1000 \text{ litre/Cmt}] / 30 \text{ litre}\} / 2$ trips a day	A
c)	<b>Calculation for six containerized handcarts and tricycles</b> (Assuming X% of waste collection will be through handcarts and Y% of waste collection will be through tricycles only. It is suggested that handcarts may be used by female sanitary workers and tricycles may be used by male sanitary workers.)	
	No. of six containerized handcarts = $(A/6) \times X\% = \text{Say, B}$	B
	No. of six containerized tricycles = $(A/6) \times Y\% = \text{Say, C}$	C
d)	<b>Nos. of central bins</b> (100 litres capacity)/ community bins required in slum areas/ markets etc. = Say, D	D
e)	<b>Add Standby containers, handcarts, tricycles, bins @ 10%</b>	

#### 4.5 Provision of Litterbins:

*To enable citizens to dispose of their waste-in-hand, litterbins should be provided at all railway stations, bus stations, in all market places, places where people gather or wait in squares and on important roads at a reasonable distance ranging from 25 to 250 metres.*

Ordinarily providing about 11 litterbins per square Km area of city/ town, depending on local condition may fulfill the requirements.

#### 4.5 Temporary Waste Storage Depots for onward transportation of Waste

*MSW collected from the doorstep or from the central bins (kept in slums, markets etc.) by the primary collection system has to be unloaded and stored at a convenient*

*place for its onwards transportation in a cost-effective manner. Temporary waste storage depots are therefore, required to be created at suitable locations in lieu of open waste storage sites.*

The following systems could be considered for set up by the local body:

- Provide large metallic containers (3.0, 4.5, 6.0, 7.0 Cubic metres capacity) with lid at a distance not exceeding 250 metres from the place of work of the sweepers and to cover all the wards. The distance between two consecutive storage bins should therefore, not exceed 500 metres. The distance between the communal storage bins can be determined on the basis of load of garbage/ refuse that is likely to be received at the containers from the area concerned.



Ordinarily 4 to 5 communal storage bins (3.0 to 7.0 cmt capacity) are required per square Km area. It has also to be ensured that atleast twice the storage capacity of the total wastes generated per day, should be created for the storage of wastes in the city/ town. This will ensure that no waste will spill outside the bin and will give sufficient time to the local body to remove the waste by organizing a periodic cycle of transportation of waste. This number could also cover ward-wise bins for storage of domestic recyclable and hazardous wastes.

- The bins should be placed on cement concrete or asphalt flooring having a gradual slope towards the road to keep the site clean. The flooring should be flush with the border of the road to maintain hygienic conditions and facilitate the transfer of waste from the containerized handcarts/ tricycles into the container. A catch pit may be provided close by if storm water drain exists in the city/ town.
- In highly congested areas an option of using small vehicles (like auto bins) for direct collection of waste instead of placing containers on the roads could be considered. Such vehicles can be parked at suitable locations in the congested areas where sweepers can bring the waste easily.

#### 4.7 Transportation of Waste

***The system of transportation should appropriately match with the system adopted for the storage of waste at the communal bins/ containers, i.e., at the temporary waste storage depots. Manual loading should be discouraged and phased out expeditiously and replaced by direct lifting of containers through hydraulic system or non-hydraulic devices or direct loading of waste into transport vehicles.***

The following measures may be taken by the local body to achieve effective transportation of wastes:

- The transportation of waste from the temporary waste storage depots/ sites may be planned in accordance with the frequency of containers becoming full. The locations where the containers are placed may be grouped into following categories as under;
  - (a) Containers which are required to be cleared more than once a day.
  - (b) Containers which are required to be cleared once a day.
  - (c) Containers which are required to be cleared on alternate days.
  - (d) Containers which take longer time to fill and need clearance twice a week.
- Depending on the containers to be cleared each day, the route for lifting the containers may be worked out avoiding zigzag movement of the vehicles to the extent possible.
- All the vehicles may be utilized at least in two shifts to lift containers, to ensure full utilization of the fleet of vehicles and to reduce the requirement of new vehicles.



- Transportation of waste during night may be done in areas where there is serious traffic congestion during the day and it hampers MSW management operations. Work at night will increase the productivity and reduce the cost of the service.
- The containers lifting tractors and devices such as dumper placers/ skip lifters may be utilized for transportation of 3.0 to 7.0 cmt containers to the wastes processing and disposal sites.
- The local body may enter into a rate contract for maintenance of vehicles and equipment and ensure that they are kept in a good working condition.

**Estimated need of the vehicles and temporary waste storage containers:**

S. No	Name of Equipments/ tools	No s	Rate per unit	Total Cost
<b>a)</b>	<b>Dumper placer containers ( 4 to 5 nos. per Sq. Km)</b>			
	3.0 cmt containers			
	4.5 cmt containers			
	6.0 cmt containers			
	7.0 cmt containers			
	Total			
	No. of containers available with the local body			
	No. of containers required to be purchased			
<b>b)</b>	<b>Container lifting devices/ vehicles</b>			
	No. of 3.0 cmt containers to be lifted each day			
	No. of 4.5 cmt containers to be lifted each day			
	No. of 6.0 cmt containers to be lifted each day			
	No of 7 cmt containers to be lifted each day			
	No. of containers that can be lifted by one tractor/dumper placers in two shifts	8 to 10		
	No. of containers lifting tractors required			
	No. standby tractors required			
	Total nos. of containers lifting tractors			
	No. of dumper placers required to lift 6 cmt/ 7 cmt containers			
	Standby dumper placers required			
	Total dumper placers required			
	No. of tractors available with the local body			
	Therefore, new tractors to be procured			
	Existing tractors to be mounted with container lifting devices			
	No. of dumper placers available with the local body			
	No. of dumper placers to be procured by the local body			

<b>c)</b>	<b>Small vehicles (like auto bins) required for direct collection</b>			
	No. of vehicles required for direct collection of waste from highly congested areas and narrow lanes			
	No. of standby vehicle			
	Total			
<b>d)</b>	<b>Hotel/ market waste collection vehicles</b>			
	No. of vehicles required for collection of hotel/ market waste			
	No. of standby vehicle			
	Total			
<b>e)</b>	<b>Construction waste collection vehicles and skips</b>			
	No. of skip containers required			
	No. of skip lifters required			

#### 4.8 Waste Processing (Composting) and Disposal

***All organic/ biodegradable wastes collected from households, shops, markets, hotels and other establishments should preferably be biologically processed; and***

***Only rejects, drain silts & domestic hazardous waste should be carefully landfilled. Bio-Medical Waste should be disposed of as per the Bio-Medical Wastes (Management and Handling) Rules, 1998***

*Available technologies:* The waste processing can be achieved either through biological route or the thermal route. In the biological route mainly two processes, aerobic stabilization (composting) and anaerobic process (biomethanation) are used.

Aerobic stabilization of organic fraction of waste yields a final product which can be used as an organic manure and is called compost. In the anaerobic process, also referred as biomethanation, the organic matter after segregation and size reduction is mixed with water and allowed to degrade under controlled anaerobic conditions. The generated biogas has a fuel value, which is used as a source of energy and the digested residue as compost.

In the thermal route, two processes are commonly adopted. In the first process, commonly referred to as 'Incineration' the waste is burnt in an excess amount of oxygen and the related heat is utilized to generate electricity. The second process in the thermal route involves combustion of the material in the absence of air or in an oxygen deficient atmosphere. This is commonly referred to as 'pyrolysis', which results in the generation of three different products namely, gas, liquid and char each of which has certain calorific value.

To facilitate the thermal processing of waste, the combustible portion of MSW is separated in yet another process to obtain Refuse Derived Fuel (RDF) which is then subjected to incineration or pyrolysis process.

Further, it is to mention that out of the various processing technologies, the technologies which are being used/ considered for use in Indian conditions are: (i) Composting, (ii) Anaerobic digestion to recover biogas and electricity, (iii) Refuse Derived Fuel and (iv) Pyrolysis.

**The following measures may be taken by the local body for setting up of waste processing plant and for development of landfill site:**

The waste processing should be addressed by the local bodies in compliance with Schedule II and IV of the Municipal Solid Wastes (Management and Handling) Rules, 2000. Similarly, the waste disposal by landfilling should meet the criteria as laid under Schedule II, III and IV of the Municipal Solid Wastes (Management and Handling) Rules, 2000.

Presently in most of cities/ towns, the generated waste is collected without any source segregation. Though it is proposed to introduce source segregation, the experience all over the world indicates that it will need a decade before an effective source segregation is achieved. It is, therefore, desirable that all the MSW produced be first biologically processed and the non-biodegradable removed for disposal in a landfill along with drain silt and such other inorganic material.

Therefore, till such time the people develop a habit of segregation and effective source segregation can be achieved, local body should set up and operate and maintain waste processing plant(s) of adequate design capacity to process all the waste of generated per day from the municipality, other than debris, biomedical waste, etc.

Based on some compost plants set by private entrepreneurs in the country, it has been estimated that a compost plant processing 100 MT of wastes per day would cost around Rs.1.50 Crores (excluding land cost). For preliminary cost estimation for setting up of a compost plant of adequate design capacity local body may use this estimates.

Similarly, preliminary estimated cost for development/ setting up of engineered landfill site could be carried out at Rs.700/- to Rs.800/- per square metre of landfill surface area to be developed (excluding land cost). A land area of about 100-150 acres may be considered as ideal for setting up of compost plant and for development of sanitary landfill site having life span of about 20 years.

However, it is required to get the waste quantification, characterization, detailed engineering site investigation, design, drawing, specification and cost estimate done for setting up of a common compost plant of adequate capacity for processing of MSW and development/ setting up of engineered landfill site from an expert consultants. It is suggested that a separate 'Detailed Project report' (DPR) for setting up of a compost plant/ waste processing facility and for development of sanitary landfill site may got be prepared.

It may be necessary that the local body may invite competitive bids from private sector to set up waste processing plant on BOO basis as well as to run

the plant that may alternately be set up by the local body, on O & M basis. In case of BOO the entire investment will have to be done by the private sector whereas, land will be made available by the local body to the private sector for a minimum 20 years on a nominal lease rent, preferably of Re.1 per Sq. metre per year and delivery of garbage at the plant site without levy of any charges. The local body may negotiate with the private sector regarding the payment of royalty by the private sector for the valuables (like compost, energy etc.) produced or payment of tipping fees by the local body to the private company as may transpire from the bids received. Whereas, in O & M contract the investments will be made by the local body to set up plant particularly compost plant and operation and maintenance will have to be done by the private sector on its own and in return they will get the compost produced to be marketed by them at their own cost. Here, the local body will not pay any charges for O & M but, will supply agreed quantities of garbage on day to day basis at its own cost at the plant site.

#### 4.8 Intra-city Activity:

The local body should set up a 'Surveillance Squad' for efficient management of intra city activities and attainment of emergency matter/ public calls related to MSW management on urgent basis.

**Local body may procure requisite nos. of sets of Walky& Talky/cell phones for management levels officials to be associated with the MSW activities and for implementation of the proposed project; and**

Control rooms may be set up to register complaints received from the public and settle such complaints expeditiously on 'no-delay' basis..

### CHAPTER - 5: REQUIREMENT OF FUNDS FOR SETTING UP OF FACILITIES FOR MSW MANAGEMENT (Indicative equipments/ tools)

S. No.	Equipments/ tools	Quantity required	Qty. existing	Qty. Shortfall	Cost per unit	Total estimated cost
	<b>Compliance with Schedule II of the MSW Rules to cover:</b>					
1	<b>Mass Awareness</b> (through booklets, print and electronics media, workshops, seminar etc.)					
	<b>Primary Collection System</b>					
2	Containers (30 litres capacity)					
3	Containerized handcarts					
4	Containerized pedal tricycles					
5	Central bins (100 litres capacity)					
6	Community bins (3.0 to 4.5 Cmt) for slums					
	<b>Street Sweeping</b>					

S. No.	Equipments/ tools	Quantity required	Qty. existing	Qty. Shortfall	Cost per unit	Total estimated cost
7	Mechanical Sweeper					
8	Seamless handcarts for drain desilting					
9	Sweeping tools (Metal tray and metal plate, Long handled brooms, shovels and protective gears)					
	<b>Litter bins</b>					
10	Litter bins (approx. 11 bins per Sq. Km.)					
	<b>Temporary Waste Storage Depots</b>					
11	Small vehicles for congested places/ important places					
12	Dumper placer containers 7 cmt.					
13	Dumper placer containers 6 cmt.					
14	Dumper placer containers 4.5 cmt.					
15	Dumper placer containers 3 cmt.					
16	Skip containers					
17	Auto bins					
	<b>Transportation/ Vehicles</b>					
18	Dumper placer vehicles					
19	Tractors to be fitted with containers lifting device					
20	Trolleys					
21	Wheel dozer					
22	JCB					
23	Trucks with JCB					
24	Bob Cat					
25	Cattle catcher					
	<b>Compliance with Schedule II and IV of the MSW Rules relating to Waste Processing:</b>					
26	Setting up of Waste Processing Plant (For compost plant estimated cost at Rs.1.5 crores per 100 MT of waste, excluding land cost)					

	<b>Compliance with Schedule II, III and IV of the MSW Rules relating to Waste Disposal by landfilling:</b>					
27	Development of landfill sites (estimated cost at Rs.700-Rs.800/- per Sq. Mt of landfill area to be developed, excluding land cost)					
	<b>Intra-city activities</b>					
28	Surveillance Squad (Walky-Talky)					

### Estimation of requirement of Sanitation workers, drivers etc. (indication)

Designation of Post	Sanitation Workers	Drivers
Street sweepers for street sweeping and primary collection of waste from households, shops and establishments		
Sanitation workers/drivers on tractors and dumper placers in 2 shifts @ 1 person per vehicle		
Sanitation workers/drivers on small vehicles @ 1 labour and 1 drivers per vehicle		
Sanitation workers/drivers on skips @ 1 per vehicle on vehicles for construction waste		
Sanitation workers/drivers on hospital vans @ 1 per van		
Sanitation workers/drivers on hotel waste collection vans @ 2/1 per van		
Sanitation workers/drivers on garden waste van, @ 2/1 per vehicle		
Sanitation workers/drivers on bull dozer		
Labour at land fill site		
<b>Sub-Total</b>		
Weekly off relievers @ 17% for round the year service		
<b>Total</b>		

### REFERENCES:

1. Municipal Solid Wastes (Management and Handling) Rules, 2000
2. Manual on Municipal Solid Waste Management, 2000 (Central Public Health and Environmental Engineering Organization, Ministry of Urban Development, Government of India).
3. Municipal Solid Wastes Processing Technologies: Reference Manual for Local Bodies, 2002 (Central Pollution Control Board)
4. Guidelines for Selection of Site for Landfilling, 2003 (Central Pollution Control Board)