

BEFORE THE NATIONAL GREEN TRIBUNAL,  
PRINCIPAL BENCH, NEW DELHI

Original Application No. 199 of 2014

**IN THE MATTER OF:-**

Almitra H. Patel & Anr.

... Applicant

Versus

Union of India & Ors

... Respondent

**I N D E X**

**N.D.O.H.: 17.03.2015**

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FILED BY:

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PLACE: NEW DELHI  
DATE : 27.02.2015

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**COMPLIANCE AFFIDAVIT ON BEHALF OF THE  
RESPONDENT NO. STATE OF WEST BENGAL.**

I, Bhupal Chandra Patra, Special Secretary  
Municipal Affairs Department, Government of West  
Bengal, Writers Buildings, Kolkata -700001 at  
presently New Delhi, do hereby solemnly affirm and  
state as under:

1. That I have perused the Original Application No. 199  
of 2014 and the various orders passed by this  
Hon'ble Court and made myself well acquainted with  
the facts of the present case and am competent to  
affirm this Affidavit on behalf of the State of West  
Bengal.

2. That this Hon'ble Court on 05.02.2015 granted last opportunity to all State/ Boards /Authorities to file their respective status report within three weeks  
Hence the present affidavit in compliance of orders of this Hon'ble court.
3. It is stated that in State of West Bengal there are in total about 128 Urban Local Bodies (ULB's) including 6 Municipal Corporations. Among these 128 ULB's, 42 ULB's including 3 Municipal Corporations are situated within Kolkata Metropolitan Area and remaining 86 ULB's with 3 other Municipal Corporations are situated outside Kolkata Metropolitan Area.
4. It is stated that for efficient Solid Waste Management 128 ULB's, the respondent/State has taken some major steps i.e. adoption of cluster approach with due regards to the proximity of ULBs involved in the concerned planning areas however the concened ULB's are facing some of the following issues for effective Solid Waste Management:
  - (a) Absence of segregation of waste at source
  - (b) Absence of institutional arrangements in ULBs and lack of technical expertise.

- (c) Inadequate resource available with the ULBs
- (d) Non availability of adequate land for landfill requirement.
- (e) Lack of community participation
- (f) Indifference of the citizens towards Solid Waste Management.

In view of above status report and a plan of action for 128 ULB is divided into 4 parts:

- (i) ULB's within the Kolkata Metropolitan Area and 8 towns outside Kolkata Metropolitan area within jurisdiction of Kolkata Metropolitan Development Authority , Asansol Durgapur Development Authority, Siliguri Jalpaiguri Development Authority and Haldia Development Authority
- (ii) Kolkata Municipal Corporation
- (iii) ULB Outside Kolkata Metropolitan Area
- (iv) Howrah Municipal Corporation.

The brief note on present status and plan of action for the Solid Waste Management in aforesaid 4 areas West Bengal is annexed hereto and marked as **Annexure "A-1"**

5. It is important to mention that in compliance of orders of this Hon'ble court in few of ULBs the State

has taken adequate steps for collection, segregation and disposal of Municipal Solid Waste generated in accordance with Management of Solid Waste Rules 2000.

In all cases the generated waste after recyclable materials are salvaged by rag pickers are disposed of in trenching ground as non engineered land fill.

*Rajpal Chandan Patra*  
**DEPONENT**

**VERIFICATION:**

I, the above named deponent do hereby verify that the contents of the above affidavit are true to the best of my knowledge as based on records of the case and nothing is false and nothing material has been concealed therefrom.

Verified by me on this 27<sup>th</sup> day of February, 2015 at  
New Delhi.

*Rajpal Chandan Patra*  
**DEPONENT**

FILED BY

Place: New Delhi

(SHAGUN MATTA)  
Advocate for the State of West Bengal  
6, School Lane, New Delhi - 110 001  
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A brief note on present status and Plan of Action for Solid Waste Management

In

West Bengal

There are 128 Urban Local Bodies in the State of West Bengal including 6 Municipal Corporations. Among these, 42 including 3 Municipal Corporations are situated within Kolkata Metropolitan Area and the remaining 86 with 3 Municipal Corporations are situated outside Kolkata Metropolitan Area.

Some of the important issues in connection with Solid Waste Management in the ULBs of the State as a whole are :

- Absence of segregation of waste at source.
- Absence of appropriate institutional arrangements in the ULBs and lack of technical expertise.
- Inadequate resource available with the ULBs for SWM.
- Non-availability of adequate land for landfill requirement.
- Indifference of the citizens towards Solid Waste Management.
- Lack of community participation.

A major problem for efficient SWM is non-availability of land in urban area. The scope of availability of land will be used for landfill sites are becoming a major concern to the ULBs. To tide over the situation and to reduce capital and recurring expenditure, clustering of contiguous towns with a centralized treatment and disposal area has been contemplated.

A few Trans-municipal Solid Waste Management Scheme has been taken up for Kolkata and Asansol Mission Cities. After withdrawal of JnNURM no centrally sponsored scheme is presently available for infrastructure development programme including SWM.

It may be recalled that the Hon'ble NGT directed Secretaries of all State to attend to Tribunal on 05.02.2015 for its instructions on further action in connection with Application No. 1999 of 2014 in the matter of A.H. Patel & Anr. Vs. Union of India & Principal Secretary, Municipal Affairs Department has attended this NGT on 05.02.2015..

Accordingly, the Hon'ble NGT in its order No. OA 199/ 2014 dated 05.02.2015 has directed all States and UTs to submit a status report with complete reply/ suggestions based upon and with reference to the judgement of the Tribunal in the case of Capt. Mall Singh vs. Punjab PCB.

Accordingly, a Status Report and an Action Plan for the following groups of Urban Local Bodies in the State are furnished herein below for submission to the Hon'ble NGT :

- (a) Status Report and Action Plan in respect of ULBs within the Kolkata Metropolitan Area & 8 towns outside Kolkata Metropolitan Area within the jurisdiction of Kolkata Metropolitan Development Authority, Asansol Durgapur Development Authority,

Siliguri Jalpaiguri Development Authority and Haldia Development Authority  
(Annexure-'A').

- (b) Status Report and Action Plan for KMC (Annexure-'B').
- (c) Status Report and Action Plan in respect of 78 ULBs outside KMA (Annexure-'C').
- (d) Status Report and Action Plan in respect of HMC (Annexure-'D').

(a) STATUS REPORT AND ACTION PLAN IN RESPECT OF ULBS UNDER THE JURISDICTIONS OF KOLKATA METROPOLITAN DEVELOPMENT AUTHORITY, ASANSOL DURGAPUR DEVELOPMENT AUTHORITY, SILIGURI JALPAIGURI DEVELOPMENT AUTHORITY AND HALDIA DEVELOPMENT AUTHORITY.

- The Urban Development Department of the State Government has initiated process for engagement of Bengal Urban Infrastructure Limited (a joint venture company of IL & FS Ltd and the Urban Development Department of the State Government) as the consultant for preparation of DPRs on Solid Waste Management Plan in the Planning areas of the four big Development Authorities under the UD Department (KMDA, ADDA, HAD & SJDA) in cluster approach in line with SWM Plan of the State of Punjab in pursuance of the Order dated 15.01.2015 of the Hon'ble National Green Tribunal. A set of Terms of Reference (ToR) for engagement of the aforesaid joint venture Government Company as already been prepared by KMDA.

(b) STATUS REPORT AND ACTION PLAN FOR KOLKATA MUNICIPAL CORPORATION.

- Present system of waste handling in Kolkata including collection and source segregation, transportation and disposal and waste utilization technology. More than 99.5% of the waste generated in KMC is disposed at open disposal site in Dhapa with an area of about 32 hectares. A 500 TDP composed plant is presently run by M/s. Easter Organic Fertilizer Limited using the windrow method.
- KMC has recently adopted segregation at source in some of its wards and afternoon service of sweeping and cleaning.
- Modern scientific waste compaction stations have recently been set up in 8 locations of the city. Some moveable compactors with Tip-carts have also been introduced recently.
- The future plan of action for KMC includes awareness campaign, complete segregation at source, 100% door-to-door collection, abolition of open vat points etc. So far as treatment and disposal of the waste is concerned, KMC contemplates construction of engineered landfills, waste to energy projects, introduction of integrated waste treatment facilities processor plants etc.
- KMC in the ultimate phase will have to treat 3,500 MT of waste per day out of a total generation of 4,000 MT. The total cost involvement for treatment has been estimated as Rs. 534 crore while the cost involvement for scientific waste disposal including procurement of land will come to Rs.1190 crore aggregating to a total of Rs.1724 crore. The present budgetary provision being of the order of Rs.10 crore only the estimated financial gap works out to Rs.1714 crore.

- A DPR for SWM at a cost of Rs.153 crore under JnNURM has been approved by the Government of India but the Central share is yet to be received by KMC & due to its sanction in the transition phase of JnNURM, fund is not likely to be released by Government of India.

(c) STATUS REPORT AND ACTION PLAN FOR 78 URBAN LOCAL BODIES OUTSIDE KMA AREA :

- Out of total 128 Urban Local Bodies (ULBs) in the State, there are 78 ULBs outside the jurisdiction of Kolkata Metropolitan Area, Asansol Durgapur Development Authority, Siliguri Jalpaiguri Development Authority and Haldia Development Area. The group of ULBs include large district headquarter towns as well as small towns in the outline districts with by and large rural characteristics.
- The Quantum of waste generated in these 78 ULBs (260 grams per capita on an average) and also its physical characteristics is of the order of 2355 MT out of which 76.13% accounts for domestic waste, 11.27% market waste and 12% relates to wastes from commercial and other activities.
- The existing system of management of solid waste in the towns from collection and transportation to disposal has been explained in the report.
- It is seen that in case of most of the municipalities the generated waste from the secondary transfer stations are transported to the disposal grounds. In the transfer stations some recyclable materials are salvaged by rag-pickers in an unorganized way. In most cases the transported waste which is a mix of compostable as well as inert non-biodegradable materials are dumped in the dumping ground in an uncontrolled manner.
- The total waste generated at present in these 78 ULBs daily is estimated to be 2350 MT and the approximate percentage of compostable and non-biodegradable components of the waste are in the order of 55% and 45% respectively.
- The proposed Action Plan for these groups of ULBs envisages (a) segregation at source with introduction of the two-bin system, (b) organized and optimized transportation system to the disposal area and treatment and disposal of the compostable and non-compostable (inert) wastes in the disposal ground in a scientific manner (c) The proposals in the Action Plan further contemplates to have a centralized treatment and disposal area for a cluster of contiguous towns where the distances from the towns in the cluster are around 20-25 kilometers. This will economize the recurring cost of transportation as well as treatment. In the Model which is being adopted by Punjab and a reference to which has been drawn by the Hon'ble NGT clustering of towns in close proximity of each other has been suggested.
- As regards treatment of compostable wastes the Action Plan envisages vermi composting / organic waste conversion package for small towns and windrow composting for larger towns. The Action Plan also assigns importance to awareness generation, capacity building and IEC campaigning for effective participation of the people.



- The Action Plan also contemplates **introduction of Compactors** – both static and mobile – to increase the bulk density of the generated waste from 0.6 MT per cu.m. to 1.8 MT per cu.m. which in turn will reduce the area required for dumping of the inert component of the waste and will increase the life of existing dumping grounds.
- Under Swachh Bharat Mission it has been proposed that project funds beyond 20% Government of India, Viability Gap Fund (VGF) assistance and a token state support will have to be mobilized through Corporate Social Responsibility (CSR) funds. The feasibility of project fund mobilization in the suggested manner which also includes contribution from the beneficiaries has been discussed in details in the proposed action Plan.
- The total capital cost involved for the programme has been estimated to be of the order of **Rs.2360 crore** with an **O&M cost of Rs.118 crore for 2015-16 and Rs.124 crore for 2016-17.**

(d) **STATUS REPORT AND ACTION PLAN FOR HOWRAH MUNICIPAL CORPORATION.**

- Howrah Municipal Corporation, the twin of Kolkata situated on the western bank of river Hooghly has a 2011 population of around 11 lakh and an area of 52 sq.km. Presently, solid waste is collected from door-to-door by conservancy staff twice a day and the primary transportation is done by hand carts.
- In the absence of any segregation system at source, the waste as it is, is presently dumped in Belgachia trenching ground which had an initial area of about 16 acres. The trenching ground has outlived its life with waste height reaching about 50 metres and is at least of collapse any time. Moreover, about 6 acres area of the original trenching ground has been taken over by KMDA for construction of an Under Ground Reservoir and also for bio-medical waste plant of a private organization.
- The Corporation has recently executed a Memorandum of Understanding (MoU) with M/s. SOWAREEN Solutions AG of Switzerland for a project of Solid Waste to Power in a PPP Mode. The proposed project envisages setting up of an emission-free waste to energy plant of SG-300 capacity with patented technology of the foreign partner. The plant will need an area of approximately 91 acres and the Corporation has identified a suitable land for the purpose in Domjur area, about 16 kilometres from the existing trenching ground.
- The total capital cost of the project is estimated at Rs.2478 crore out of which the Corporation's contribution will be of the order of Rs.289 crore (Roughly 10%). The proposed PPP Project is presently under the consideration of the Government in the Department of Municipal Affairs.

The detailed presentations for each of the above groups of ULBs in the State are annexed hereto marked Annexure A to D.

It may be mentioned in this connection with reference to orders of the Hon'ble Tribunal dt. 05.02.2015 that State has taken adequate steps in few of ULB's for collection, segregation and disposal in accordance with MSW Rules 2000. In almost all cases the generated waste after

recyclable materials are salvaged by rag pickers are disposed of in trenching ground as non engineered land fill (uncontrolled tripping).

Status of preparation of Solid Waste Management Plan in cluster approach in the Planning Areas of the Development Authorities of KMDA, ADDA, HDA and SJDA under U.D. Deptt., GoWB pursuant to the order dated 15.01.2015 of the Hon'ble National Green Tribunal (NGT), Principal Bench, at New Delhi in the matter of Almitra H. Patel & Anr. Vs. - Union of India & Ors. (Original application No. 199 of 2014).

Consequent upon the order dated 15.01.2015 of the Hon'ble National Green Tribunal (NGT), Principal Bench, at New Delhi in the matter of Almitra H. Patel & Anr. Vs. - Union of India & Ors. (Original application No. 199 of 2014), the Urban Development Department, Govt. of West Bengal has already held a meeting on 16<sup>th</sup> Feb., 2015 in the Conference Hall of the U.D. Deptt. at Nagarayan, Salt Lake with the officials of Development Authorities of Kolkata Metropolitan Development Authority (KMDA), Asansol Durgapur Development Authority (ADDA), Haldia Development Authority (HDA) and Siliguri Jalpaiguri Development Authority (SJDA) regarding preparation of Solid Waste Management Plan in the respective Planning Areas of those Development Authorities in cluster approach with due regards to the Urban Local Bodies involved in the concerned Planning Areas. In the said meeting the Managing Director and also the Chief Executive officer of BUIDL, which is a Joint Venture Company of the IL&FS Ltd. and the Urban Development Department, GoWB have also been invited to participate in the discussion.

Already financial process has started for engagement of BUIDL as the consultant for preparation of DPR on Solid Waste Management Plan in the Planning Areas of the aforesaid 4 (four) big Development Authorities under U.D. Deptt. in cluster approach in line with Solid Waste Management Plan of the State of Punjab in pursuance of the order dated 15.01.2015 of the Hon'ble National Green Tribunal (NGT), Principal Bench, at New Delhi. The KMDA has already prepared the Terms of Reference (ToR) for engagement of BUIDL as the consultant for preparation of SWM Plan in cluster approach for all the said 4 (four) Development Authorities and it is under active consideration by the Deptt. of Urban Development Department.

In accordance with the directions of the Hon'ble NGT, the following actions have been taken by the Urban Development Department of Govt of West Bengal:

1. A clustering approach has been taken up in the matter of strategy of Solid Waste Management (SWM).
2. Four clusters based on Planning Areas have been identified with centres at Kolkata (Kolkata Metropolitan Area barring KMC and HMC), Asansol (Asansol Urban Agglomeration), Haldia (Haldia Planning Area) and Siliguri (Siliguri-Jalpaiguri Planning Area). There will also be few sub-clusters in KMA for effective handling of SWM
3. The factors that need to be inbuilt in the concept plan for each of these four clusters have been identified. Some of these are as follows:
  - a) Present practices being followed
  - b) Intervention/projects already taken up
  - c) Broad level assessment and Need for Improvement
  - d) Recommended Solid Waste Management Plan

- i. Overall Vision
- ii. Principles to be followed
- iii. Salient features of suggested plan
- iv. Suggested regulatory framework
- v. Possible clustering approach
- vi. Broad Level Operational and Management Plan

vi Suggested Institutional & Management Framework

Recommendations for development of awareness programmes.

- A very well defined Roadmap should be built in so that appropriate activity can be designed and implemented.
- Programs for effective Outreach to every single family, Community, institution have to be outlined following the road map.

- Strong Advocacy with the decision makers in the municipality should be stressed to ensure positive motivation of the ULB.
- Institutional (market, shops, hotels & eateries, educational Institutions, Celebration houses etc.) participation has to be ensured.
- Efforts to bring in change in Outlook and Behaviour of the Waste Collectors, Supervisors and the Conservancy staff should be there.
- IEC materials (visual, audio and audio-visual), for widespread Environmental education have to be developed.
- A Cadre of grass root level workers to implement the road map should be built up.
- Certificate of Land Acquisition / possession for setting up MSW Treatment Plant (MSWTP), landfill and MSW transfer stations by ULBs & Right of Way (ROW)/spots for setting up community MSW storage containers should

include in the DPR.

- Clearance / consent from the State Pollution Control Board, Airport / Airfield Authorities, Flood Control/ Ground Water Management Authorities etc. for setting up MSW treatment plants and landfill received
- f) Clearance for environmental impact assessment obtained for the proposed sanitary landfill site. If not, whether a status note and the date by which the clearance is expected to be received has to be stated
- g) Topographic map of the city/town/project area to scale -will be included in DPR / Zone wise Maps to scale showing all Streets
- h) Geo-technical (soil) investigation reports and bore hole logs for the site of MSW treatment plant and landfill has been furnished with DPR
- i) Characteristics of municipal solid waste has to be analysed using a recent composite sample and certificate to that effect from a laboratory accredited by State Pollution

Control Board/ MOEF / State Govt. Detailed component wise break up of physical and chemical analysis need to be appended.

- a) % Biodegradable
  - b) % Non-biodegradable
  - c) % Recyclables
  - d) Others (to specify)
- j) Detailed note on performance of existing solid waste management system has been furnished in the DPR
- k) Rationale for location of the transfer station and operating schedule of primary and secondary collection vehicles for synchronization has been calculated and attached with the DPR
- l) All components of MSW management system such as segregation at source has to be considered, door to door collection, primary transportation, community/street side storages, secondary transport, transfer stations, bulk transport, waste receiving pad, segregation/recycling



facilities, MSW treatment plant and landfill have been designed as per the CPHEEO Manual and detailed drawings have been provided in the DPR.

- m) Details of Secondary collection and transportation system
- n) Detail of primary collection equipment, secondary transportation vehicles proposed with tender specification and quotation.
- o) Mass Flow Diagram for entire MSW management system involving all components (Generation, collection, transportation, processing plant and disposal)
- p) Design of processing plant with Mass flow diagram
- q) Design of Sanitary landfill as per CPHEEO guidelines
- r) Design of Leachate collection system and Treatment Plant
- s) Bill of Qualities (BOQ) and cost estimates of individual component of MSW management system prepared as per latest SOR and copy of latest Schedule of Rates (SOR) and Pro-forma invoices have to be annexed with DPR.

- t) Detailed PERT/CPM network showing implementation schedule has to be furnished in DPR
- u) Whether Internal rate of return (IRR) / Economic rate of return (ERR) has to be furnished in DPR
- v) Institutional and financial status of Project Executing Agency (PEA) has been reported in DPR
- w) Mechanism for marketing of compost/RDF has been tied Up with any agency
- x) Operation & Maintenance cost and revenue generation details (O & M Framework – existing & proposed) has to be furnished in DPR
- y) Whether the proposed tariff charges has different rates for different categories such as residential, commercial, establishments, hotels, restaurants, vegetable markets Environment Management Plan (inclusive of post implementation monitoring plan) and mitigation measures have been included in the DPR
- aa) Proposed SWM Sustainability Plan

- bb) Schedule of the project Implementation
- cc) Funding resources for the project
- dd) List of Anticipated Bottlenecks and Possible Solutions

4. A consultancy agency comprising of a Joint Venture Company between ILF&S and State Government called BUIDL (Bengal Urban Infrastructure Development Corporation Ltd) have been engaged by UD Department for making out the strategy paper and concept plan based on the Punjab Model. Incidentally, ILF&S was the same consultancy company that had made the cluster-approach model of Punjab referred to by Hon'ble NGT
5. A meeting has been held by the UD Department on 16 Feb 2015 with BUIDL, the consultant agency, and Chief Executive Officers and ULBs to discuss the directions of the Hon'ble NGT and ensure compliance.

## Report on Solid Waste Management of Kolkata

### 1.0 Introduction

Kolkata is one of the four metropolitan cities of India and is the capital of the state of West Bengal. The city is centered on latitude 22°34' North and longitude 88°24' East. Elevation ranges from 1.5 to 9.0m. above sea level. The river Hooghly is the principal waterway and forms the western boundary of Kolkata. The region contains numerous low-lying areas, marshes, wetlands and shallow lakes of jheels. The Kolkata Municipal Corporation (KMC) area comprising about 206.08 Sq. km. having population of 44, 86,679 as per census 2011. The climate of Kolkata is hot and humid. Avg. temperature ranges between 20°C to 30°C. Relative humidity varies between 85% in August and 68% in March. On an average the city receives 1650 mm rainfall. Waste generation rate 450-500 gpcd (avg.). Quantity of municipal solid waste (MSW) generation in the city is about 4000 ton per day (t/d). The collection, transportation and the disposal of the municipal solid waste is primarily executed and managed by employees, about 16000 are engaged in the street sweeping and door-to-door collection.

The predominant land use pattern of this city may be termed as mixed i.e. residential and commercial. To be very precise, no part of this city can be clearly distinguished from the other in terms of typical land use pattern because the city never came up in a planned fashion rather in a much chaotic manner as and where opportunities were there. However in consideration of the above factors it was seen that waste generation by household is approximately 55% of total generation and waste generated by commercial, institutional, medical & others is approximately 45% of total waste generation. There are all-together 252 markets in the city out of these 96 are registered private markets, 23 KMC own markets and nine wholesale markets of which only two are owned by KMC. In addition there are about 124 nos. of unregistered roadside markets all over the city.

The city is divided into 15 Boroughs & 144 wards. For the collection points about 350 vehicles (100 no KMC own vehicles and 280 no private vehicles) transport the municipal solid waste to the disposal site. On average about 97% of the total collected waste i.e. 3880 t/d of solid waste is transported to the main disposal site Dhapa, which is located at the eastern side of the city. The site has a total available area of 810 ha out of which 35 ha is currently used for waste disposal. A compost plant 500 t/d capacity is presently operating by M/s. Eastern Organic Fertilizer Private Limited. Actions has been prepared to augment the waste volume to be composted.

KMC has taken several steps to arrest and remove of solid waste, plastic bags and flower garlands, Polybags are tossed publicly and casually; piles of refuse tumble down slopes to the river edge.

So, solid waste management has been adopted top priority by Kolkata Municipal Corporation to improve the collection, transportation and augmentation of the existing composting plant with the financial assistance of KMC revenue fund ADB and state finance. KMC needs financial assistance from govt. to take measures for effective abatement of pollution and conservation of the river Ganga which helps to ameliorate the environmental conditions in Kolkata.

## 2.0 Physical & Chemical analysis of city refuse

The analysis of refuse (Table 1) is carried out normally to know it's physical as well as chemical characteristics (Table 2) which enable us to decide the desired frequency of collection, precautions to be taken during its transportation and method of processing and disposal.(NEERI,2005)

**Table 1:** Average physical composition of municipal solid waste

Total Compo- tables	Recyclables				Other including Inerts						Total
	Paper	Plastic	Glass	Metal	Inert	Rubber And Leather	Rags	Wooden Matter	Coconut	Bon es	
50.56	6.07	4.88	0.34	0.19	29.60	0.68	1.87	1.15	4.50	0.16	100.0 0
50.56	11.48				37.96						100.0 0

(All values are expressed in percentage on wet weight basis)

**Table 2:** Average chemical composition of municipal solid waste

Sl. No	Parameters	Year 2005
01	Moisture	46
02	pH	0.3-8.07
03	Loss of Ignition	38.53
04	Carbon	22.35
05	Nitrogen as N	0.76
06	Phosphorus as P <sub>2</sub> O <sub>5</sub>	0.77
07	Potassium as K <sub>2</sub> O	0.52
08	C/N Ratio	31.81
09	LCV Kcal/Kg	1201

(All values are in percent by dry weight basis except pH & LCV)

All values of physical parameters are in percent by net weight and all values of chemical parameters are in percent by dry weight basis except pH & LCV; \* Bio-resistant and synthetic material.

### 3.0 Present system of waste handling in Kolkata

#### 3.1 Collection & source segregation

- House-to-House Collection System has been introduced in 144 wards of KMC and covers approximately 100 % area.
- For SWM service each ward is divided into 7 to 10 blocks & each block is provided with 8-10 sweepers.
- Approximately 16000 nos. of sweepers are engaged to sweep 3275.41 Km. major road lengths and other lanes, by lanes etc.



Cleaning Width – 2.6 m.

(Working on E. M. Bye Pass)



Cleaning Width – 1.8 m.

(Working near Writer's Building)

**Average cleaning speed 10 km. / hour**

- Collected garbage is taken to secondary collection point i.e. in the form of vat / dumper placer container and modern scientific waste compactor stations (mini transfer stations).
- There are about 600 such collection points of which are in the form of open vats and bulk containers. A considerable number of open vats have already been converted into covered vat points and modern scientific waste compactor stations. Some of the vats are now removed by movable compactors.

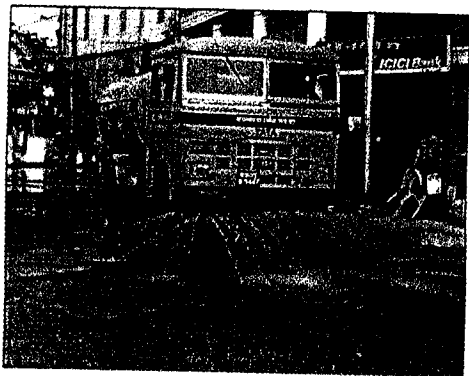
Additional 28 compactor stations are ready to use and KMC will be able to eradicate 200 numbers of open vats throughout the city within a short period.

- KMC has introduced source segregation of bio-degradable and non bio-degradable waste in 7 wards like 33, 47, 64, 103, 110, 115, 130 and still continuing.

### 3.2 Transportation

- About 70 % of the total collected waste is transported from collection point by private agency and remaining 30 % by departmental vehicles.
- Vehicles used by KMC for waste transportation are tipper trucks of 8 m<sup>3</sup> and 12 m<sup>3</sup> (manually & mechanically loaded) and Dumper placer of 4.5 m<sup>3</sup> & 7 m<sup>3</sup>, prime mover (hook loader ) for lifting of 10.5 cum portable compactor containers and 14.00 cum movable compactors.
- KMC has 12 mechanical sweepers, 17 pay loaders, 4 bulldozers, 2 breakdown van, 8 wrecker vans, 25 street watering and washing vehicles etc.

### Street Watering & Washing Vehicles



10 KL. Capacity  
Working on Corporation Place

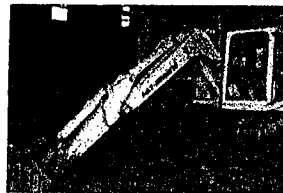
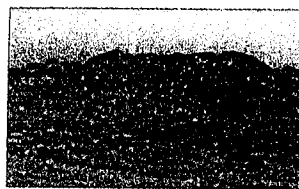
8 KL. Capacity  
Working on J. L. Nehru Rd



### 3.3 Disposal and waste utilization technology

- More than 99.5% of total waste generated in KMC area is disposed at saturated open disposal site Dhapa (31.5 hectare) and the rest at Garden Reach dumping site (8.7 hectare).
- 5 numbers computerized weighbridges with capacity 30 ton each are used and "Hourly Report" on position of disposal is available.
- 500 TPD Compost Plant is presently run by M/s. Eastern Organic Fertilizer Ltd. Windrow method is used for processing of compost.

Composting Plant

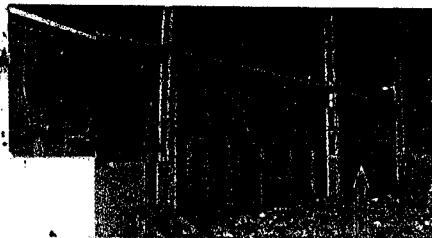


TRANSPORT OF DECOMPOSED WASTE THRU BOBCAT TO CONVEYOR BELT

Composting Plant



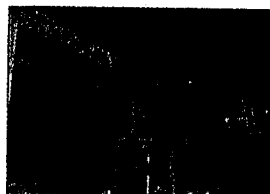
CONVEYING THRU TROMMEL NO. 1 (65 MM) MESH



CONVEYING THRU TROMMEL NO. 2 (40 MM) MESH

CONVEYING THRU TROMMEL NO. 3 (16 & 12 MM) MESH

Composting Plant



CONVEYING UPWARD & PASSED THRU 4 MM STRAINER



FINISHED MANURE BAGGING IN 50 KGS. HDPE BAG & STORED UNDER SHED



#### 4.0 Recent developments in Solid Waste Management

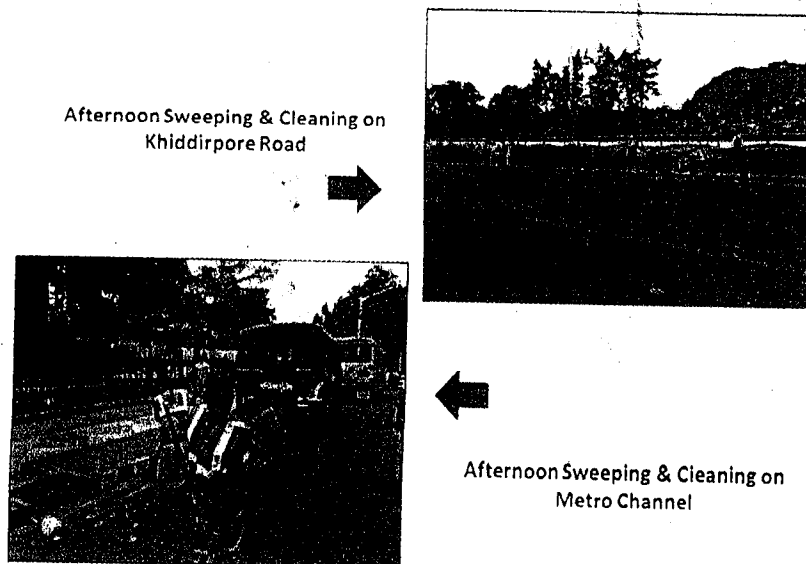
- ❖ Segregation of solid waste at source has already been introduced in seven wards with awareness campaign
- ❖ In reference to the notification of Govt. of West Bengal, SWM department has already implemented the scheme namely "West Bengal Urban Employment Scheme" to provide employment in urban areas and to create as well as maintain civic infrastructure in all 144 wards of 15 Boroughs. Average 40 youth is selected for mainly sweeping purposes under the Urban Wage Employment Programme in each ward for afternoon sweeping.
- ❖ Rendering Afternoon Sweeping & Cleaning in Central Business District & evening services in some areas to keep the city clean.

#### Impact

Before 2010 conservancy service was restricted upto 12.00 Noon. But this afternoon & evening service helps

- To improve collection efficiency;
- To make the city presentable;

#### Afternoon Service of Sweeping & Cleaning (After 2010)



- ❖ Currently, bio-medical waste is separated at source and not mixed with MSW.

- ❖ KMC has already introduced environment friendly battery operated hydraulic dumper in addition to hand carts and tricycles for door-to-door collection.

#### Development of Primary Collection Vehicles (After 2010)



Handcart at Hogg street



Battery Operated Vehicle

Tri Cycle Van at Hogg Street

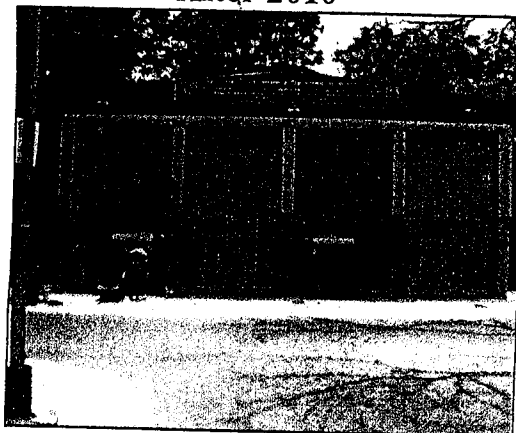


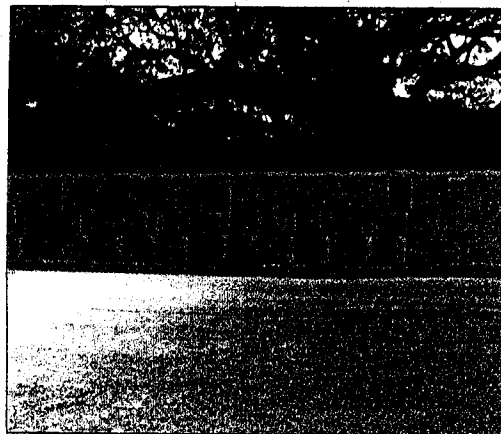
- ❖ 2000 numbers of Portable stand-mounted street trash bins have already installed for the pedestrians to avoid littering and to keep the footpath on roadside clean
- ❖ KMC has already introduced ten modern scientific waste compactor stations with eight numbers of prime movers to abolish the open storage points at
  - Kalighat Park.
  - Talla Park.
  - Southern Avenue opposite to Lake Kalibari.
  - Ballygunge Circular Road opposite to AAEI Club.
  - Gobinda Auddy Road.
  - Samsul Huda Road.

#### Before 2010



#### After 2010



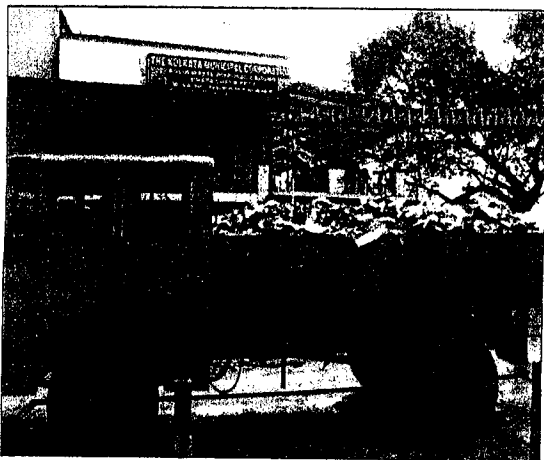


- D. N. Mitra Square.
- Asbestos Vat near Ramnagar
- Bhukailash Road
- Camac Street Vat

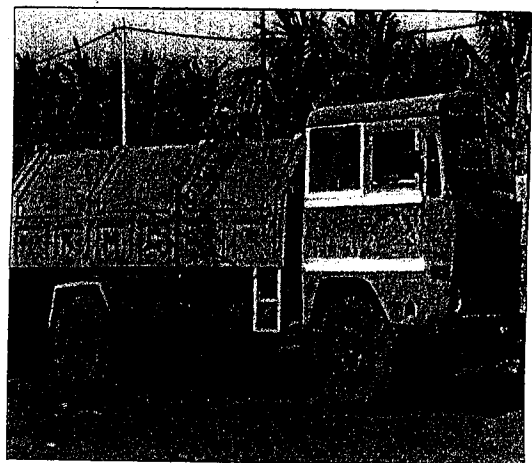
Additional 23 number of compactor stations are ready for operation where 91 number of compactor containers along with 20 number of hook loaders will start their function within a short period.

- ❖ To ensure efficient and timely transportation of municipal solid waste, department has procured 20 number of fully covered tipper vehicle to replace the old uncovered vehicles in order to prevent of spillage of garbage during transportation.

### Conventional Method Vis-à-Vis Covered Vehicle (After 2010)



8 Cu.M Open Tipper Truck



Covered Vehicle



Hook loader

- ❖ KMC has also engaged 17 numbers of movable compactors with tip cart (14 Cu.M capacity) at Naktola (ward-100), Jodhpur Park, near Bhavani cinema (ward-93), Moor Avenue (ward-97), Charu market (ward-81), State Bank of India (ward-81), D.H.Road-Allahabad bank (ward-131), Shyam Park (ward-8), James Long Sarani-Sree Sangha (ward-120) & near Ashutosh College (Ward-73).



State Bank New Alipore (Ward 81)



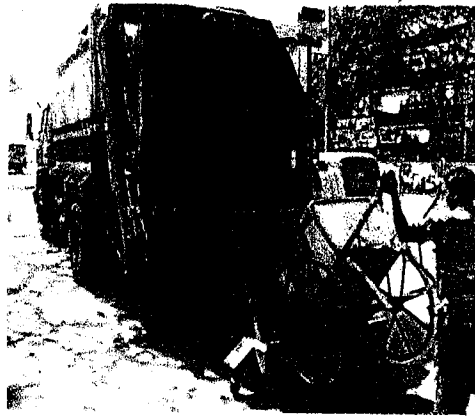
Allahabad Bank (D.H.Road Behala)



James Long Sarani



Jodhpur Park



Charu Market (D.P.S.Road)

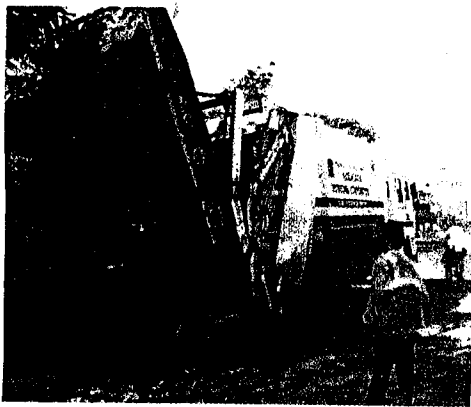
- ❖ KMC has also placed 7 numbers of movable compactors of 14 Cu.M. capacity with skip arm to lift 75 number 4.5 Cu.M containers and 300 trash bins in partly in Jadavpur area, Behala and north Kolkata.



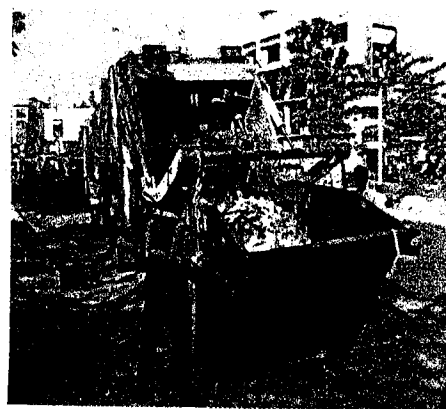
B.T.Road



Usha (D.H.Road Behala)



Nabapally



Abhishikta



Naskar Para



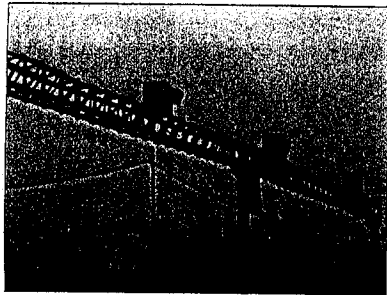
Joka

- ❖ Construction of more number Weigh Bridges, Implementation of Online Central Server with CCTV net working System and Vehicle Washing Facilities at Dhapa Disposal site.

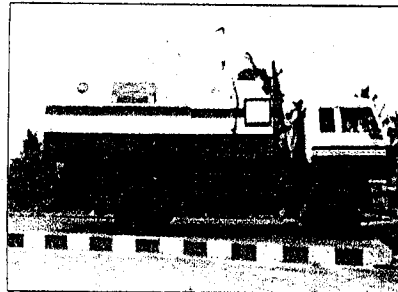
#### Impact

- Weighbridges are used for accurate record of waste inputs.
- Instant data available and helps to analyze collected information, able to corrective measures and support the planning & implementation process.
- Huge data storage facilities and highly secured.
- It helps in establishing a strong and reliable data base.
- CCTV monitoring helps to provide spatial and visual validation for provision of services.
- Car washing facility is available and helps to maintain the vehicles.

Online Central Server System with CCTV Monitoring at Dhapa Check Post (After 2010)



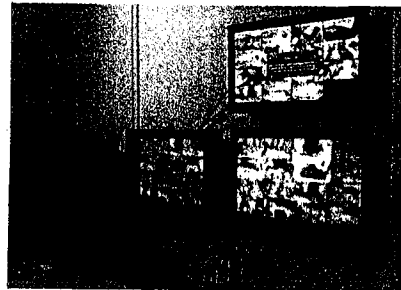
Close Circuit Camera



Weigh Bridge

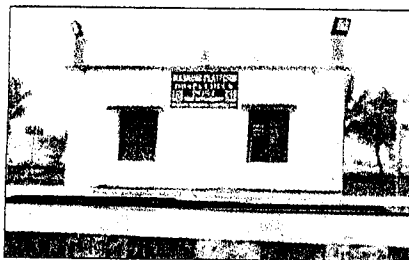


Online Data Entry

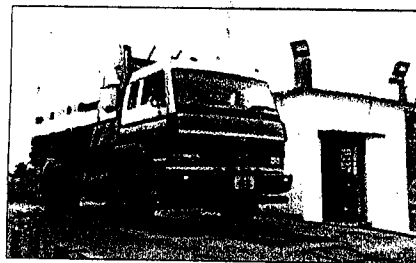


CCTV Monitoring

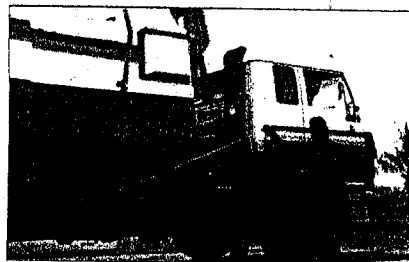
Car Washing Platform at Dhapa Check Post (After 2010)



Car Washing Room ↑



↑ Car Washing Platform



← Vehicle being washed

- ❖ The Department of Environment, Govt. of West Bengal had proposed the remediation of Dhapa municipal solid waste disposal site in Kolkata as a possible demonstration project and the Ministry of Environment & Forest (MoEF), G.O.I will be implementing the World Bank aided project titled "India-Capacity Building for Industrial Pollution Management (CBIPM). The remediation plan envisages capping of the disposal site and capture of landfill gas. At the Central level the MoEF, G.O.I will be the implementing Agency and at the state level it will be respective State Pollution Control Board. Of the

total project expenditure, only 85% will be paid by the World Bank while the rest has to be borne by the states.

- ❖ KMC has already processed to acquire initially around 14 hectare out of 52 hectare against crop compensation and solatium for interim waste disposal.

## 5.0 Future Plan

### For Collection & Transportation System:

- **Awareness campaign:** Continuous Awareness Campaign needs to create better waste consciousness among citizens. Promoting stakeholder awareness for better waste management, segregation of waste at source by public participation and involving NGOs and also educational institutions are required for training to trash sorters (rag pickers). Awarding or felicitating the citizens in public for efforts to keep their localities clean, are some of the ways to encourage public participation.
- **Segregation of waste at source:** Implementation of phase wise segregation at source is urgently needed in remaining 134 wards, Joka I and Joka II as it is crucial for effective solid waste management. Plastic materials like carry bags, disposable plates and cups, thermocole etc. not having resale value are just thrown out and littered around. The littered wastes are mixed with other wastes, especially with municipal wastes, thereby making segregation difficult. There is no specific organization to collect the waste plastics; hence it is accumulated with municipal solid waste (MSW).
- **100 % door to door collection & transportation:** 100 % Collection and transportation of waste will be done from KMC area and newly added Joka I and Joka II. Vehicle productivity is usually the most important factor influencing collection efficiency, because the cost of operating vehicles is usually much higher than the cost of labor. Improving vehicle productivity means increasing the total number of generators served and the total amount of waste transported each day per vehicle.
- **Small and medium sized mechanical sweepers:** Introduction of more small and medium sized mechanical sweepers is needed to make sweeping operation efficient, dust free and reducing manpower.
- **Abolition of open vat points:** KMC will abolish all open vat points made of reinforced cement concrete / masonry to avoid multiple manual handling and waste will not be visible or not come in contact with the atmosphere, thereby polluting the environment.



- **Own waste storage system in housing complexes:** Housing complexes, multistoried buildings and societies can collect waste from each household and store it a common point within their complex. This can be near the entrance from where an operator can easily lift the same.
- **Outsourcing for cleanliness of major thoroughfares:** Generally we provide sweeping in the morning by the departmental staffs and in the afternoon through West Bengal Urban Employment Scheme. But due to huge amount of waste generated in the evening and night at the major thoroughfares of the city, night services are required to get rid of such problems, but availability of fund is the main constraint.
- **Stationary / portable compactors of different sizes:** Considerable number of stationary / portable compactors of different sizes is needed to remove open vats throughout the city of Kolkata. Advantages of compactor station and portable compactor are (i) restriction of accessibility of birds, animals and rain water (ii) transport more garbage due to compaction system (iii) odorless transportation from compactor station to the disposal ground (iv) stoppage of rag picking (v) no spilling of garbage during transportation (vi) no seepage of water during transportation due to water tight system (vii) facilitates night transportation of solid waste etc.

#### **For Treatment & Disposal Facilities:**

- **Construction of engineered landfill, C&D facilities:** Construction of an Engineered Landfill site is urgently needed since one of the existing Kalmiban- Makaltala dumping site (11.6 hectare plot) has already been handed over to WBPCB, for implementation of World Bank aided project (CBIPM) on remediation of Dhapa municipal solid waste dumping ground in Kolkata, therefore, present available active landfill site is almost saturated and shall only be sufficient for KMC to continue its SWM operations for a maximum period of one year. Design life of a scientific Landfill on 14 Acre land provided by HIDCO will be only 1.5 years, so land for multiple disposal sites are an immediate prerogative for long term planning.
- **Waste to Energy Project:** - KMC has taken up to set up a waste to energy project by using Municipal Solid Waste at Chapna Mouza, Rajarhat on 06 acre land. The project will be executed on PPP model. Tender has also been floated.
- **Review of waste treatment facilities:** For integrated waste treatment facilities processor plants such as composting, bio-mechanization, etc. for the biodegradable waste may be reviewed.
- **Laboratory scale pilot project for utilization of MSW and clayey materials:** KMC has taken up development of laboratory scale process knowhow for making common building blocks vitreous tiles decorative tiles and paver block utilizing MSW and clayey materials for KMC.

Central Glass & Ceramic Research Institute (CGCRI), a central government research institute of CSIR has been entrusted to execute the work.

### Fund Required:

- Total Waste generated : Av. 4000 MT / day
- At present waste treated : Av. 500 MT / day
- Waste to be treated : Av. 3500 MT / day
- Cost involvement for treatment of waste including land (excluding inert) : Rs. 534 Crores
- Quantity of Inert Waste for scientific land filling : Av. 2650 MT / day
- Quantity of waste to be disposed scientifically : Av. 2650 MT / day
- Cost involvement for scientific waste disposal including land : Rs. 1190 Crores
- Total cost for treatment & disposal of waste including land : Rs. 1724 Crores
- Budget available (From KMC & State Govt.) : Rs. 10 Crores
- Financial gap of cost : Rs. 1714 Crores.

### Bottle necks:

- Kolkata grew up along the Hooghly River, a tributary of the Ganges. The Hooghly River lies to the east and the now defunct Bidyadhari River to the West, Since the mid-1800s, the area east of the city had been used as a garbage dump. The Hooghly river lies to the east of the city and the now defunct Bidyadhari river is in the West. The East Kolkata Wetlands are part of a region which is the mature delta of the Ganges river where its tributaries eventually drain into the Bay of Bengal. The tropical region is naturally suitable for using solar radiation to improve wastewater quality. The real objective for using the site is to protect the river Ganga as Kolkata's general health and specifically its waste disposal problems have been intimately connected to the characteristics of its site and natural drainage since 1847.

The sewage fed fisheries and garbage farms that grew out of waste disposal in the eastern wetlands, survive today and serve to process Kolkata's wastes. Productive shallow fish ponds act as oxidation ponds and are extremely important for the city, as Kolkata has no separate sewage treatment units. There are about 1700 acres of farm land adjoining the Dhapa Solid Waste dump who regularly take loads of fresh garbage for use as soil conditioner and fertilizer. The Ramsar Convention, while

declaring the East Kolkata Wetlands as a designated site, said that "the East Kolkata Wetlands are world renowned as a model of a multiple use wetland, the site's resource recovery systems, developed by local people through the ages, have saved the city of Calcutta from the cost of constructing and maintaining waste water treatment plants. So, Kolkata historically uses this site for waste disposal for more than 150 yrs.

- KMC has approached to ADB, World Bank, JnNURM for financial funding but KMC has not yet get any funding due to having no sites for treatment & disposal other than Ramsar sites.
- Principle Secretary, Govt. Of West Bengal has also requested to the Secretary MOEF by sending two letters on 30.01.12 & 11.04.12 to make an exception to the central wetland rule for 2010 specifically for the East Kolkata Wetlands and has requested for an early amendment to the existing notification and sought permission for setting up of a new modern scientifically managed landfill for the total MSW generated within Kolkata. It may be appreciated that "wise use" of these wetlands includes management of the Urbane Environment and Solid Waste Management is only a subset of the overall Governance regime.

In this case statutory clearances are necessary and exceptions be incorporated in the wetlands (Conservation & Management) Rules, 2010 by Ministry of Environment & Forests (MoEF), Govt. of India for implementation of such projects on treatment & disposal facilities.

#### **6.0 Status of SWM projects initiated by KMC:-**

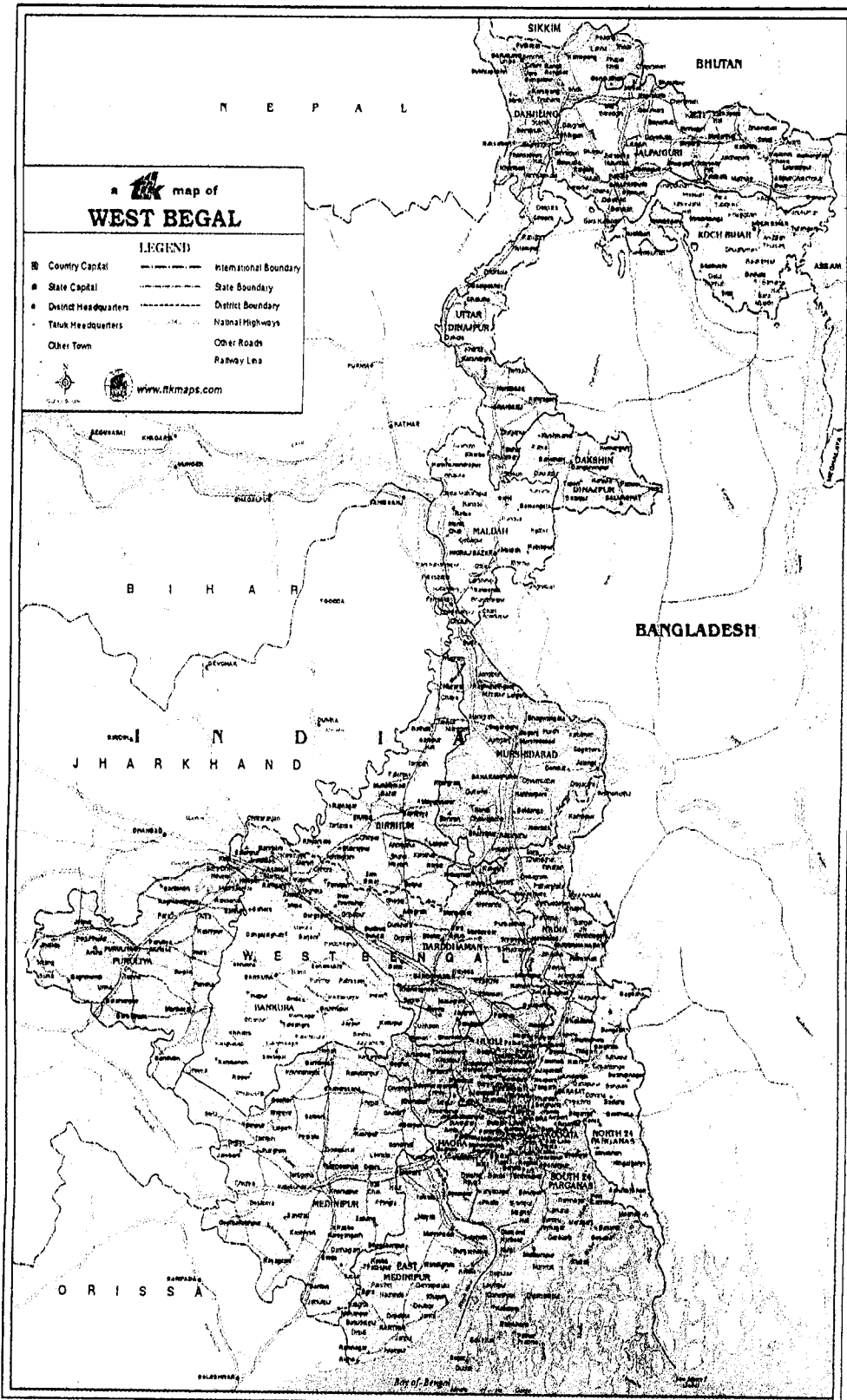
With a view to improve the SWM system of Kolkata, KMC submitted the DPR to the Govt. Of India under JnNURM scheme with project cost of Rs 152.83 crores and subsequently approved in 133 CSMC meeting held on 04.03.2014 at Nirman Bhavan, New Delhi.

After sanctioning of the project KMC has requested by their letter No CON/COM/570/-2013-14 dt. 18.02.2014 to release the 1<sup>st</sup> installment of the project. However KMC has learnt from the letter of the director ( N/2) vide letter no K-14012/9(48)/2013-N-I/N-V 1<sup>st</sup> installment could not be released due to the reason as mentioned in their said letter (Copy enclosed).

Action Plan for Integrated Solid Waste Management for 78 Urban Local Bodies  
outside Kolkata Metropolitan Area

36

2015-19



Department of Municipal Affairs  
Govt. of West Bengal

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### A. 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, this responsibility lies with the concerned municipal body – a Corporation, Council or Municipality – or whatever such body is named in line with applicable statutes.
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 recommendation, States such as Punjab 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,

## West Bengal MSW Management Action Plan

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 mutatis mutandis, and submit action plans to the Union of India in order to report compliance.

7. This instant report addresses such an action plan, drawing from the model adapted in Punjab, but also utilises learning from its own cities and towns, as well as best practices drawn from other States, opportunities created through other Government programmes and experiences from other States such as Kerala (Clean Kerala mission supported by the Kudumbasree umbrella programme).

### B. Need for the action plan

8. 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 129 municipal bodies within the State, of which six are Municipal Corporations, while the remaining are smaller 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. A rapid assessment of municipalities being conducted at the time of preparing this draft action plan indicates that with the exception of Kolkata Municipal Corporation, none of the other municipal bodies appear to be in compliance of the Municipal Solid Waste (Handling and Management) Rules, 2000. Although 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.

9. 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 plan is to identify sources (in the form of practices) where such contamination occurs, and recommend measures that would lead to reduction of such instances.

10. At the same time, a rapid analysis of the waste stream indicates that there is significant diversity within the waste constituents – with large amounts of inert waste that does not react with any known biological or naturally occurring agent, as well as large amounts 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

purpose of this plan is to identify such opportunities and to suggest ways and means to capitalise upon them.

11. 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 plan 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.

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

- a. Reinforcement of the three 'R's – Reduce, Reuse and Recycle
- b. 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
- c. 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.
- d. The generation of waste has negative externalities, and therefore the 'polluter pays' principle must apply

### C. Organisation of the plan

13. Urban areas within the State of West Bengal may be divided into the following groups:

- a. Municipalities within the Kolkata Metropolitan Area, subsumed into the area administered by Kolkata Metropolitan Development Authority (41 nos.)
- b. All other municipal areas, not included in the above (88 nos.)

14. In addition to the above, certain development authorities, constituted under the provisions of the West Bengal Town and Country (Planning and Development) Act, 1979 also have supra-administrative control over certain municipalities and/or municipal Corporations outside the Kolkata Metropolitan Area, such as (i) Siliguri and Jalpaiguri, (ii) Haldia, (iii) Asansol and Durgapur, (iv) Santiniketan and Sriniketan, (v) Digha and DighaSankarpur, (vi) Burdwan, (vii) Jaigaon, and (viii) Kharagpore and Midnapore. Out of these, the planning and execution of solid waste management programmes in some of these areas, viz. Kolkata Metropolitan Area, Haldia, Siliguri&Jalpaiguri, Asansol and Durgapur, Raniganj, KultiandJamuriaare managed by the respective development authorities. This action plan covers the 73 remaining municipalities in the State of West Bengal, up to the perspective period of 2019.

15. This action plan proceeds in the following manner:

- a. Each unique activity in the process of solid waste management – namely, (i) generation, (ii) collection, (iii) segregation at source, (iv) sorting, division and transportation, (v) treatment &



## West Bengal MSW Management Action Plan

recycling, and (vi) disposal is assessed separately in terms of present state, characteristics, practices employed and resources utilised.

- b. Proposals for the same activities as regards desirable state, characteristics, practices to be followed and resources to be utilised are listed
- c. The cities are classified on the basis of whether they may be 'clustered' akin to the model utilised in Punjab, or left to manage their waste locally at their individual level. This is determined by the following three parameters: (1) Physical proximity of the towns with each other, (2) Amount of waste generated and (3) Waste generated per capita

16. This document does not assert or assure that the clusters as suggested in these documents are absolute and final since a number of input variables such as amount and nature of waste has not been adequately sampled, nor has any assessment been carried out as to whether any nearby alternative exists as regards scientific treatment of waste. This will be performed separately on a case to case basis.

17. The subsequent sections will detail out the existing state of affairs and the proposed interventions with each sub-area of the solid waste management process.

### D. The existing solid waste management process

18. As discussed in para 15 a above, 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.

#### D1. Generation of solid waste

##### D1.1 Existing situation

19. From data made available by the Municipal Affairs Department, on an average, municipal solid waste generation varies from 0.29 kg per capita per day to about 0.46 kg per capita per day. Lower amounts appear to emanate mainly from smaller towns, mostly with population less than 50,000 souls (Census 2011). Higher amounts (in excess of 0.4 kg per capita per day) appear to be prevalent for towns with a population of above 1,00,000 souls. Towns with population ranging between 50,001 through 1,00,000 souls appear to show a per capita generation of about 0.39 kg per day. As of now, of the 73 cities covered in this plan, 42 towns show per capita generation of less than 0.3 kg, and 16 towns show per capita generation of more than 0.4 kg, leaving the balance of 15 towns in the range of 0.3 kg to 0.4 kg per capita per day. The average per capita generation for all of these towns is close to about 0.36 kg per day. The population of these towns put together, in 2011 was 58.50 lakh, thus the total waste emanating from these towns was close to 2,080 MT/ day.

20. The bulk of the waste generated from these towns comprises of organic in nature, comprising of vegetable and food waste, biomass and other compostable material – making up to about 52 per cent of waste. Inert substances – largely soil from household and street sweeping/ dusting, rocks, pebbles etc. makes up for the second largest constituent of the waste at about 43 per cent. Recyclables, such as plastics (including packaging material), glass, metal scraps, leather pieces, cloth etc. makes up for about 5 to 10 per cent, the percentage increasing with the size-class (population) of the town.

21. Waste largely emanates from households, followed by markets, other commercial areas, other urban uses and finally agricultural waste.

**Table 1: 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%

21A. The prevailing composition of waste in the State of West Bengal is similar to the trend exhibited at an all India level.

**Table 2: Waste composition from municipal bodies**

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  $X \rightarrow$  mean of  $n$  observations expressed as decimals

$Y \rightarrow$  transformed value of  $X$ , and

$V \rightarrow$  standard deviation

21B. The distribution (in percentage of total) of various constituents of waste may be classified in terms of size class population as follows:

**Table 3: Waste composition from municipal bodies, distributed across size-class**

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Population Range (in millions)	Number Of Cities Surveyed	Paper	Rubber, Leather And Synthetics	Glass	Metals	Total compostable matter	Inert
0.1 to 0.5	12	2.91	0.78	0.56	0.33	44.57	43.59
0.5 to 1.0	15	2.95	0.73	0.35	0.32	40.04	48.38
1.0 to 2.0	9	4.71	0.71	0.46	0.49	38.95	44.73
2.0 to 5.0	3	3.18	0.48	0.48	0.59	56.67	49.07
> 5	4	6.43	0.28	0.94	0.80	30.84	53.90

**D1.2 Forecasted situation**

21C. Assuming the present CAGR of 2.9% per cent in urban areas across India, by 2019, the population will have increased to 75.66 lakh. If the average waste generation per capita were to be kept constant, the waste generation would increase to 2,691 MT/ day. 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 3,178 MT/ day.

22. While the volume of waste is likely to go up naturally on account of increase in population, the composition of waste is expected to largely stay consistent within the period specified. However, the percentage of recyclable and recyclable-biodegradable waste may increase with consumption of packaged items and adoption of green packaging.

23. At this time, construction and demolition waste in smaller 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.

24. 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 souls) 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.

**D2. Collection of solid waste**

**D2.1 Existing situation**

25. In most cases, waste from households and market places are collected by designated workers directly from doorsteps, along with street sweeping. The waste collected is largely unsegregated, since households tend to dispose of the same within the same receptacle. In recent times, with the advent of plastic bags, households and shops often place the refuse inside such bags, which themselves become part of the waste. In some of the larger cities, polyethylene (LDPE) bin liners are commercially available, however, these are not widely used in residential households.

Households are broadly aware, at least on a conceptual level that segregation of waste at source has certain benefits, but are discouraged by the lack of the municipal body's interest to process these streams separately.

26. 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.

27. Flatted, gated and closed communities (residential, commercial or mixed use) usually arrange for door to door collection internally through the association of owners/ occupiers, and the cost of this is covered within the maintenance charges payable by the owner/ occupier of each such flatted tenement to the association. The collected waste is left in a single large receptacle at a specified point outside the complex, from where the municipal staff engaged in door to door collection picks up the same. In certain complexes created by entities such as West Bengal State Housing Board or Kolkata Metropolitan Development Authority, where there is no functional association of apartment owners, the municipal waste collector actually collects waste from each flatted tenement, and in certain cases, enters into an informal arrangement with the residents to sweep/ clean common areas against payment of an agreed monthly rate divided between residents.

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

28. The workers engaged in the collection of waste are usually municipal staff (on regular employment), or contracted through labour contractors. Since 2003, on account of various judicial orders as well as austerity measures prescribed by the Government, new staff is not being recruited to municipal bodies for this manner of work. However, a number of casual staff have filed lawsuits claiming regularisation with municipalities on account of their long and largely uninterrupted services. The workers are not provided any protective apparel or gear such as masks, gloves, safety glasses or first aid kits. While the sampling for this report is considerably small, there are indications that much of the casual labour engaged through contractors belong to certain marginalised segments of the society, such as backward classes. In very few cases are community based organisations engaged in this kind of work.

29. In cities where municipal bodies do not have custody of roads (viz. Cooch Behar), 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.

30. Community bins, although provided for and mentioned in the asset registers of municipalities, are largely absent and most of the informal 'agglomeration' of waste is done by

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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.

### **D2.2 Forecasted situation**

31. 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.

32. 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. The Government of India programme on National Urban Livelihoods Mission can be proactively utilised to foster such organisations that 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.

33. 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.

### **D3. Sorting, division and transportation of solid waste**

#### **D3.1 Existing situation**

34. As explained up to para 33, till the point of collection of waste, no organised sorting of any kind is carried out. As a result, the waste is transported in its unsegregated form for the most part to the designated point of treatment (or disposal).

35. 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.

36. 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 debris (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.

37. Transport to sites are taken up in trucks with 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, 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.

38. 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.

#### ***D3.2 Forecasted situation***

35. If the waste volume were to increase in line with para 21, and be taken up in the same unsegregated and uncompacted 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.

36. 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.

37. 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.

#### **D4. Treatment and recycling**

##### ***D4.1 Existing situation***

38. 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.

39. 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

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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.

40. Certain forms of waste, for instance sugarcane remnants (molasses, from sugar factories) have exceptionally high calorific value and can be used to generate energy. However, municipal bodies, in their own capacity are not equipped to harness this resource. A rapid assessment of chemical composition of waste is indicated hereunder:

**Table 4: Chemical composition of waste from municipal bodies**

Population Range (in millions)	Number of Cities Surveyed	Moisture (%)	Organic matter (%)	Nitrogen as Total Nitrogen (%)	Phosphorous as P <sub>2</sub> O <sub>5</sub> (%)	Potassium as K <sub>2</sub> O (%)	C/N Ratio	Calorific value* in kcal/kg
0.1 to 0.5	12	25.81	37.09	0.71	0.63	0.83	30.94	1009.89
0.5 to 1.0	15	19.52	25.14	0.66	0.56	0.69	21.13	900.61
1.0 to 2.0	9	26.98	26.89	0.64	0.82	0.72	23.68	980.05
2.0 to 5.0	3	21.03	25.60	0.56	0.69	0.78	22.45	907.18
> 5	4	38.72	39.07	0.56	0.52	0.52	30.11	800.70

Source: CPHEEO manual, page 43

41. As explained in para 23, 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.

42. 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.

43. Certain municipalities, such as Cooch Behar, 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 Municipality 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/- per household for every month of service rendered. However, owing to a decision of the State Government as regards not charging any user charges, this revenue stream stopped, and the entity had to eventually cease operations.

#### *D4.2 Forecasted situation*

44. Without segregation or recycling, the municipal body will be in contravention of the municipal solid waste (handling and management) rules of 2000, 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.

45. 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.

#### **D5. Disposal**

##### *D5.1 Existing situation*

46. Outside the Kolkata Metropolitan Area, there are hardly any engineered sanitary landfill sites, probably 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.

47. 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.

48. 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.

49. In hilly areas, waste is usually dumped along slopes, which results in the same being washed downstream, contaminating surface water sources in the process. In the case of Dhupguri, the waste stream has been known to flow along the slopes across the international border in contravention of UNEP protocols.

50. Assuming a depth of 5 meters and an unsegregated, non-compacted waste density of 0.85 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.

51. 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.



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### *D5.2 Forecasted situation*

52. 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.

53. 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.

54. 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.

### **D6. Institutional establishment and management**

#### *D6.1 Existing situation*

52. 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 seen to be by a Deputy Chairperson, the Municipal Engineer, a sub-assistant engineer or assistant engineer and a sanitary inspector/ safaidaroga. 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. While some of the senior staff exhibit general knowledge of the MSW rules, 2000, most of the staff is demotivated to pursue the same.

53. 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.

54. 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, 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.

55. 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, the existing

policy of the State Government is to not levy 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.

**E. Proposed action(s)**

54. As discussed in section D above, 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.

55. For the purposes of this plan, the clustering approach, similar to the model used in Punjab has been considered with respect to three parameters, namely:

- a. Distance between cities
- b. Waste generated by cities
- c. Per capita waste generation

56. Based on the above, this action plan proposes the following arrangement of municipal bodies:

**Table 5: Stand-alone and cluster oriented projects**

Sl. No.	Location of landfill site	Name of Dist.	Cluster/ Stand-alone mode	Name of ULBs	Population as on 2011 (Lakh)
1		Bankura	Stand-alone	Bankura	1.38
2			Stand-alone	Bishnupur	0.63
3			Stand-alone	Sonamukhi	0.30
4		Birbhum	Stand-alone	Bolpur	0.66
5	Jhanjhania, near Rampurhat			Rampurhat	0.60
6				Nalhati	0.38
7			Stand-alone	Sainthia	0.45
8	Khatanga, near Siuri/Ward				Siuri

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Sl. No.	Location of landfill site	Name of Dist.	Cluster/ Stand- alone mode	Name of ULBs	Population as on 2011 (Lakh)
9	No 16 near Dubrajpur			Dubrajpur	0.38
10		Burdwan	Stand alone	Burdwan	3.22
11			Stand alone	Gushkara	0.39
12	Kalna		Stand- alone	Kalna	0.58
13	Near Katwa			Dainhat	0.41
14				Katwa	0.82
15			Stand alone	Memari	0.46
16			Coochbehar	Stand alone	Dinhata
17	Majherdabri/MajherSarik Road			Coochbehar	1.02
18				Haldibari	0.15
19				Mathabhanga	0.28
20				Mekhliganj	0.14
21				Tufanganj	0.24
22		Darjeeling	Stand- alone	Darjeeling	1.20
23			Stand- alone	Kalimpong	0.46
24			Stand- alone	Kurseong	0.46
25			Stand- alone	Mirik	0.11

Sl. No.	Location of landfill site	Name of Dist.	Cluster/ Stand- alone mode	Name of ULBs	Population as on 2011 (Lakh)
26		Hooghly	Stand- alone	Arambagh	0.70
27			Stand- alone	Tarakeswar	0.31
28		Jalpaiguri	Stand- alone	Alipurduar	0.81
29			Stand- alone	Mal	0.25
30			Stand- alone	Dhupguri	0.48
31	Near Nababgunj, ward No.1	Maldá	Cluster	Englishbazar	2.50
32				Old Malda	0.82
33	Near Ward No. 7, Khirpai/Near ward No. 2, RamNagar	Midnapore (W)	Cluster	Chandrakona	0.23
34				Ghatal	0.64
35				Ramjibanpur	0.21
36				Kharar	0.13
37				Khirpai	0.16
38	Hoshnabad/near IltKharagpur		Cluster	Kharagpur	2.75
39				Midnapore	1.79
40			Stand- alone	Jhargram	0.62
41		Midnapore (E)	Stand- alone	Contal	0.78
42			Stand- alone	Egra	0.30

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Sl. No.	Location of landfill site	Name of Dist.	Cluster/ Stand- alone mode	Name of ULBs	Population as on 2011 (Lakh)
43	Near Rupnarayan River		Cluster	Tamluk	0.65
44				Panskura	0.58
45	Kanupur, near Jangipur		Cluster	Dhulian	0.73
46				Jangipur	0.86
47	Nasirpur, Natungunj		Cluster	Berhampore	1.95
48				Murshidabad	0.44
49		Murshidabad	Stand- alone	Beldanga	0.29
50			Stand- alone	Jiaganj- Azimganj	0.55
51			Stand- alone	Kandi	0.75
52	Ward No.5 of Taki Municipal area near Mankundu Rd.		Cluster VIII	Taki	0.43
53				Baduria	0.52
54				Basirhat	1.25
55		North 24 Parganas	Stand- alone	Bongaon	1.08
56			Stand- alone	Gobardanga	0.54
57	Inbanipur/BaigachhiKhalpar		Cluster	Habra	1.50
58				Ashoknagar- Kalyangarh	1.34
59		Nadia	Stand- alone	Birnagar	0.29
60	Anulia, beside Ranaghat			Cluster	Taherpur
61		Ranaghat			0.77
62		Chakdah			0.95
63		Coopers Camp			0.19
64	Beside KrishnaNagar		Cluster	Krishnanagar	1.56

Sl. No.	Location of landfill site	Name of Dist.	Cluster/ Stand- alone mode	Name of ULBs	Population as on 2011 (Lakh)
65	Highway, nearer from PanthaTirtha Bus Stand			Nabadwip	1.35
66				Santipur	1.55
67		Purulia	Stand- alone	Jhalda	0.17
68			Stand- alone	Purulia	1.21
69			Stand- alone	Raghunathpur	0.25
70		South 24 Parganas	Stand- alone	Diamond Harbour	0.42
71			Stand- alone	Joynagar-Mazilpur	0.26
72		Uttar Dinajpur	Stand- alone	Islampur	0.61
73	Right Bank of River Torsa			Kaliaganj	0.55
74				Raiganj	1.82
75			Stand- alone	Dalkhola	0.37
76		DakhsinDinajpur	Stand- alone	Balurghat	1.54
77			Stand- alone	Gangarampur	0.56

## E1. Generation

### E1.1 Proposed action plan

57. 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 such as rebate or waiver of trade license fees

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58. 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:

- a. Introduction of local collection/ deposition bins for vegetable waste at markets
- b. Common repository for slaughterhouse waste at meat and fish markets
- c. 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.
- d. Prominent display and announcements to guide users to use the appropriate bins for disposal of waste items.

59. 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:

- a. "There is nothing called waste. Everything is reusable. Help us re-use everything."
- b. "A small item that you throw today becomes a larger problem for all of us tomorrow"
- c. "How municipal bodies manage waste"

60. 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.

61. The State Government would depute its in-house Department/ agency for advertising and visual publicity to develop semi-customised software (costs to be shared between State Government and municipality, plus any sponsor).

## **E2. Collection**

### ***E2.1 Proposed action plan***

62. 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-biodegradable 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.

63. Certain specific items, viz. electronic parts, batteries (excluding lead acid batteries) and animal carcasses/ remains (excluding slaughter house waste) will be segregated at source. Depending on whether a specialised collection service is available for this at such location or not, waste collectors may refuse taking such items into their inventory, or charge a pre-designated fee for disposal of such items.

64. 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.

65. 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.

66. 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.

67. 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.

68. 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:

- a. 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.
  - b. 50 per cent of the costs of the society for collection of waste will be borne out of funds of the Municipality
  - c. 50 per cent of costs of the society may be recovered from direct door to door collection from beneficiaries.
  - d. 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.
69. **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:
- a. Construction & demolition waste (debris)
  - b. Animal carcasses (excluding slaughter house waste)
  - c. Lead acid batteries (in line with Batteries Handling and Management Rules, 2001)
  - d. Electronic waste



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e. Bio-medical waste from small medical establishments

70. 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.

71. 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:

- a. Sharps – glass and metal scraps
- b. Plastic items
- c. Non-standard waste items (subject to safeguards as indicated in para 69)

72. 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 6: Waste treatment options

Waste type	Treatment	Size/ distribution of facility
Sharps (glass)	Recycling through melting and reclamation	One unit per 5 lakh population
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)	One unit per two lakh population
Plastic items	To be reclaimed through melting	One unit per two lakh population
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	One unit per two lakh population
Dead animals	Rendering plant for production of rendered waste as chicken/ poultry feed	One unit per 5 lakh population, preferably clubbed along with a slaughter house
Lead acid batteries	Specialised waste facility in line with Batteries Handling and Management Rules, 2001	One unit of disassembly and reclamation per 5 lakh population, collection and storage units can be had at the rate of one per every two lakh population
Electronic waste (printed circuit boards, discarded electronic items)	Specialised waste facility designated by the State Pollution Control Board	One unit for disassembly, salvage and reclamation per 5 lakh population
Bio-medical waste – plastic disposables	Melting and reclamation as plastics	One unit for a population size of two lakh.
Bio-medical waste – bandages, biological waste	Incineration at a minimum of 2,000 degrees, preferably electrical or composite fuel	One unit for a population size of two lakh.
Bio-medical waste – metals & sharps	Autoclaving and grinding, reclaimable as conventional sharps	One unit for a population size of two lakh.

### E3. Transportation

#### E3.1 Proposed action plan

73. The present system of collecting waste in tricycles or wheelbarrows, subject to the conditions in para 62 above would continue, but for transport to the waste treatment and disposal site, the following regime shall be followed:

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- a. Instead of conventional tipper trucks with capacities of about 200 cu. Feet, compactor trucks with a capacity of 400 cu. Ft. shall be used. These trucks will 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 kg/ cubic meter (twice the unsorted/ uncompressed density), while inert material will be compacted to about 1.3 kg/ cubic meter (subject to presence of rocks and other non-compressable matter).

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

**Table 7: Waste carriage vehicles**

Type of vehicle and capacity	Coverage	No. of trips in one day
Tractors with a trailer capacity of up to 200 cu. Ft., 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

74A. The inventory of vehicles for managing solid waste in a city with a population of 10 lakh may be considered as follows:

**Table 8: Waste carriage vehicles, numbers**

Tricycle rickshaw	Tipper/ LCV	Refuse Compactor	Dumper Placer
150	125	15	20

74B. Likewise, the inventory of manpower for managing solid waste in a city with a population of 10 lakh may be considered as follows:

Table 9: 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
	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
<b>Total</b>			<b>518</b>

75. 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.

76. Trucks will be fitted with bi-directional Global Positioning Systems radios 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.

#### E4. Treatment

##### E4.1 Proposed action plan

77. 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 10: 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 souls, 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.  Landfill site application for soil which is deemed as too amorphous or loamy to utilise as filler material.	One unit for a population size catchment exceeding 2 lakh and not exceeding 10 lakh
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.

**E5. Disposal**

**E5.1 Proposed action plan**

78. For the most part, 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.

79. 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).

80. As per para 21, a waste volume of 3,178 MT/ day is expected from the said 73 municipalities in West Bengal covered in this action plan. This may be considered as below:

Total (MT)	3,178	100%
Recyclable (MT)	318	10%
Organic (MT)	1,573	50%
Inert (MT)	1,287	41%

80A. Assuming a waste density of about 0.83 kg/cubic meter for un-compacted waste, ramming based compaction will lead to density increasing by about two to two and a half times, i.e. 2.075 kg/ cubic meter for inert matter. The inert material, if disposed of completely into sanitary landfills after compacting will require a land area of 582 sq. kilometres to 730 sq. kilometres by 2019 all over the State of West Bengal. The average area consumed per MT of waste is therefore around 55.74 sq. meter.

80B. For compostable matter, mechanised compaction will result in increase in density by about three times, i.e. up to 2.49 kg/ cubic meter. Assuming a holding time of 14 days, the gross area required for landfill site will be close to 4 sq. kilometres only (2.5 sq. kilometers for windrows/ composting pits, balance for handling and circulation).

80C. There is, therefore a clear requirement to reduce the amount of inert waste entering the landfill site. As indicated elsewhere in this report, inert material can be used as follows:

Table 11: Isolation of waste from inert material

Component of inert material	How segregated	Use(s) proposed
Earth	Sieving at disposal site	<ul style="list-style-type: none"> <li>- Substitute for fine sand</li> <li>- Bricks (class II or below)</li> <li>- Filler blocks</li> <li>- Mud phoska in roofing material (insulation)</li> </ul>
Rocks	Leftover from sieving at disposal site	<ul style="list-style-type: none"> <li>- Crushed aggregates for mass concrete (low load bearing toe walls, culvert parapets etc.)</li> </ul>
Construction debris	Segregated at source - collected from sites	<ul style="list-style-type: none"> <li>- Rubble aggregate for concrete blocks</li> <li>- Filler material for road undercourse</li> <li>- Filling of potholes</li> </ul>

81. Design considerations for siting of a landfill site cum-compost plant: In accordance with the orders of the National Green Tribunal in the case of Mall Singh and Ors. Vs the State of Punjab, and

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the provisions of the Municipal Solid Waste (Management and Handling) Rules, 2000, the following considerations would be had with respect to siting of sites:

- a. The site has to be located at least 8 to 10 km from the city; and at least 2 km from any human settlement;
  - b. It has to be located at least 35 km away from any major airport (civil or military)
  - c. It has to be at least 500 meters away from any surface or sub-surface water source
  - d. It has to be in the leeward direction of the closest human settlement, i.e. winds should not be blowing from the site towards the human settlement
  - e. A buffer of at least 200 meters comprising of tree plantations is to be maintained all around the site.
  - f. The landfill site would be filled up to a depth of 3.5 meters, and thereafter capped and closed off scientifically in line with the Municipal Solid Waste (Handling and Management) Rules.
82. The site has to be cleared under the following aspects:
- a. 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.
  - b. In-principle clearance from the State Environmental Impact Assessment Authority as regards the site;
  - c. 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
  - d. Clearance from State Pollution Control Board after determination of nature of development of the site.
83. The issue of leachate in designated landfill sites may be treated as follows:
- a. 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.
  - b. 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 50mm crushed rock laid to a depth of 400mm with a permeability of  $1 \times 10^{-4}$  cm/sec.
  - c. Inclusion of perforated HDPE pipes in the drainage blanket to facilitated leachate flow with pipes laid on a typical spacing of 50m.
  - d. 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.

- e. 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.
- f. 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.
- g. The precise methods and degree of treatment shall accommodate the fluctuations in leachate generation.

84. 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.

85. 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.

86. In view of the issues faced by municipalities in acquiring land for establishing of such sites, an alternative model for assembly is proposed. This relies on the fact that over 80 per cent of land holdings in the State of West Bengal are marginal in nature and tends to lose economic productivity with increasing proximity to urbanisation. As per this alternative:

- a. The land is leased directly from one or more farmers. For ease, it may be considered to seek a cluster of marginal holdings (1 hectare or less). This is because income from such lands is usually single crop based and likely sporadic. Usually where land has been redistributed in West Bengal under land reforms, the average landholding is 0.82 hectares.
- b. The lease amount per year is (1) either the highest agricultural income from such land within last five years (as base value) escalated by 7.5% compounded for each passing year, or (2) pre-specified percentage (usually current market value of the land against total capital investment on the site) of all revenue (tipping fee + sales of compost + W2E or any other source) – whichever (1 or 2) is higher. For (1), double crop basis could be considered.
- c. After the closure of the landfill site at the end of the concession period, the finished site can be handed back to the farmer for capitalization in whatever limited form it can be used, though with improvement in technologies an increasing number of uses can now be taken up on such sites. The compost plant can be co-shared between the municipality and farmer(s).

## **E6. Management**

### ***E6.1 Proposed action plan***

87. Underscoring the need for Governments to shift from working as a service provider to a facilitator of services, and the need for professional services, managerial skills and inputs, it is proposed to establish a corporate waste management venture, which may be set up with participation from each of the following shareholders:



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- a. Municipal bodies within the State of West Bengal, but outside Kolkata Metropolitan Area or areas under the jurisdiction of any development authority
- b. The West Bengal Municipal Development Fund Trust
- c. The West Bengal Housing and Infrastructure Development Corporation

88. The above entity would enter into an arrangement with each municipal body separately and by default and be delegated the task of managing solid waste within such areas, whether on a stand-alone basis or on a cluster basis.

89. The entity will have the following mandates:

- a. 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.
- b. 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.
- c. 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.
- d. 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 in line with para 86 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 as indicated in para 68 above, 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.]

90. The following concession(s) shall be granted to the entity:

- a. 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.

- b. 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.
- c. 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.
- d. 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.
- e. 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.]

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

Table 12: Nature of private sector participation

Module	Nature of private entity and obligation	Concession granted
Door to door collections	<p>Cooperative societies formed of self-help groups prevailing in the area (as per para 68 of this report). Obligations include:</p> <ul style="list-style-type: none"> <li>- Door to door collection of waste from households, markets and commercial establishments</li> <li>- Street sweeping</li> <li>- Primary collection of non-standard waste</li> <li>- Segregation at source or first point of collection</li> <li>- Allowing rag-pickers to pick away recyclable waste</li> <li>- Agglomerate and provide contractors with C&amp;D waste</li> </ul> <p>Appointed on nomination basis, costs to be determined based on</p>	<p>50 per cent of costs to be borne out of sanitation fund established by municipal body within whose area they operate</p> <p>50 per cent of costs to be recovered from users</p> <p>Space, license and other facilitation to conduct community level services such as ironing, washing, food stalls</p> <p>Access to funds from National Urban Livelihoods Mission to meet capital costs</p>

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Module	Nature of private entity and obligation	Concession granted
	negotiations between municipal body, common utility and society.	
Transport	<p>Private entity of any manner (body corporate). Obligations include:</p> <ul style="list-style-type: none"> <li>- Covering, collection and compaction of waste from secondary collection points/ transfer stations</li> <li>- Transport to disposal site</li> </ul> <p>Relinquishing of all rolling stock (less manpower and consumables) to the concessioning party at zero value.</p>	<p>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)</p>
Treatment and disposal	<p>Private entity of any manner (body corporate). Obligations include:</p> <ul style="list-style-type: none"> <li>- Establishment of composting plant</li> <li>- Establishment of plants for recycling of other forms of waste (e.g. eco-bricks made from inert material)</li> <li>- Development of landfill site and dumping of residual waste</li> </ul> <p>Relinquishing of all plant, equipment and land at the end of the period of concession at zero value.</p>	<p>Included in tipping fee above; however, certain penal clauses would follow, such as:</p> <ul style="list-style-type: none"> <li>- 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)</li> </ul> <p>In addition, following revenue concessions will also be available to such party:</p> <ul style="list-style-type: none"> <li>- 70% of the sale revenue from recycled material</li> <li>- 30% of earnings from CER units (see para 89, point e)</li> <li>- Lease rights of land for leveraging of operating capital from financing institutions and/or banks</li> </ul>
Information, Education and	Separate professional services agency hired by the entity	Monthly/ quarterly retainer fee plus reimbursement of approved costs of

Module	Nature of private entity and obligation	Concession granted
Communication	mentioned in para 86: <ul style="list-style-type: none"> <li>- Development of communications, advertising, media and behavioural change communication strategy for various stakeholders</li> <li>- Production of media products</li> <li>- Periodic review of campaign effectiveness and redesigning of strategy</li> </ul>	produced media and broadcast airtime.

### E7. Financing of the plan

#### E7.1 Proposed action plan

92. 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 carried out by the entity mentioned in para 86. As indicated in para 88, sub-para d, 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.

93. While capital funding may be available from State and Central sector schemes such as JNNURM and its successors such as the National Urban Development Mission, municipalities would be expected to factor the addition of a sanitation cess to 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 cess as opposed to others.

[User charges are not generally recommended as there is a certain cost involved in collection, and unlike 'inbound' services such as water, which can be disconnected in case of non-payment, waste services cannot be disconnected as property occupants can technically dump waste on roads, making its disposal a municipal liability.]

94. The collected cess may be placed into a municipal sanitation fund, about 70 per cent of which will be placed in an escrow account, which will be at the disposal of entity mentioned at para 86. Tipping fees will be paid from this escrow account.

95. 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.

96. Financing through Central Schemes: With effect from 01 April 2015, the Government of India will launch the new Swachha Bharat Mission, which is expected to extend financial assistance to projects on 75:25 basis, where the Central Government will provide 75% of funding and the States/ municipalities have to garner the remaining 25%. In the case of solid waste management, the

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assistance will be limited to a maximum of 20 per cent, which will be provided as viability gap funding (supported by the Ministry of Finance) for the capital cost. This would imply that if a project has a life-cycle cost of Rs. 100/-, of which Rs. 55/- will be invested as capital costs, and Rs. 45/- will be recurring expenditure, then:

**Table 13: Funding pattern under Swachha Bharat Mission (as per draft guidelines)**

Share of Central Government	Rs. 11.00
Share of State Government	Rs. 3.67
Private sector contribution	Rs. 40.33 (capital) Rs. 45.00 (operating)

[Note: In solid waste management projects considerable costs are incurred in the operating phase, particularly in transport and fuel].

97. Private sector involvement may be leveraged in any one or all of the methods indicated in para 90 above. Typically, tipping fees in the case of capital subsidy being granted from schemes such as JNNURM has wavered around Rs. 550/- to Rs. 700 per MT. The unaided tipping fee (payable in case no capital subsidy is available) stands close to Rs. 900/- per MT, where purchase and operation of rolling stock and development of sanitary landfill site is carried out by the concessionaire. However, it has been seen that certain smaller municipalities in other parts of India have managed to reduce costs by restricting the concessionaire's investment.

### F. Status of detailed project reports prepared on solid waste management

98. The Municipal Engineering Directorate, the arm of the municipal affairs department which technically support municipalities in developing technically and commercially viable projects in various municipal services. At the time of submitting this report, the following detailed project reports are available.

**Table 14: Status of detailed project reports in solid waste management**

Sl. No	Name of Municipality	Status of DPR	Status of authorisation granted by WBPCB
A.	Non-KMA Towns		
1	Habra	Prepared by MED	Granted upto 31.07.07
2	Kalna	Prepared by MED	Granted
3	Jalpaiguri	Prepared by MED	Granted
4	Kurseong	Prepared by MED	Granted upto 31.07.07

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Sl. No	Name of Municipality	Status of DPR	Status of authorisation granted by WBPCB
5	Englishbazar	Prepared by MED	Granted
6	Balurghat	Prepared by MED	Granted upto 31.07.07
7	Tarakeshwar	Prepared by MED	Granted
8	Burdwan	Prepared by MED	Granted
9	Berhampur	Prepared by MED	Granted
10	Ashoknagar-Kalyangarh	Prepared by MED	Granted
11	Mal	Prepared by MED	Granted
12	Katwa	Prepared by MED	Granted
13	Coochbehar	Prepared by MED	Granted
14	Tufanganj	Prepared by MED	Granted
15	Arambagh	Prepared by MED	Granted upto 31.03.07
16	Haldibari	Prepared by MED	Granted
17	Mekliganj	Prepared by MED	Granted
18	Dinhata	Prepared by MED	Granted
19	Alipurduar	Prepared by MED	Granted
20	Mathabhanga	Prepared by MED	Granted
21	Darjeeling (Revised)	Prepared by MED	Submitted
22	Mirik	Prepared by MED	Granted
23	Taki	Prepared by MED	Granted
24	Raiganj	Prepared by MED	Granted
25	Kalimpong (Revised)	Prepared by MED	Submitted

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Sl. No	Name of Municipality	Status of DPR	Status of authorisation granted by WBPCB
26	Old Malda	Prepared by MED	Granted
27	Kaliaganj	Prepared by MED	Granted
28	Gobardanga	Prepared by MED	Granted
29	Nabadwip	Prepared by MED	Submitted
30	Basirhat	DPR prepared by MED	Granted
31	Rampurhat	DPR prepared by MED	Initiation taken, application for clearance

Table 15: Budget(for 78 Non-KMA ULBs)

Capital Expenditure(INR)	O&M Cost(INR)	
	FY2015-16	FY2016-17
2362 Crore	118 Crore	124 Crore

**G. Time Frame for implementation**

99. The integrated solid waste management system for 78 ULBs will be implemented from 1<sup>st</sup> April, 2015 to 19<sup>th</sup> October, 2019 in a phased manner.

Table 16: Phase wise distribution of projects

Phase 1 (2015 – 2017)	Cluster	Rampurhat, Nalhati
	Cluster	Suiri, Dubrajpur
	Cluster	Dainhat, Katwa
	Cluster	Coochbehar, Haldibari, Mathabhanga, Mekhlignj, Tufanganj
	Cluster	Englishbazar, Old Malda
Stand-alone towns of Darjeeling, Kalimpong, Kurseong, Mirik, Arambagh, Tarakeswar, Alipurduar, Mal, Dhupguri, Bankura, Bishnupur, Sonamukhi, Bolpur		
Phase 2 (2017 – 2018)	Cluster	Chandrakona, Ghatal, Ramjibanpur, Kharar, Khirpai
	Cluster	Kharagpur, Midnapore
	Cluster	Dainhat, Katwa

	Cluster Tamluk, Panskura Cluster Dhulian, Jangipur  Stand-alone towns of Burdwan, Gushkara, Kalna, Memari, Dinahata, Jhargram, Contai, Egra, Beldanga, Jiaganj- Azimganj, Kandi, Bongaon, Gobardanga
Phase 3 (2018 – 2019, with closure till 2020)	Cluster Berhampore, Murshidabad Cluster Taki, Baduria, Basirhat Cluster Habra, Ashoknagar- Kalyangarh Cluster Taherpur, Ranaghat, Chakdah, Coopers Camp Cluster Krishnanagar, Nabadwip, Santipur Cluster Kallaganj, Raiganj  Stand-alone municipalities of Jhalda, Purulia, Raghunathpur, Diamond Harbour, Joynagar-Mazilpur, Islampur, Dalkhola, Balurghat, Gangarampur

100. Priority will be given for those municipalities which need immediate intervention. Also search, selection and purchase of lands for common treatment and disposal of municipal solid waste will be given top priority from the very beginning of the programme.





**EXISTING SWM STATUS OF NON KMA ULB**

Sl. No.	Name of District	Name of Urban Local Bodies	No of ward	Area in (Sq. Km)	Population as on 2011 (Lakh)	Waste Generated (MT per day)	Waste Collected (MT per day)	Waste Transported (MT per day)	Biodegradable Waste Disposed (MT per day)	Non Biodegradable Waste Disposed (MT per day)	Mode of Disposal of Biodegradable Waste	Mode of Disposal of Inert Waste
2	Bishnupur	19	22.010	0.63	25.03	22.53	19.15	10.53		Disposed of in low lying areas, unsorted		
3	Sonamukhi	15	11.650	0.30	8.78	3.07	2.61	1.44	1.17	Disposed of in low lying areas, unsorted		
4	Birbhum	Bolpur	19	13.130	0.66	26.23	26.23	22.30	12.26	10.03	Disposed of in low lying areas, unsorted	
5		Rampurhat	17	6.250	0.60	23.96	13.18	11.20	6.16	5.04	Disposed of in low lying areas, unsorted	
6		Nalhati	16	12.000	0.38	11.22	6.17	5.24	2.88	2.36	Disposed of in low lying areas, unsorted	
7	Burdwan	Sainthia	16	10.000	0.45	13.03	13.03	11.08	6.09	4.98	Disposed of in low lying areas, unsorted	
8		Suri	18	10.250	0.70	27.79	23.62	20.08	11.04	9.03	Disposed of in low lying areas, unsorted	
9		Dubrajpur	15	16.840	0.38	11.14	9.47	8.05	4.43	3.62	Disposed of in low lying areas, unsorted	
10	Burdwan	Burdwan	0	0.000	3.22	149.97	0.00	0.00	0.00	0.00	Disposed of in low lying areas, unsorted	
11		Gushkara	15	17.080	0.39	11.31	0.00	0.00	0.00	0.00	Disposed of in low lying areas, unsorted	
12		Kalna	18	10.100	0.58	23.24	22.31	18.96	10.43	8.53	Disposed of in low lying areas, unsorted	
13	Burdwan	Dainhat	14	10.360	0.41	12.00	6.00	5.10	2.81	2.30	Disposed of in low lying areas, unsorted	
14		Katwa	19	7.930	0.82	32.55	30.92	26.28	14.46	11.83	Disposed of in low lying areas, unsorted	
15		Memari	16	8.840	0.46	13.39	13.39	11.38	6.26	5.12	Disposed of in low lying areas, unsorted	
16	Coochbehar	Dinhat	15	4.550	0.41	12.00	7.80	6.63	3.65	2.98	Disposed of in low lying areas, unsorted	
17		Coochbehar	20	8.290	1.02	40.80	40.80	34.68	19.08	15.61	Disposed of in low lying areas, unsorted	
18		Haldibari	11	10.000	0.15	4.51	4.51	3.83	2.11	1.73	Disposed of in low lying areas, unsorted	
19	Darjeeling	Mathabhanga	12	3.710	0.28	8.22	6.99	5.94	3.27	2.67	Disposed of in low lying areas, unsorted	
20		Mekhligiri	9	3.880	0.14	4.22	0.00	0.00	0.00	0.00	Disposed of in low lying areas, unsorted	
21		Tufanganji	12	2.490	0.24	7.07	7.07	6.01	3.31	2.71	Disposed of in low lying areas, unsorted	
22	Darjeeling	Darjeeling	32	7.430	1.20	56.09	50.48	42.91	23.60	19.31	Disposed of in low lying areas, unsorted	
23		Kalimpong	23	8.680	0.46	13.51	2.03	1.73	0.95	0.78	Disposed of in low lying areas, unsorted	
24		Kurseong	20	7.500	0.46	13.47	9.43	8.02	4.41	3.61	Disposed of in low lying areas, unsorted	
25	Hooghly	Mirik	9	6.500	0.11	3.35	3.35	2.85	1.57	1.28	Disposed of in low lying areas, unsorted	
26		Arambagh	18	34.750	0.70	27.84	20.88	17.75	9.76	7.99	Disposed of in low lying areas, unsorted	
27		Tarakeswar	15	3.880	0.31	9.08	0.00	0.00	0.00	0.00	Disposed of in low lying areas, unsorted	
28	Jalpaiguri	Alipurdwar	20	9.570	0.81	32.35	27.49	23.37	12.85	10.51	Disposed of in low lying areas, unsorted	
29		Jalpaiguri	25	12.970	1.12	52.33	28.78	24.46	13.45	11.01	Disposed of in low lying areas, unsorted	
30		Mal	15	7.500	0.25	7.43	7.43	6.31	3.47	2.84	Disposed of in low lying areas, unsorted	
31	Malda	Dhupguri	16	14.990	0.48	14.13	1.41	1.20	0.66	0.54	Disposed of in low lying areas, unsorted	
32		Englisbazar	25	13.250	2.50	116.46	116.46	98.99	54.45	44.55	Disposed of in low lying areas, unsorted	
33		Old Malda	18	9.580	0.82	32.93	32.60	27.71	15.24	12.47	Disposed of in low lying areas, unsorted	
34	Midnapore (W)	Chandrakona	12	16.580	0.23	6.88	1.72	1.46	0.80	0.66	Disposed of in low lying areas, unsorted	
35		Ghatol	17	10.400	0.64	25.36	21.55	18.32	10.07	8.24	Disposed of in low lying areas, unsorted	
36		Ramjibapur	11	15.830	0.21	6.26	1.38	1.17	0.65	0.53	Disposed of in low lying areas, unsorted	
37	Midnapore (W)	Kharar	10	10.260	0.13	3.80	3.42	2.91	1.60	1.31	Disposed of in low lying areas, unsorted	
38		Khirpal	10	11.650	0.16	4.80	0.00	0.00	0.00	0.00	Disposed of in low lying areas, unsorted	
39		Kharagpur	35	103.350	2.75	127.91	102.33	86.98	47.84	39.14	Disposed of in low lying areas, unsorted	
40	Midnapore	Midnapore	24	18.360	1.79	83.39	73.38	62.37	34.31	28.07	Disposed of in low lying areas, unsorted	
41		Jhargam	17	21.400	0.62	24.69	22.22	18.89	10.39	8.50	Disposed of in low lying areas, unsorted	

## EXISTING SWM STATUS OF NON KMA ULB

Sl. No.	Name of District	Name of Urban Local Bodies	No of ward	Area in (Sq. Km)	Population as on 2011 (Lakh)	Waste Generated (MT per day)	Waste Collected (MT per day)	Waste Transported (MT per day)	Biodegradable Waste Disposed (MT per day)	Non Biodegradable Waste Disposed (MT per day)	Mode of Disposal of Biodegradable Waste	Mode of Disposal of Inert Waste
42		Contai	20	14.250	0.78	30.95	30.95	26.31	14.47	11.84	Disposed of in low lying areas, unsorted	
43	Midnapore (E)	Egra	14	17.210	0.30	8.74	7.87	6.69	3.68	3.01	Disposed of in low lying areas, unsorted	
44		Tamluk	20	17.860	0.65	19.12	11.47	9.75	5.36	4.39	Disposed of in low lying areas, unsorted	
45		Panskura	17	19.940	0.58	16.96	15.26	12.97	7.13	5.84	Disposed of in low lying areas, unsorted	
46		Dhulian	19	6.250	0.73	29.11	29.11	24.75	13.61	11.14	Disposed of in low lying areas, unsorted	
47		Jangipur	20	8.200	0.86	34.38	33.69	28.64	15.75	12.89	Disposed of in low lying areas, unsorted	
48	Murshidabad	Berhampore	25	31.420	1.95	90.84	81.76	69.50	38.22	31.27	Disposed of in low lying areas, unsorted	
49		Murshidabad	16	16.400	0.44	12.89	10.96	9.32	5.12	4.19	Disposed of in low lying areas, unsorted	
50		Beldanga	14	3.980	0.29	8.55	8.55	7.27	4.00	3.27	Disposed of in low lying areas, unsorted	
51		Jiaganj- Azimganj	17	11.660	0.55	21.96	18.67	15.87	8.73	7.14	Disposed of in low lying areas, unsorted	
52		Kandi	17	12.970	0.75	29.78	25.02	21.27	11.70	9.57	Disposed of in low lying areas, unsorted	
53		Taki	16	12.970	0.43	12.71	12.71	10.81	5.94	4.86	Disposed of in low lying areas, unsorted	
54		Baduria	17	22.430	0.52	15.19	3.98	3.38	1.86	1.52	Disposed of in low lying areas, unsorted	
55	North 24 Parganas	Basirhat	22	22.050	1.25	36.61	36.61	31.12	17.12	14.00	Disposed of in low lying areas, unsorted	
56		Bongaon	22	14.270	1.08	43.04	25.82	21.95	12.07	9.88	Disposed of in low lying areas, unsorted	
57		Gobardanga	17	13.500	0.54	15.84	15.84	13.47	7.41	6.06	Disposed of in low lying areas, unsorted	
58		Habra	23	21.800	1.50	69.78	59.31	50.41	27.73	22.69	Disposed of in low lying areas, unsorted	
59		Ashoknagar- Kalyangar	22	20.640	1.34	62.39	62.39	53.03	29.17	23.86	Disposed of in low lying areas, unsorted	
60		Birnarar	14	5.520	0.29	8.50	3.25	2.76	1.52	1.24	Disposed of in low lying areas, unsorted	
61		Taherpur	13	2.010	0.21	6.12	2.34	1.99	1.09	0.90	Disposed of in low lying areas, unsorted	
62		Ranaghat	19	7.720	0.77	30.83	27.75	23.59	12.97	10.61	Disposed of in low lying areas, unsorted	
63	Nadia	Chakdah	21	15.360	0.95	37.97	14.52	12.34	6.79	5.55	Disposed of in low lying areas, unsorted	
64		Coopers Camp	12	1.500	0.19	5.52	5.52	4.69	2.58	2.11	Disposed of in low lying areas, unsorted	
65		Krishnanagar	24	15.960	1.56	72.75	69.11	58.74	32.31	26.43	Disposed of in low lying areas, unsorted	
66		Nabadwip	24	11.660	1.35	62.91	62.91	53.48	29.41	24.06	Disposed of in low lying areas, unsorted	
67		Santipur	24	25.880	1.55	72.30	72.30	61.45	33.80	27.65	Disposed of in low lying areas, unsorted	
68		Jhalda	12	3.335	0.17	5.06	4.81	4.09	2.25	1.84	Disposed of in low lying areas, unsorted	
69	Purulia	Purulia	22	14.000	1.21	56.57	48.08	40.87	22.48	18.39	Disposed of in low lying areas, unsorted	
70		Raghunathpur	13	12.950	0.25	7.37	3.32	2.82	1.55	1.27	Disposed of in low lying areas, unsorted	
71	South 24 Parganas	Diamond Harbour	16	10.890	0.42	12.24	12.24	10.40	5.72	4.68	Disposed of in low lying areas, unsorted	
72		Joynagar-Mazilpur	14	5.810	0.26	7.57	2.90	2.47	1.36	1.11	Disposed of in low lying areas, unsorted	
73		Islampur	17	11.400	0.61	17.86	17.86	15.18	8.35	6.83	Disposed of in low lying areas, unsorted	
74	Uttar Dinajpur	Kaliaganj	17	11.670	0.55	16.24	16.24	13.80	7.59	6.21	Disposed of in low lying areas, unsorted	
75		Raiganj	25	10.760	1.82	84.82	84.82	72.10	39.65	32.44	Disposed of in low lying areas, unsorted	
76		Dalkhola	14	15.950	0.37	10.87	10.87	9.24	5.08	4.16	Disposed of in low lying areas, unsorted	
77	Dakhsin Dinajpur	Balurghat	23	10.560	1.54	71.68	64.51	54.83	30.16	24.68	Disposed of in low lying areas, unsorted	
78		Gangarampur	18	10.290	0.56	16.45	10.69	9.09	5.00	4.09	Disposed of in low lying areas, unsorted	
	<b>Total</b>				<b>58.54</b>	<b>2355.31</b>	<b>1865.31</b>	<b>1585.51</b>	<b>872.03</b>	<b>704.86</b>		

## PROPOSED TREATMENT AND DISPOSAL OF INTEGRATED SOLID WASTE MANAGEMENT IN NON-KMA MUNICIPALITIES

Sl. No.	District	Name of Municipality	No of ward	Area In (Sq. Km)	Population 2011 (Lakh)	Waste Generated (MT per day)	Waste Collected (MT per day)	Waste Transported (MT per day)	Compostable Waste Treated (MT per day)	Inert Waste Disposed (MT per day)	Proposed method of treatment Organic Waste	Proposed method of treatment of Inert Waste	
1	Bankura	Bankura	23	19.060	1.38	64.29	57.86	52.07	28.64	23.43	Windrow composting	Sieving/ reclamation and use as filler, balance to landfill	
2		Bishnupur	19	22.010	0.63	25.03	22.53	20.28	11.15	9.12	Windrow composting	Sieving/ reclamation and use as filler, balance to landfill	
3		Sonamukhi	15	11.650	0.30	8.78	3.07	2.76	1.52	1.24	Vermi-compost/ organic waste conversion package unit	Sieving/ reclamation and use as filler, balance to landfill	
4	Birbhum	Bolpur	19	13.130	0.66	26.23	26.23	23.61	12.98	10.62	Windrow composting	Sieving/ reclamation and use as filler, balance to landfill	
5		Rampurhat	17	6.250	0.60	23.96	13.18	11.16	11.16	11.16	Windrow composting	Sieving/ reclamation and use as filler, balance to landfill	
6		Nalhati	16	12.000	0.38	11.22	6.17	5.55	3.05	3.50	Windrow composting	Sieving/ reclamation and use as filler, balance to landfill	
7		Sainthia	16	10.000	0.45	13.03	13.03	11.73	6.45	5.28	Vermi-compost/ organic waste conversion package unit	Sieving/ reclamation and use as filler, balance to landfill	
8		Suri	18	10.250	0.70	27.79	23.62	21.26	21.26	19.57	19.57	Windrow composting	Sieving/ reclamation and use as filler, balance to landfill
9		Dubrajpur	15	16.840	0.38	11.14	9.47	8.52	4.69	3.24	Windrow composting	Sieving/ reclamation and use as filler, balance to landfill	
10	Burdwan	Burdwan	0	0.000	3.22	149.97	0.00	0.00	0.00	0.00	Vermi-compost/ organic waste conversion package unit	Sieving/ reclamation and use as filler, balance to landfill	
11		Gushkara	15	17.080	0.39	11.31	0.00	0.00	0.00	0.00	Vermi-compost/ organic waste conversion package unit	Sieving/ reclamation and use as filler, balance to landfill	
12		Kalna	18	10.100	0.58	23.24	22.31	20.08	11.04	9.04	Windrow composting	Sieving/ reclamation and use as filler, balance to landfill	
13		Dalihat	14	10.360	0.41	12.00	6.00	5.40	2.97	2.48	Windrow composting	Sieving/ reclamation and use as filler, balance to landfill	
14		Kalyani	19	7.930	0.82	32.55	30.92	27.83	15.34	12.52	Windrow composting	Sieving/ reclamation and use as filler, balance to landfill	
15		Memari	16	8.840	0.46	13.39	13.39	12.05	6.63	5.42	Vermi-compost/ organic waste conversion package unit	Sieving/ reclamation and use as filler, balance to landfill	
16	Coochbehar	Dinhata	15	4.550	0.41	12.00	7.80	7.02	3.86	3.16	Vermi-compost/ organic waste conversion package unit	Sieving/ reclamation and use as filler, balance to landfill	
17		Coochbehar	20	8.290	1.02	40.80	40.80	36.72	20.20	16.56	Windrow composting	Sieving/ reclamation and use as filler, balance to landfill	
18		Haldibari	11	10.000	0.15	4.51	4.51	4.06	2.21	1.81	Windrow composting	Sieving/ reclamation and use as filler, balance to landfill	
19		Mithachandrapur	12	3.710	0.28	8.22	6.99	6.29	3.16	2.53	Windrow composting	Sieving/ reclamation and use as filler, balance to landfill	
20		Mekhliguri	9	3.880	0.14	4.22	0.00	0.00	0.00	0.00	Windrow composting	Sieving/ reclamation and use as filler, balance to landfill	
21		Tufanganj	12	2.490	0.24	7.07	7.07	6.37	3.50	2.83	Windrow composting	Sieving/ reclamation and use as filler, balance to landfill	
22	Darjeeling	Darjeeling	32	7.430	1.20	56.09	50.48	45.43	24.99	20.44	Windrow composting	Sieving/ reclamation and use as filler, balance to landfill	
23		Kalimpong	23	8.680	0.46	13.51	2.03	1.83	1.00	0.82	Vermi-compost/ organic waste conversion package unit	Sieving/ reclamation and use as filler, balance to landfill	
24		Kurseong	20	7.500	0.46	13.47	9.43	8.49	4.67	3.82	Vermi-compost/ organic waste conversion package unit	Sieving/ reclamation and use as filler, balance to landfill	
25		Mirik	9	6.500	0.11	3.35	3.35	3.02	1.66	1.36	Vermi-compost/ organic waste conversion package unit	Sieving/ reclamation and use as filler, balance to landfill	
26	Hooghly	Arambagh	18	34.750	0.70	27.84	20.88	18.79	10.34	8.46	Windrow composting	Sieving/ reclamation and use as filler, balance to landfill	
27		Tarakeswar	15	3.880	0.31	9.08	0.00	0.00	0.00	0.00	Vermi-compost/ organic waste conversion package unit	Sieving/ reclamation and use as filler, balance to landfill	
28	Jalpaiguri	Alipurduar	20	9.570	0.81	32.35	27.49	24.74	13.61	11.13	Windrow composting	Sieving/ reclamation and use as filler, balance to landfill	
29		Jalpaiguri	25	12.970	1.12	52.33	28.78	25.90	14.25	11.66	Windrow composting	Sieving/ reclamation and use as filler, balance to landfill	
30		Dhuppguri	15	7.500	0.25	7.43	7.43	6.68	3.68	3.01	Vermi-compost/ organic waste conversion package unit	Sieving/ reclamation and use as filler, balance to landfill	
31		Mal	16	14.990	0.48	14.13	1.41	1.27	0.70	0.57	Vermi-compost/ organic waste conversion package unit	Sieving/ reclamation and use as filler, balance to landfill	
32	Malda	Malda	25	13.250	2.50	116.46	116.46	104.82	57.35	47.87	Windrow composting	Sieving/ reclamation and use as filler, balance to landfill	
33		Malda	18	9.580	0.82	32.93	32.60	31.54	16.74	13.70	Windrow composting	Sieving/ reclamation and use as filler, balance to landfill	
34	Midnapore (W)	Chandernagore	12	16.580	0.23	6.88	1.72	1.53	0.81	0.70	Windrow composting	Sieving/ reclamation and use as filler, balance to landfill	
35		Ghatal	17	10.400	0.64	25.36	21.55	19.40	10.82	8.74	Windrow composting	Sieving/ reclamation and use as filler, balance to landfill	
36		Raniganj	11	15.830	0.21	6.26	1.38	1.24	0.68	0.56	Windrow composting	Sieving/ reclamation and use as filler, balance to landfill	
37		Khatra	10	10.260	0.13	3.80	3.42	3.02	1.56	1.31	Windrow composting	Sieving/ reclamation and use as filler, balance to landfill	
38		Krupal	10	11.650	0.16	4.80	0.00	0.00	0.00	0.00	Windrow composting	Sieving/ reclamation and use as filler, balance to landfill	

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39	Midnapore (W)	Kanchipur	35	103.350	2.75	127.91	102.33	12.00	50.55	14.44	Windrow composting	Sieving/ reclamation and use as filler, balance to landfill
40		Midnapore	24	18.360	1.79	83.39	73.38	66.04	36.34	29.77	Windrow composting	Sieving/ reclamation and use as filler, balance to landfill
41		Jhargram	17	21.400	0.62	24.69	22.22	20.00	11.00	9.00	Windrow composting	Sieving/ reclamation and use as filler, balance to landfill
42	Midnapore (E)	Contai	20	14.250	0.78	30.95	30.95	27.86	15.32	12.54	Windrow composting	Sieving/ reclamation and use as filler, balance to landfill
43		Egra	14	17.210	0.30	8.74	7.87	7.08	3.90	3.19	Vermi-compost/ organic waste conversion package unit	Sieving/ reclamation and use as filler, balance to landfill
44		Titagarh	20	17.860	0.65	19.12	11.47	10.32	3.69	4.65	Vermi-compost/ organic waste conversion package unit	Sieving/ reclamation and use as filler, balance to landfill
45	Murshidabad	Raniganj	17	19.940	0.58	16.96	15.26	13.74	7.65	4.78	Vermi-compost/ organic waste conversion package unit	Sieving/ reclamation and use as filler, balance to landfill
46		Chandernagore	19	6.250	0.73	29.11	29.11	27.20	14.34	11.47	Windrow composting	Sieving/ reclamation and use as filler, balance to landfill
47		Chandernagore	20	8.200	0.86	34.38	33.69	31.22	13.65	11.32	Windrow composting	Sieving/ reclamation and use as filler, balance to landfill
48		Chandernagore	25	31.420	1.95	90.84	81.76	75.34	16.17	11.14	Windrow composting	Sieving/ reclamation and use as filler, balance to landfill
49		Murshidabad	16	16.400	0.44	12.89	10.96	10.66	5.43	4.44	Windrow composting	Sieving/ reclamation and use as filler, balance to landfill
50		Beldanga	14	3.980	0.29	8.55	8.55	7.70	4.23	3.46	Vermi-compost/ organic waste conversion package unit	Sieving/ reclamation and use as filler, balance to landfill
51		Jiaganj-Azimganj	17	11.660	0.55	21.96	18.67	16.80	9.24	7.56	Windrow composting	Sieving/ reclamation and use as filler, balance to landfill
52	Kandl	17	12.970	0.75	29.78	25.02	22.52	12.38	10.13	Windrow composting	Sieving/ reclamation and use as filler, balance to landfill	
53	North 24 Parganas	Chandernagore	16	12.970	0.43	12.71	12.71	11.44	6.44	5.15	Windrow composting	Sieving/ reclamation and use as filler, balance to landfill
54		Bardhaman	17	22.430	0.52	15.19	3.98	3.33	1.17	1.17	Windrow composting	Sieving/ reclamation and use as filler, balance to landfill
55		Bardhaman	22	22.050	1.25	36.61	36.61	34.95	16.72	14.39	Windrow composting	Sieving/ reclamation and use as filler, balance to landfill
56		Bongaon	22	14.270	1.08	43.04	25.82	23.24	12.78	10.46	Windrow composting	Sieving/ reclamation and use as filler, balance to landfill
57		Gobardanga	17	13.500	0.54	15.84	15.84	14.26	7.84	6.42	Vermi-compost/ organic waste conversion package unit	Sieving/ reclamation and use as filler, balance to landfill
58		Haldia	23	21.800	1.50	69.78	59.31	56.53	29.36	24.07	Windrow composting	Sieving/ reclamation and use as filler, balance to landfill
59	Shyambazar	22	20.640	1.34	62.39	62.39	56.19	31.98	25.07	Windrow composting	Sieving/ reclamation and use as filler, balance to landfill	
60	Nadia	Birnagar	14	5.520	0.29	8.50	3.25	2.93	1.61	1.32	Vermi-compost/ organic waste conversion package unit	Sieving/ reclamation and use as filler, balance to landfill
61		Chandernagore	13	2.010	0.21	6.12	2.34	2.21	1.16	0.83	Windrow composting	Sieving/ reclamation and use as filler, balance to landfill
62		Chandernagore	19	7.720	0.77	30.83	27.75	24.96	13.71	11.34	Windrow composting	Sieving/ reclamation and use as filler, balance to landfill
63		Chandernagore	21	15.360	0.95	37.97	14.52	13.07	7.40	6.88	Windrow composting	Sieving/ reclamation and use as filler, balance to landfill
64		Chandernagore	12	1.500	0.19	5.52	5.52	4.57	2.45	2.12	Windrow composting	Sieving/ reclamation and use as filler, balance to landfill
65		Chandernagore	24	15.960	1.56	72.75	69.11	65.40	34.24	28.91	Windrow composting	Sieving/ reclamation and use as filler, balance to landfill
66	Chandernagore	24	11.660	1.35	62.91	62.91	58.37	31.21	25.43	Windrow composting	Sieving/ reclamation and use as filler, balance to landfill	
67	Chandernagore	24	25.880	1.55	72.30	72.30	65.07	33.29	27.43	Windrow composting	Sieving/ reclamation and use as filler, balance to landfill	
68	Purulia	Jhalda	12	3.335	0.17	5.06	4.81	4.33	2.38	1.95	Vermi-compost/ organic waste conversion package unit	Sieving/ reclamation and use as filler, balance to landfill
69		Purulia	22	14.000	1.21	56.57	48.08	43.27	23.80	19.47	Windrow composting	Sieving/ reclamation and use as filler, balance to landfill
70		Raghunathpur	13	12.950	0.25	7.37	3.32	2.99	1.64	1.34	Vermi-compost/ organic waste conversion package unit	Sieving/ reclamation and use as filler, balance to landfill
71	South 24 Parganas	Diamond Harbour	16	10.890	0.42	12.24	12.24	11.02	6.06	4.96	Vermi-compost/ organic waste conversion package unit	Sieving/ reclamation and use as filler, balance to landfill
72		Joy Nagar-Mazilpur	14	5.810	0.26	7.57	2.90	2.61	1.44	1.17	Vermi-compost/ organic waste conversion package unit	Sieving/ reclamation and use as filler, balance to landfill
73	Uttar Dinajpur	Islampur	17	11.400	0.61	17.86	17.86	16.08	8.84	7.23	Vermi-compost/ organic waste conversion package unit	Sieving/ reclamation and use as filler, balance to landfill
74		Kalchini	17	11.670	0.55	16.24	16.24	14.90	7.94	6.58	Windrow composting	Sieving/ reclamation and use as filler, balance to landfill
75		Kalchini	25	10.760	1.82	84.82	84.82	79.84	41.98	34.35	Windrow composting	Sieving/ reclamation and use as filler, balance to landfill
76	Dalkhola	14	15.950	0.37	10.87	10.87	9.78	5.38	4.40	Vermi-compost/ organic waste conversion package unit	Sieving/ reclamation and use as filler, balance to landfill	
77	Dakhsin Dinajpur	Balurghat	23	10.560	1.54	71.68	64.51	58.06	31.93	26.13	Windrow composting	Sieving/ reclamation and use as filler, balance to landfill
78		Gangarampur	18	10.290	0.56	16.45	10.69	9.62	5.29	4.33	Vermi-compost/ organic waste conversion package unit	Sieving/ reclamation and use as filler, balance to landfill
Total					58.54	2355.31	1865.31	1678.78	923.33	755.45		



Figure 1: Transport of unsorted municipal waste using tractors (Behrampore)



Figure 2: Tractor-mounted hydraulic tipper unit (Behrampore)

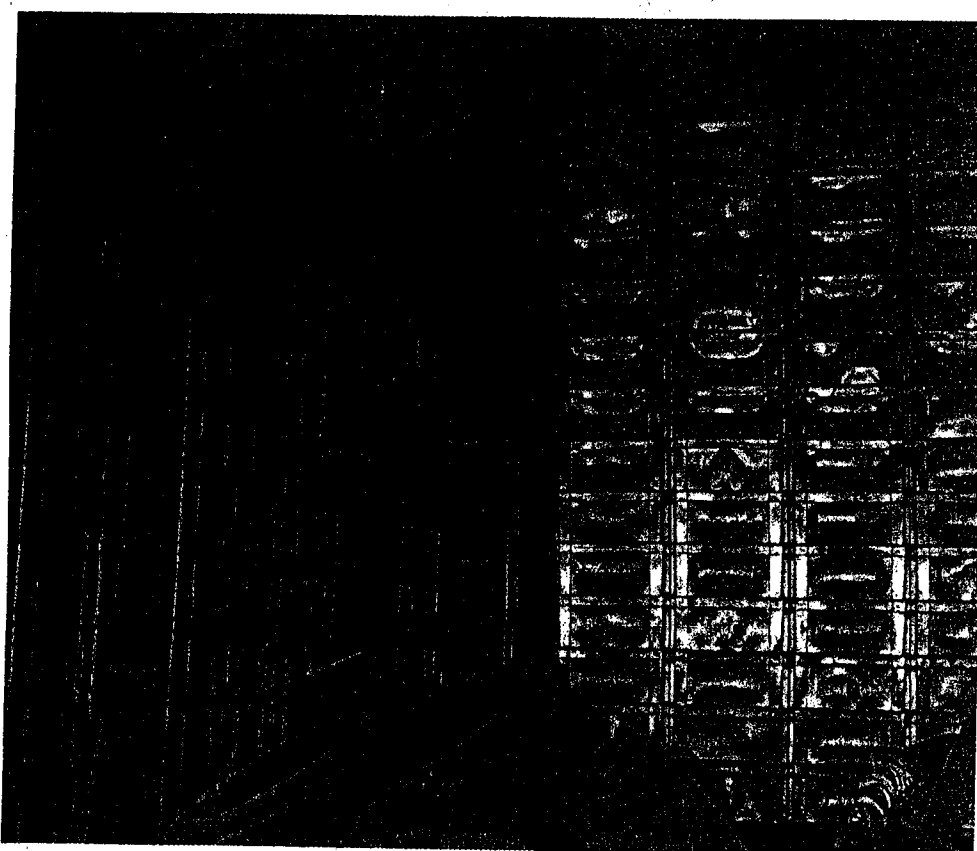


Figure 3: Red and green bin system – these are supplied to houses, but are not properly used (Behrampore)



Figure 4: Community level enclosure for dumping of waste (Bankura)

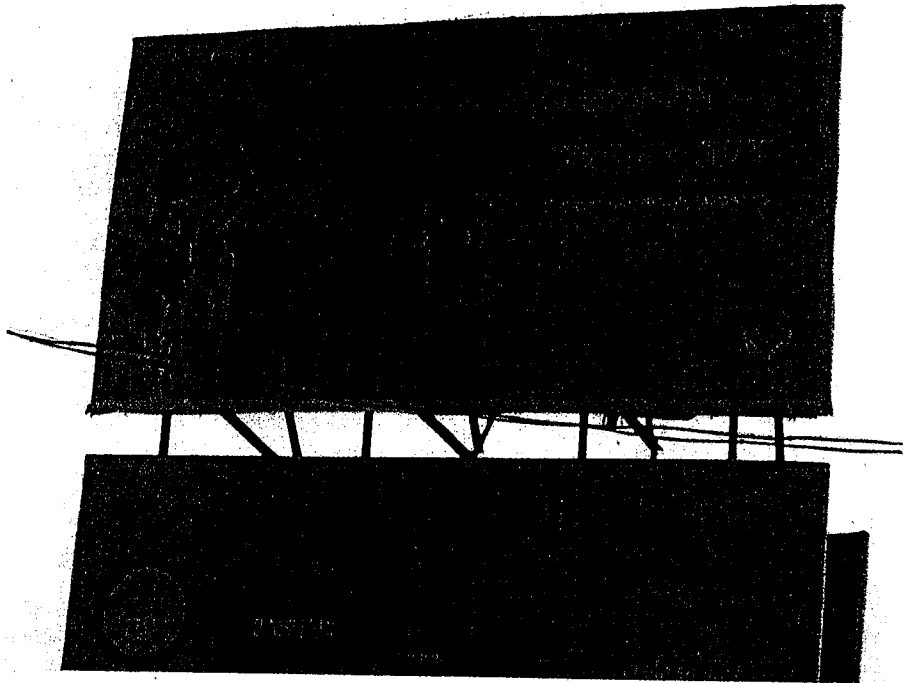


Figure 5: IEC activities are carried out by Panchayati Raj & Rural Development, even inside urban areas (Bishnupur)

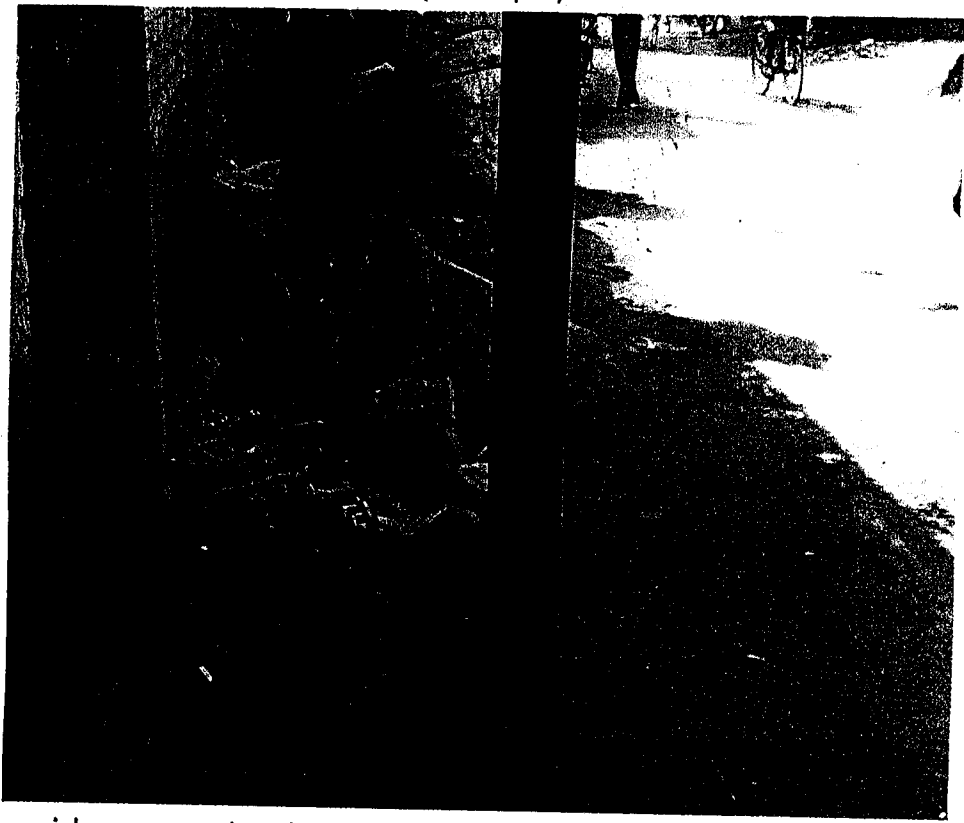


Figure 6: A ragpicker engages in collection of plastics for recycling within the city, at source (Bolpur)





Figure 7: Ragpickers engage in collection of recyclable waste from dumping ground (Bolpur)

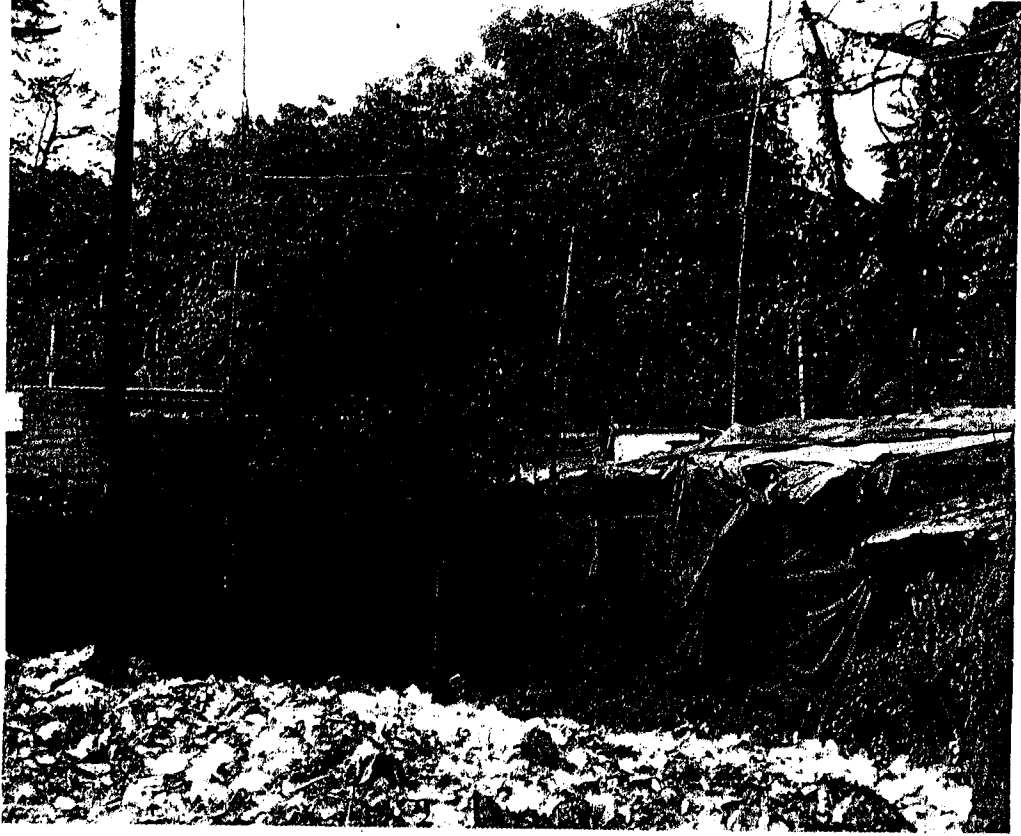


Figure 8: Areas near slum pockets are also used as informal dumping grounds (Chakdaha)

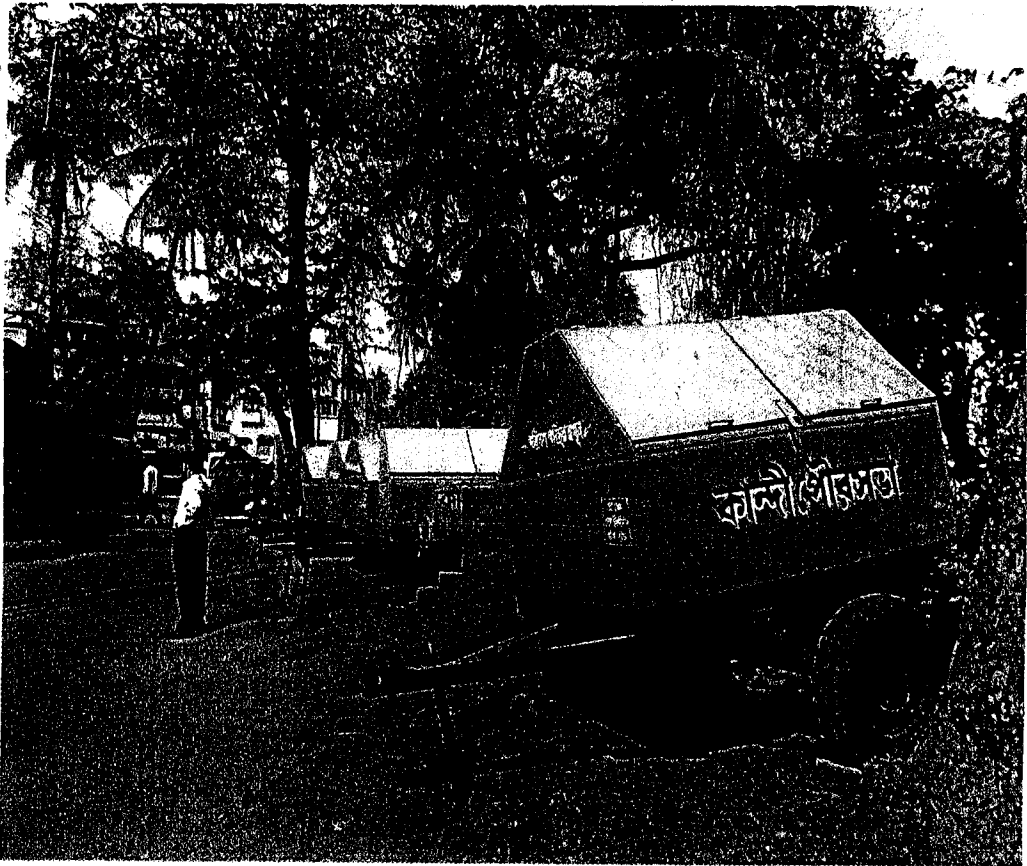


Figure 9: Compartmentalised door to door collection carriages (tractor or tricycle mounted) in use (Kandi)



Figure 10: Waste is often dumped next to drainage channels (Rampurhat)



Figure 11: Community bins are often found in a neglected state (Sonamukhi)

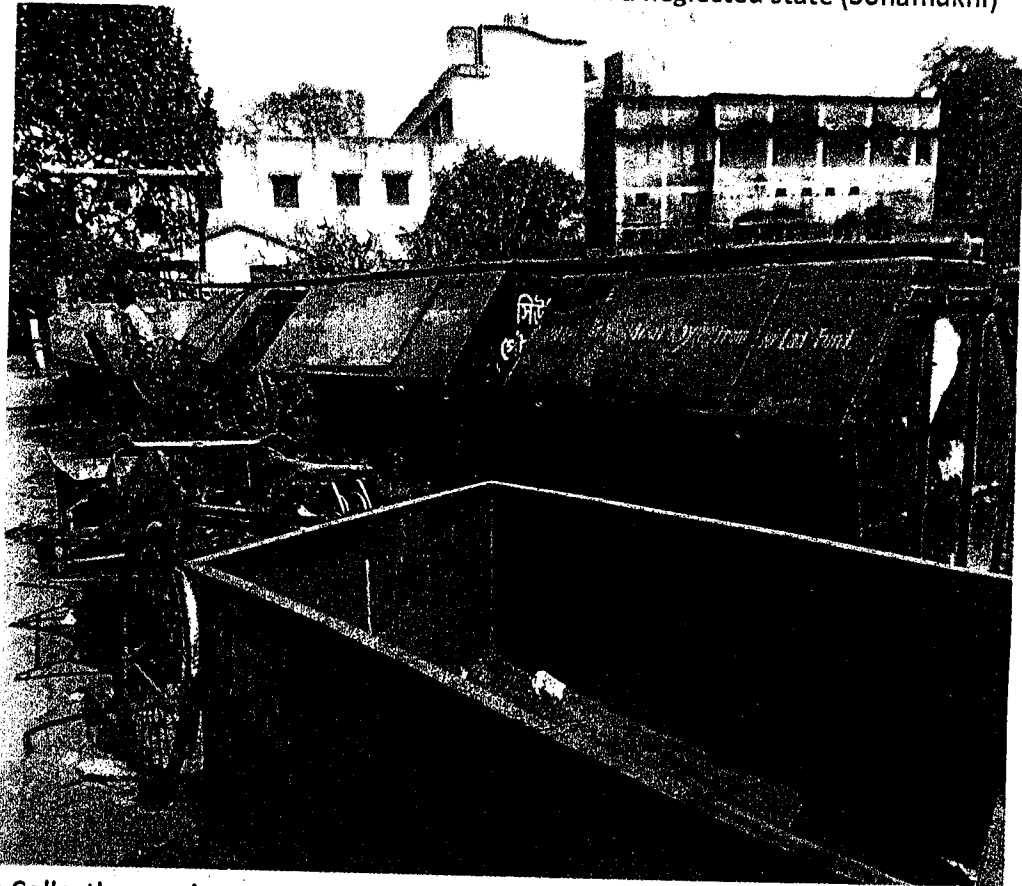


Figure 12: Collection equipment used by municipalities – compartmentalised transport vehicles and tricycle rickshaws (Siuri)



Annexure - 'D' 83

# HOWRAH MUNICIPAL CORPORATION

4, Mahatma Gandhi Road, Howrah - 711 101

No. MYR-47/14-15

Date: 02.02.

From  
Dr. Rathin Chakravarty  
Moyor  
Howrah Municipal Corporation

To,  
The Principal Secretary,  
Municipal Affairs Department,  
Writers' Buildings  
Kolkata - 700001.

Sub :- Proposal for the project "Solid Waste to Power".  
Ref :- No. 72/MA/C-10/35-4/2015 dt. 29.01.2015.

Sir,

Apropos above, I am to submit a comprehensive proposal for the project "Solid Waste to Power" incorporating details of all the components including location, land area, quantum of investment, employment etc. as mentioned in para -3 of the write up circulated in the review meeting.

Encl.: as stated.

Yours faithfully

(Dr. Rathin Chakravarty)  
Mayor

Howrah Municipal Corporation

Index / P. part up  
for forward  
to  
CA 2 Dept  
2/2/15

## REPORT ON THE PROPOSED PROJECT OF "SOLID WASTE TO POWER"

Solid Waste Management is considered as the most important topic of any Municipal Corporation just after supply of Drinking Water and the Sewerage & Drainage disposal on the priority basis. The poor management of such core function invariably leads to formation of various harmful micro bacterial elements causing Air and Water Pollution and blockage of huge valuable land resources. As per observation made by the WHO (World Health Organization), 22 types of diseases can be prevented/controlled in India by just improving Municipal Solid Waste Management system and thus huge financial involvement on medical ground can be saved. Moreover, the land required for dumping of the Solid Waste is the burning issue now a days which also can be solved by taking an integrated approach of recycling of Solid Waste.

Howrah, situated on the West Bank of the river Hooghly, is the second largest city in West Bengal having a total area of about 51.74 Sq.K.M with recorded population of 10,77,077 (as per 2011 censuses). Though perceived as the twin city of Kolkata with the river flowing in between and even older than that of the Capital of the State, Howrah has been deprived from all corners since long. In fact, the population density of HMC which is about three times that of Indian average and the recent population growth is about 1.5 times that of KMC and naturally it is suffering from high population density, low awareness level due to regular migrants, weak socio economic and poor environment status. The unplanned urbanization has aggravated the problem of this old city to a large extent.

Under this scenario, the problems of Solid Waste Management of HMC have been cropped up over the years and are really different from a proper planned city. Presently solid wastes are being collected from door to door by the conservancy people ordinarily twice a day with the help of Hand Carts and are dumped at the Municipal Primary Vats/Bins. This way around 500 M.T of solid waste is collected everyday without any provision of at-source segregation and ultimately be transported to the Belgachia Trenching Ground which is over exhausted and working beyond the capacity. The height of the Trenching Ground under disposal has now become as high as 50 Mtrs and may at any time collapse affecting the adjacent Pacha Khal which would lead to disturbances of the flow of liquid waste and sewage disposal. Initially 50 bighas of land was kept for the purpose but thereafter the area has now been reduced to almost 30 bighas due to encroachment and also for the provision of KMDA UGR and the biomedical waste plant set-up and operated by private party in this region. HMC, however, searched for alternative place for the said purpose but due to environmental reason / agitation and high escalation of land price, the same could not be materialized. It will not be out of place to mention that HMC had earlier entered into a MOU with SELCO for climate proofing of storage site of Hazardous waste and the treatment there-of but the same was not fruitful in any case.

Considering the same, it is very much essential to take up the issue on top most priority basis with the proper engineering and administrative policies to be adopted for the essential scenario. An integrated Municipal Solid Waste Management system is governed by 3 Rs, namely, i) Reuse, ii) Recycle and iii) Reduce, as mandated by the Municipal Solid Waste Rules 2000.

In one such efforts initiated by the Hon'ble Mayor of HMC Dr. Rathin Chakravarty, he put forward a proposal to clean up the municipal solid waste (MSW) in Howrah. In his observation, the waste being dumped in an area of Belgachia for the last 20-30 years, without being treated or processed at any level, the high percentage of toxicity element of that waste is not only a menace for the present, but for the posterity too. The recent deaths in 2014 caused due to dengue in the area and the reports of the spread of deadly Japanese encephalitis are only precursors to something which can be even more dangerous. On 28<sup>th</sup> July 2010, the Hon'ble Kolkata High Court ordered HMC to prepare an action plan for the dumping yard at Belgachia which is heavily polluting the Ganges and the neighbourhood. Unfortunately, due to lack of proper technological know-how and infrastructure, adequate proactive measures could be taken to prevent the spread of epidemics and loss of lives.

On 6<sup>th</sup> January 2014, Dr. Rathin Chakravarty, Hon'ble Mayor of Howrah got an opportunity to meet Mr. Wolfgang Lutzner the Lord Mayor of Boblingen which is a waste free city in the South of Germany in the state of Baden Wurttemberg, who along with Mr. Debasish Mukherjee initiated the project. After consultations with several experts in the field and the Federal Ministry of Environment, Germany, Intec Micropowder AG was recommended. It is a company which has patented the technology (INTEC TCP) to produce 100% emission free energy from deferent categories of waste including biomass and plastics. The system converts waste to Sync gas, by a process of "Gasification". The other conventional processes involving Pyrolysis or Incineration are reported to be contaminated with dioxins, furans and other harmful gases. However the entire range of logistic and technologies from waste collection, their treatment till feeding of electricity to grid, is provided by SOWAREEN Solution AG.

In this backdrop, the project of "Solid waste to Power" has been conceived primarily after making a series of deliberations and technical presentations that took place between the HMC authority and the interested Private Partner. Accordingly, a "Memorandum of Understanding" (MOU) was signed between HMC and M/s SOWAREEN Solutions AG, Switzerland duly represented by Dr. Rathin Chakravarty, Hon'ble Mayor and Mr. Norbert Burkhardt, M.D & CEO respectively on 07.01.2015 to form a PPP Project for production of electricity from waste thorough formation of a SPV where HMC is to be treated on a contractual basis equivalent to a (10%) shareholder, e.g., in terms of gaining (shared 10%) profits of the said SPV. The MOU describing prima-facie the scope of the project with modus-operandy to be followed including Indicative Offer of investment and the Project Report prepared and placed by M/s SOWAREEN Solutions AG containing along with other points Project Description, Project viability and Company Profile are enclosed herewith and made part of this report, marked as Annexure A and Annexure B respectively, for further careful scrutiny from technological, financial, socio-economic and environmental points of consideration keeping special emphasis on FDI clearance and International treatise and laws.

Now, as desired by the Municipal Affairs Dept., Govt. of West Bengal vide its letter No. 72/MA/C-10/35-4/2015 dated 29.01.2015 for submitting proposal / brief synopsis for the project "Solid Waste to Power" incorporating such details like location, land area, quantum of investment, employment etc, following brief points are submitted here-under for consideration and onward transmission to the Commerce & Industries Dept., Govt. of West Bengal.

(i) **Location & Land Area:** The proposed company intends to build up an emission free waste to energy plant of SG-300 capacity with their own patented technology licensed under INTEC-TCP for treatment of any type of garbage or waste which require 15,00,00 Sq. Mtr. of land, i.e. 91.0 Acres (apprx.). While, it is almost impossible to get such huge area of land in one parcel within the HMC area due to heavy population density which is about three times that of Indian average, HMC is striving hard to find land of similar size that suits to the purpose and has somehow found one near to Domjur area, which is about 16 Km. from the existing Trenching Ground at Belgachia, the exact land schedule with Mouza name/s etc, however, will be communicated later on. Further, direct purchase of land may be done in this case in compliance of the existing govt. norms by forming a "Purchase Committee" as communicated in the Memorandum issued by the Land and Land Reforms Dept., Govt. of West Bengal vide No. 3145-LP/1A-03/14 dated 24.11.2014.

(ii) **Quantum of Investment :**

1. Gas / Power Plant - Ready for operation - 317,668,000 / Rs. 247781,04,000/-;

2. Total CAPEX (Incl. Finance costs, substation & infrastructure ) 370,254,000 / Rs. 288798,12,000/- out of which Rs 7464,60,000/- for Substation, Rs. 19710,60,000/- for Halls and Infrastructure and Rs. 13841,88,000/- for finance and structuring costs [ Converted at current currency conversion rate 1 EUR = 78 Rs.]

3. Obligations of HMC -

(a) 37,025,400 / Rs. Rs. 28879,81,200/- i.e. 10% of share contribution of total investment [ Converted at current currency conversion rate 1 EUR = 78 Rs.];

(b) Cost of Land - Rs. Rs. 10-11 crore (apprx.), to be purchased directly on commercial rate in terms of existing Govt. guidelines;

(c) Gate-in fee for new as well as old waste to be used in the plant which comes around Rs. 8.60 crore (apprx.) per month as per the rate mentioned in the Indicative Offer of MOU;

(d) Transport / Handling cost for collection, loading and transportation of old deposit from the existing Trenching Ground to the Project Site and cost of transportation of new 500 MT. of new garbage / day which is yet to be calculated.

4. Obligations of J.V. Partner - 333,228,600 / Rs. 259918,30,800/- i.e., 90% of investment (share and /or debt) from SOWAREEN.

(iii) **Quantum of Govt. Support :** As it may not be possible for the HMC alone to provide for such a huge parcel of land required for setting up of the project and also to arrange for 10% share of the total project cost as envisaged in the previous paragraph, it is suggested that the State Govt. may bear this obligations of the HMC by clubbing together other ULBs so that this can be a **Trans-Municipal State Project** by forming a suitable SPV from which the participating civic bodies including the HMC can reap the benefits of scientific disposal of their municipal solid waste without using the precious land any more as well as conversion of the same to the "Clean Energy" in the form of "Bio-Electricity" for benefits of their own as well as the civic society at large.

(iv) **Generation of Employment:** Since, this is a capital intensive project driven by the most sophisticated and state-of-the-art technologies, as envisaged in the enclosed vision documents, the direct employment generation impact in this project is estimated to be around 500 (five hundred) required mainly for Operation and Maintenance of the Plant after it is successfully commissioned. However, at the time of construction, both skilled and un-skilled labour, will be required which again would create possibilities of employment generation on seasonal basis. Further, once the project is commissioned, various down-stream economic activities would surely generate indirect employment generation of tangible volume in and around the locale which surely have a direct bearing and impact on the employment scenario of the state.

(v) **Regulatory clearance frame-work:**

1. Formation of a J.V. Company (SPV) and in-corporation of the same under the Companies Act, 1956;
2. Clearance of the project by the Foreign Investment Promotion Board (FIPB), Dept. of Economic Affairs, Ministry of Finance, G.O.I. as the proposed foreign investment in the instant case is 90%;
3. Compliance of RBI / SEBI / Tax Treaty formalities;
4. ISO Certification;
5. Compliance of Pollution Control Board norms and approval of the competent authority in this regard;
6. Tariff agreement for purchase of power with the Power Distribution authority within the extant framework as laid down in this regard by the Central / State Electricity Regulatory Commission;
7. Clearance from Factories Act authority;
8. Compliance of IT / Service Tax / Sales Tax norms.

Lastly, our observation in this regard is that while the proposed project is surely a plausible solution to the critical problem of municipal solid waste management of Howrah city and its vicinity which remains a "Pain in the Neck" of the HMC authorities for years together and requires not only immediate attention but its successful implementation in view of the imminent health hazard and strictures issued by the Hon'ble Kolkata High Court in this regard, choice of the private partner and the technology is no doubt a big and sensitive issue as the viability and success of the project depends primarily on it. While, this type of PPP project normally require global bidding and appointment of approved Transaction Advisors for preparation of pre-bid / bid documents, in the instant case the same has not been followed considering the emergent nature of the problem and the nature of technology to be used which require no segregation of waste at source, as claimed. Moreover, the technology used by the SOWAREEN Solutions AG for setting-up of the plant is claimed to be a patented one and, in such a case if the competent authority is of the opinion that the technology is found to be suitable and effective for the purpose, then norms for Proprietary items can be followed. However, it is strongly felt that before arriving to such a conclusion, a team of experts from our State should visit the plants (at least more than one) which the private partner claims in its documents to be successfully operating in other countries set-up by them.

Encl.: Annexure 'A' & 'B'



(Dr. Rathin Chakravarty)

Mayor

Howrah Municipal Corporation



**DRAFT**

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  
DELHI: 110 032

February 19, 2015

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# THE NATIONAL ACTION PLAN FOR MSW MANAGEMENT

## 1.0 INTRODUCTION

It has been a fact that cities and towns are littered with garbage (MSW) and giving ugly look at many places in the city / town. Only important locations of a city or towns are maintained and leaving many other places chocking with uncollected waste. The collected waste is disposed on un-attended land-fills and it is almost long-way to go to ensure that entire waste collected by a city or town is processed and only remnants is disposed through landfill. Infact, remnants classifying as "inert / non-recyclable has to be converted into other useable product so to have vision and mission of 'Zero' land filling achieved.

Drawing of time – targeted action plan for management of MSW by each city and town in utmost essential need otherwise, increasing quantities of waste and not having required waste processing and disposal facilities will create un-healthy 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. There are only a few references of National Environmental Engineering Research Institute (NEERI) on selected

towns, CPCB's study on 59 cities (2008-09) and other institutes. Hence, there is no systematic and authentic data on MSW generation at National Level and subsequently at State, District and at each city / town level. It is to mention 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 only 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. Rest is plastics, paper, rags and other components. The calorific value of garbage will help to choose the technology 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 common approach / strategy adopted by the local body. 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 and other waste is getting 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 dumpsites pose potential threat for ground water pollution and causing deterioration of the ambient air quality.
- ix) Local bodies have not developed action plan for their city / town and the requirements 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 made with local bodies in coordination with SPCBs/PCCs
- iv) Field visits made on different occasions on 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 individuals 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**

CPCB suggests that Action Plan formulation and its implementation can be done by dividing under followed Heads;

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

Each Local Body may handle at its own level to 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 and contracting / outsourcing can also be done.

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

The Waste processing and disposal services can be operated by involving 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 that to set up Regional / cluster based common waste processing and disposal facilities.

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

CPCB has studied the cluster-based approach adopted by the state of Punjab. The Govt. of Gujarat has also attempted the 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 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 travel of garbage transportation.

**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 for each 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 have difficulty to arrange transport on daily basis. For such villages / towns, alternative options may be worked-out.
- iii) An adequate size of land will have to be acquired which should be free from public objection. In no case, any settlement or important structure



should be allowed. Common facility should have no settlement at least 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 give some value back interms of end-product and also to be sustainable.
- v) Common facility should be 'integrated' that, on the site, there will be sorting facility, 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; composing 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) In case of 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 Distract and sub divisional level, centralized RDF / Compost facility can be set up.

### 9.3 How clusters can be formed

- i) Gujarat Govt. sometime back, has carried out a study through Bhaskaracharya Institute of Space Application and Geo Centre (BiSAG), a State Remote Sensing Agency who have surveyed the entire state and based on 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, a common site to be 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 Private entrepreneurship in setting up of waste processing and disposal facility.
- The cities where estimated waste generation is more than 500 t/d are; Ahmedabad, Agra, Bangalore, Bhopal, Chennai, Delhi, Hyderabad, Jaipur, Kanpur, Kolkata, Lucknow, Mumbai, Nagpur, Pune, Surat and others.

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

- The towns generating waste ranging 100-500 tonnes per day would be required to initiate similar type of actions as suggested 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	Variety of vehicles to be used for transportation of waste. Storage facilities should synchronize with transportation system. Strict compliance with Schedule-II to be ensured	Variety of vehicles to be 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, land filling 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; <ul style="list-style-type: none"> <li>(i) waste segregation</li> <li>(ii) Collection</li> <li>(iii) Storage</li> <li>(iv) Transportation</li> <li>(v) Proceeding; and</li> <li>(vi) Disposal</li> </ul> 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	<ul style="list-style-type: none"> <li>- 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>                             Through :                             <ul style="list-style-type: none"> <li>• Pamphlet</li> <li>• Interaction</li> <li>• Hoarding/newspaper/ local cable network, etc.</li> </ul> </li> <li>- Door - to - door collection of segregated waste followed by recycling/ utilization by appropriate environment friendly manner.</li> </ul>	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. (to be started on experimental basis).</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>	<p>Procuring tools/tackles, as per DPR.</p>	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>	<p>Procuring transport vehicles as per DPR</p>	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 &amp; 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	Thiruvanathpuram	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

## Annexure-III

## 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

Annexure-IV

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



**CENTRAL POLLUTION CONTROL BOARD**

(Ministry of Environment & Forests)

Parivesh Bhawan, East Arjun Nagar,

DELHI-110 032

**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

Census Year	Population			Projected population
	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	Function al	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 management	
			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 cmt capacity) 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.
a)	<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)	Calculation for 30 litres capacity containers (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)	Calculation for six containerized handcarts and tricycles (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)	Nos. of central bins (100 litres capacity)/ community bins required in slum areas/ markets etc. = Say, D	D
e)	Add Standby containers, handcarts, tricycles, bins @ 10%	

#### 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			

c)	<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			
d)	<b>Hotel/ market waste collection vehicles</b>			
	No. of vehicles required for collection of hotel/ market waste			
	No. of standby vehicle			
	Total			
e)	<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)