Ministry of Housing and Urban Affairs
Government of India

Swachh Bharat Mission - Urban

ADVISORY ON
LANDFILL RECLAMATION

Central Public Health and Environmental Engineering Organisation (CPHEEO)

Ministry of Housing and Urban Affairs
Government of India

www.swachhbharaturban.gov.in | www.cpheeo.gov.in

June 2020

आत्मनिर्भर भारत

सत्यमेव जयते

Ministry of Housing and Urban Affairs
Government of India

स्वच्छ भारत
एक कदम स्वच्छता की ओर

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दुर्गा शंकर मिश्र
सचिव
Durga Shanker Mishra
Secretary

भारत सरकार
आवासन और शहरी कार्य मंत्रालय
निर्माण भवन, नई दिल्ली–110011
Government of India
Ministry of Housing and Urban Affairs
Nirman Bhawan, New Delhi-110011

Preface

While we can take pride in the country-wide adaptation of impressive scientific management of municipal solid waste under Swachh Bharat Mission- Urban launched in 2014, there lies in the background the crucial issue that needs to be addressed to make our cities truly clean - the remediation of dumpsites/landfills. The legacy waste lying dumped therein runs into several lakhs of tonnes. Unless these are remediated, no city can be considered clean in the true sense.

The Solid Waste Management Rules 2016 have laid down a timeline of 5 years for the Urban Local Bodies (ULBs) for the bio-remediation or capping of old and abandoned dump sites. Except for a few ULBs, this has remained to be addressed. Central Pollution Control Board has brought out Guidelines for Disposal of Legacy Waste (Old Municipal Solid Waste) in February 2019. This advisory is a comprehensive document for capacity building of Cities towards taking up the task of remediation of dumpsites.

The advisory compiles different approaches and methods, the advantages and disadvantages, the probable costs and the outcome benefits etc. together with a few case studies of ULBs successful in undertaking remediation work.

I congratulate the officers of the SBM-U and CPHEEO division for bringing out this Advisory and I believe that it will lead to heightened responsibility of Cities in cleaning up and beautification of dumpsites.

Happy World Environment Day !

(Durga Shanker Mishra)

New Delhi
June 5, 2020

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GOVERNMENT OF INDIA
MINISTRY OF HOUSING AND URBAN AFFAIRS
NIRMAN BHAWAN

नई दिल्ली-110011, तारीख 20
New Delhi-110011, dated the 20

FOREWORD

The Ministry of Housing and Urban Affairs (MoHUA) is implementing, in cooperation with the States, Union Territories (UTs) and Urban Local Bodies (ULBs) the Swachh Bharat Mission- Urban with one of the objective being scientific management of the municipal solid waste, as laid down in the Solid Waste Management Rules 2016. The Rules mandate the investigation and analysis of all old open dumpsites and existing operational dumpsites for their potential of biomining and bio-remediation and wheresoever feasible, take necessary actions to bio-mine or bio-remediate the sites. The ULBs have taken up the Swachhata issues wholeheartedly, as reflected in the success of the annual Swachh Survekshans and the certification of Star Rating of Garbage free Cities. However, the dark area of legacy dumpsites, standing out as piled up garbage in and around cities is a challenge to the overall environmental cleanliness of our cities. These dumpsites pollute the air, water, soil and downgrades the quality of life and value of the urban spaces around them with heavy social costs. These have to be remediated on priority.

The SWM Rules 2016 give a timeline of 5 years to ULBs for the bio-remediation or capping of old and abandoned dump sites. Except for a few ULBs, this has not been taken up vigrously. This advisory has been brought out to build the capacity of States/ UTs in this direction. This document describes various approaches and their suitability in various categories of cities. It discuss the planning, tendering and implementation for the entire scope of work for remediation as well as suggested eligibility criteria of contractors. Using this advisory, ULBs can develop their own tailor made solution for remediating the dumpsites. Case studies of successful ULBs such as Tirupati, Ahmedabad and Nawanshahr(Punjab) covering three different implementation models have been added. This advisory will continue to be updated based on the feedback received from States/ ULBs from time to time.

I appreciate the entire team of CPHEEO particularly Sh. J. B. Ravinder, Incharge of Solid Waste Management and other officers involved in preparing this advisory in such short time. I seek the constructive suggestions for improvement in this advisory.

New Delhi
5th June, 2020

V.K. Jindal

(V.K.Jindal)

Table of Contents

Abbreviations

CPCB	Central Pollution Control Board
CPHEEO	Central Public Health and Environmental Engineering Organization
C&D	Construction and Demolition
GHG	Green House Gas(es)
INR	Indian national Rupee
ISWM	Integrated Solid Waste Management
MT	Metric Ton
MoHUA	Ministry of Housing and Urban Affairs
MNRE	Ministry of New and Renewable Energy
MOEFCC	Ministry of Environment, Forest and Climate Change
MSW	Municipal Solid Waste
MSWM	Municipal Solid Waste Management
NGO	Non-Government Organizations
O&M	Operation and Maintenance
PA	Per Annum
PPP	Public Private Partnership
PVC	Polyvinyl Chloride
RDF	Refuse Derived Fuel
RFP	Request for Proposal
SBM	Swachh Bharat Mission
SLRM	Solid Liquid Resource Management
SPCB	State Pollution Control Board
SQM	Square meter
SWM	Solid Waste Management
TPD	Tonnes Per Day
ULB	Urban Local Body
WtE	Waste to Energy

Definitions

1. “aerobic composting” means a controlled process involving microbial decomposition of organic matter in the presence of oxygen;
2. “anaerobic digestion” means a controlled process involving microbial decomposition of organic matter in absence of oxygen;
3. “authorization” means the permission given by the State Pollution Control Board or Pollution Control
4. Committee, as the case may be, to the operator of a facility or urban local authority, or any other agency responsible for processing and disposal of solid waste;
5. “biodegradable waste “ means any organic material that can be degraded by micro-organisms into simpler stable compounds;
6. “bio-methanation” means a process which entails enzymatic decomposition of the organic matter by microbial action to produce methane rich biogas;
7. “buffer zone” means zone of no development to be maintained around solid waste processing and disposal facility, exceeding 5 TPD of installed capacity. This will be maintained within total and area allotted for the solid waste processing and disposal facility.
8. “bye-laws” means regulatory framework notified by local body, census town and notified area townships for facilitating the implementation of these rules effectively in their jurisdiction.
9. “combustible waste” means non-biodegradable, non-recyclable, non-reusable, nonhazardous solid waste having minimum calorific value exceeding 1500 kcal/kg and excluding chlorinated materials like plastic, wood pulp, etc;
10. “composting” means a controlled process involving microbial decomposition of organic matter;
11. “contractor” means a person or firm that undertakes a contract to provide materials or labour to perform a service or do a job for service providing authority;
12. “co-processing” means use of non-biodegradable and non-recyclable solid waste having calorific value exceeding 1500k/cal as raw material or as a source of energy or both to replace or supplement the natural mineral resources and fossil fuels in industrial processes;
13. “disposal” means the final and safe disposal of post processed residual solid waste and inert street sweepings and silt from surface drains on land as specified in Schedule I to prevent contamination of ground water, surface water, ambient air and attraction of animals or birds;
14. “domestic hazardous waste” means discarded paint drums, pesticide cans, CFL bulbs, tube lights, expired medicines, broken mercury thermometers, used batteries, used needles and syringes and contaminated gauge, etc., generated at the household level;
15. “dry waste” means waste other than bio-degradable waste and inert street sweepings and includes recyclable and non-recyclable waste, combustible waste and sanitary napkin and diapers, etc;
16. “dump sites” means a land utilised by local body for disposal of solid waste without following the principles of sanitary land filling;
17. “facility” means any establishment wherein the solid waste management processes namely segregation, recovery, storage, collection, recycling, processing, treatment or safe disposal are carried out;
18. “handling” includes all activities relating to sorting, segregation, material recovery, collection, secondary storage, shredding, baling, crushing, loading, unloading, transportation, processing and disposal of solid wastes;
19. “inerts” means wastes which are not bio-degradable, recyclable or combustible street sweeping or dust and silt removed from the surface drains;
20. “incineration” means an engineered process involving burning or combustion of solid waste to thermally degrade waste materials at high temperatures;

21. “informal waste collector” includes individuals, associations or waste traders who are involved in sorting, sale and purchase of recyclable materials;
22. “leachate” means the liquid that seeps through solid waste or other medium and has extracts of dissolved or suspended material from it;
23. “ local body” for the purpose of these rules means and includes the municipal corporation, nagar nigam, municipal council, nagarpalika, nagar Palikaparishad, municipal board, nagar panchayat and town panchayat, census towns, notified areas and notified industrial townships with whatever name they are called in different States and union territories in India;
24. “non-biodegradable waste” means any waste that cannot be degraded by microorganisms into simpler stable compounds;
25. “operator of a facility” means a person or entity, who owns or operates a facility for handling solid waste which includes the local body and any other entity or agency appointed by the local body;
26. “processing” means any scientific process by which segregated solid waste is handled for the purpose of reuse, recycling or transformation into new products;
27. “recycling” means the process of transforming segregated non-biodegradable solid waste into new material or product or as raw material for producing new products which may or may not be similar to the original products;
28. “refused derived fuel”(RDF) means fuel derived from combustible waste fraction of solid waste like plastic, wood, pulp or organic waste, other than chlorinated materials, in the form of pellets or fluff produced by drying, shredding, dehydrating and compacting of solid waste;
29. “residual solid waste” means and includes the waste and rejects from the solid waste processing facilities which are not suitable for recycling or further processing;
30. “sanitary land filling “ means the final and safe disposal of residual solid waste and inert wastes on land in a facility designed with protective measures against pollution of ground water, surface water and fugitive air dust, wind-blown litter, bad odour, fire hazard, animal menace, bird menace, pests or rodents, greenhouse gas emissions, persistent organic pollutants slope instability and erosion;
31. “segregation” means sorting and separate storage of various components of solid waste namely biodegradable wastes including agriculture and dairy waste, non-biodegradable wastes including recyclable waste, nonrecyclable combustible waste, sanitary waste and non-recyclable inert waste, domestic hazardous wastes, and construction and demolition wastes;
32. “solid waste” means and includes solid or semi-solid domestic waste, sanitary waste, commercial waste, institutional waste, catering and market waste and other nonresidential wastes, street sweepings, silt removed or collected from the surface drains, horticulture waste, agriculture and dairy waste, treated bio-medical waste excluding industrial waste, bio-medical waste and e-waste, battery waste, radio-active waste generated in the area under the local authorities and other entities mentioned in rule;
33. “sorting” means separating various components and categories of recyclables such as paper, plastic, cardboards, metal, glass, etc., from mixed waste as may be appropriate to facilitate recycling;
34. “stabilizing” means the biological decomposition of biodegradable wastes to a stable state where it generates no leachate or offensive odours and is fit for application to farm land ,soil erosion control and soil remediation;
35. “tipping fee” means a fee or support price determined by the local authorities or any state agency authorised by the State government to be paid to the concessionaire or operator of waste processing facility or for disposal of residual solid waste at the landfill;
36. “treatment” means the method, technique or process designed to modify physical, chemical or biological characteristics or composition of any waste so as to reduce its volume and potential to cause harm;
37. “waste generator” means and includes every

person or group of persons, every residential premises and nonresidential establishments including Indian Railways, defense establishments, which generate solid waste;

38. “waste hierarchy” means the priority order in which the solid waste is to should be managed by giving emphasis to prevention, reduction, reuse, recycling, recovery and disposal, with prevention being the most preferred option and the disposal at the landfill being the least;

Introduction

Urban India accounts for a third of India's population and generates 54.75 Million Tonnes of municipal solid waste annually. The most prevalent method of disposal of this waste has been open dumping, for most of India's history. The accelerated growth of urban population and increasing economic activities rule out the viability of this method any longer. Swachh Bharat Mission since 2014 has introduced several scientific methods in MSWM. Environmental adjudication has also mandated the scientific remediation of dumpsites. The fact that many old dumpsites and landfills in the country pose threat to public health and the environment necessitates action to remediate dumpsites and reclaim the land being degraded.

After decades of use, these open dumps have grown larger and higher, becoming huge point sources of pollution. Waste rotting in these dumps produces leachate, a foul dark liquid concentrate that kills vegetation in its path and irreversibly pollutes groundwater. The heaps of garbage also produce methane, a greenhouse gas that causes 21 times more global warming than carbon dioxide. Methane often auto-ignites, causing fires in the dumpsites, generating smoke and emissions thereby severe air pollution.

It is estimated that more than 10,000 hectares of urban land is locked in these dumpsites in India. In the absence of exposure to air, these dumpsites in the absence of oxygen generate methane (a greenhouse gas) and other landfill gases, which contribute to global warming. They also produce leachate (liquid generated by dumped) waste) which pollutes groundwater. Frequent outbreaks of fire at the dumpsites lead to air pollution. The presence of these dumps encourages further dumping at these sites, even though they are filled beyond capacity to take any more waste.

The need for remediation of these dumpsites is directed by NGT Order in OA 519/2019 dated 17/7/2019 on Remediation, the observation being the following (gist only- not verbatim)

1. "where bio-mining and bioremediation is possible, both ex-situ and in-situ, such options can be exercised, which is not only environmentally safe but cost effective. There may be hardly any situation when bioremediation is not possible.

2. The option of capping of legacy wastes, which has huge environmental and health consequences, is no option at all, except for inert waste, which again is to be disposed in a scientific secured landfill"

The order further traces the magnitude of the problem as follows:

As per Annual Report of the CPCB (2016-2017), there are 2120 Legacy waste dumpsites in India across 23 States: (as per MoHUA MIS data 1,764 dumpsites are recorded. The figure 2120 may include the under construction and existing SLF also, which do not require remediation)

The NGT orders for actions by States & ULBs may be mentioned as

1. Bioremediation and Biomining of dumpsites should be the preferred option.
2. Cities with more than 10 lakh population need special localized solutions.

The Solid Waste Management Rules of 2016 directed Urban Local Bodies to clear legacy waste dumps as well as existing operational dumpsite down to pre-existing ground level through a process called bioremediation or biomining, which refers to an environment-friendly technique to separate soil and recyclables from legacy waste.

Provisions of SWM Rules, 2016

The Government of India has notified the Solid Waste Management Rules (SWM) Rules, 2016 for proper and effective management of municipal solid waste (MSW). Under the SWM Rules, 2016, following provisions have been made to manage old dumps of MSW.

Rule 15 - Duties and responsibilities of local authorities and village Panchayats of census towns and urban agglomerations. - The local authorities and Panchayats shall, -

- investigate and analyze all old open dumpsites and existing operational dumpsites for their potential for bio-mining and bio-remediation and wherever feasible, take necessary actions to bio-mine or bio-remediate the sites;
- in absence of potential of bio-mining and bio-remediation of dumpsites, they shall be scientifically capped as per landfill capping norms to prevent further damage to the environment.

Further, provisions under Schedule I (j) are given below:-

Schedule-I (j) - Closure and Rehabilitation of Old Dumps- Solid waste dumps which have reached their full capacity or those which will not receive additional waste after setting up of new and properly designed landfills should be closed and rehabilitated by examining the following options:

i. Reduction of waste by bio-mining and waste processing followed by placement of residues in new landfills or capping as in (ii) below.
ii. Capping with solid waste cover or solid waste cover enhanced with geomembrane to enable collection and flaring / utilization of greenhouse gases.
iii. Capping as in (ii) above with additional measures (in alluvial and other coarse-grained soils) such as cut-off walls and extraction wells for pumping and treating contaminated ground water.
iv. Any other method suitable for reducing environmental impact to acceptable level.

Impact of Legacy Waste Dumpsites

The sites for landfills were originally located outside of the cities, but as the cities have expanded the dumpsites are now almost in the middle of cities. Delhi's open dumps at Ghazipur (69 metres high), Okhla (55 metres high) and Bhalaswa (56 metres high), for example, are all much higher than the permissible height limit of up to 20 metres, and way past their capacity of holding waste for which they were set up.

It is estimated that more than 10,000 hectares of urban land is locked in dumpsites in India.

In the absence of exposure to air, the high rates of rotting mixed waste on these sites generate methane (a greenhouse gas) and other landfill gases, which contribute to global warming. They also produce leachate (liquid generated by airless waste) which pollutes groundwater. Frequent outbreaks of fire at the dumpsites lead to air pollution. The presence of these dumps encourages further dumping at these sites, even though they are filled beyond capacity to take any more waste.

Many municipal authorities across the country are opting for "capping" as a solution to the legacy of mixed waste, which is not the first option in the order of priority for environmentally safe legacy waste management as per Clause 'J' of Schedule–I of the SWM Rules, 2016.

The methane produced at solid waste disposal sites contributes approximately 3 to 4 percent to the annual global anthropogenic greenhouse gas emissions (IPCC, 2001). Clearing these mounds of years-old waste, called legacy waste, is one of the easiest and fastest way to reduce our national emissions, and save surrounding villages from polluted water sources, smoke, flies and stench.

Local Bodies also need to ensure that the upcoming infrastructure for solid waste management is designed to handle and store unmixed wastes separately. Government bodies should also create infrastructure for collection, handling, and sorting, processing and sustainable end disposal infrastructure for all types of waste.

Existing Scenario

As per the data available with MoHUA, the breakup of legacy waste dumpsites is as below:

Population Class of Cities	Total Legacy Waste at dumpsite in Tons	Number of Cities	No. of Dumpsites
>20 Lakh	6,67,17,223	15	20
10-20 Lakhs	1,88,89,538	33	35
5-10 Lakhs	2,20,80,203	46	51
3-5 Lakhs	1,03,38,668	56	60
1-3 Lakhs	2,40,83,948	322	351
Grand Total	14,21,09,581	472	517

List of dumpsites in ULBs with population of more than 1 million provided in Annexure-VI

Though the cities with more than 20 lakhs population cater to only 23% of the urban population, the dumpsites in these cities account for almost half (47%) of the total waste present in dumpsites of cities with more than 1 lakh population. This issue is further compounded by the fact that these cities have grown the most in terms of area, and so these dumpsites, which were at one point located in the outskirts of the cities, are now standing tall in the middle, exposing a large number of people to the health hazard of open dumpsites. Moreover, these dumpsites are growing in size, becoming an eyesore for these cities, causing considerable social, economic and environmental losses to surroundings. The cities will soon have to deal with the fact that these dumpsites will soon be unable to take in any more waste, and it is imperative

that they are proactive in tackling this issue. ULBs stand to gain access to valuable land by remediation of their dumpsites.

The 106 dumpsites in the ULBs with a population of more than 5 lakhs must be considered a priority as they affect almost a half (46%) the total urban population. These are also on the verge of overflowing, and their remediation must be prioritized.

Problem statement

ULBs have been dumping municipal solid waste in open dumpsites for decades. Moreover, due to the expansion of cities, these dumpsites are now situated in the middle of cities even though they were originally in the outskirts. These dumpsites have neither a lining nor a daily covering and receive mixed and untreated waste which has a large organic fraction. These open dumpsites pose serious health risks such as ground water pollution caused by leachate seeping into the ground, air pollution, vector borne diseases, hazardous landfill fires, and unaesthetic appearance. In addition to the environmental losses, these dumpsites cause social and economic losses to the nearby people due to the stigma around dumpsites. All these issues necessitate the remediation of dumpsites in a scientific manner. The problem of dump sites being in the middle of cities is particularly troublesome for metro cities, where the large quantities of waste result in large plots of useful land being wasted as dumpsites.


THE TIMES

EVERTON STAR WAYNE ROONEY ARRESTED FOR DRUNK DRIVING AFTER 10-HOUR BOOZING SESSION AT A CHESHIRE BAR 25

2 killed as 50 tonnes of waste hurtles down Ghazipur landfill

Vehicles Swept Into Drain; Toll May Increase

AN AVALANCHE OF GARBAGE

Local lad pulled out driver of sinking car

AAP govt, EDMC blame each other

Why tragedy was waiting to happen

Operational

- Disposal of rejects
- 100% Land reclamation is difficult
- Clearing land required for setting up of Biomining equipment within dumpsite
- Existing litigation on project or land
- Opposition from local public
- Lack of clarity on Volume vs. Weight based measurements
- Provision of power and water connections for the project
- Lack of familiarity with CPCB Guidelines for this matter
- Delay in processing due to climatic conditions
- Difficulty in quantifying the legacy waste below ground level and hence separate methodology to be worked out to assess the quantity which needs

Challenges encountered in Dumpsite remediation projects:

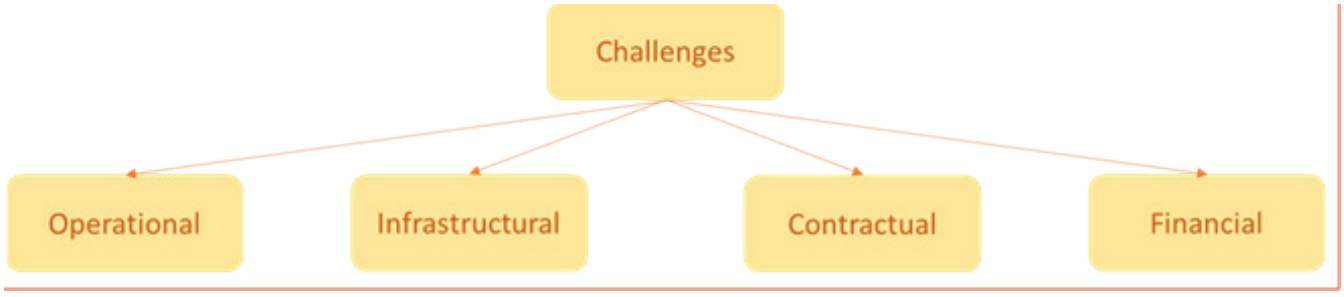


Figure 1: Types of challenges

another project.

- Availability of space in the existing dump yard for setting up of plant
- Cement companies are not favorable to accept RDF and there is no price for the same which makes the transportation cost expensive.
- Difficulty in disposal of bio earth since farmers are not accepting the bio earth recovered
- For smaller ULBs of less than 1 lakh population, farming areas are close by so that mined soil-enricher is taken by the farmers. Inerts also get used up by the ULBs & citizens in building activities. However, transportation of RDF from these ULBs to the points of usage such as cement kilns, road projects and WtE Plants can be a costly task.
- The quality of bio earth does not meet the standards due to presence of heavy metal content in some sites
- Disposal of non-recyclable fresh dry waste segregated every day is not accepted by the cement industries which necessitates the continued dumping in the existing dumpsite.
- On the other hand, for metropolitan cities of 10 lakhs and above, the RDF which maybe 5-15% by mass maybe readily utilized, whereas the remaining 85-95% soil and inerts may not find any takers due to lack of farming areas.
- The linkages for offtake of by-products like soil enricher, RDF, C&D Waste, recyclables and inert to farmers, industries/ WtE, recyclers, etc. are still big challenges for ULBs/ operators in providing sustainable solution of dumpsite remediation.

Infrastructural

- Customized machineries are not available for removal of legacy waste

Contractual

- Lack of experienced contractors for carrying out Biomining work
- No incentive or reward for carrying out this work since the contractors have to work in unhygienic and hazardous dump yards.
- The quantification of legacy waste is based on volume basis (as per CPCB guidelines) for making payment is some areas.

- Cement companies are reluctant to take the Refuse Derived Fuel (RDF) and the Contractors are not able to dispose the separated materials.
- Unreasonable timelines proposed by ULB
- Contract agreements are not standardized
- Lack of clarity of State PCB clearances

Financial

- Mostly biomining projects are under budgeted
- No grants or financial assistance from government
- The ULBs could not bear the entire biomining cost from their own resources
- Payment terms and methodologies vary with different ULBs
- Lack of clarity on the applicability of GST
- The cost burden for transporting the soil and inerts maybe Rs 4000-5000/MT for 10-50 KM, there by the transportation cost may become exponentially higher than the cost for remediation itself. This problem will be acute in the case of mega cities like Delhi having population more than 50 lakh

Type and Methodology for Dumpsite Remediation

The treatment & disposal of Legacy MSW can be done by Bio-remediation. A total station survey or drone mapping of any landfill/dumping site must be done prior to start of the project. Hence, it is suggested to ensure a precursor study with history of the site, compositional analysis of waste. Site environment parameters such as baseline study of heavy metals in surface and subsurface soils and water, rainfall, soil type, surface hydrology, topography, wind direction etc. shall be studied before and after bioremediation. Periodic study should also to be carried out after completion of bioremediation to check for any adverse effects in the surrounding area.

Applicability of Bioremediation and Capping:

Bioremediation	Capping
• Applicable where the ownership is well defined • Where working space is available in the dumpsite. • Where linkage with utilization of remediation by-products are available	• Applicable only in cases having: • lack of resources • lack of working space • Lack of linkage for utilization/ disposal of segregated components.

a. Capping Model without Land Recovery

The dumpsite is profiled, covered with soil, surface drainage system, leachate management and gas collection systems and capped. The land becomes a green space. Has environmental monitoring systems. This is adopted in absence of viable reclamation options.

S.No	Advantages	Disadvantages
1	Can be completed fast	No land recovery, no financial benefit from land capped (except parks/ recreation)
2	Process requires less environmental clearances	Regular operation and maintenance required, thus recurring expenditure.
3	Relatively cheaper	Problems with leachate collection and gas generation
4	Land capped can be developed into parks /recreational areas	Post closure O&M

Although capping is mentioned as a method in this advisory, it must be noted that SWM Rules 2016 and NGT have mandated that for remediation of legacy waste dumpsites Bioremediation is preferred over Capping.

Before

After

Partial land reclamation and capping project carried out at Nashik, Maharashtra.

Before

After

Partial land reclamation and capping project carried out at Nashik, Maharashtra.

b. Bioremediation and reclamation of part of land by utilizing part of retrieved fractions and the leftovers heaped in stable profile and capped appropriately.

In this process, approximately 50- 60 % waste is excavated, which is then processed as per CPCB guidelines. The useful fractions derived from this process can be sold to relevant buyers and the inert material with rest of the dumpsite will be capped to prevent further degradation of the environment.

S.No	Advantages	Disadvantages
1	Cheaper than 100% reclamation	Only partial Compliance to SWM Rules and NGT orders
2	Can be faster than 100% reclamation	Only partial land recovery
3	Volume of waste is reduced	Methodology is time taking, extensive work
4	Waste segregated is utilized	Disposal of segregated portions is a challenge (transportation etc.)
5	Improvement in aesthetics and quality of life & health	Industry expertise is limited (only a few contractors)
6	Land capped can be developed into parks /recreational areas	Difficult to quantify the waste

c. Reclamation with complete Land Recovery

This refers to the excavation of old dumped waste and making windrow of legacy waste to stabilize of the waste through bio-remediation i.e. exposure of all the waste to air along with use of composting bio-cultures, followed by screening of the stabilized waste to recover all valuable resources (like organic fines, bricks, stones, plastics, metals, clothes, rags etc.) followed by sustainable management through recycling, co-processing, road construction etc.

S.No	Advantages	Disadvantages
1	100% Land recovery	Expensive, requires heavy machinery
2	Volume of waste is reduced	Methodology is time taking, extensive work
3	Waste segregated is utilized	Disposal of segregated portions is a challenge (transportation etc.)
4	End to Environmental management (air,water,soil)	Industry expertise is limited (only a few contractors)
5	Increase in land value	Difficult to quantify the waste. Expensive to weigh all recovered fractions
6	Compliance to SWM Rules and NGT orders	
7	Improvement in aesthetics and quality of life & health	

Before

After

Complete land recovery project at Poonamallee, Tamil Nadu

The remediation of dumpsites leads to the following advantages:

- Elimination of foul odour to benefit the citizen living nearby
- Decline in vector borne diseases arising out of the dumpsite
- Significant Reduction in Air pollution of the entire area
- Elimination of dump fires and leachate generation
- Uplifting of the environmental, aesthetic and social parameters of entire area
- Reduction in Green House Gas Emissions, soil pollution and Ground water contamination
- Increase in nearby real state value and rental values.
- Dumpsite land becomes available for other use

Approaches to Dumpsite Remediation

The project must adopt an integrated approach to propose all the activities required for Dumpsite Remediation. It may be detailed as follows:

- Quantity of the waste to be Bio-remedied to be determined on the basis of contouring of area and geotechnical surveys
- Lowest Ground Level to be reached
- Raking of garbage layer through long spike harrow operating in cross directions was done regularly to pull out rags, plastic, rubber, textiles etc.
- Coarse material and garbage are screened through rotary/ horizontal screens. The recovered earth is spread in the dedicated area. No extra charge is paid to the contractor for lead or lift of the material
- The stone, bricks, ceramics which are removed while screening and raking to be sent for land filing or for filling up of low-lying area, while the recyclables like plastic, glass, metal, rugs cloth recovered from the waste was bundled and sold
- The soil recovered to be used for refilling the ground on the same site for greenery
- The recovered construction and demolition waste to be recovered and sent to C&D processing facility for producing building materials and the left-over of the waste to be sent to a secured landfill
- Valuable land to be recovered by bio-remediation process of legacy waste
- The project machines to be deployed: Trommels, Horizontal Screens, excavators, backhoe loaders, workers
- Daily monitoring of the progress of work to be done by a team headed by an expert

Survey and Steps for Bioremediation

The treatment & disposal of Legacy MSW can be done by Bioremediation. A total station survey or drone mapping of any landfill/dumping site must be done prior to start of the project. Hence, it is suggested to ensure precursor study with history of the site, compositional analysis of waste.

Site environment parameters such as baseline study of heavy metals in surface and subsurface soils and water, rainfall, soil type, surface hydrology, topography, wind direction etc. shall be studied before and after bioremediation. Periodic study should also to be carried out after completion of bioremediation to check for any adverse effects in the surrounding area.

The steps for dumpsite remediation are (a) planning and site preparation, (b) excavation, (c) bio stabilization of waste and (d) screening and recovery of recyclables. The planning and site preparation are detailed in the following section whereas excavation, bio stabilization of waste and screening and recovery of recyclables are detailed in the subsequent sections of this advisory.

Planning & Site Preparation

The first step in a dumpsite remediation project is planning & site preparation. This will start with a detailed site assessment of dumpsite and estimate the material processing method and rate.

This site assessment involves different parameters such as geological features, stability of the surrounding area, and proximity of ground water, and determines the fractions of usable soil, recyclable material, combustible waste, and hazardous waste at the site etc. Future land use will be a key factor in determining the extent of remediation to occur. The various components to be considered in planning and site preparation are shown in Figure 2.

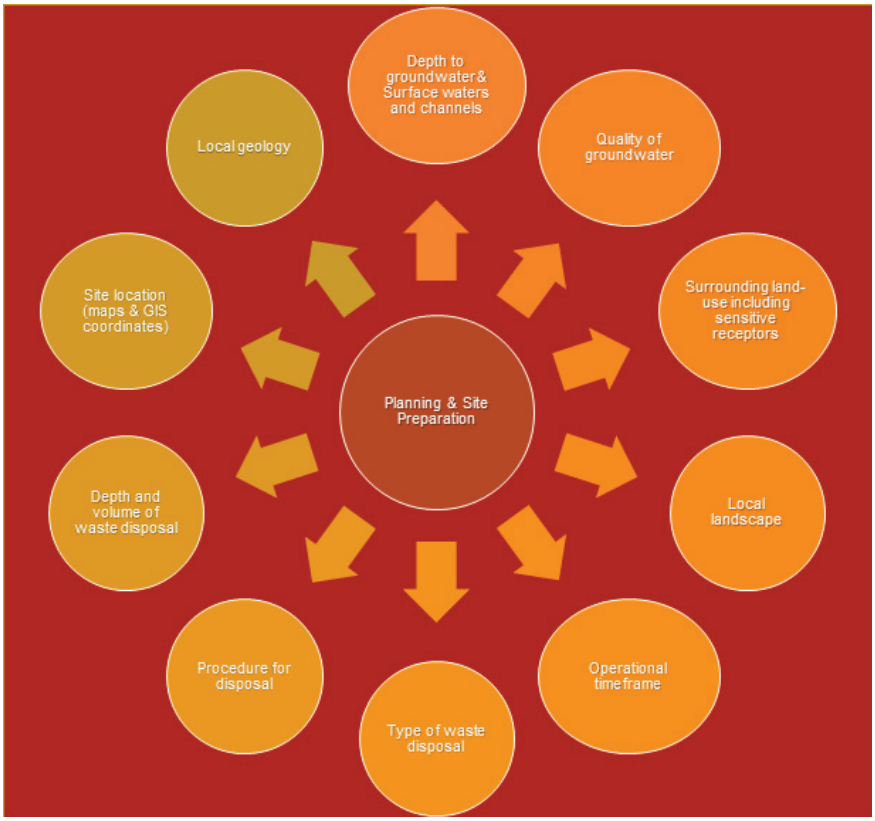
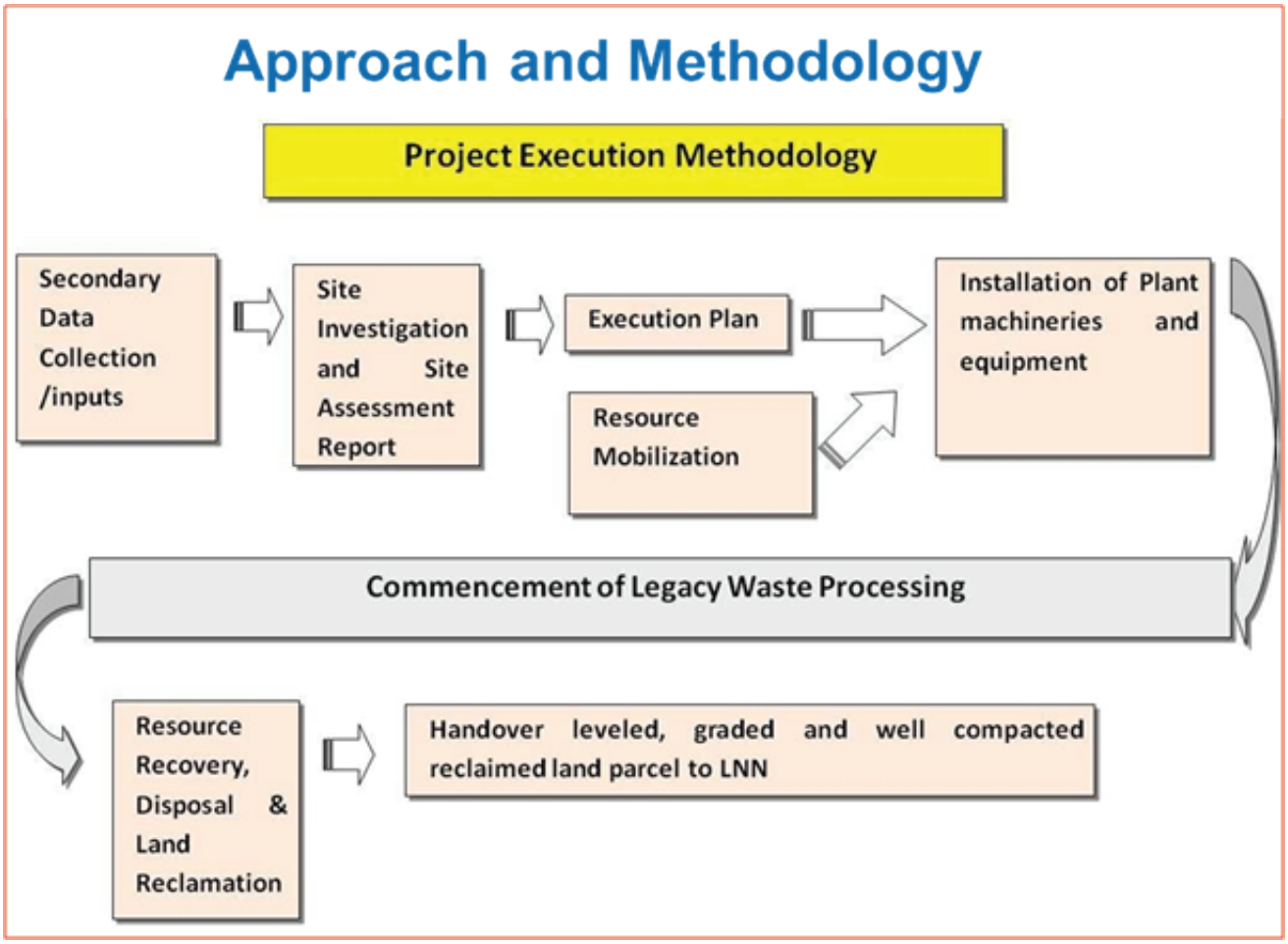


Figure 2: Components to be considered in planning and site preparation

Approach and Methodology



An illustrative planning and management for dumpsite remediation is shown in the below table:

Unit operation	Operational requirement	Support
Pre-operational period		Base-line monitoring Community consultation
Site preparation	Site services (power/water/drainage) • Site access / internal access / working platforms • Temporary storage / recycling / materials treatment areas • Disposal area • Site security • Wheel and vehicle washing • Weigh bridge • Roads	Environmental protection measures (whole area, operational areas) • Monitoring (equipment/support facilities) • Health and safety requirement/emergency support area)
Excavation	Depth and extent of excavation Means of controlling depth and extent of excavation (physical stability nature of strata degree of contamination) • Size zoning/phasing (horizontally) vertically/over time) • Volumes, types and variability of material to be excavation Rate of excavation (material flows) Number, types and variability of material to be handled Segregation, separation and dewatering needs Material flows Nos. and types of vehicles or other transport means Plant and equipment needs	Environmental protection (air/water protection measures, vehicle decontamination, temporary cover over excavation) • Monitoring (QC an arising/recycled material/ effluent, in support of health and environmental protection, in respect of residual contamination for partial excavation)
		Health and safety (equipment/procedures) • Record-keeping procedure
Materials handling	Volume, types and variability of material to be handled Segregation, separation and dewatering needs Material flows Numbers and types of vehicles or other transport means Plant and equipment needs	Environmental protection for operational areas Monitoring (QC on material flows, in support of health and environmental protection) Health and safety (equipment/procedures) Record-keeping procedures
Replacement	Method of placement Plant and equipment required Protection against further migration of waste	Environmental protection for operational areas Monitoring (QC on material flows, in support of health and environmental protection) Health and safety (equipment/procedures) Record-keeping procedures
Final disposal off-site	Transport arrangements	Environmental protection for transit vehicles/trains etc. • Record-keeping procedures
Final disposal on-site	Technical characterization of designated area Volumes and types of materials to be placed	Environmental protection (containment for soils/ liquids/gases)
Post-treatment management	Post-excavation validation for excavated area & periodic review and maintenance	Collection of long-term monitoring data from on-site deposits • Record-keeping procedures

The general workflow for Reclamation with complete Land Recovery is as follows:

1. Geo-technical investigations (Contour Survey, Geo-technical Investigation, Physio-chemical analysis and baseline environmental monitoring).

2. Estimation of Legacy Waste Quantity

3. Execution plan, drawings of Scientific Reclamation Layout and required infrastructure

4. Site Assessment Report (SAR) including Environment Management Plan (EMP), Environment Monitoring Plan and its implementation Mechanism

5. Resource mobilization

6. Construction of processing facility and installation of weighbridge

7. Excavation, resource recovery, sale and disposal of the recovered material

8. Scientific disposal of the process rejects

9. Reclamation of land, leveling, grading and compaction

10. Storm water management system/ infrastructure

11. Leachate management system/ infrastructure

Points to consider for seamless operations during Project Implementation

1 **Contractual clarity:** Contract must clearly mention scope and obligations of relevant stakeholders

2 **Predefined Work plan:** A detailed operational plan with work process flow and timelines must be prepared and accepted by all involved parties

3 **Fresh Waste:** The issue of dumping of fresh waste generated by ULBs must be resolved as the remediation work cannot be carried out on any section of the dump site receiving fresh waste.

4 **Space Management:** Availability of space is a constant challenge as each of aeration, stabilization, and screening need to be done within the boundaries of the dumpsite, and the solution to this problem varies on a case-to-case basis. Safety must always be ensured when trying to manage space.

5 **Leachate Management:** Opening up of legacy waste leads to the trickling out of leachate, which must be properly collected and treated. Aeration of the waste leads to reduction in leachate.

6 **Fire Control, Safety and environmental compliance:** Most dumpsites are smoldering with hidden fires. Sometimes, digging into a dump awakens these fires. Make fire safety paramount.

7 **Use of Recovered Space:** The recovered land is ideal for continued long term waste management. However, the land must be demarcated in a way that ensures compliance with all guidelines. If the site is not planned for continued waste management, alternative plans must be made immediately to prevent encroachment.

8 **Odour and Dust Management:** Odour and dust from a dump site causes problems for workers as well as nearby residents, and so must be controlled by stabilizing the waste and regular spraying of bio culture solution on the waste heaps.

9 **Linkage of sale/ reuse of segregated material:** The segregated material must be put to use to maximize the economic efficiency of the dumpsite reclamation exercise.

Bioremediation Process Schematics

Waste stabilization has been shown as a schematic in Figure 3

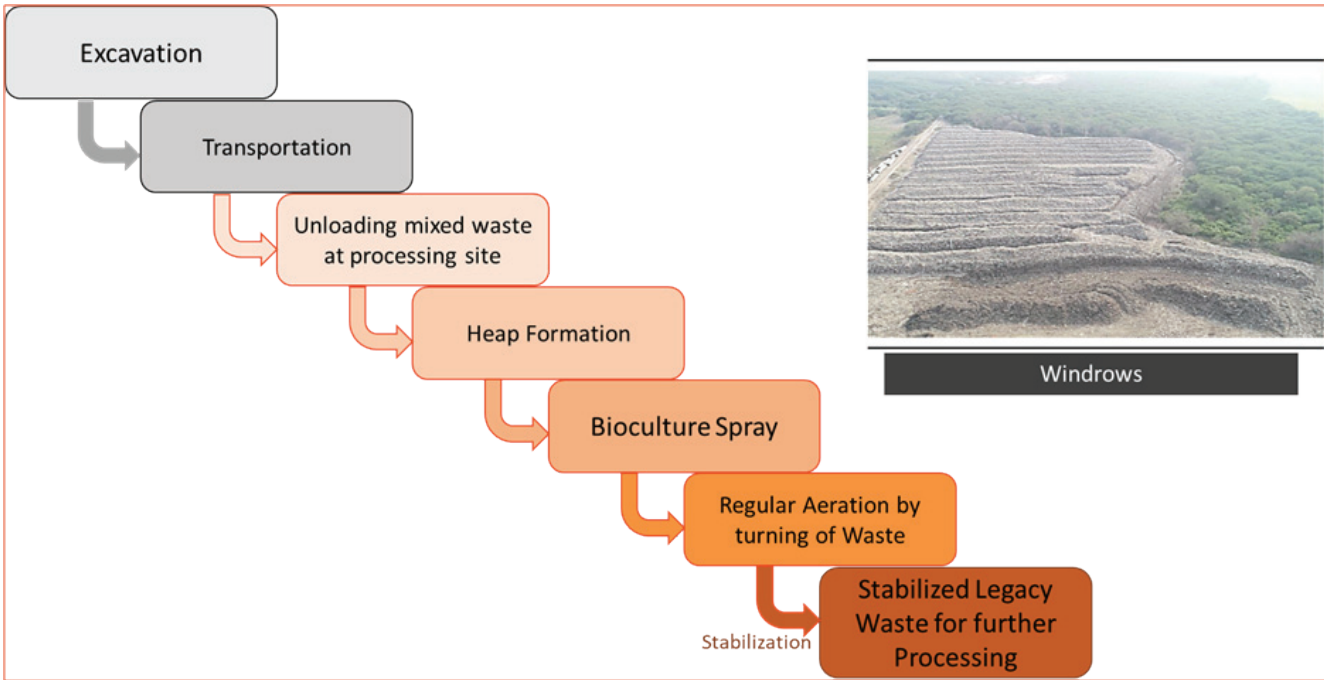


Figure 3: Bio-stabilization of Waste

Below is the indicative overview of dumpsite remediation process. This is a stepwise overview to help understand the process and outcome of remediation (For more details, please refer CPCB Guidelines for the disposal of legacy waste 2019).

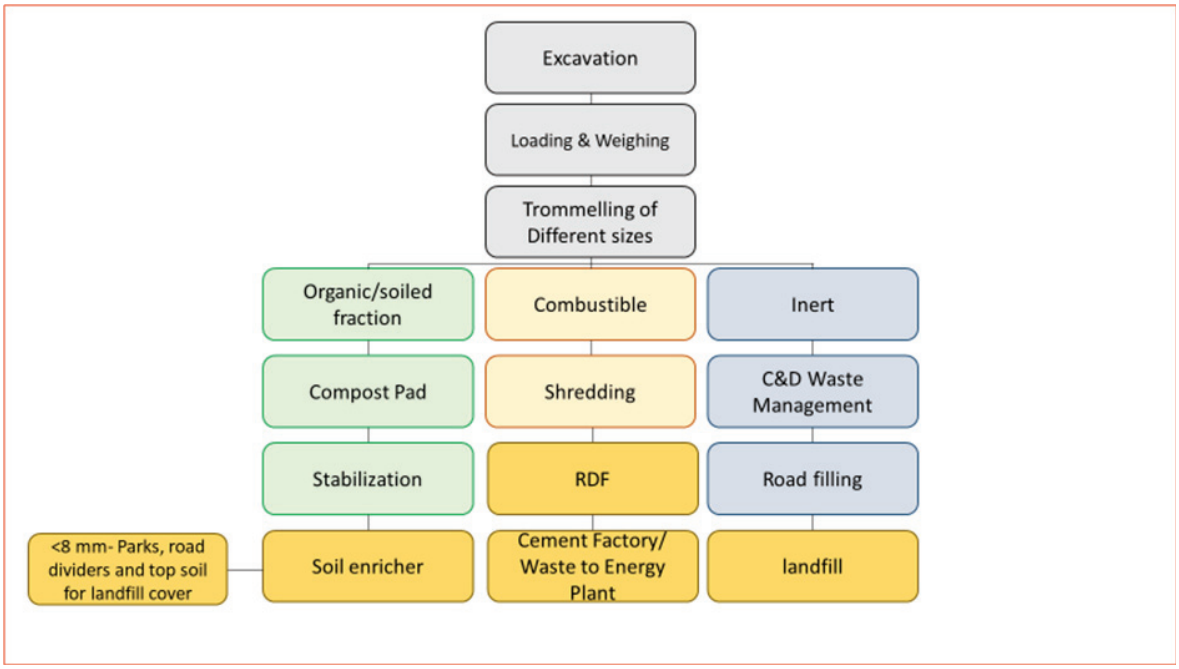


Figure 4: Overview of Dumpsite Remediation

The different screening sizes of waste have been mentioned in the figure below. Detailed Screening sizes and their respective outcomes have been shown in the figures 5 & 6.

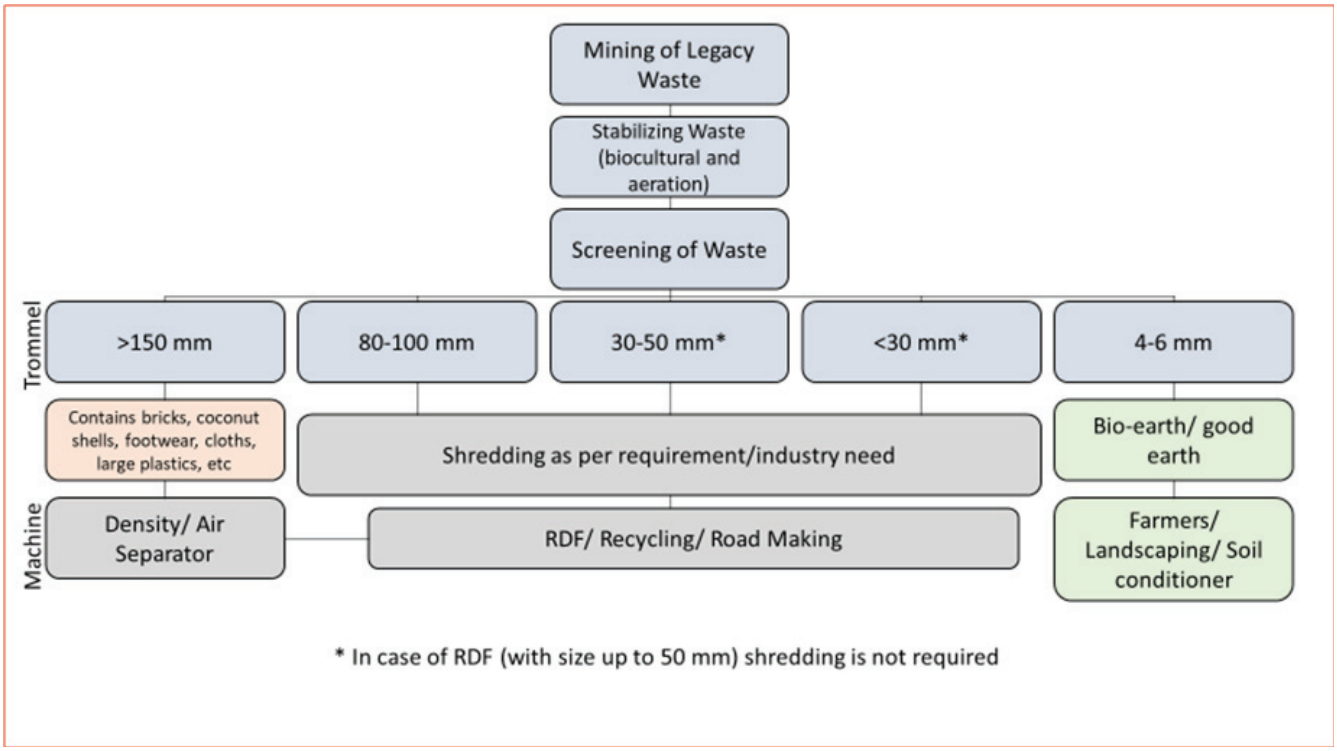


Figure 5: Overview of Bioremediation of Legacy Waste

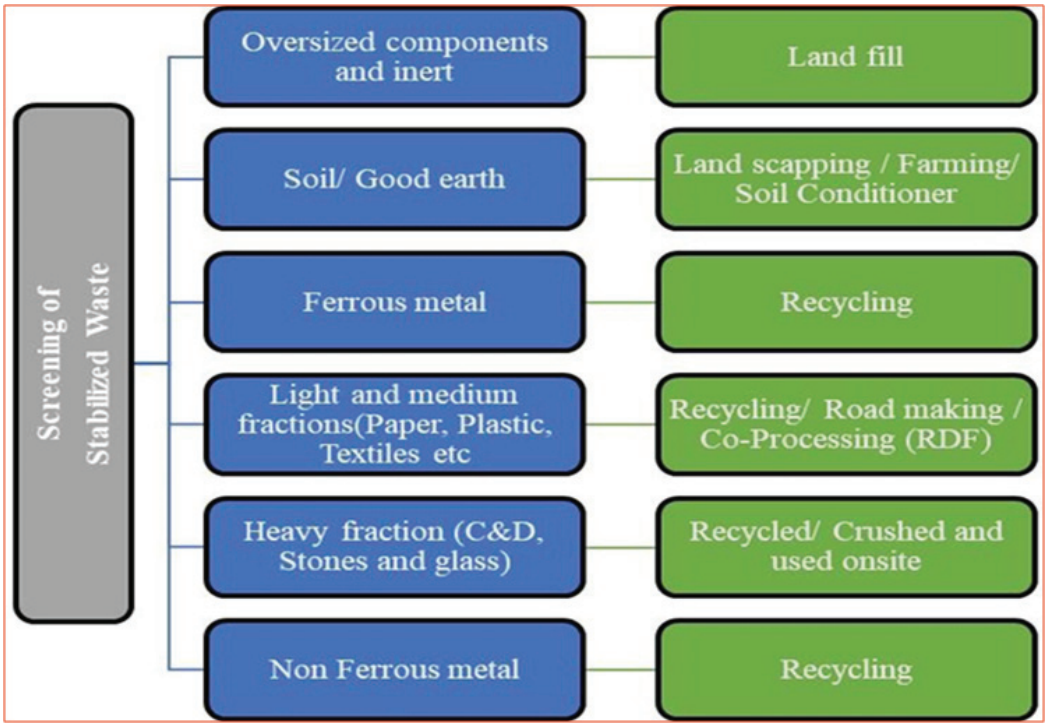


Figure 6: Schematic representation of screen components and its sustainable disposal

The above workflow may be referred for a general understanding of the process. The detailed, technical description of the process may be found in the Guidelines for Disposal of Legacy Waste (Old Municipal Solid Waste) published by Central Pollution Control Board.

Equipment Required for the Processing of Legacy Waste

The major equipment that is deployed in the processes like excavation, shredding, screening, air classification and ferrous separation. As per suitability and requirement, appropriate choices of equipment should be made.

i. Screening equipment

- Trommels (different size sieves- separate the soil material, Combustibles and inerts): Trommels are rotating cylindrical screens that are inclined at a downward angle with the horizontal. Material is fed into the trommel at the elevated end and the separation occurs while the material moves down the drum. The tumbling action of the trommel effectively separates materials that may be attached to each other. Length, angle and diameter of the drum, depth of the material and the speed of rotation are important specifications in configuring the trommel to accomplish the desired goals.

Figure 8: Trommel

Screen sizes commonly used are one or more of the following: 150 mm. 80 to 100 mm, 24 to 50mm, 12-16 mm and 4-6. Trommel screens are more effective than vibrating screens for dumpsite reclamation. Vibrating screens, however, are smaller, easier to set up, and more mobile.

Figure 9: Ballistic Separator

- Air Density Separators/Classifiers (to separate the stones, papers, plastics and such light fractions): Air classification is utilized to separate light materials from heavier materials through the use of an air stream of sufficient velocity to carry away the lighter materials. A cyclone separator may be used in conjunction with the air classifier to remove the lighter separated fraction from the air stream after it exits the classifier throat. The cyclone separator uses a centrifugal action that results from the airflow through the cyclone to move the materials to the walls of the separator.
- Ballistic Separators (to separate stones and soil & humus)
- Magnetic Separator:

ii. Handling Equipment

- Loaders (Front Load) & Excavators: The old waste dump contains leachate at different layers and various gases and odour-causing substances. Before starting the excavation process, it is necessary to vent out these gases and drain out the leachate. An excavator or front end loader may be used to dig up and transport the dumped material


Figure 10: Conveyor

to elevator conveyor belts, then to the sorting machinery.

- Dumpers
- Forklifts,
- Elevator and conveyor Belts: Belt conveyors system is utilized for effectively transporting materials up steep inclines and is extremely versatile.
- Water tankers, etc.
- Shredders (optional)
- Baling Machines (optional)

iii. Other Equipment

- Odour control sprayers: are wheeled tractors with a cab and movable spray arm mounted on a rotating platform. A large reservoir tank mounted behind the cab holds neutralizing agents, usually in liquid form, to reduce smell of exposed wastes.

The equipment required for carrying out of remediation work such as trommels, screens, excavators, dumpers, weigh bridges etc are readily available in the country; there are at least 18 vendors available. A list of vendors is provided in Annexure III.

A Toolkit/ template has been attached as Annexure II to collect and provide information / details as DPR / Technical feasibility report for legacy waste management and further reference.

For typical remediation projects, the tentative manpower requirement is shown below. This requirement is for sites with more than 1 lakh ton of waste.

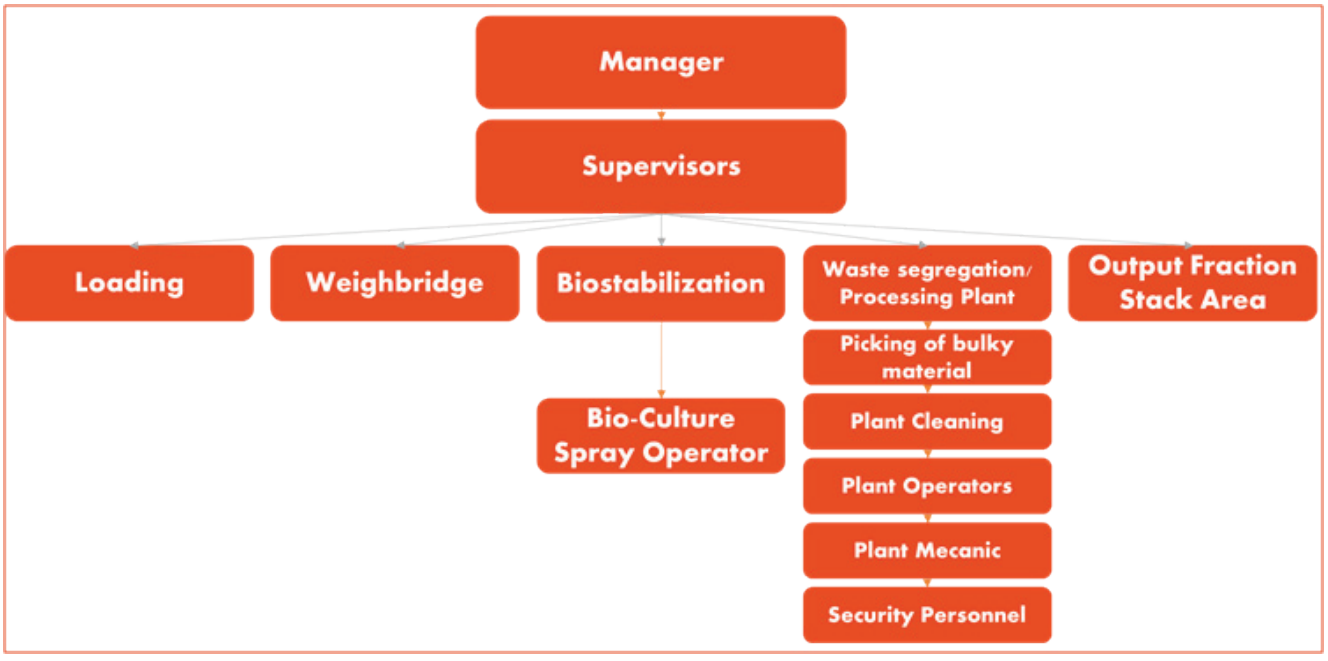


Figure 11: Indicative Manpower Requirement

Models for Implementing Dumpsite Remediation

The models employed for dumpsite remediation work in the present scenario are as follows:

i. Execution Methods

- 100% Reclamation: Design Finance Own and Operate and Transfer with near-zero residues. All work must be carried out in compliance with SWM Rules 2016 and CPCB Guidelines for the disposal of legacy waste 2019. (Tamil Nadu Model)- Maximum processing cost & no operating costs
- 100% Capping (Minimum operating/ processing cost) e.g. Gorai Dumpsite in Mumbai
- 60-70% Reclamation, rest with inert capping - Part Capping, (Nashik Model, EPC)-Processing & Operating cost lying between the first two models

ii. Working Models

- 100% work to outsourced to selected private contractor
- 100% by ULB with rented equipment and manpower
- Part by private operator (processing only) and rest by ULB (utilization, transportation and disposal)

Given below are the reference scope and qualification criteria for each model mentioned above, for general understanding:

A. 100% Outsourced Model

ULB shall assess the quantity of waste and hand over the land for setting up of the plant Contractor to set up the plant at his own cost Electricity connection to be provided by ULB for the plant Electricity charges for the usage of the plant to be paid by contractor ULB shall facilitate the disposal arrangements with their processing facilities

(To be included) Responsibility for disposal of RDF, recyclables and aggregates ULB to appoint academic institution as Third party to verify the activities Bio-mining to be carried out as per SWM rules 2016 and CPCB guidelines

Payment shall be made for the quantity of waste removed subject to verification by Third\party Contractor shall make all investment for machineries and daily operational cost in advance

Suggested Scope of Work:

- Set up bioremediation facility with all the required infrastructure and equipment and manpower
- Excavate the existing mixed compacted garbage

A. 100% Outsourced Model

ULB	CONTRACT CONTRACTOR OR
ULB shall assess the quantity of waste and hand over the land for setting up of the plant	Contractor to set up the plant at his own cost
Electricity connection to be provided by ULB for the plant	Electricity charges for the usage of the plant to be paid by contractor
ULB shall facilitate the disposal arrangements with their processing facilities (To be included)	Responsibility for disposal of RDF, recyclables and aggregates
ULB to appoint academic institution as Third party to verify the activities	Bio-mining to be carried out as per SWM rules 2016 and CPCB guidelines
Payment shall be made for the quantity of waste removed subject to verification by Third party	Contractor shall make all investment for machineries and daily operational cost in advance

and bioremediate the waste through mechanical sieving/ segregation/ other machines like shredders, separators, / any other equipment at the cost of the Developer/Contractor.

- The Contractor shall ensure processing of the Legacy Waste in accordance with CPCB guidelines for handling Legacy Waste (Old Municipal Solid Waste dated Feb 2019) along with SWM Rules 2016 (as amended from time to time).

- The Contractor shall take necessary steps and processes to minimize environmental pollution while carrying out remediation/ reclamation of legacy waste at the ___ Dumpsite. The Contractor shall take all reasonable steps to ensure that there is control of odour, dust and treatment generated leachate, flies, rodents and bird menace and fire hazards in and around the ___ Dumpsite during the period of remediation work.

- Set up a processing system flexible enough and convenient for segregation of dumped material;

- Segregate the excavated garbage in the land portion earmarked into as many categories as possible in compliance with CPCB guidelines. Maximize the separation of recyclables viz. glass, metal etc. from the ___ Dumpsite. Maximize the separation of components for generation of Refuse Derived Fuel ("RDF") from the ___ Dumpsite.

- Set up an eco-friendly and non-polluting processing system in order to reduce the impact of the dumping site on the adjacent areas.

- Carry out necessary geotechnical surveys for considering the hydrological and flooding potential at site, in order to mitigate any effect on the activities during Bioremediation

- Carry out soil, air, ground water and noise baseline studies so that the same will be available to evaluate post Remediation/ Reclamation of the Dumpsite from authorized laboratories/agencies and submit the reports.

- Monitor and measure noise levels at the site, at the facility with plant boundary and surrounding area.

- Provide on-site storage facility for various fractions of processed Waste.

- Deal with processing outputs such as RDF, soil enricher, recyclables and inert from component of the Waste at the ___ Dumpsite.

- While reclaiming and excavating MSW from the present open dumpsite following aspects must be handled carefully

- Exposure to hazardous material, leachate, gases, odour etc.

- Contaminated wastes that maybe uncovered during reclamation operations require special handling and disposal requirements as per CPCB guidelines.

- Precautions must be taken while excavating as it releases gases like methane, Sulphur dioxide and other gases which causes explosion and fire

- The Contractor shall explore the possibility of minimizing the disposal of inert/ processing rejects and maximize the usage of such inert waste including but not limited to making of curb side blocks, filling of low lying areas, construction of roads etc.

- Be responsible for the sale and marketing of all recovered materials to appropriate vendors.

- Be responsible for creation and maintenance of infrastructure, facilities and amenities for sieving the excavated garbage and storing the segregated materials etc. at their own risk and cost. Provide adequate number of processing machines for achieving its daily target of handling at least ---------- Metric Tonnes of Waste per day based on the estimated quantum of waste at ___ Dumpsite;

- Provide weighbridge to measure the quantity of various components of waste at dumpsite, processed in terms of sorting and segregated materials, RDF, soil enricher, and inert going out of the ___ Dumpsite.

- Carry out leveling of the earth surface by bulldozers or any other earth moving equipment.

- Deploy the necessary manpower, materials, equipment, tools and construction of plants and sheds and creation of facilities for handling, separating, segregating and storing for the operation of the plant.

- Provide security arrangements for the planned project site, machineries, equipment etc. at the cost of the Developer / Contractor.

- Legacy C&D waste if found during excavation, sorting/segregation and final disposal of such legacy C&D Waste shall be the sole responsibility of the Contractor. The Contractor shall be free to explore alternate uses for C&D waste as per the C&D Waste Rules, 2016. Further, if the said C&D Waste is found to be lying around the ___ Dumpsite or found to be not properly disposed of, the Contractor shall be liable to be penalized for the same in accordance with the terms of the Draft Contract.

- Hazardous waste such as physical, chemical, biological, reactive, toxic, flammable, explosive or corrosive waste, if found, during excavation, sorting or segregation shall be handled as per the Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016.

- Handover any domestic hazardous waste/ biomedical waste if found during excavation, sorting/ segregation to the nearest biomedical/ hazardous waste facility. This waste shall be handled as per Biomedical Waste Management Rules, 2016.

- Access to the Project Site provided by ___ Municipal Corporation shall have to be maintained by the Developer/Contractor to have easy movement of vehicles and etc. from outside.

- Provide fire protection measures and safety equipment for all workers at the site.

- Ensure total stabilization of the waste dump so that it releases no offensive odors and generates no leachates, so as to have the stabilized material fit for application to farmland, parks, road dividers control of soil erosion and soil remediation.

- All the necessary regulatory approvals should be taken prior to the commencement of reclamation and remediation work.

- The ULB will earmark the legacy waste area at all times during the contract period.

- The ULB will provide an alternative site for the disposal of fresh waste.

- If the alternative site is not available, then the ULB, in consultation with selected contracted, must specifically earmark the area of legacy waste and the disposal area for fresh waste. In any circumstances, the contractor will not be held responsible for the environmental degradation caused by fresh waste.

- Method of quantification of waste: (Metric tonne/ cubic meter)

- Stage of quantification/ measurement must be clearly specified

- All payment conditions must be clearly mentioned (rate, schedule, mode, etc.)

Suggested Qualification Criteria:

- Bidding entity can be a Joint Venture with a maximum of 3 entities. Lead Member must own 51% equity for the duration of the project and other members must own minimum 10% each.
- Bidder must have a minimum net worth as well as minimum turnover of 20% of the estimated project

cost.

Technical Capacity:

- At least 02 (Two) years of Satisfactory experience in last 05 (Five) years in solid waste management projects/ Remediation of a MSW Dumpsite/ Landfill Mining/ Bio-Mining/ Mining/ Material Handling

and

- Satisfactory Experience of Operating 01 (One) project of Remediation of a MSW Dumpsite/ Landfill Mining/ Bio-Mining in India or abroad having 40 % (Seventy percent) capacity of the Estimated Capacity, during the last 5 (five) years preceding the Bid Due Date

or

- Satisfactory Experience of operating 01 (One) Solid Waste Management Project 40 % (Sixty percent) of Estimated Capacity in India or abroad during the last 5 (five) years preceding the Bid Due Date.

or

- Satisfactory Experience of operating 2 (Two) projects of Remediation of a MSW Dumpsite / Landfill Mining/ Bio-Mining in India or in abroad, Each having 30% (fifty percent) of the Estimated Capacity, during the last 5 (five) years preceding the Bid Due Date.

or

- Satisfactory Experience of operating of 02 (Two) Solid Waste Management project each having capacity of 30% (fifty percent) of Estimated capacity in India or abroad during the last 5 (five) years preceding the Bid Due Date.

B. 100% Work done by ULB with Rental Equipment

Suggested Scope of Work:

- To rent machines (trommel, separators, and other required processing equipment as per DPR/ Technical feasibility report for setting up bioremediation facility.

- To arrange manpower (manager, supervisors, technical support staff, labourers, etc.) to operate provided machinery and manage the entire process as per CPCB guidelines for reclamation of said landfill site.

- To arrange operational and maintenance support for the machinery to keep them operational during the remediation period at their own cost and efforts for processing the legacy waste.

- The contractor will process the waste at their processing site. The excavation and subsequent transportation of waste will be carried out by the Urban Local Body (ULB)

- The ULB itself shall ensure processing of the Legacy Waste in accordance with CPCB guidelines for handling Legacy Waste (Old Municipal Solid Waste dated Feb 2019) along with SWM Rules 2016 (as amended time to time).

- Set up a processing system flexible enough and convenient for segregation of dumped material;

- Selected contractor will segregate the excavated garbage in the land portion earmarked, into as many kinds and categories as possible in compliance with CPCB guidelines at the rental cost finalized by ULB through competitive bid process. Maximize the separation of recyclables viz. glass, metal etc. from the ___ Dumpsite. Maximize the separation of components for generation of Refuse Derived Fuel ("RDF") from the ___ Dumpsite.

- Set up an eco-friendly and non-polluting processing system in order to reduce the impact of the dumping site on the adjacent areas.

- Monitor and measure noise levels at the site and interface of the facility with plant boundary and surrounding area.

- Store the processing outputs such as RDF, soil enricher, recyclables and inert from component of the Waste at the ___ Dumpsite at the space provided by ULB.

- The contractor shall provide fractions like soil enricher, RDF/ combustible fraction, C&D waste and recyclables to ULB at the processing site. .

- Contractor has no responsibility for the disposal of such segregated fractions.

- The Contractor shall explore the possibility of minimizing the disposal of inert/ processing rejects and maximize the usage of such inert waste including but not limited to making of curb side blocks, filling of low-lying areas, construction of roads etc.

- Be responsible for Supply of machines, their operations & maintenance by the manpower provided for the reclamation work at their own risk and cost. Provide adequate number of processing machines for achieving its daily target of handling at least -------- Metric Tonnes of Waste per day based on the estimated quantum of waste at ___ Dumpsite;

- Provide weighbridge to measure the quantity of various components of waste at dumpsite, processed in terms of sorting and segregated materials, RDF, soil enricher, and inert going out of the ___ Dumpsite.

- Provide security arrangements for the planned project site, machineries, equipment etc. at the cost of the Contractor.

- Provide fire protection measures and safety equipment for all workers at the site.

- Ensure total stabilization of the waste dump so that it releases no offensive odors and generates no leachates, so as to have the stabilized material fit for application to farmland, parks, road dividers control of soil erosion and soil remediation.

- Excavation and transportation of the legacy waste will be in the scope of ULB.

- ULB will carry out the transportation of the by-products at its own cost.

- The ULB will earmark the legacy waste area at all times during the contract period.

- The ULB will develop an alternative site for the disposal of fresh waste as required

- If the alternative site is not available, then the ULB, in consultation with selected contracted, must specifically earmark the area of legacy waste and the disposal area for fresh waste. In any circumstances, the contractor will not be held responsible for the environmental degradation caused by fresh waste.

- Method of quantification of waste: (Metric tonne/ cubic meter)

- Stage of quantification/ measurement must be clearly specified

- All payment conditions must be clearly mentioned (rate, schedule, mode, etc.)

Suggested Qualification Criteria:

- Bidding entity can be a Joint Venture with a maximum of 3 entities. Lead Member must own 51% equity for the duration of the project and other members must own minimum 10% each.

- Bidder must have a minimum net worth as well as minimum turnover of 20% of the estimated project cost.

Technical Capacity:

- Supply of machinery, manpower and O&M services in last 05 (Five) years in solid waste management projects/ Remediation of an MSW Dumpsite/ Landfill Mining/ Bio-Mining/ Mining/ Material Handling

and

- Satisfactory supplying of machinery, manpower and O&M services for 01 (One) project of Solid waste processing facility/ Remediation of an MSW Dumpsite/ Landfill Mining/ Bio-Mining in India or abroad having 70% (Seventy percent) capacity of the Estimated Capacity, during the last 5 (five) years preceding the Bid Due Date

or

- Satisfactory supplying of machinery, manpower and O&M for 2 (Two) projects of Solid waste processing facility/ Remediation of an MSW Dumpsite / Landfill Mining/ Bio-Mining in India or in abroad, each having 50% (fifty percent) of the Estimated Capacity, during the last 5 (five) years preceding the Bid Due Date.

C. Combination of private operator and ULB

Suggested Scope of Work for contractor/ private operator:

- To provide machines (trommel, separators, and other required processing equipment as per DPR/ Technical feasibility report for setting up bioremediation facility at the cost of ULB.
- To provide operational and maintenance support for the machinery to keep them operational during the contract period at their own cost and efforts for processing the legacy waste.
- Be responsible for Supply of machines, their operations & maintenance of the supplied equipment for the reclamation work by the ULB at their own risk and cost.
- Contractor has no responsibility for the disposal of such segregated fractions.
- Ensure that provided machinery in an operational condition at all times. Any breakdown in the machinery will be informed to contractor for repair and maintenance.
- Contractor will repair and maintain the machines within the stipulated time as informed by the site supervisor. All the machines will be maintained by the contractor as per the standard operating procedures of original equipment manufacturer.
- Manpower for the processing and other related works related to legacy waste remediation shall be provided by the ULB
- Operations related to processing shall be carried out by the ULB
- The respective sale and disposal of by-products shall be carried out by the ULB.
- Contractor will provide replacements for damaged components at the cost of ULB for that equipment which is not covered under warranty.
- All the consumables for the regular maintenance purpose will be provided by the ULB.
- The ULB will earmark the legacy waste area at all times during the contract period.
- The ULB will develop an alternative site for the disposal of fresh waste as required
- If the alternative site is not available, then the ULB, in consultation with selected contracted, must specifically earmark the area of legacy waste and the disposal area for fresh waste. In any circumstances, the contractor will not be held responsible for the environmental degradation caused by fresh waste.
- Method of quantification of waste: (Metric tonne/ cubic meter)
- Stage of quantification/ measurement must be clearly specified
- All payment conditions must be clearly mentioned (rate, schedule, mode, etc.)

Suggested Qualification Criteria:

- Bidding entity can be a Joint Venture with a maximum of 3 entities. Lead Member must own 51% equity for the duration of the project and other members must own minimum 10% each.
- Bidder must have a minimum net worth as well as minimum turnover of 20% of the estimated project cost.

Technical Capacity:

- Supply of machinery, manpower and O&M services in last 05 (Five) years in solid waste management projects/ Remediation of a MSW Dumpsite/ Landfill Mining/ Bio-Mining/ Mining/ Material Handling

and

- Satisfactory supplying of machinery and O&M services for 01 (One) project of Remediation of an MSW Dumpsite/ Landfill Mining/ Bio-Mining in India or abroad having 70 % (Seventy percent) capacity of the Estimated Capacity, during the last 5 (five) years preceding the Bid Due Date

or

- Satisfactory supplying of machinery and O&M for 2 (Two) projects of Remediation of MSW Dumpsite / Landfill Mining/ Bio-Mining in India or in abroad, Each having 50% (fifty percent) of the Estimated Capacity, during the last 5 (five) years preceding the Bid Due Date.

Salient Features of Contract Agreement

ULBs may have different type of contracts based on scope of the Bioremediation of Legacy waste dumpsite/ landfills. Some Salient points of Contract agreements have been mentioned below to facilitate understanding of ULBs while outsourcing the work:

i. Definitions- Contract agreement must have definitions for clarity of terms in given contract. Few are listed herein as example:

- Applicable laws
- Applicable permits
- Project
- Project site
- Project facility
- Project start date
- Work Start date/COD
- Reclamation/ Remediation Work
- Project/Contract Duration
- Parties
- Payments / Fee

ii. Scope of the work: ULBs should clearly define the scope of work for the external party in details to maximize the transparency and prevent any conflict during project execution. ULBs are required to give all the information in EOI/ RFP/ Contract agreement in details in simple language and terms.

iii. Specifications of equipment: In case if ULB requires only some equipment for remediation the details of requisite equipment and their desired output shall be mentioned specifically to avoid any misinterpretation by any party.

iv. Operation and Maintenance/ Manpower requirement: Scale of O&M / Manpower requirement shall be evidently stated in the RFP and contract agreement for the desired work.

v. Weighing/ Measurement of Legacy waste: There shall be transparent mechanism to weigh/ measure quantity of legacy waste to be processed. This will help in payment related issues.

vi. Duration of Project: Time frame/ completion time of the project must be clearly mentioned in the contract agreement.

vii. Project site: ULB shall mention the duration of handing over the project site to the contractor after signing the agreement.

viii. Extension of Project Duration: The provisions and terms of providing extension of project duration shall be incorporated in contract with penalty provisions (if any) to avoid any legal issue while delay in completion of the project.

ix. Obligations of different Stakeholders: Obligations, roles and responsibilities of different stake holders during the project shall be defined in detail to avoid any operational complications during the project implementation. Obligations are divided into three categories: -

- Obligations of State Government
- Obligations of Urban Local Body
- Obligations of Selected Contractor/ Equipment supplier/Manpower supplier

x. Force Majeure: All the parties must agree to clauses of force majeure before signing/ participation in the project implementation to avoid any problem

during execution.

xi. Compliance Management: It must be clearly cited in agreement that regulatory and local compliance (if any) shall be done by which party.

xii. Outcome of Project/ Quantification of work done: Agreement must capture the desired outcome of project i.e. recovered land/ segregated fractions of waste/ sale proceedings/ SLF/ Capping.

xiii. Payment Terms: Terms on which payments to be made to Contractor by State Government/ ULB shall be quantifiable and complete to avoid any issues during execution of project.

xiv. Penalty: Any penalty provision with respect to completion time/ quality of work of agreement shall be mentioned in EOI/ RFP and quoted by ULB before calling for final price/ fee for the desired work.

xv. Project Schedule/ Payment Schedule: Draft agreement must have Information regarding the project execution schedule and related mechanism of payment for smooth operations

xvi. Monitoring/ Reporting: Clause for responsibility for monitoring/ reporting with requisite frequency and format shall be mentioned in agreement.

xvii. Receiving of Fresh Waste: ULB will inform contractor whether dumping of fresh waste will be ceased or that it will continue to receive ___ quantity of fresh waste on a daily basis

Safety Measures

- The execution of projects of legacy waste bioremediation all the workers involved should be covered under ESIC and proper safety equipment and kids should be provided

- Such projects can be a part of regulatory compliances of environmental protection under PWM Rules, 2016.

- Local Bodies (LB) shall ensure insurances of workers working at the Bio-remediation dumpsite for any hazards due to fire, radiation or explosion, etc.

- Small scale/ laboratory testing for monitoring a Bio-remediation project will need to be borne by the LB in addition to Operational expenditure to achieve objectives of Bioremediation project.

For detailed guidelines on safety measure as well as on fire protection on the dumpsite, CPCB guidelines for handling Legacy Waste (Old Municipal Solid Waste dated Feb 2019) may be referred.

Annexure-I: Case Studies

Tirupati

Project Brief:

The Tirupati Smart City Corporation Limited ("TSCCL") intended to implement the project on "Remediation of Ramapuram Dumpsite through Bio-mining process". The project involves Design, Construction, Operation and Maintenance of the Bio-mining and Reclamation of existing solid waste dumpsite in a scientific manner at Ramapuram dumpsite in Tirupati Municipal Corporation area.

Description		Details
Contract	Project Title	Solid Waste Management Project – Remediation of Existing MSW Dumpsite at Ramapuram through Bio-Mining Process under Implementation of the Smart City Mission in Tirupati
	Name of the Contractor	M/s. Zigma Global Environ Solutions Private Limited
	Awarded Contract Value	INR. 18,64,00,000.00
	Duration of Contract	18 Months (for Implementation) 24 Months (Operation & Maintenance)
	Commencement Date	12th Jan 2019
	Completion Date	12th Jul 2020 (for Implementation) 12th Jul 2022 (Operation and Maintenance)

Details of Procurement

Name of the work	:	Solid Waste Management Project – Remediation of Existing MSW Dumpsite at Ramapuram through Bio-Mining Process under Implementation of the Smart City Mission in Tirupati
Scope of the work	:	Sorting & Segregation, Recovery of city compost, Site Development & Facilities, operation & maintenance of infrastructure & Equipment for 18 months, Awareness &Extension activities and Completion & Exit.
Work awarded to	:	M/s. Zigma Global Environ Solutions Private Limited
Period of completion	:	18 Months.

A. Cost Break Up as per the estimated quantity of work:

S.No.	Item Description	Cost per ton in Rs	Cost for 2 Lakhs ton (Rs in Lakhs)
1	Machinery Cost	440	880
2	Material Handling cost	90	180
3	Power Cost	65	130
4	Manpower Cost	30	60
5	Fuel Cost	35	70
6	Disposal	300	600
7	Miscellaneous	7	14
8	Contingency	20	40
Total Cost		987	1974

B. Cost Break up as per the Successful bidder:

S.No.	Item Description	Cost per ton in Rs	Cost for 2 Lakhs ton (Rs in Lakhs)
1	Machinery Cost	430	1000
2	Material Handling cost	80	360
3	Power Cost	55	180
4	Manpower Cost	20	60
5	Fuel Cost	32	100
6	Disposal	290	60
7	Miscellaneous	5	14
8	Contingency	20	680
Total Cost		932	1864

• Scope of Services as per RFP:

A. Sorting & Segregation

a. The Contractor after agreement should prepare and submit detailed project report covering a comprehensive Bio-mining & Reclamation Plan. This would also include a plan for reducing the inert should be treated properly as per MSW Rules 2016.

b. The Contractor shall take necessary steps and processes that would bring in control of odour and leachate in the region.

c. The Contractor shall set up sorting system flexible enough and convenient for segregation of dumped material.

d. The Contractor should maximize the separation of recyclables viz. glass, metal etc. as well other components for generation of RDF from the dump site.

e. The responsibility of the Contractor includes providing adequate number of sorting machines for achieving the daily target as per the capacity quoted in the bid.

f. The Contractor will be required to provide at site storage facility for various wastes processed.

g. The bidder shall handover any domestic hazardous waste, biomedical, C & D waste if found during excavation, sorting / segregation. He shall handover the waste to nearest biomedical, C & D facility, waste management facility. The Sanitary Inspector should make necessary arrangements to transport the same to the concerned.

h. The bidder shall handover any valuable items like gold, diamonds and all precious metals other than iron scrap material to TSCCL

B. Recovery of City Compost

i. The Contractor should target to separate the compost from the biodegradable component of the solid waste at the dump site.

j. The Contractor should ensure total stabilization of the waste dump so that it releases no offensive odours and generates no leachates, so as to have the reclaimed land fit for any other purpose including construction after the settling period as approved scientifically.

k. The Contractor should take precaution of minimizing flies, rodents and bird menace and fire hazards.

l. The Contractor should as in above section deal with pre-process output such as RDF, while recyclables be sold to appropriate vendors. The pre-process and post composting process rejects shall be handled as per SWM Rules, 2016. The bidder should explore the possibility of minimizing the quantum of inert with alternatives. The accumulated inert / rejects should not sent for any other applications/ uses.

m. The plastic material segregated from the compost shall be handled as per Solid Waste Management rules-2016.

n. After the removal of clump, the site shall be reclaimed to its natural ground level.

o. The transportation and storage of the inert material and the compost material shall entirely be under the scope of the bidder under this project.

C. Site Development & Facilities

p. The TMC shall assist successful bidder in getting the access to the dumpsite with a license to the Contractor to implement the project “Remediation of Ramapuram Dumpsite through Bio-mining process” system.

q. The Contractor should carry out necessary geotechnical surveys for considering the hydrological and flooding potential at sites, in order to mitigate any effect on the activities during bio-mining in terms of leachate transport.

r. The site which shall be utilised for Machinery and material under Bio-Mining process shall be fenced or hedged and provided with proper gate to monitor incoming vehicles or other modes of transportation.

s. Contractor should provide weighbridge to measure quantity of various components of waste at dumpsite is processed in terms of sorting and segregated materials, RDF, compost material, and inerts going out of the site.

t. The Contractor shall also provide fire protection measures and safety equipment.

u. The Contractor shall provide utilities such as drinking water facilities and sanitary facilities (preferably washing/bathing facilities for workers) and lighting arrangements for easy operations during night hours shall be provided and safety provisions including health inspections of workers at site shall be carried out.

v. In order to prevent environmental impacts of the activities the Contractor as per the SWM Rules 2016 adopt guidelines for development of land fill as per Schedule-I of the Rules.

w. Contractor shall set a soil and ground water baseline so that the same will be available to evaluate post Bio- mining and bioremediation/ reclamation of the site.

x. Contractor shall monitor ground water quality, work zone air quality and ambient air quality monitoring within the site from authorized laboratories/ agencies and submit the report on monthly basis.

y. The Contractor shall monitor and measure noise levels at the site and interface of the facility with plant boundary and surrounding area.

D. Operation & Maintenance of Infrastructure and Equipment for 18 Months.

a. The Contractor shall be responsible for construction, operation of site, maintenance of transportation trucks, mechanical lifting arrangements to transfer the by-products into trucks, parking facilities, weighbridge, CCTV, hook loaders, on Design Build Operate (DBO) basis. The Contractor should maintain the facility and machinery in order to operate for the Contract period.

E. Awareness & Extension Activities

a. The Contractor shall undertake a mass awareness/ sensitization programme, in surrounding residential/ villages' area, so as to ensuring the local people are aware and taken into confidence of the bio-reclamation activities.

b. The Contractor shall create a sustained system of information, education and communication for Bio-Mining& reclamation through collaborations with expert institutions and civil societies and also disseminate through their own website.

c. The Contractor shall device appropriate measures in consultation with expert institutions for Bio-Mining& reclamation and for sale of recycle products in the best possible manner.

d. The Contractor can keep a track of the progress of its activities and establish a database and update on a regular basis in-order to optimize its activities

e. The Contractor can coordinate with the TMC for successful engagement of this Contract.

f. The Contractor will involve community participation and discuss with the citizen community in order to ensure a free flow of information.

F. Completion & Exit

a. At the end of the Contract period, the Contractor will leave the site along with all his equipment's and facilities used and handover the clean area and capped area of inerts without claiming any compensation of whatever nature

The Price Quoted by M/s. Zigma Global Environ Solutions Private Limited (Rs. 932/- per MT) –

Rs.18,64,00,000/- [Rupees Eighteen Crore Sixty-Four Lakh only] for 2,00,000 MT.

• Advantages & Benefits:

- The bidder on further assessment has arrived the quantity of Legacy waste at 1.50 Lakhs M.T and carrying out the work as per RFP document. By the end of January2020 the total legacy waste processed is 106750 Tonnes and the quantity of extracted reusable materials were dispatched to third party which are as follows:

- By conducting the Bioremediation & Bio-mining project the Ac 25 of existing Dumping yard land will completely remediated and reclaimed
- Pollution of water, Soil & Air will be reduced.
- Overall health of the people in the surrounding area will be improved.
- Fauna & Flora in the surrounding area will be improved.

S.No.	Month	Bio -Earth in Ton	RDF in Ton	Stones / C&D in Ton	Wood Scrap in Ton	Rubber Scrap in Ton	Ferrous Scrap in Ton	Glass Scrap in Ton	Plastic (Non - RDF)
1	April 2019 to January 2020	44630.735	4826.07	5090.795	5.8	18	2.74	63.76	0.32
		Pawan Traders	Bharathi Cement	Pawan traders	Mahi Reddy Vendor	Jay Shree Traders	G.N.Murthy sons scrap trading company	Jay Shree Traders	MAA BHAGAVATHI TRADERS
		Farmers	Ambuja cement Pvt ltd.,	Municipal Corporation Tirupati		G.N.Murthy sons scrap trading company		T.N.R. Steel scrap Traders	
		Municipal Corporation Tirupati	Dalmia Cemnet (B) Ltd., Kadapa				Roshni Traders		

- By conducting the Bioremediation & Bio-mining project the Ac 25 of existing Dumping yard land will completely remediated and reclaimed
- Pollution of water, Soil & Air will be reduced.
- Overall health of the people in the surrounding area will be improved.
- Fauna & Flora in the surrounding area will be improved.

Pirana Dumpsite Biomining Project, Ahmedabad, Gujarat

Introduction: -

- Pirana Dump Site is being operated since 1980.
- Total Area of dumpsite is around 84 acres with more than 80 Lakhs MT

(approximately) of legacy waste.

- There are three heaps of waste (1) Ajmeri Dump (2) High Dump (3) Excel Dump. The height of heaps at dump site is ranging from 25 mtr to 55 mtr with steep slope.

AMC has Initiated Biomining Project by its own: To overcome and resolve the long 40 years legacy waste issue to resolve effectively and efficiently.

As a part of pilot project, AMC had started bio-mining of one portion of Pirana Dump Site

i.e. Ajmeri Dump with 3 trommel machines in Jan-2019.

The Hon'ble National Green Tribunal, Principal Bench at New Delhi has passed detailed oral order in Original Application No.606 of 2018 on 26.03.2019.

As per the above referred order, the legacy waste dump sites should not be simply capped but should be bio-mined and then kept and maintained in accordance with MSW rules.

Hence, as per the order, AMC cannot directly cap the Pirana dump site.

1st trommel machine started operating on 1st July 2019. In a span of 9 months, AMC has successfully installed and is operating total of 21 trommels.

Recently, in addition to above, additional 17 nos. work order have been issued to agencies. All 17 trommels are delivered at site and installation work is in process.

Methodology: -

AMC has provided requisite infrastructure by constructing RCC platforms along with electricity connections and measures have also been taken to provide proper sanitation facilities and logistics for all the staff including Labour, Supervisors, Engineers, etc.

End products & By-products: -

After Remediation of Legacy waste, mainly four outputs are derived namely:

1) Refuse Derived Fuel (RDF)
2) Construction & Demolition Waste
3) Semi-Compost
4) Inert.

1) **RDF:** It was a great Challenge to deal with the RDF obtained from the Pirana Biomining work; The Corporation has timely and periodically done meetings with GPCB, Cement Industries, Major Stake holders, Boiler Associations in the month of July-2019 and Nov-2019. Finally, AMC is giving the RDF to Abellon Clean Energy free of cost; they are utilizing it as a fuel in their Bio-mass Gasification and also to 3 other Plants of similar type.

2) **Construction & Demolition Waste (C & D):** AMC has installed construction and demolition waste plant, Segregating, Crushing & recycling by nano technology of 1000 MT Capacity on PPP basis commissioned in the year 2013. The C & D waste has been transported to the C & D plant to reuse and produce paver blocks, precast walls, manhole covers and many more products, AMC also has a 50% buyback policy under which the reproduced products can be used by AMC only.

3) **Semi- Compost:** The Semi-compost has been transferred to the existing MSW compost plants namely Excel Industries and BEIL to treat further and for sale to farmers.

4) **Inert:** The Semi-compost has been transferred to the existing Landfill Site at Gyaspur 3.0 Km away from the Dump Site.

Approx. 10 lakh metric ton of legacy waste has been processed till date and around 8.85 acres land reclaimed.

The AMC has started working on War footing basis under the guidelines from the Hon'ble NGT and Significant changes can be seen today.

The endeavors taken by the Ahmedabad Municipal Corporation for clearance of legacy waste (at Pirana), the model and process has also been appreciated in the visit of Hon. Chairman NGT, Shri Adarsh Kumar Goel who motivated AMC to complete this task.

Machineries required per trommel machine:

- 1 JCB backhoe loader
- 1 Excavators of 20-ton capacity
- 2 Hyva Dumpers

Cost of per Ton of Legacy Waste Processing:

- Trommel Rent: 71.11 Rs.
- Electricity Cost: 7.00 Rs.
- Hyva Dumper Cost: 30.00 Rs.

Total Cost = 108 Rs. /Ton (Apprx.)

Specification of 300 TPD Trommel:

Capacity	Minimum 300 TPD
Length of trommel	Minimum 7.0 mtrs or set of two drum min 4.0 mtrs each
Diameter of trommel	Minimum 1.8 mtrs
Feeding conveyor	1 no.
Reject conveyor	1 no.
Air blower	1 no.
Structure for machine	1 no.
Operating panel	1 no.

Specification of automated mobile segregation machine:

A) Capacity:	Minimum segregation capacity of 1000 Metric Tonnes per Shift of 08 Hrs.
B) Material:	Legacy waste
C) Screening Sizes Required:	
1. Less Than 100mm. & more than 40 mm.	
2. Less Than 40mm. & more than 20 mm.	
3. Less Than 20mm.	

D) Bulk Density of Waste to processed:	0.8 T/Cu.M	
E) Basic Unit will have:	2 deck track screens	
	Feed Hopper (LxB) Mini.	3.5 mt. X 2.0 mt.
	Feeding belt Conveyor (LxB) Mini.	8.1 mt. X 1.2 mt.
	Discharge belt conveyors, Product belt conveyors Mini.	10 mt. X 0.8 mt.
	Screen Box Mini.	1.55 mt. X 6.1 mt.
	Fully automatic control system	
	Inbuilt light system for working late hours	
	Mobile unit	
	Machine Working hours record tracking system	
	Walking gangways for maintenance and safety of manpower.	
	PLC	PLC operated control system with print out mechanism
	IP rating	Minimum IP 65
F) RDF generation:	Min 20% to 25% of the input waste quantity	
G) Inert generation:	Min 55% to 60% of the input waste quantity	

AMC is now on its way to complete this most challenging task of removing the legacy waste of Pirana within a span of approx. 3 years and will set an example for the whole country.

Bioremediation of Legacy Waste/ Dump Sites in Nawanshahar, Punjab

Municipal Council Nawanshahr falls in district Saheed Bhagat Singh Nagar, Punjab. It has 46024 population (Census 2011), generating 10-12 TPD solid waste which comprises 50% bio-degradable waste, 25% Dry recyclable and 25% Non-recyclable dry and inert waste.

Legacy Waste: The legacy waste site of measuring about 2.0-acre areas is in the proximity of the town. Mixed waste of last twenty years was accumulated here. Till December 2017, dump site was a serious concern for the ULB authorities and threat to environment and people were agitating for shifting of the dumpsite. The MC was searching for some alternative so that the necessity of shifting of dump site does not arise. In consultation with the PMIDC team a low-cost solution was found after having seen the working of a simple mechanical separator being used by Baba Balbir Singh Sicchewal for sieving of garbage heaps, “Ruris” in rural areas.

Bioremediation: Bioremediation of legacy waste with a mechanical separator machine was started in January 2019 and cleared in about 4 months. One Supervisor, 1 JCB operator and 1 helper was deployed for the whole process of bioremediation. Cost of electricity was Rs.6000-7000/- per month and JCB consumed about 450 litres diesel per month.

As first step, a low cost, easy to operate mechanical separator machine for screening of legacy waste was designed and got fabricated locally from M/s Sirsa Industries, Nawanshahr at the Initiative of President of MC under CSR funds of Axis Bank. The first mechanical separators were manufactured at a cost of Rs.3.5 lakhs, later it was modified/ upgraded, which now costs approximately 5.00 lakh including transportation.

Specifications for mechanical separator machine for screening of legacy waste are given below.

This machine operates with the help of JCB and 3-phase electric connection; segregates the legacy waste by sieving in their streams i.e. degraded/ composted wet waste, non-biodegradable plastic/ rag waste and C&D waste. The degraded/ composted wet waste has been used as city compost in farms by farmers of nearby villages / parks/ green belts, dry waste as SCF/RDF and C&D waste as raw material for construction works. This composted waste is being sold to farmers at a cost of Rs.1000/- per Trolley and total 45 trolleys have already been sold so far and more than 100 trolley compost on the site is ready for sale. Composted waste extracted from legacy waste was got tested from the Analytical Laboratory and it found containing all the quality parameters of the city compost as prescribed under SWM Rules, 2016. From the extracted dry waste fine material is being sold by the Waste Collectors/ Rag Pickers to the local junk dealers and combustible waste extracted from legacy waste is being stored which will further sent to the nearest cement plant for co-processing.

After remediation, about half of the vacated area of land of the dump site has been cleared and a composting unit and Material Recovery Facility has been set up on 12750 Sq. ft. A small park has also been developed after clearing the legacy waste from the site and one office room is constructed thereat.

Technical Specifications of Mechanical Separator Machine of Legacy Waste Cleaning

1.	Length	168 Inch
2.	Width	96 Inch
3.	Height	108 Inch
4.	Chassis Frame Ms Pipe	100 mm Sq.
5.	Sieve Sheet Thickness	4 mm
6.	Hopper sheet Thickness	3-4 mm
7.	Sieve Frame No. 1	84 Inch x 94 Inch
8.	Sieve Frame No. 2	84 Inch x 128 Inch
9.	Sieve Hole	30 mm / Optional
10.	Sieve Bearing	6304-6305
11.	Main Gear Teeth	11-20
12.	Came dia	6 Inch
13.	Cam Cup Bearing	6308 No.
14.	Cam Working Distance	4 Inch
15.	Motor to Came Operate	7.5 HP
16.	Main Axle Bearing	210 UCP
17.	Motor Pulley Drive	4.4 Inch
18.	Pulley Driven Gear	18 Inch
19.	Belt Main Motor	C-109 No.
20.	Motor Elevator Conveyor	2 HP +2 HP
21.	Conveyor Motor Pulley	3 Inch - 12 Inch
22.	Conveyor Step Down Gear	12/70
23.	Conveyor Motor Belt	B-72
24.	1 No. Conveyor Belt Width Inner	36 Inch
25.	Elevator Conveyor Length	11 Ft.
26.	2 No. Conveyor Belt Width	30 Inch
27.	Elevator Conveyor Length Outer	12 Ft.
28.	Elevator Bearing	UCP 206 UCP 205
29.	Hopper Length	30 Inch x 240 Inch 102 Inch x 48 Inch
30.	Tyre 600-16 4 Pc. Self-Axle	
31.	Axle Bearing	32 210
32.	Axle Seal	55 90 10
33.	Working Capacity	Appx. 2-3 Ton per hour dry material

Note: This machine is not useful for wet material
Rate: 4,90,000/- with Freight
GST 5% Extra

Annexure-II: DPR/ Technical Feasibility Report Preparation Toolkit for Dumpsite Remediation

Ministry of Housing and Urban Affairs

Toolkit for project preparation on Dumpsite Remediation

1.	Name of the Project:
2.	Name of the ULB, District, State/UT:
3.	Brief Description of City indicating population, Area, No. of Wards etc.
4.	Scope of the project: Supply and installation of necessary machines, equipment, excavating, stabilising (windrows), screening and segregation into different classes and sizes (C & D waste, RDF, Bio-soils and others).
5.	Detail Description of Dumpsite like location, Age, Area, Height, quantity etc.
6.	Map showing description of boundaries of the Dumpsite all around, such as Roads, Localities, Rivers/Canals, Hills, nearest habitation along with Longitude and Latitude.
7.	Scope of disposal for RDF, Bio Soils, C & D waste and others as per local demands
8.	Estimated Cost
9.	Estimated duration of the project
10.	Benefits of the Project like area to be reclaimed, estimated value and intended use.
11.	Source of funds
12.	List anticipated hindrances in project implementation and measures for solutions

Certified that the facts and figures mentioned have been duly verified.

(Officer 1)	(Officer 2)
Municipal Commissioner	Municipal Engineer

Explanatory Note

Sl. 7 Various options where segregated waste like RDF, Bio soils, C & D waste and other fractions may be utilised in nearby area may be indicated.

Sl. 8 Approximate cost may be estimated based on scope of work proposed to be given to contractor like whether only equipment are proposed on rent or purchase and O & M or on processing fee basis.

Additional points

Sl. 1 characterisation of waste, if any, done may be given

Sl. 2 Suggested models of reclamation of Dumpsites

Model 1: *(Recommended to be anchored by state govt. for a cluster of smaller ULBs – adopted by Punjab and Uttarakhand)*

- State purchases necessary equipment and machinery having annual O&M contract with supplier.
- The machine will be supplied to any ULB who in turn will engage another agency for providing requisite labours.
- Segregated material will be taken care by the ULB

Model 2: (Suitable for Individual medium and large ULBs – Ahmedabad model)

- ULB hires necessary equipment and machinery on rent basis while its maintenance lies with supplier.
- Separate Agency is engaged with ULBs to provide labour/support.
- Segregated material to be taken care by the ULB

Model 3: (Suitable for Large ULBs – Tirupati Model)

- ULB engages agency to carry out remediation on per tonne processing fee basis and most of the activity is undertaken by agency.

Segregated material to be taken care by the agency with support of ULB

Annexure-III: List of Equipment Suppliers

MSW HANDLING TOOLS AND EQUIPMENT INCLUDING MECHANIZED TRANSFER STATION				
S.no.	**Name of the Company**	**Contact person Name and Address**	**Contact Number and Email Address**	**Presence on GeM**
1	Hyva India Pvt. Ltd.	Mr. Haridas Gopalkrishnan EL 215, MIDC Mahape, Navi Mumbai Maharashtra-400710	Call +91-9677159207 Email: haridasg@hyvaindia.com; susheel@hyvaindia.com Phone.:+91 22 67618888 Customer Care: 1800 2121 528 Fax.:+91 22 27672182 www.hyva.com sales@hyvaindia.com	Available
2	Zonta Infratech Pvt. Ltd.	Mr. Dennis Pulimittathu, 1st Floor, Reliable Phoenix Towers, #16 & 16/1, Museum Road, Bengaluru - 560001	Call+91-8067292100, 8086779855, 8965050732, dennis.puli@zontainfratech.com	Available
3	Kam Avida Enviro Engineers Pvt. Ltd.	Mr. Krishna MD, Plot No. 2, Survey No. 255/1, Hinjewadi, Tal.: Mulshi, Dist.: Pune - 411057	Call 09822025166; 022-66756300; Tel.: +91 - 020 - 6675 6500 (BOARD) Fax: +91 - 020 - 6675 6400 E-Mail: query@kam-avida.com Email: mkrishna12@sify.com; salesnorth1@csd.kam-avida.in; mk@kam-avida.com	Available
4	TPS Infrastructure Ltd.	Jaspreet Singh 84, M-Block, Commercial Complex, Greater Kailash Part-II, New Delhi 110 048, (INDIA).	Email : tps@tpsmfg.com, tps@tpsmfg.net; nehra.jaspreet@tpsmfg.com	To be listed by GeM
5	Waste Management Corporation	Mr. Ajay Arora GG-1/1798, Vikaspuri, New Delhi-110018	Email: info@wastemanagementcorp.com; ajayarora@wastemanagementcorp. com +91-11-28543080 +91-9811169618	To be listed by GeM
6	Precision Conveyor Systems	MR. Santosh Jha (Director) B-26, Ist Floor, Hill Apptt., Plot No: 17, Sec-13, Rohini, Delhi-110085, INDIA	Call +91-9810014957, +91-9013445492, 91-11-27564654 91-11-27564654 info@precisionconveyors.com, precesion@gmail.com	To be listed by GeM
7	Advance Equipment & Projects	E-18-B, Sector-8, Noida, Uttar Pradesh-201301	+91 9873384443 advance_equipment@yahoo.com	To be listed by GeM
8	AVK Technologies Private Limited	Plot No. 440, Udyog Vihar-3, Udyog Vihar, Gurugram, Haryana-122016	0124-4002426 bbchaudhry@rediffmail.com	To be listed by GeM
9	Genesis Waste Handling Private Limited	I12-16, Gajraulla Indl. Area, (UPSIDC), Gajraulla II, J.P Nagar, Uttar Pradesh-244235	+919818190759 gwh.equip@gmail.com	Available
10	Green Tech Life	Level II, Prestige Omega, 104 EPIP Zone, Whitefield, Bangalore-560066	+91 9820086532 support@greentechlife.in	To be listed by GeM

11	GSE Lining	223, Gemsstar Commercial Complex, Ramachandran Lane, Extn. Kanchpada, Malad West, Mumbai-400064	022-28440841/42 sudhirr@gseworld.com	To be listed by GeM
12	JCB (JC Bamford Excavators Ltd.)	23/7, Mathura Road, Ballabgarh, Faridabad, Haryana-121004	0129-4299000 delhi.marketing@jcb.com	Available
13	Marvel Globes Industries	Plot No. 954, Gali No. 2, Luxman Vihar, Phase 1, railway Road, Gurgaon, Haryana-122001	+91 9810688683 marvelgloves@gmail.com	To be listed by GeM
14	Navdeep Engineering Private Limited	732, Near Bus Stand Babyal, Ambala cant, Haryana	+91 8071802590 meenakshibajaj33@rediffmail.com	To be listed by GeM
15	SRG International Private Limited	Plot No 13 A, Sector 4, Industrial Area, Faridabad, Haryana-121004	+91 8071803487 srgprefab@gmail.com	To be listed by GeM
16	Usha Engineering	S-70/71, Lodhi Road Industrial Area Mohan nagar, Ghaziabad-201005	0120-2658299 rakesh.sales@ushaengineerings.com	Available
17	Kwality Conveying Sytems (P) Ltd.	Tarsem Singh 14/25, Nangli Poona, Delhi-110036	+91 9810012402 kwality.tarsem@gmail.com	To be listed by GeM
18	Geron Engineering Pvt Ltd	Ankit Aggarwal, P- 4 , Bulandshahar Road , BSR Industrial Area, near by R.T.O office, BSR Industrial Area, Ghaziabad-201002, Uttar Pradesh	+91-9911181517 +91 9818709594 info@geronengineering.com	Available

Annexure-IV: EPC Contractors and O&M Vendors

DUMPSITE REMEDIATION EPC AND O&M VENDORS

S.no.	Name of the Company	Contact person Name and Address	Contact Number and Email Address	Dumpsite Remediated in:
1	Detox Corporation	Hiral Desai & Ankit Jani Business Development Detox House, Opp. Gujarat Samachar Press, Udhana Darwaja, Ring Road, Surat-395002	Call +91-261-2351248, 2346181; +91-9924440695; info@detoxcorp.com; info@sepplindia.com	Surat
2	Zigma Global Environ Solutions Pvt. Ltd.	Nagesh Prabhu C, Director & Ajay Arora (Vice President)	Call +91-8220005157; +91-9811169618; nagesh@zigma.in	Tamil Nadu, Noida
3	Chennai MSW Private Limited	Mr. RM Rao (National Head)	Call +91-9515114539; 7331175459 Email: cmswpl@gmail.com	Tamil Nadu
4	Ecogreen Energy Private Limited	Sanjay Sharma Dy. CEO 2nd Floor ILD Towers Sohna road Gurugram	+91-9899404979 sanjay.sharma@ecogreenenergy.co.in;	Gurugram
5	IL&FS Env. Infra & Service Ltd.	Mr. Manish Mishra Core 4B, 4th Floor, India Habitat Centre, Lodhi Road, New Delhi – 110 003	Call +91-8826895220 manish.mishra@ilfsindia.com	
6	Abellon Clean Energy Ltd.	Aatrey Pandya	Call +91-9099964346; aatrey.pandya@ abelloncleanenergy. com	Ahmedabad
7	De-Syecan Waste Mgmt Pvt. Ltd	Mehul Mistry 507, AURUM, Makrand Desai Road, Bh. Vasna Petrol Pump, Vadodara-390007	Call +91-9067002496; mehul.mistry@desyecan. com	
8	Mailhem Engineers Private Limited	14, Vishranbaug Society, 2nd Floor, Senapati Bapat Road, Opp. International Convention Centre, Pune, Maharastra-411016	020-25532228 info@mailhem-ikos.com	Nagpur
9	Daya Charan & Company	Nagendra Kumar, D-2/96, Janak Puri, New Delhi-110058	+91 7016871947 +91 9712955978 info@dozer.in	Tamil Nadu
10	Ramky Enviro Engineers Ltd.	A Ayodhya Ram Reddy, Ramky Grandiose – 12th & 13th Floors, Ramky Towers Complex, Gachibowli, Hyderabad-500 032. Telangana, India.	Phone No. 040-2301 5000 (60 - Lines) 9515104390 E-mail: waste@ramky.com Web: www.ramkyenviroengineers.com arr@ramky.com;	Hyderabad
11	Rollz India Waste Management Pvt Ltd	R-10/107, Raj Nagar, Ghaziabad, UP	info@rollzindia.com 0120 4565999	Udaipur

Annexure-V: List of Dumpsite Remediation Projects

Completed:

- Kumbakonam- 2.5 lakh ton / 12 Acres
- Sembakkam (Chennai) – 30k ton / 4 Acres
- Poonamallee – 50k ton / 4 Acres
- Pammal – 60 k ton / 6 Acres
- Noida Sector 54 – I lakh ton / 4 Acres
- Gorai (Capping)
- Indore
- Nashik (Partial Reclamation and Complete Capping)

Ongoing:

- Sector 145 Noida
- Vadodara
- Vijayawada
- Nagpur
- Tirupati
- Vishakhapatnam
- Trichy
- Erode
- Tambaram (Chennai)
- Pallavaram
- Chidambaram
- Karur
- Karaikudi
- Dindigul
- Cuddalore
- Bodinayakanur
- Srivilliputhur
- Sivakasi
- Ghazipur
- Gurugram
- Udaipur
- Nathdwara
- Delhi

Annexure-VI: Detailed NGT Order in O A 519 of 2019

The extract of the NGT order in O A 519 of 2019 along with O A 386 of 2019 on the date of hearing 17-7-2019

a) The action taken report of the North Delhi Municipal Corporation (North MCD) is that DPR has been prepared on 08.03.2019 which has three options.

First option "leaving the site as it is", which is out of question. Second option, bio-mining for 8.8 million cum waste which is said to require a period of 15 years and cost of Rs. 1178 crores. The third option is of capping.

Clause-J of Schedule-I of the SWM Rules provides for reduction of waste by bio-mining and waste processing followed by placement of residues in new landfills or capping with appropriate measures.

b) The cost indicated in the DPR for bioremediation is Rs.1178 Crores. However, as per CPCB (2019), cost of bio-remediation and bio-mining of dumpsite ranges from Rs.400 to 700 per cum and works out in the range of Rs.440 to 560 Crore.

The actual cost shall be further reduced, if cost of land recovered by means of bio-mining/bio-remediation is factored in. Hence the cost indicated by NDMC seems to be very much on the higher side. Similarly, the other issues raised by NDMC need detailed assessment.

c) As per CPCB Guidelines, capping of dumpsites is not advisable as it would lead to generation of more leachates and methane/landfill gas generation which would further contaminate the already heavily contaminated groundwater.

d) Further as per CPCB Guidelines, gas extraction is very difficult and inefficient when attempts are made to insert suction pipes into dumped waste instead of before dumping begins.

e) Poor success at Gorai capping led to the forced refund by Mumbai city of Rs.15 crore advance carbon credits. Taking into consideration the present height (65 m) of the landfill, extraction of leachate & gas will be even more difficult.

f) Table-I pertains to ground water sampling report of hand pumps which has indicated that average levels of BOD (2.4 mg/1), COD (28.0 mg/1), TDS (2783 mg/1) are more than the prescribed acceptable limit of zero for BOD, zero for COD and 500 mg/1 for TDS. Besides, the average highlevelo fResidualFreeChlorineof208.7mg/1, (limit 0.2mg/l), Chlorides 769.7 mg/1 (limit 250 mg/1), Sulphate 228.2 mg/1 (limit 200mg/l), Alkalinity 508.7 mg/1 (limit 200 mg/1), Lead 0.2 mg/1 (limit 0.01 mg/1) and Nickel 0.1 mg/1 (limit 0.02mg/l) indicates that drinking water from hand pumps are significantly polluted and is not drinkable.

g) Table-2 reflects ground water analysis report pertaining to 18 boreholes. The average levels of BOD (93.11 mg/1), COD (783.72 mg/1) and TDS (6841.83 mg/1) were found more as against the acceptable limit of zero for BOD, zero for COD and 500 mg/1 for TDS indicating that ground water has been significantly contaminated due to percolation of leachates from the landfill.

h) Table-3 pertains to analysis of surface water taken from Bhalaswa drain and Bhalaswa lake. The analysis report indicates that the average levels of BOD (68.40 mg/1), COD (547.51 mg/l) and TDS (4465.23 mg/l) were found higher as against the permissible limit for drinking water for BOD (0), COD (0) and TDS (500 mg/l) respectively indicating that surface water is significantly polluted due to

discharge of untreated leachates. Besides, the average levels of residual free chlorine (179.60 mg/1, limit 0.2 mg/1), Iron (0.53 mg/1, limit 0.3), Chlorides (13119.04 mg/1, limit 250), Calcium (188.99 mg/1, limit 75), Alkalinity (1285.96 mg/1, limit 200), phenolic compound (0.07 mg/1, limit 0.001), Lead (0.15 mg/1, limit 0.01), Mercury (3.75 mg/1, limit 0.001) and Nickel (0.15 mg/1, limit 0.02) were found high indicating that surface water is very polluted and Bhalaswa lake is not meeting the criteria for drinking water as toxic elements like phenolic compounds including heavy metals are present in the lake water. It is quite possible that the animals (buffalos, cows etc.) may be drinking lake water and as such the possibility of toxic chemicals and heavy metals entering the food chain cannot be over ruled. Therefore, lake water should not be used for drinking purposes by the human beings and the animals.

i) Table-4 leachate emanating indicates that BOD (500 mg/1), COD (2279 mg/1) & TDS (19000 mg/1) levels are higher in comparison to leachate standards of BOD (30 mg/1), COD (250 mg/1) & TDS (2100 mg/1) as per SWM Rules, 2016.

j) Recommendations:

i. NDMC should do a detailed assessment of the alternative technological options including Bio-mining / Bio-remediation for Bhalaswa dumpsite.

ii. NITI Aayog has constituted a Committee to identify technologies in SWM for cleaning of Delhi. NDMC may consider outcome of this committee's report in assessing options for Remediation of Bhalaswa dumpsite.

iii. In case, capping of Bhalaswa Dumpsite which is not advisable as per CPCB Guidelines is proposed as the only option due to time and space constraints as also techno-economic reasons, the DPR should be revisited especially to look into the following conditions:

iv. Bio-mining should be undertaken to the maximum extent possible without having significant adverse environmental impacts on the adjoining population.

v. Bio-remediation/decontamination of surface, ground water and soil should also be undertaken in the affected areas.

vi. No dumping of MSW/Garbage (about 2000 tonnes/ day) shall be done at Bhalaswa dumpsite and alternate arrangements for disposal of this waste to be made by NDMC on priority in accordance with SWM Rules, 2016."

vii. Information from Indore Municipal Corporation is as follows:

- "For screening purposes, trommels of 30 MT per hour capacities are available in the market on rental basis.
- Necessary vehicles & equipment's (excavators, backhoe loaders, dumpers, vibratory screens for dust removals and bundling machines for RDF) are required for bio-mining & bio-remediation.
- Normally, 20 trommels along with necessary machines and tools can process 5000 MT of legacy waste on daily basis in two shifts.
- Indore has successfully completed bio-mining/bio-remediation of 15 lakh MT legacy waste in 1 year.
- Rent for trommels paid by Indore to various machine manufacturers were in tune of Rs. 7.25 Lakh per trommel per month and bio-mining/bio-remediation process was followed as mentioned in the latest guidelines issued by the CPCB.
- Normally, per metric ton cost of bio-remediation process of legacy waste range between Rs. 300-450 depending upon area to area.
- In legacy waste sites where local bodies have space constraints can initially start the bio-mining/ bio-remediation options through mobile trommels.

viii. Information from Ahmedabad Municipal Corporation is as follows:

- Ahmedabad Municipal Corporation has started the bio-mining/bio-remediation at Pirana dumping site and they are paying Rs. 6.40 Lakh per trommel per month.

- Trommel machines are simple in fabrication and can be fabricated as per design mentioned in CPCB guidelines by local fabricators.

- Instead of having multiple machines, it is advisable to have a single trommel of 16 to 20 mm bore size screen and reject conveyer should have blower.

- This will reduce the cost due to multiple trammelling. Also, to utilise the RDF recovered from this process should be made free from dust. Thereafter RDF can be bundled and sent to waste-to-energy plant and cement industries for further utilisation.

- Recovered soil from bio-mining/bio-remediation process can be used in filing dead mines and afforestation can take place.

- Secondly, it can be used by National Highway Authorities/ State Road construction agencies and local bodies in sub-base filing.

- Local bodies can install number of trommels at bio-remediation site based on availability of land and with time they can increase the number so as to complete the process as soon as possible.

- Once the bio-mining and bio-remediation process starts, dumping of fresh garbage should be stopped at the legacy waste dumpsites, local bodies may identify a separate piece of land to process the fresh garbage through various processes mentioned in SWM Rules, 2016 and guidelines issued by the CPCB.

ix. As per the Annual Report of CPCB (2016-2017) the following information is available with regard to the dumpsites in each state. (Table 3).

x. Table 4 lists the cities with more than 10 lakh population as per census 2011 with regard to dumpsites.

Table 3 List of existing Dumpsites as per CPCB Annual Report 2016-2017

No	States	Total No. of existing Solid Waste Dumpsites
1.	Andaman Nicobar	1
2.	Andhra Pradesh*	-
3.	Arunachal Pradesh	2
4.	Assam	94
5.	Bihar	Data not available
6.	Chandigarh	1
7.	Chhattisgarh	75
8.	Daman and Diu*	-
9.	Delhi*	-
10.	Goa	3
11.	Gujarat	170
12.	Haryana	60
13.	Himachal Pradesh	50
14.	Jharkhand*	-
15.	Jammu & Kashmir*	-
16.	Karnataka	207
17.	Kerala*	-
18.	Nagaland	11
19.	Lakshadweep*	-
20.	Madhya Pradesh	381
21.	Maharashtra	271
22.	Manipur*	-
23.	Mizoram	1
24.	Meghalaya	6
25.	Odisha	2
26.	Punjab	160
27.	Pondicherry	3
28.	Rajasthan*	-
29.	Sikkim	2
30.	Tamil Nadu	499
31.	Telangana*	-
32.	Tripura	17
33.	Uttarakhand	2
34.	Uttar Pradesh*	-
35.	West Bengal	102
	Total	**2120**

*INR: Information Not Received

List of Million plus cities with existing Dumpsites as per Census 2011

S. No	Urban Agglomerations	State	Landfill/dump site
(1)	1. Mumbai	Maharashtra	Deonar
(2)			Kanjurmarg
(3)	2. Delhi	Delhi (UT)	Bhalaswa
(4)			Okhla
(5)			Ghazipur
(6)	3. Kolkata	West Bengal	Dhapa
(7)	4. Chennai	Tamil Nadu	Kodungaiyur
(8)	5. Bangalore	Karnataka	Mavallipura
(9)			Bellahalli
(10)	6. Hyderabad	Telangana	Jawahar Nagar
(11)	7. Ahmedabad	Gujarat	Pirana
(12)	8. Pune	Maharashtra	Uruli Devachi
(13)			Phursungi
(14)	9. Surat	Gujarat	Khajod
(15)	10. Kanpur	Uttar Pradesh	Panki
(16)	11. Lucknow	Uttar Pradesh	Shivri
(17)			Ghaila Village
(18)	12. Nagpur	Maharashtra	Bhandewadi
(19)			Kalmeshwar
(20)	13. Ghaziabad	Uttar Pradesh	Pratap Vihar
	14. Indore		-
(21)	15. Coimbatore	Tamil Nadu	Vellalore
(22)	16. Kochi	Kerala	Kalamassery
(23)	17. Patna	Bihar	Ram ChakBairiya
(24)	18. Kozhikode	Kerala	Njeliyanparamba
(25)	19. Bhopal	Madhya Pradesh	Bhanpur
(26)			AdampurChhawni
(27)	20. Thrissur	Kerala	Laloor
(28)	21. Vadodara	Gujarat	Jambuva
(29)	22. Agra	Uttar Pradesh	Kuberpur

S. No	Urban Agglomerations	State	Landfill/dump site
(30)	23. Malappuram	Kerala	Theruvushala
(31)	24. Thiruvananthapuram	Kerala	Vilappilsala
(32)	25. Kannur	Kerala	Chelora
(33)	26. Nashik	Madhya Pradesh	KhatPrakalp
(34)	27. Vijayawada	Andhra Pradesh	Ajith Singh Nagar
(35)	28. Madurai	Tamil Nadu	Vellakal
(36)	29. Varanasi	Uttar Pradesh	Saraiyyabasti
(37)	30. Meerut	Uttar Pradesh	Ganwri Village
(38)	31. Rajkot	Gujarat	Nakrawadi
(39)	32. Jamshedpur	Jharkhand	Bara
(40)	33. Jabalpur	Madhya Pradesh	Ranital
(41)			Kathonda
(42)	34. Srinagar	Jammu Kashmir	Saidpora Achan
(43)	35. Asansol	West Bengal	Kalipahadi
(44)			Samdihi
(45)	36. Allahabad	Uttar Pradesh	Baswar
(46)	37. Dhanbad	Jharkhand	Telipada
(47)			Matkudiya
(48)	38. Aurangabad	Maharashtra	Madki NaregaonVillage
(49)	39. Amritsar	Punjab	Bhagtanwala
(50)	40. Jodhpur	Rajasthan	Keru
(51)	41. Ranchi	Jharkhand	Jhiri Village
(52)	42. Raipur	Chhattisgarh	Sarona
(53)	43. Gwalior	Madhya Pradesh	Site in Gwalior-Shivpuri Road
(54)	44. Kollam	Kerala	Kureepuza
(55)	45. Durg and BhilaiNagar	Chhattisgarh	Jamul
(56)	46. Chandigarh	Chandigarh(UT)	Dadu Majra
(57)	47. Tiruchirappalli	Tamil Nadu	Ariyamangalam

Notes

Notes

Swachhata Pledge

Mahatma Gandhi dreamt of an India which was not only free but also clean and developed.

Mahatma Gandhi secured freedom for Mother India.

Now it is our duty to serve Mother India by keeping the country neat and clean.

I take this pledge that I will remain committed towards cleanliness and devote time for this.

I will devote 100 hours per year that is two hours per week to voluntary work for cleanliness. I will neither litter nor let others litter.

I will initiate the quest for cleanliness with myself, my family, my locality, my village and my work place.

I believe that the countries of the world that appear clean are so because their citizens don't indulge in littering nor do they allow it to happen.

With this firm belief, I will propagate the message of Swachh Bharat Mission in villages and towns.

I will encourage 100 other persons to take this pledge which I am taking today.

I will endeavour to make them devote their 100 hours for cleanliness.

I am confident that every step I take towards cleanliness will help in making my country clean.

Ministry of Housing and Urban Affairs
Government of India