

Karnataka State Policy on Integrated Solid Waste Management

1. Introduction

The most pressing problem faced by any urban centre in India today is Municipal Solid Waste Management (MSWM). Rapid urbanisation and changing lifestyles have led to the generation of huge amounts of garbage and waste in the urban areas, so much so, over the past few years, just the handling this Municipal Solid Waste (MSW) has assumed the proportion of a major organizational, financial and environmental challenge.

Despite MSWM being a major task of the local governments, typically accounting for a sizeable portion of the municipal budget - about 20% to 50%, yet the Urban Local Bodies (ULBs) are unable to provide effective services. Most of the ULBs do not even have reliable MSW generation estimates.

An unfortunate fallout of rapid urbanization without the adequate infrastructure backup is that in all Indian cities/towns, disposal of waste is done indiscriminately, leading to stray animal menace, clogged drains and spread of diseases. The process of collection, transportation and disposal of MSW is not complete in most of the cities/towns with garbage heaps remaining unattended until the severity reaches unmanageable proportions. Also, the high organic content of Indian MSW, compounded by the hot and humid tropical climate leads to the rapid decomposition of the uncollected waste and is an ever-present health hazard. In addition, the contamination of MSW by bio-medical and industrial hazardous waste is a growing concern. Brief Statistical Details of Generation, Collection & Disposal of Waste in ULBs are indicated in **Appendix-1**

Most ULBs spend nearly 60%-70% of their total overall budgetary allocation on collection, another 20%-30% on transportation, and often less than 10% on the treatment and final disposal of MSW. Also, even today, the disposal of wastes is being carried out in an unscientific manner, with crude open dumping in low-lying areas being the prevalent practice followed by most ULBs. MSW is also commonly deposited at dump-yards without ascertaining the suitability of the land for waste disposal. The results of these are foul smell,

breeding of flies and other pests and generation of liquid run offs (leachate), which pose a serious threat to the underground water reserves.

MSWM practices in India are employee intensive, with an estimated 50% of the total municipal staff engaged in these activities. Of late, most ULBs have been restricting new recruitment, therefore even this staff strength is inadequate and is less than desired as per norms (estimated 70% availability vis-à-vis norms). Moreover the implements, machinery and equipment used by staff are mostly of outdated technology, and serve poorly in meeting the new demands. The communication programs for effective MSWM have not been given adequate importance.

As the onus of MSWM has been assumed by ULBs, participation of the other stakeholders (waste generators, NGOs, private entities) is minimal. This and all the above-mentioned factors have hampered the efficient delivery of MSWM services. There is an urgent need to revisit, develop, and implement appropriate strategy for effectively handling MSW.

2. MSW Rules

In view of the serious environmental degradation resulting from the unscientific disposal of MSW, the Ministry of Environment and Forests (MoEF), Government of India, has notified the Municipal Solid Wastes (Management & Handling) Rules, 2000, (MSW Rules), stipulating all municipal authorities to scientifically manage MSW.

Compliance criteria for each and every stage of waste management - collection, segregation at source, transportation, processing and final disposal - are set out in the MSW Rules, which include:

- a. Dumping of MSW in oceans, rivers, open areas, and compaction or bailing are not acceptable.
- b. The biodegradable waste has to be processed by means of composting, vermin-composting, anaerobic digestion or any other appropriate biological processing for stabilization of wastes.
- c. Mixed waste containing recoverable resources should be recycled.

- d. Other technologies for treatment such as Pelletisation, Gasification, Incineration etc. require clearance from Pollution Control Board before planning and implementation.
- e. Landfilling should be the waste disposal method for non-biodegradable, inert waste and other waste that is not suitable either for recycling or for biological processing.

3. Objective

The goal of effective MSWM services is to protect public health, the environment and natural resources (water, land, air). An effective MSWM service can be achieved only by improving the efficiency of MSWM activities, thereby leading to the reduction of waste generation, separation of MSW and recyclable material, and recovery of compost and energy.

The objectives of this State Municipal Solid Waste Management Plan are:

- a. Providing directions for carrying out the waste management activities (collection, transportation, treatment and disposal) in a manner, which is not just environmentally, socially and financially sustainable but is also economically viable.
- b. Establishing an integrated and self-contained operating framework for MSWM, which would include the development of appropriate means and technologies to handle various waste management activities.
- c. Enhancing the ability of ULBs to provide effective waste management services to their citizens.

4. Touchstone Principles

The touchstone principles, which govern the future approach to provision of MSWM services, include the following:

- a. Promoting awareness of waste management principles among citizens and other stakeholders
- b. Minimizing multiple and manual handling of waste, and designing a system to ensure that MSW does not touch the ground till treatment and final disposal
- c. Defining the roles and responsibilities of various stakeholders and putting in place an operating framework, which would include appropriate contractual structures
- d. Developing systems for effective resources utilisation and deployment
- e. Promoting recovery of value from MSW; developing treatment and final disposal facilities, which, while adhering to the statutory requirements, are sustainable, environmentally friendly and economical.

Stakeholder Involvement

MSWM depends, as much upon organisation and co-operation between households, communities, NGOs and ULBs, as it does upon selection and application of appropriate technical solutions for various waste management activities. Towards enhancing the stakeholders' involvement in MWSM, the State Plan proposes the following innovations:

- a. Directing the waste management initiatives to the waste generator level, and entrust the responsibility of source segregation and primary collection to the relevant community based organisation / resident welfare association / Self help group (SHG).
- b. Developing and maintaining, at the KUIDFC, details of the Information, Education and Communication (IEC) activities and awareness programs designed by the State Resource Center for planning and designing.
- c. Utilizing the services of non governmental organisations (NGOs) to operate and coordinate between the ULB, Community and SHG / RWA, in order to propagate the awareness program, the IEC campaign, and to provide support to the informal sector (rag pickers, waste recyclers etc.)

- d. Defining the role of NGOs: The MSW Rules, 2000, stipulate for extensive involvement of the community in SWM. In order to educate the community and bring awareness regarding the modernization of SWM program, the involvement of an intermediary, by way of a Non-Governmental Organisation is very much necessary. NGOs would help in the effective propagation of the complete awareness regarding SWM among various stakeholders so that Waste Management would take place as per the State Policy. The IEC activity would be carried out by NGOs as per the specified terms.
- e. ULBs would allow RWA / SHG to enter into contracts with private operators for various waste management activities, under specified guidelines and structures.

5. Information, Education & Communication Activity (IEC)

IEC is the key to the success of the modernization of MSWM. As stated, awareness amongst community and different stakeholders to meet the demands of the new system for a cleaner environment requires a detailed and thorough understanding at every stage. Involvement of community is going to be the main thrust of the program.

As a prelude to implementation, this IEC activity is going to be taken up, which would involve the participation of some leading NGOs, who would be appointed after a careful selection process. Materials required for the IEC campaign like manuals, flipcharts and other media communication are designed by State Resource Center, Mysore. A detailed Terms of Reference has been prepared for NGO activity (**ToR is enclosed in the Appendix-2**)

6. Primary Collection

Where Primary collection, or first stage collection is concerned, the principle of reducing manual handling and doorstep collection would be promoted. For this purpose, the various activities proposed include the following:

- a. Residents would be encouraged to segregate, store and deliver the MSW to primary collection staff as per procedures set out by ULBs

- b. Auto tippers would be used to enable doorstep collection (residents would be encouraged to deliver waste at door step at a pre-specified time).
- c. The procurement of auto tippers could be done either by the ULB concerned or the SHG / RWA, and appropriate contractual arrangements would be entered into with RWA/SHG and private operator(s) to carry out primary collection activities
- d. The ULB would charge a “user fee” from the residents and other generators, the amount of which would be based on need and affordability criteria
- e. The MSW from other larger generators (commercial zones, institutions, hotels etc.) and construction debris would be collected and transferred directly to the secondary transport system and disposed appropriately (bio-degradable to the treatment facility and others to the landfill facility)

7. Street Sweeping and road side drain cleaning

Plans for efficient and effective street cleaning include:

- a. Provision of ergonomically designed implements for street sweeping to the conservancy staff.
- b. Deposition of the refuse swept from the street would be directly into the secondary transportation system
- c. ULB entering into appropriate contractual agreements with private operators (preferably on lump sum basis) for carrying out the activities.

8. Secondary Collection and Transportation

- a. Usage of metal containers of specified dimensions and capacity is proposed for secondary storage. The usage of concrete bins would be discontinued as per the mandatory recommendation of the Committee constituted by The Hon. Supreme Court of India.
- b. MSW from the auto tippers (obtained during primary collection) would be directly uploaded into these metal containers
- c. The metal containers would be handled mechanically through dumper placers, or tractors with tipping trailer mechanism. Compactors have a separate system for secondary collection and these vehicles are not recommended for towns with population of less than 20lakhs.
- d. The transportation vehicles would carry and unload the waste mechanically at treatment plants and landfill sites depending on the type of waste
- e. The procurement of vehicles could either be by ULB concerned or could be arranged with private operators under suitable contractual arrangements

9. Treatment and Landfill Operation

- a. Pursuant to the Supreme Court guidelines and the prevalent market constraints, composting would be the preferred method of treatment.
- b. Landfill, as required under prevailing statutes, would need to be developed to dispose non – biodegradable matter and compost rejects
- c. Development of these facilities, either individually or as integrated unit, could be done under appropriate contractual arrangement (management contract / BOT contracts etc.)

- d. In case of private participation, ULBs would enter into contractual arrangement on a tipping fee basis

10. Implementation Plan

In accordance with and as per the guidelines of the MSW Rules 2000, initially all Class I cities in the state would have both compost plant and landfill sites.

Other cities/towns with less than 1 lakh population would have only suitable Engineered landfill sites with controlled tipping to begin with, and would be progressively upgraded to sanitary landfill with treatment facility. In the controlled tipping process care would be taken to isolate the fill area from surface run offs.

11. Way Forward

Flowing from the principles outlined here, a long-term management strategy and action plan for the state would be developed based on experiences and addressing the following aspects:

- a. Assessment of MSW generation at various ULBs and identification of the best possible means for managing the same
- b. Setting operational targets for each of the waste management activities and indicating the means of achieving the same for various ULBs
- c. Setting out roles and responsibilities of stakeholders under various contractual arrangements
- d. Developing IEC material and promotional / awareness campaigns
- e. Developing a resource utilisation guidelines for different categories of ULBs
- f. Setting out operational guidelines for the procurement of equipment and services

Normative Standards and Procedure for Collection, Storage and Transportation of MSW

1.0 Primary collection of waste:

1.1 From Slums and other BPL settlements:

- Collection of waste to be done predominantly by Pourakarmikas (PKs), who should be positioned at 100% strength at these locations.
- One 40 litre – HDPE bin to be placed for every unit of 100 people of the area. (Approximately 20 house holds)
- Approximate weight of waste per bin would be 15 Kgs.
- **Mode of transportation:**
 - 2 Pourakarmikas to be deployed for a normative area (about 1080 houses / 5400 population).
 - One pushcart / tricycle to be provided for transfer of waste from the bins to push cart.
 - Then the waste from Push Carts / Tricycles or from 40 litre collection bins is to be transferred to nearest secondary container.
- **Normative standard for operation:**
 - a) **Pushcart:**
 - One pushcart (Capacity – 40 to 50 kgs) can hold waste from 3 bins.
 - Approximate time taken for one such operation for delivering to secondary container – 20 minutes.
 - Number of bins handled by Pourakarmikas in a 6-hour shift = 54 bins = 810 kgs = 5400 population = 1080 houses.
Depending on operational distance and travel time, quantity of waste and number of houses handled would vary.
 - If a town has 15000 slum houses, 14 batches or 28 PKs are required for slum operation.
 - b) **Tricycle:**
 - One tricycle (Capacity – 80 to 100 kgs) can hold waste from 6 bins
 - Approximate time taken for one such operation for delivering to secondary container – 40 minutes.

- Pourakarmikas should also collect recyclable waste if the dwellers prefer to deliver to PKs for centralized collection.
- Recyclables to be delivered to a separate transport system using existing vehicles like tippers and tractor-trailers at pre-determined time schedules.

1.2 From non slum residents:

- Normative standard: (Collection from houses only)
 - a) **Auto tipper:**
 - The auto tipper would stop at every 50 m.
 - The segregated green waste is to be delivered by the residents to the vehicle either on move or stationery, at 50 m distance intervals.
 - Time taken at every stop including traverse is 3 minutes.
 - At least 10 houses can be handled at each stop.
 - Time taken by auto tipper for collection from 500 houses before 1st transfer of waste to secondary container = 2½ - 3 hours
 - Time duration for collection from 1000 houses = 6 hours.
(6.30AM to 1.30 PM) with 1 hour break in between.
 - The waste collected from Auto tippers would be transferred directly to 3 cum / 4.5 cum secondary container.
 - b) **Pushcart:**
 - One pushcart can cover about 160 houses in a shift.
 - Pushcart can collect waste from 40 houses in one trip.
 - After each trip, the waste is delivered to the secondary container.
 - Time required for one trip will be 90 minutes.
 - In a 6-hour shift 160 houses can be covered.
 - One person is required for the operation of waste collection.
 - c) **Tricycle:**
 - One tricycle can cover about 240 houses in a shift.
 - Tricycle can collect waste from 80 houses in one trip.
 - After each trip, the waste is delivered to the secondary container.
 - Time required for one trip will be 2 hours.
 - In a 6-hour shift 240 houses can be covered.
 - One person is required for the operation of waste collection.

- **Operation of the system:**
 - ❖ The ULB should procure the vehicle in areas where SHGs cannot be formed and should operate on contract basis.
 - Agreement between ULB and Service Provider
Refer agreement document: Primary Collection Doc-1
 - ❖ Through RWA/SHG/Urban Stree Shakti etc. under following arrangement:
 - Agreement between ULB, RWA and Service Provider
Refer agreement document: Primary Collection Doc-2
 - Agreement between ULB and SHG
Refer agreement document: Primary Collection Doc-3
 - Agreement between ULB and RWA
Refer agreement document: Primary Collection Doc-4

- **Collection from commercial establishments.**
 - Waste to be collected during afternoon soon after green waste collection from houses.
 - Time duration for collection – 1 ½ hrs approximately (10% Of houses).
 - **Operation of the system:**
 - ❖ Through RWA/SHG/Urban Stree Shakti who manage the waste collection in the specified area.
 - ❖ Private operator hired by ULB

- **Collection from bulk waste generators:**
 - Waste generators to make their own provisions as per specified storage container for storage of waste and to synchronize its collection with transport system.
 - Waste generators may also arrange for storage and transport of waste under contract arrangement.
 - **Operation of the system:**
 - ❖ Through an arrangement with existing system of ULB.
 - ❖ Private operator hired by ULB
Refer agreement document: Bulk Collection Doc-1

- **Recyclable waste collection – from houses:**
 - Periodical collection on scheduled days and at a specific time – once/twice in a week in a cyclic system during or after commercial waste collection.
 - Duration of collection – 2 hours.
 - Waste so collected would be delivered to a specified collector of recyclable waste.
 - In the absence of an established collection system by the recycling operators, the ULB is to store at the disposal site and make arrangements for recycling agencies to collect the waste.

2.0 Secondary Storage:

- The waste from the primary collection vehicle is to be transferred to secondary containers
- The secondary storage is the secondary containers having a capacity of 3 m³, 4.5 m³ and 7 m³.
- 7 m³ containers are proposed for large cities only.
- On the basis of weight, the capacity of secondary containers are as follows:
3 m³ : 1.2 tons
4.5 m³ : 1.8 tons
- The secondary containers of 3 m³ and 4.5 m³ are provided in the ratio of 40:60 from the convenience of transportation and storage.
- The secondary storage points are to be identified based on the volume of waste generated. The guideline for locating the containers are indicated below:
 - One container at the center point between a set of 500 households on the main road.
 - One 3m³ container as indicated above in an operational area of 1000 houses.
 - One 4.5 m³ container at the mid point of 2 operational areas of 1000 houses each.
 - Alternately a combination of 3 m³ and 4.5 m³ to be located in the operational area of 1000 houses based on the volume of waste generated.
 - Based on local situation and special circumstances, additional 3 m³ and 4.5 m³ containers may be placed in commercial zones, market areas and other places of bulk waste generators. These containers are in addition to containers for houses indicated in action plan for equipments / vehicles.

- Bulk generators like Choultries, large hotels etc to be insisted for procuring and placing secondary container of required capacity as per standard design in their premises to handle their waste.
- The Secondary Containers are placed on a pre-cast cement concrete floor measuring 4.85 m x 3 m
- ULB will procure required number of secondary containers and manage the system

3.0 Transportation of Secondary containers:

- Secondary containers are to be transported either by Dumper Placer or Tractor Placer as per recommendation based on the size of ULB.
- Dumper Placers are to be provided for Cities with population of 1 lakh or more.
- For towns with less than 1 lakh population Tractor Placer is recommended.
- The vehicle to place empty container before lifting filled up container.
- The green waste and predominantly biodegradable waste to be transported to Treatment facility / disposal site as per arrangement.
- The inorganic waste is to be transported directly to landfill site.
- One twin container Dumper Placer would be required to make 5 trips in shift to treatment/disposal site with an average one way lead of 15 km.

Operation of the system:

- ULB to procure the vehicles and operate the system
- ULB procuring the vehicles to operate the system on O&M contract

Refer Agreement Document: Secondary Collection Doc-1

- ULB to operate the system on contract basis with the Operator providing the designated type of vehicle

Refer Agreement Document: Secondary Collection Doc-2

4.0 Street Sweeping:

- The roads need to be divided into three categories.
- Type A: Daily sweeping
- Type B: Four days in the week. (Sun, Tue, Thu, Sat)
- Type C: Three days in the week. (Mon, Wed, Fri)

- Same staff could be deployed for Type B & C roads.
- Normative standard for staff requirement (For 4 hr work):
 - Average road width – 80 ft: One for every 350m length
 - Average road width – 60 ft: One for every 500m length
 - Average road width – 40 ft and below: One for every 750m length
- Street sweeping to include roadside drain cleaning.
- Use the pushcarts for collection of waste and transport using the available tractor-trailer.
- The waste should be transported directly to landfill site.

Operation of the system:

- ULB would operate the system through Pourakarmikas
- ULB to operate the system on contract basis with specific type of equipments under the following arrangement:
 1. **Lump Sum Fee Contract:**
Refer Agreement Document: Street-Sweeping Doc-1
 2. **Road Length Contract:**
Refer Agreement Document: Street-Sweeping Doc-2

5. MSW management contract:

The entire process of Solid Waste Management could be brought under Service provider who will operate all components of SWM till disposal at designated treatment and landfill site.

Refer Agreement Document: MSWM Contract Doc-1

6. Procurement of Equipments and Vehicles:

The types of equipments and Vehicles for the operations of the SWM have been specified. The choice of vehicle should be based on the normative requirement depending on the class of the city/town.

The details and guidelines for procurement for ULBs are contained in the following document:

Design and Specifications of Tools and Equipments for SWM in Urban Local Bodies

Refer Agreement Document: Procurement Doc-1

Guidelines for Establishment and Operations of Treatment and Landfill Facilities

Treatment and Landfill operation is set out under the following process:

In compliance with MSW Rules 2000, Composting shall be the method of treatment. Other technologies like Incineration, Pelletisation can also be used in specific cases. However Municipal Authorities or Operators wishing to employ State-of-the-Art Technologies shall obtain standards specified by CPCB before applying for authorization.

Landfill sites shall be established in conformity with the provisions of MSW Rules 2000. Quality of leachate shall satisfy the standards indicated in the Schedule IV of MSW Rules 2000.

1.0 Composting:

The solid waste management policy states that composting would be the treatment and processing option for municipal solid waste. At present there are concerns on sale of the compost. It has been proposed that the incoming waste shall be composted using aerobic composting technique so that the waste is inertised. If there is a market for the compost then the inertised waste would be sieved and compost sold while the rejects are land filled. If there were no market for compost the inertised waste would be land filled. Vermi compost has a limited market but has a good price. It is proposed that the partially digested aerobic compost can be converted to vermi compost based on the demand. Here the technology proposed for aerobic composting for inertisation, the sieving system and the vermi-composting are described.

1.1 Aerobic Composting:

The waste being generated and received at the processing site is composted aerobically. This composting process makes the waste inert. The aerobic composting process involves placing the waste into windrows. Windrows are long heaps of waste

formed in a trapezoidal shape of base 4-5 m and height of 2.5 to 3 m. The dimensions would vary depending on the volume of waste to be handled per day. The windrows are placed on a specially constructed concrete platform. The windrows are turned every 6-7 days over a period of 6 weeks. The turning of the waste is done using front-end loaders. After this the material will be stored under shelter for a period of 1 week. In this process the material get stabilized. Addition of microbial cultures like cow dung slurry or special cultures can speed up the degradation and with adequate turning the stabilization process can be completed in 30 days. This stabilized material can be sent for landfill.

1.2 Compost processing:

The compost processing involves segregation of rejects from the stabilized wastes by sieving. The stabilized materials are sieved using rotary sieves. The material movement for sieving can be manual or mechanised based on the capacity of the plant. Three-stage sieving is adequate for Karnataka. The first and second stage would be sieving the waste through 50 mm and 25 mm sieves. The materials not passing 50 mm and above are sent to landfill as reject. The material passing 50 mm but retained on 25 mm can be sold as pit filling material. The materials passing through 25 mm is then sieved through 10 mm sieve. The third and fourth stage would be sieving through 10mm and 4mm sieves. The material passing 10 mm sieve and retained on 4mm sieve is the grade II compost and the material passing 4 mm is sold as Grade I compost. Organic manure could be enriched for improving its material value by organic additives like neem cake, rock phosphate, decomposed poultry litter and micro-nutrients like zinc and boron.

1.3 Vermi-composting

Earthworms eat partially decomposed waste and give out castings which is a very good manure. Vermi- composting involves feeding the worms with organic fraction of the municipal waste and collecting the castings to be used as organic manure. The earthworm feed on partially decomposed wastes. The incoming municipal waste has to be composted aerobically for about 2 to 3 weeks to ensure partial decomposition. These partially decomposed wastes are fed to the earthworms. The earthworms would

eat the waste and convert them to casting over 4-6 weeks. The castings have to be collected manually at regular intervals. Earthworm requires shade and protection from rain and predators. A pit over ground is preferred for storing the partially decomposed waste and the worms. The pits have to be covered to provide protection from sun and rain. The inorganic portion of waste, which is not eaten by the worms, is sent for landfill and the organic portions are fed back to the worms. The adult worms and the young worms from each cycle are collected back and used again in the next cycle.

2.0 Landfill:

The rejects from the composting process have to be land filled. It is proposed that a sanitary landfill would be developed for Class I towns. For smaller urban local bodies with lower waste generation, it is proposed that progressive development approach to waste management shall be adopted. No treatment of waste is proposed to start with. It is proposed that an Engineered landfill development would take place for all the waste. Progressively the treatment and improved landfill practises shall be implemented. Here the development required for the sanitary landfill and engineered landfill is detailed.

2.1 Sanitary landfill

The Sanitary landfill approach is based on the MSW rules 2000. The landfill is based on concepts of isolation of the landfill from surface water and containment of wastes within the landfill. This would involve development of the landfill site with provision of the basic infrastructure of proper road access, gatehouse with weighbridge, building with record rooms and facilities of storage, washing and toilets for staff. The landfill proper would be developed for isolation of the wastes from surface runoff and containment of the waste to protect against movement of leachate directly to ground. Liner systems with leachate collection would be provided. A leachate treatment facility would also be provided. The waste would be tipped to a plan and covered daily. Monsoon waste placement plans would be made. Once the planned waste levels are reached a cover liner would be provided. The landfill would be developed with 20-25 year perspective. A detailed plan for implementation would be prepared prior to investment.

2.2 Engineered landfill

The Engineered landfill would be based on the approach of progressive upgradation of integrated solid waste management facility. The primary concept in the Engineered landfill is to have isolation of the waste from surface run off to ensure that water entering into the waste is minimised and consequent leachate generation is minimised. The landfill site would initially developed so that all the rain water from outside the site do not come into the proposed landfill area by construction of appropriate surface drains. Two strategies are proposed for the landfill based on the prevalent ground conditions.

Where the ground consists of hard laterite or is rocky and where the excavation is not advisable it proposed that landform method of waste management shall be adopted.

Where it is possible to excavate the ground, a pit based system of waste management shall be adopted.

The two techniques proposed are detailed below.

2.2.1 Pit based system:

The solid waste management system here consists of digging pits of typical dimensions 5 m wide, 2.5 m deep and 50 m long or to any required length so that the pit will cater for one month of operation. The waste is filled from the top till the pit is filled. Adequate care is taken to cover the pit with plastic sheet during monsoons to ensure that direct rainwater does not enter the pit. Then the top of the pit is again covered with a liner of with average 15 to 30 cm of soil and compacted to 95 % Procter density using appropriate rollers. The soil, which was originally excavated from the site, is stored at site for this purpose. The soil is placed such that a slope of 1 in 20 is provided from the centre. A plastic liner made of discarded HDPE sacks used for cement bags etc. stitched together is placed on this compacted soil over the entire pit area. Another layer of average 15 cm soil compacted as given above is placed on the top with slope towards the edge.

Additional pits are dug and the above procedure is followed for filling and covering the pit as required on an ongoing basis. In the above process the waste inside the pit is anaerobically composted. If a market for compost exists the waste can be exhumed from the pit sieved in 4 mm sieves and sold. The rejects in the process would be refilled in the subsequent pits or a special pit dedicated to rejects. The pits from which wastes have been removed can be used again for refilling. A complete record of the pit with the number and date of filling and what was filled shall be maintained for future reference.

2.2.2 Landform system:

The construction of a waste landform starts with the construction of soil bund. The site would be excavated to obtain the necessary soil for making the bund. The bund is trapezoidal in cross section with a top width of 0.5 m, with side slopes of 1V:2H and a height of 3.0 m. The initial length of the bund shall be 50 m and the same can be extended or shortened based on waste requirement. The edge of the bund is also trapezoidal. The waste is placed from bund end and progress towards other end as per site conditions. The waste is tipped by the transport vehicle and pushed into shape using a tractor-mounted front-end loader. This process is continued based on waste arrivals. The waste line, which has been filled, would be covered with a plastic sheet made of stitched HDPE cement bags. This would be then covered with 300 mm of soil, which is excavated at location. The soil shall be placed in 15 cm layer to 95 % Procter density. As each line gets filled up, the same shall be covered progressively. During monsoons, plastic sheets shall be used to cover all the open waste lines so that direct rains do not fall on waste. At the end of the landfill a raised plat form would be available for use as play ground or other facility.

Guidelines and schedules/specifications for compost plant and landfill facilities have been published.

**Refer: Integrated Solid Waste Management for Treatment and
Landfill Operations in Urban Local Bodies**

Operation of the systems:

A. Treatment:

- Establishment of Compost Plant under Build-Operate-Transfer (BOT) basis

Refer agreement document: Treatment Doc-1

- ULB investing in civil infrastructure and operator to erect the machinery and run the plant under O&M contract

Refer agreement document: Treatment Doc-2

- ULB investing in both civil infrastructure and machinery, Operator to run the plant under O&M contract

Refer agreement document: Treatment Doc-3

B. Treatment and Landfill:

- Establishment of Treatment and landfill facility under BOT basis

Refer agreement document: Treatment & Disposal Doc-1

- ULB investing in the infrastructure with O&M contract for operations

Refer agreement document: Treatment & Disposal Doc-2

C. Landfill:

- Establishment of landfill facility under BOT basis

Refer agreement document: Disposal Doc-1

- ULB investing in the infrastructure with O&M contract for operations

Refer agreement document: Disposal Doc-2

1. Details of MSW Generation in Select ULBs

Sl.No.	Name of ULB	Population (2001 census)	MSW Generated (TPD)	Per Capita Generation (gms)
1	Hospet	163,284	39.93	244.54
2	Hassan	116,628	54.51	467.38
3	Shimoga	274,105	85.00	310.10
4	Raichur	205,634	90.68	440.98
5	Chikmagalur	101,022	40.86	404.47
6	Belgaum	399,600	121.90	305.06
7	Gadag	154,849	67.20	433.97
8	Bidar	172,298	42.76	248.17
9	Bijapur	245,946	80.63	327.84
10	Gangavathi	93,249	38.62	414.16
11	Bellary	317,000	123.46	389.46
12	Davangere	363,780	180.00	494.80
13	Chitradurga	122,594	50.00	407.85
14	Bhadravathi	160,392	51.68	322.21
15	Kolar	113,299	52.00	458.96
16	Robertsonpet	141,294	55.30	391.38
17	Holenarasipura	27,018	12.00	444.15
18	Channarayapatna	33,240	10.00	300.84
19	Sakaleshpura	23,201	6.00	258.61
20	Arasikere	45,160	14.00	310.01
21	Alur	6,133	1.00	163.05
23	Belur	20,225	8.00	395.55
24	Moodigere	8,962	4.50	502.12
25	N.R. Pura	7,441	5.00	671.95
26	Shringeri	4,253	1.50	352.69
27	Ullal	49,862	9.90	198.55
28	Tumkur	248,592	54.00	217.22
29	Ramanagaram	79,365	20.00	252.00
30	Channapatna	63,561	20.00	314.66
31	Mandya	131,211	50.00	381.07
32	Maddur	26,456	6.00	226.79
33	Kundapura	28,595	11.34	396.57

The quantity of waste collected and transported by ULBs is approximately 75% of waste generated. The treatment and scientific disposal is almost non-existent.

2. Generation of Waste from various sources in Select ULBs

S.No.	Name of ULB	House holds	Markets	Shops	Others ¹	Total
1.	Ullal	7.4	0.20	0.86	1.03	9.89
2.	Kundapura	4.29	0.40	2.77	1.95	11.34
3.	KGF	35.30	9.00	10.0	3.14	58.98
4.	Hassan	39.29	6.00	8.50	4.86	54.51
5.	Bellary	76.00	9.00	2.60	31.35	123.46
6.	Bidar	25.25	5.00	5.00	7.50	42.76
	Total % of each source	62.31	9.84	9.88	16.56	

The unaccounted difference is not attributable.

3. MSW Generated and Collected in ULBs

Sl. No.	Type of ULB	Total amount of waste generated per day (Tonnes)	Total amount of waste collected per day (Tonnes)
1	City Corporations*	880	735
2	City Municipal Corporations	1921	1360
3	Town Municipal Corporations	599	532
4	Town Panchayats	912	676
	TOTAL	4312	3304

*-Excluding Bangalore City Corporation

4. Availability of Vehicles in ULBs

(Capacity in Tonnes)

Sl. No.	Type of ULB	Lorries		Mini Lorries		Tractors		Others	
		Number	Capacity	Number	Capacity	Number	Capacity	Number	Capacity
1	City Corporation*	43	41	11	19	55	63	5	6
2	City Municipal Corporation	28	122	25	88	170	575	20	77
3	Town Municipal Corporation	1	6	14	50	129	412	12	26
4	Town Panchayat	5	44	4	18	99	280	25	317
	TOTAL	77	213	54	174	453	1330	62	425

Information Educational Communication Programme (IEC) for Solid Waste Management in the cities / towns of Karnataka

TERMS OF REFERENCE

OBJECTIVE:

To undertake a detailed IEC campaign, in Solid Waste Management to bring in awareness among citizens, bulk waste generators and agencies involved in handling of Municipal Solid Waste for a modernized and scientific system. The modernized SWM will have to be brought into practice in accordance with MSW Rules 2000.

SCOPE OF WORK AND STRATEGY:

Scope of Work	Strategy & Tasks to be performed	Target Group
<p>To promote MSW Rules and the Supreme Court judgment and put them into practice. It would mean to promote among citizens and bulk waste generators; Reduction in generation of SW Segregation of recyclable waste and Recycling of waste.</p> <p>Compliance with integrated waste management practice to be set up by the ULBs and its benefits. Participation in all components of the project through IEC. Awareness on proper use of SWM facility.</p>	<p>Distribution of campaign materials like flip chart brochures, posters, stickers etc. to target group. Showing audiovisual tapes and CDs, short films, street plays. Pursue with various media including cinema halls in public interest to create awareness Establishing necessary RWA and other supporting net works. Identifying resource persons from the target group (preferably institutions and media) and train them to propagate awareness to citizens and their institutional members</p>	<p>General public, commercial / trade bulk generators like various associations related to trade eg. restaurants, market etc., Educational institutions- primary, secondary, college, university and other institutions, Media Youth clubs, Mahila Mandals, Social clubs like Rotary Club, Lion Club, Round table club etc., RWAs and SHGs</p>
<p>To promote: A change in the mind set of the ULB staff with regard to service orientation and focus on customer satisfaction. Focus on role and responsibilities of the officials in SWM How to make use of manuals and materials. Focus on role of pourakarmikas on SWM starting from generation to disposal</p>	<p>Conducting workshops to staff of ULBs and training them using manuals and other IEC materials. Conducting orientation programme for pourakarmikas Conducting orientation programme for line department staff. Identifying resource person from ULB / any other local organisations and training them to propagate awareness amongst staff on continuous basis.</p>	<p>Municipal staff and officials of ULBs.</p>

Participation cooperation, civic sense and payment of user charges and cost recovery.	Establish two way communication mechanisms with stakeholders of the project such as citizens, the media, RWAs on one hand and the implementing agencies like ULBs on the other hand. Community level meetings Identifying resource persons from RWA or local organisations (College, School, Society) to propagate awareness amongst the citizens.	General Public, Commercial, trade & bulk generators.
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Details of activities to be carried out:

There is an increasing concern among the both waste generators and ULBs to provide a systematic approach for safe handling and disposal of municipal solid waste. The state has planned a scientific and modernized Solid Waste Management for all ULBs. In order to make the system sustainable and efficient, it is necessary to generate proper awareness to all concerned. Awareness among people is very low resulting in dumping of waste haphazardly which can be seen on streets, vacant lands, public places, drains etc.,

Under the IEC programme, the NGO will undertake the following:

Motivation, social mobilization and environment building for implementation of SWM.

Enhancing community participation in Solid Waste Management.

Communication activities including dissemination of communication materials to promote behavior change towards the environment and its cleanliness.

Establishing necessary RWA and other supporting networks

Strengthening the urban local bodies with appropriate training including:

Focus on role and responsibilities of the officials in SWM

How to use manuals and materials.

Focus on role of pourakarmikas on SWM starting from SW generation to disposal.

The NGOs should be oriented to reach the target population through CBOs, SHGs, Youth Clubs, Mahila Mandals, Educational Institutions etc., to encourage them for active participation in SWM. Certain social organizations like Rotary Club, Lions Club, Round Table etc., will also be involved in IEC activities.

The NGOs will co-ordinate implementation of the IEC on sustained basis, using local mass media such as newspapers, radio and community level meetings, involving government agencies, ULBs, local communities, NGOs and civil society organizations.

Duration : The IEC activity is proposed for 12 months duration.

Feed back:

NGO shall give the feedback periodically on the implementation of IEC activities for SWM.

Public cooperation in SWM to keep city clean & litter free.

Segregation/storage of waste at house hold level and dedicated primary collection system for bio degradable & recycling waste.

Disposal of house hold hazardous and inorganic waste.

Disposal from commercial area.

Public reaction / views for implementing the new system of SWM.

Cooperation & understanding of ULB employees in SWM activity.

Any other activity needs reporting.

Documentation of the IEC Activity:

NGO is expected to document the IEC activities carried out and submit monthly, quarterly and annual detailed report on the activities conducted by them. This shall include:

List of all activities carried out / proposed.

Expenditure / budget.

List of institutions / organizations / establishments / individual participation in dissemination of awareness programme along with details.

List of the activities and actions carried out to train and empower the employees of ULB.

Any other related activity.

The NGO is expected to have experience, reputation and contacts in the project areas. The NGO will report to the Commissioner/Chief Officer of the respective ULB.

All required communications materials such as manual, posters, leaflets, films etc., for supporting the IEC activities for SWM will be provided.

The NGO will prepare the following:

IEC programme within two weeks of signing of the contract.

Monthly and Quarterly reports.

Final Report within two months after completion of the project.

KUIDFC, The Directorate of Municipal Administration (DMA) and the Urban Local Bodies (ULBs) will make available copies of all studies, plans, reports, financial statements and progress reports as may be needed by the NGO for conducting the IEC programme.
