



**Ministry of Urban Development
Government of India**

**Advisory
on
Improving Municipal Solid Waste Management Services**

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1.0 Introduction

With fast pace of urbanization in the country, the Management of Solid Waste has posed a tough challenge to Municipal Authorities and Policy Makers at different levels in Government. At present, Urban India produces about 54.75 Million Tonnes of municipal solid waste annually i.e. 1.50 Lakh Tonnes Per Day (LTPD). Per capita waste generation in cities varies from 0.20 kg to 0.60 kg per day depending upon the size of population. The waste collection efficiency in India ranges between 70% and 90% in major Metro cities, whereas, in several smaller cities it is ranging between 50% to 70% or so.

Treatment of Municipal Solid Waste is virtually absent in many cities and towns except composting in a limited way in some cities. The main method of disposal of solid waste at present is by crude dumping in many cases. The cities resort to indiscriminate dumping of domestic, commercial, industrial and even medical wastes in low lying areas. This leads to contamination of surface and ground water by the leachate and also creates unhygienic condition in an around urban areas which are engines of growth. The unsightly condition in an around the cities also poses serious threat to health and well-being of people and often results in spread of diseases like dengue, malaria and plague etc.

2.0 Responsibility of Handling Municipal Solid Waste

As per the Constitution of India, Solid Waste Management is a state subject and it is the primary responsibility of state governments to ensure that appropriate solid waste management practices are introduced in all the cities and towns in the state. The role of Government of India is broadly to formulate policy guidelines and provide technical assistance to the states/cities whenever needed. It also assists the state governments and local bodies in human resource development and acts as an intermediary in mobilizing external assistance for implementation of solid waste management projects.

Though SWM is a State subject, it is basically a municipal function and as such urban local bodies are directly responsible for performing this important activity. The 74th amendment of the constitution also envisages the urban local bodies to shoulder this responsibility. The urban local bodies in the country are, therefore, responsible and required to plan, design, operate, and maintain the solid waste management system in their respective cities/towns.

The Ministry of Environment & Forests, Government of India have notified the Municipal Solid Waste (Management & Handling) Rules, 2000, for management of Municipal Solid Waste. The rules make it mandatory to treat the bio-degradable waste adopting composting or other state of the art technologies or

power generation, etc. with due authorization by the CPCB. It prohibits disposal of organic matter at the landfill and permits land filling of inert material only to reduce the burden on the landfill. The MSW rules has specific directives to the Local Bodies, District Administrations and the Urban Development Department of the State Governments to provide facilities for collection, transportation, treatment & disposal of municipal solid waste in a scientific and hygienic manner. Ministry of Environment & Forests is currently revising the MSW Rules, 2000.

Though solid waste management is an obligatory function of the urban local bodies, this service has been poorly performed by most of them resulting in problems of public health, sanitation, and environmental degradation. With rapid pace of urbanization, the situation is becoming more and more critical day-by-day. Infrastructure development is not in a position to keep pace with population growth owing to poor financial health of most of the urban local bodies. Lack of financial resources, institutional weakness, improper choice of technology, lack of public participation in solid waste management, non-involvement of private sector, etc., have made the service far from satisfactory. There is, therefore, a need to handle this problem in a concerted manner and adopt strategies to tackle all aspects of waste management scientifically involving private sector wherever necessary and possible. A policy framework is, therefore, necessary to guide and support the urban local bodies in the country for managing the solid waste scientifically and cost effectively.

3.0 Potential Risk to Environment and Public Health

There are potential risks to environment and health from improper handling of solid wastes. Direct health risks concern mainly the workers in this field, who need to be protected, as far as possible, from contact with wastes. There are also specific risks in handling wastes from hospitals and clinics. For the general public, the main risks to health are indirect and arise from the breeding of disease vectors, primarily flies and rats.

The most obvious environmental damage caused by municipal solid wastes is aesthetic, the ugliness of street litter and degradation of the urban environment and beauty of the city. More serious, however, and often unrecognised, is the transfer of pollution to water, ground water. Air pollution can be caused from the inefficient burning of wastes, either in open air, or in plants that lack effective treatment facilities from the gaseous effluents.

Uncontrolled hazardous wastes from industries mixing up with municipal wastes create potential risks to human health. Traffic accidents can result from toxic spilled wastes. There is specific danger of concentration of heavy metals in the food chain, a problem that illustrates the relationship between municipal solid

wastes and liquid industrial effluents containing heavy metals discharged to a drainage/sewerage system and/or open dumping sites of municipal solid wastes and the wastes discharged thereby maintains a vicious cycle.

Municipal Solid Waste Management System involves various activities like storage, collection, transportation, disposal etc. These activities even if properly controlled and with proper precautionary measures adopted, may have adverse impact on land, water and air environment, human and environmental health, aesthetics and quality of life.

4.0 Challenges in Municipal Solid Waste Management

- Absence of segregation of waste at source
- Lack of funds with ULBs for waste management
- Lack of technical expertise and appropriate institutional arrangement
- Unwillingness of ULBs to introduce proper collection, segregation, transportation and treatment / disposal systems perhaps because of incurring expenses in O&M.
- Unwillingness of ULBs to charge SWM charges
- Indifference of citizens towards waste management due to lack of awareness
- Lack of community participation towards waste management and hygienic conditions
- On social aspect, the presence of rag pickers is a blot on our society specially because of their involvement in picking up waste without using protective equipments.
- Lack of proper planning and indigenization of sophisticated waste processing facilities which result in closing down of plants thus shaking the confidence of others also.
- Lack of different models on Solid Waste Management suiting to different size of cities.
- Lack of enabling requirement for PPP in SWM
- Challenges to reduce land requirement in urban areas for sanitary landfill requirement.

Urban Local Bodies have been mandated to cover 100% collection, segregation, transportation, treatment & safe disposal of Municipal Solid Waste as per Municipal Solid Waste Rules, 2000. However, hardly any city comply with above legal requirements.

5.0 Principles of Municipal Solid Waste Management

Municipal Solid Waste Management involves the application of principle of Integrated Solid Waste management (ISWM) to municipal waste. ISWM is the application of suitable techniques, technologies and management programs covering all types of solid wastes from all sources to achieve the twin objectives of (a) waste reduction and (b) effective management of waste still produced after waste reduction.

6.0 Effective Management of Municipal Solid Waste

Rapid urbanization has resulted in over-stressing of urban infrastructure services including Municipal Solid Waste Services due to poor resources and inadequate capacity of the ULBs. Therefore, augmentation of Solid Waste Management (SWM) facilities and their Operation & Maintenance in a sustainable manner by the urban local bodies would not only require huge capital investment, but also introduction of latest and cost effective technologies, Public-Private Partnerships (PPP) in waste management and introduction of appropriate waste management practices in order to prevent urban waste from causing environmental pollution and health hazards.

To ensure better human health and safety, there is need for effective management solid waste systems. It should safeguard the public health and should be safe for the workers. Also, it should be both environmentally and economically sustainable. An environmentally and economically sustainable waste management is effective if it follows an integrated approach.

6.1 Functional elements of municipal solid waste management and the measures needed by local bodies

The activities associated with the management of municipal solid wastes from the point of generation to final disposal can be grouped into the six functional elements: (a) waste generation; (b) waste handling and sorting, storage, and processing at the source; (c) collection; (d) sorting, processing and transformation; (e) transfer and transport; and (f) disposal.

6.2 Waste generation

Municipal solid waste (MSW), also called Urban Solid Waste, and is a waste type that includes predominantly household waste (domestic waste) with sometimes the addition of commercial wastes, construction and demolition debris, sanitation residue, and waste from streets collected by a municipality within a given area. They are in either solid or semisolid form and generally

exclude industrial hazardous wastes. MSW can be broadly categorized into five broad categories as-

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

6.3 Storage of waste at source

Storage of waste at source is the first essential step of Solid Waste Management. Every household, shop and establishment generates solid waste on day to day basis. The waste should normally be stored at the source of waste generation till collected for its disposal. In India, such a habit has not been formed and in the absence of system of storage of waste at source, the waste is thrown on the streets, treating streets as receptacle of waste. If citizens show such apathy and keep on throwing waste on streets and expect that municipal sweepers should/ would clean the city, the cities will never remain clean. Even if local bodies make arrangements to remove all the waste disposed of by the citizens on the street on day to day basis, the city will remain clean only for two to three hours and not beyond till the habit of throwing waste on the streets is not changed. There is, therefore, a need to educate the people to store waste at source, dispose of the waste as per the directions of the local bodies and effectively participate in the activities of the local bodies to keep the cities clean.

For keeping streets and public places clean throughout the day, it is necessary that waste producers co-operate and effectively participate in the waste management efforts of local bodies. People, therefore, may be educated to form a habit of storing waste at source in their personal bin/bins and deposit such waste into the municipal system only, at specified time.

In order to encourage the citizens, municipal authority shall organize awareness programmes for segregation of wastes and shall promote recycling or reuse of segregated materials. The municipal authority shall undertake phased programme to ensure community participation in waste segregation. For this

purpose, regular meetings at quarterly intervals shall be arranged by the municipal authorities with representatives of local resident welfare associations and non- governmental organizations.

Urban local bodies must, therefore, take concerted measures to ensure that citizens do not throw any waste on the streets, footpaths, open spaces, drains or water bodies and instead store the waste at source of waste generation in two bins/ bags, one for food waste/ bio-degradable waste and another for recyclable waste such as papers, plastic, metal, glass, rags etc.

6.4 Storage of recyclable waste

It is essential to save the recyclable waste material from going to the waste processing and disposal sites and using up landfill space. Profitable use of such material could be made by salvaging it at source for recycling. This will save national resources and also save the cost and efforts to dispose of such wastes. This can be done by forming a habit of keeping recyclable waste material separate from food wastes, in a separate bag or a bin at the source of waste generation. This recyclable waste can be handed over to the waste collectors (rag pickers) at the doorstep.

Local bodies may mobilize voluntary organizations, Non-Governmental Organizations (NGOs) or co-operatives to take up the work of organizing street rag-pickers and elevate them to door step “waste collectors” by motivating them to stop picking up soiled and contaminated solid waste from streets, bins or disposal sites and instead improve their lot by collecting recyclable clean materials from the doorstep at regular intervals of time. Local bodies may, considering the important role of rag pickers in reducing the waste and the cost of transportation of such waste, even consider extending financial help to NGOs and co-operatives in providing some tools and equipment to the rag pickers for efficient performance of their work in the informal sector.

Local Bodies may actively associate resident associations, trade & Industry associations, Community Based Organizations (CBOs) and NGOs in creating awareness among the people to segregate recyclable material at source and hand it over to a designated waste collector identified by NGOs. The local body may give priority to the source segregation of recyclable wastes by shops and establishments and later concentrate on segregation at the household level.

The upgraded rag pickers on becoming doorstep waste-collectors, may be given an identity card by the NGOs organizing them so that they may have acceptability in society. The local body may notify such an arrangement made by the NGOs and advise the people to cooperate.

6.5 Primary collection of waste

In India, the system of primary collection of waste is practically non-existent, as the system of storage of waste at source is yet to be developed. Doorstep collection of waste from households, shops and establishments is insignificant and wherever it is introduced through private sweepers or departmentally, the system does not synchronize further with the facility of Waste Storage Depots and Transportation of Waste. The waste so stored is deposited on the streets or on the ground outside the dustbin. Thus streets are generally treated as receptacles of waste and the primary collection of waste is done, by and large, through street sweeping.

An appropriate system of primary collection of waste is to be so designed by the urban local bodies that it synchronizes with storage of waste at source as well as waste storage depots facility ensuring that the waste once collected reaches the processing or disposal site through a containerized system.

Local bodies should provide daily waste collection service to all households, shops and establishments for the collection of putrescible organic waste from the doorstep because of the hot climatic conditions in the country. This service must be regular and reliable. Recyclable material can be collected at longer regular intervals as may be convenient to the waste producer and the waste collector, as this waste does not normally decay and need not be collected daily. Domestic hazardous waste is produced occasionally. Such waste need not be collected from the doorstep. People could be advised or directed to deposit such waste in special bins kept in the city for disposal.

The waste collection efficiency in India ranges between 70 and 90% in major Metro cities, whereas in several smaller cities it is below 50%, whereas 100 percent in Kunming (China), 95 percent in Belo Horizonte (Brazil) and 99 percent in Quezon City (Philippines).

6.6 Street cleansing

The sweeping of streets is such a simple and humble occupation that it rarely attracts technical interest of the managers responsible for such activities. However, many cities spend between 30 to 50 percent of their solid waste budgets on street cleansing. It is a service for which a wide variety of tools, equipment and methods, both manual and mechanical, are available, and it is one in which there is often great scope for financial saving by the introducing of more efficient methods.

It has been estimated that the Urban Local Bodies (ULBs) spend about 60-70% of total expenditure on street sweeping, 20-30% on transportation, and less than 5% on final disposal of waste, which shows that hardly any attention is given to scientific disposal of waste. Inadequacy of transportation fleet, breakdown of the vehicles is the major hurdles in collection of garbage

This is an area in which public relations are very important. Much of the work arises directly from shortcomings in public behaviour, such as throwing litter on the streets and open spaces. In some cities, however, a high proportion of street wastes arise from deficiencies in the refuse collection service as a result of which residents dispose of domestic and shop-wastes in the streets. The cost of removing wastes which have been scattered on the streets is very much higher than the cost of collecting similar wastes which have been placed in containers such as domestic wastes bins or litter containers.

The main source of wastes is litter thrown by pedestrians and hose or shop-wastes swept or thrown out of private premises instead of being placed in the suitable container meant for the purpose. Human spittle and the excrement of domestic pets also fall into this category and together provide health risk, which arises from street wastes due to inhalation of dust contaminated by dried spittle and excrement.

Behavioural wastes are largely avoidable provided an efficient refuse collection service is in operation and litter bins are provided for the use of pedestrians. But success requires a continuing programme of **public education and awareness** backed up by **legislation** and rapidly **operating enforcement** procedures.

6.7 Waste storage depots

This is the third essential step for an appropriate Solid Waste Management System. All the waste collected through Primary Collection System, from the households, shops and establishments has to be taken to the processing or disposal site either directly necessitating a large fleet of vehicles and manpower or through cost effective systems which are designed to ensure that all the waste collected from the sources of waste generation is temporarily stored at a common place called "Waste Storage Depots" and then transported in bulk to the processing or disposal sites. Such temporary arrangement for storage of waste is popularly known as dust bin, Dhalavs, etc. This facility has to be so designed that the system synchronized with the system of primary collected as well as transportation of waste.

The solid waste collected from the doorsteps or from the community bins through the primary collection system needs to be unloaded and stored at convenient

places for its onward transportation in a cost-effective manner. Temporary waste storage depots which synchronize with primary collection and transportation system are, therefore, required to be located at suitable sites in lieu of open waste storage sites, and in replacement of cylindrical cement bins, masonry bins, Dhalavs, etc. In any case, manual handling of waste to be stopped or minimised to the extent feasible. Further, every precaution

7.0 Treatment and Disposal

Treatment of Municipal Solid Waste is almost absent in many cities and towns except composting in a limited way in some cities. The main method of disposal of solid waste is by crude dumping in about 94% of the cases. The cities resort to indiscriminate dumping of domestic, commercial, industrial and medical wastes in low lying areas. This leads to contamination of surface and ground water by the leachate.

7.1 Technology selection & trained manpower

Disposal is the final & most important step of the Solid waste management. The crucial aspect of this stage is the selection of proper disposal technology. The equipment and machinery used in the system are usually that which have been developed for general purpose or that which have been adopted from other industry. This results in over utilization of existing resources and lowering of the efficiency. Technology transfer in MSW is not as simple as it is in case of another sector. Solid waste characteristics and local conditions in any country if is different from country from where developed technology is borrowed then implementation issues may arise. Use of indigenous technology & machinery on the basis of the analysis of garbage should be adopted & promoted. Quantity and characteristics of the waste are the major factors, which decide technology to be used for waste disposal. On the basis of the waste quantity, infrastructure requirement can be estimated.

It is also necessary to carry out waste analysis frequently in order to assess the changes in waste characteristics due to ever-changing scenario. This data will also serve as a basis for up gradation or switching over to better disposal/treatment option. Availability of adequate trained man-force to implement the procedures of the adopted technology in a correct manner is another important aspect. Staff deployed by Local Administration to carry out waste disposal is most of the times not trained, motivated & efficient.

7.2 Technologies for processing & treatment of municipal solid waste

The main technological options available for processing and treatment of Municipal Solid Waste for Resource/Energy Recovery/ Disposal, are the following:

1. Composting
2. Vermi-composting
3. Anaerobic Digestion/Biomethanation
4. Incineration
5. Gasification/pyrolysis
6. Plasma Pyrolysis
7. Production of Refuse Derived Fuel (RDF)/Palletisation
8. Sanitary Landfilling/Landfill Gas Recovery

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

All these technologies are described in detail in the Technology Advisory Group Report on Municipal Solid Waste Management and the Manual on Solid Waste Management published by the MOUD. The advantages and disadvantages are given in the Technology Advisory Group Report on Municipal Solid Waste Management published by the Ministry.

7.3 Composting (wealth from waste)

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

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

Decomposition and stabilization of solid organic waste material has been taking place in nature ever since life appeared on this planet. Composting is the

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

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

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

7.4 Energy recovery from municipal solid waste

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

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

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

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

- (i) The total quantity of waste gets reduced by nearly 60% to over 90%, depending upon the waste composition and the adopted technology;
- (ii) Demand for land, which is already scarce in cities, for landfilling is reduced;
- (iii) The cost of transportation of waste to far-away landfill sites also gets reduced proportionately; and
- (iv) Net reduction in environmental pollution.

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

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

7.5 Incineration

The process of burning waste in large furnaces is known as incineration. Incineration is a disposal method that involves combustion of waste material. Incineration and other high temperature waste treatment systems are sometimes described as "thermal treatment". Incineration is carried out both on a small scale by individuals and on a large scale by industry. It is used to dispose of solid, liquid and gaseous waste. Incineration facilities generally do not require as much area as landfills. Waste-to-energy or energy-from-waste is broad terms for facilities that burn waste in a furnace or boiler to generate heat, steam and/or

electricity. At the end of the process all that is left behind is ash. This method produces heat that can be used as energy. Incinerators convert waste materials into heat, gas, steam, and ash. It is recognized as a practical method of disposing of certain hazardous waste materials (such as biological medical waste). Incineration of waste is a thermal process, which reduces the waste to 15-20 per cent. However, due to lower calorific value of waste, this process has not been fully exploited.

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

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

7.6 Sanitary land filling

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

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

materials that are impermeable such as plastics and clay, and are also built over impermeable soil.

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

8.0 Construction and Demolition Waste

Construction and demolition waste is generated whenever any construction/ demolition activity takes place, such as, building roads, bridges, fly over, subway, remodelling etc. It consists mostly of inert and non-biodegradable material such as concrete, plaster, metal, wood, plastics etc. A part of this waste comes to the municipal stream.

It is estimated that the construction industry in India generated about 10-12 million tons of waste annually. Projections for building material requirement of the housing sector indicate a shortage of aggregates to the extent of about 55,000 million cum. An additional 750 million cum. aggregates would be required for achieving the targets of the road sector. Recycling of aggregate material from construction and demolition waste may reduce the demand-supply gap in both these sectors.

While retrievable items such as bricks, wood, metal, tiles are recycled, the concrete and masonry waste, accounting for more than 50% of the waste from construction and demolition and activities, are not being currently recycled in India. Recycling of concrete and masonry waste it, however, being done abroad in countries like U.K., USA, France, Denmark, Germany and Japan.

Concrete and masonry waste can be recycled by sorting, crushing and sieving into recycled aggregate. This recycled aggregate can be used to make concrete

for road construction and building material. Normally two processes namely Dry Process and Wet process are used to get clean material for recycle and reuse.

8.1 Land requirement

The main constraint for the effective implementation of Municipal Solid Waste (Management & Handling) Rules, 2000 & setting up of waste processing facility for local bodies is non-availability of suitable land. Ideally dumping sites should be located at where there is, usually, no human population or at a safe distance from all human settlement. But the increase in the population of the city has forced people to settle near the dumping grounds. This leads to problems like people living in unhealthy conditions and protesting for the closure of the dumping grounds, as dumping causes health hazards for the people in the vicinity. Increasing population generates large amount of waste, which need the large patch of land for its proper disposal. But with increasing urbanization, land available for dumping and creation of landfill sites for disposal of waste is becoming difficult especially for metro cities. It is desirable that adequate land be earmarked at the planning stage itself for solid waste disposal. Dumping site has the definite life span, so appropriate alternative should be envisaged at planning stage only. Also, site selection must be carried out meticulously in consultation with CPCB/SPCBs, as the case may be, to avoid any difficulty in implementation and running of facilities later on.

8.2 Law enforcement

The Ministry of Environment and Forest has notified the Municipal Solid Waste (Management & Handling) Rule, 2000 under the Environment (Protection) Act, 1986 to manage the Municipal Solid Waste (MSW) generated in the country. According to this rule there is specific provision for Collection, Segregation, Storage, Transportation processing and Disposal of MSW & it apply to all Municipal authorities. Under the Management of Municipal Solid Waste section, it is stated that any municipal solid waste generated in a city or town, should be managed & handled in accordance with the compliance criteria and the procedure laid down in Schedule-II of the rule.

Solid Waste Management is a vital, ongoing and large public service system, Municipal agencies will have to plan and execute the system in keeping with the increasing urban areas and population. Community participation is essential for smooth and efficient operation of SWM system, which lack in current scenario. The financial constraints, institutional problems within the departments, fragile links with other concerned agencies, lack of suitable staff, and other allied problems prevent the urban local bodies from delivering and maintaining an

efficient waste management system. Sometimes provisions of the law are not implemented due to one or other reasons.

9.0 Government of India Initiatives

Looking at the pathetic situation of solid waste management practices being adopted by urban local bodies in the country and lack of action plan to solve the problem, and to provide technical & financial assistance to the urban local bodies in management of municipal solid waste in a scientific and hygienic manner, Government of India has taken a number of initiatives to address the problem.

- The Ministry of Urban Development has published the Manual on Municipal Solid Waste Management in May, 2000 to assist ULBs in management of municipal solid waste. The Manual provides detailed guidelines / methodology for planning, designing, executing and operation & maintenance of solid waste management schemes. It also provides comprehensive guidelines for processing, treatment and disposal and resource recovery (compost/energy) from municipal waste. The Manual has been uploaded in the Ministry's website (www.moud.gov.in) under policies sub-head.
- Pursuant to the recommendations of the Committee on Solid Waste Management for Class-I cities constituted by the Hon'ble Supreme Court of India, Ministry of Urban Development constituted a Technology Advisory Group on Solid Waste Management in August, 1999. The report principally covers the details of various technologies available within and outside the country for the treatment of municipal solid waste and deriving compost, RDF, power, etc. from the waste, their merits, demerits, their limitations, etc. It also narrates the extent of application of these technologies in India so far. The report also deals with Government of India's initiatives and schemes supporting the solid waste management services, financial aspects giving details of sectoral lending by financial institutions, the extent of private sector participation attempted, the legal issues related to private sector participation in India and makes recommendations of fiscal incentives for SWM infrastructure financing by the state and central governments as well as makes recommendations for central and State Governments as well as urban local bodies. The report also spells out the strategies proposed to be adopted for building community awareness and insight in finding financial resources and the manner in which they could involve private sector to take over part of their burden of improving SWM services. It will also help them in designing public awareness campaign and internal capacity building programs. The Committee finalized its report and the Ministry has published the same in

May, 2005 and circulated the same to all states /UTs for reference. The report has been uploaded in the Ministry's website (www.moud.gov.in).

- Pursuant to the directions of the Hon'ble Supreme Court of India, Ministry of Urban Development had set up a Task Force in March, 2003 to prepare policy, strategy and action plan for promoting "Integrated Plant Nutrient Management using City Compost" along with chemical fertilizers in the area of agriculture, horticulture, plantation crops, forestry, and create market demand & supply mechanism for city compost within 50 km radius of all urban local bodies and their compost plants. The report has been finalized by the Committee and accepted by the Supreme Court of India in September, 2006 with a direction to follow the recommendations of the Committee. The report has been circulated to all states /UTs for reference. The report has been uploaded in the Ministry's website (www.moud.gov.in).
- Ministry of Urban Development formulated and forwarded a scheme to 12th Finance Commission requesting them for devolution of funds to the tune of Rs.24455.50 million for solid waste management in 423 class – I cities. The 12th Finance Commission has accordingly recommended devolution of Rs.25000.00 million over a period of 5 years starting from 1st April, 2005 to 31st March, 2010 for providing appropriate collection & transportation systems, compost plants and sanitary landfill for solid waste management in 423 Class-I cities and state capitals as per 2001 Census.
- High powered committee report on Urban Infrastructure and Services report estimated investment for solid waste management sector of Urban Infrastructure for the 20 years period from 2012 to 2031 amount to Rs. 48.58 thousand crore at 2009-10 prices.
- The Ministry has also launched two programmes i.e. Jawaharlal Nehru National Urban Renewal Mission (JNNURM) and Urban Infrastructure Development Scheme for Small & Medium Towns (UIDSSMT) with a view to provide infrastructure facilities in all the urban areas of the country including solid waste management projects with a reform oriented agenda. The solid waste management projects are approved with integrated approach that includes segregation at source, collection, transportation, processing & treatment and disposal of municipal solid waste. The composting is being adopted for treating bio-degradable waste and sanitary landfill has been approved for disposing inert and rejects etc. Refuse Derived pellets (RDF) plants are also allowed in some of the projects to use pellets as fuel.

- Under the Central Sector Scheme of "Solid Waste Management and Drainage in 10 Selected IAF Airfield Towns" launched by the Ministry, integrated Solid Waste Management projects including compost plants for converting garbage into organic fertilizers have been approved in 10 all airfield towns. Out of 10 solid waste management projects, 8 projects for towns namely, Sirsa, Jodhpur, Gwalior, Tezpur, Adampur, Ambala Tezpur and Pune have been completed and the remaining 2 projects for the towns, namely, Hindon, and Bareilly, are at different stages of implementation.
- Ministry of Non-Conventional Energy Sources is the nodal Ministry for assisting waste to energy projects.
- Ministry of Health & Family Welfare is administering the subject of bio-medical waste management.

10 Managing Municipal Solid Waste: Way Forward

Due to the present consumeristic lifestyle, waste generation is on the increase. For better management of solid waste, periodic review of every steps involved in waste management like generation, collection, disposal etc. should be conducted. Best practices for waste management can be achieved by well known '3Rs' principle (Reduce, Reuse, Recycle).

Each State Govt. may pass Sanitation Act and Solid Waste Management Rules/Act for effective sanitation and solid waste management in the State. The Govt. of Goa has passed a Sanitation Act in 2008 and Solid Waste Management Rules in 2010 for management of sanitation and solid waste in the State. Further, each municipality may implement levy user charges and/ or solid waste management tax (either clubbed with property tax or separately) to meet the O&M and part of capital cost of solid waste management services.

10.1 Waste management practices

Three Rs (3Rs) classify waste management strategies according to their desirability in terms of waste minimization. These "3 Rs" are the foundation of most waste minimization strategies. The aim of this is to extract the maximum practical benefits from products and to generate the minimum amount of waste.

Reduce:

- The most uncontrollable phase in Solid waste management is 'Waste generation'. Generated solid waste particularly from Non-point sources is

always a challenge for local administration, so best practice is to reduce the generation of Solid waste.

- The reduction of waste can happen only when everybody reduces waste generation in the first place.
- Every individual has to contribute in doing so. There is urgent need of public awareness about waste generation. There should be awareness at all levels of Society, which will motivate them to change their casual habits which creates waste.
- Public- Private Partnership should be engaged in this awareness activity.
- Definite Point Sources of waste generation like Hotels, Restaurant, and Shopping Complexes etc. should contribute their space for disposal in their area itself, which ultimately reduces the burden of Collection.
- For Public Gatherings and Events organised in public places for any reason (including for processions, exhibitions, circuses, fairs, political rallies, commercial, religious, sociocultural events, protests and demonstrations, etc.), it will be the responsibility of the Organiser of the event or gathering to ensure the cleanliness of that area.

Reuse:

- Utilization value of any item should be known to people who are using it.
- NGOs working for under privilege society should work for establishing centres which provide goods for secondary use. Such centres can be set up at the source.
- Private sector involvement should be encouraged, repairing facilities should be offered so goods can be used as per its utilization value. NGOs, Self -help group etc. can organize workshop, seminars which encourage people to use waste material to create some decorative articles.

Recycle:

- The process of transforming materials into secondary resources for manufacturing new products is known as Recycling.
- Waste recycling leads to less utilization of raw materials, saves on landfill space, reduces the amount of energy required to manufacture new products. In fact recycling can prevent the creation of waste at the source.
- Promoting/motivating citizens to start segregation of waste at source involving NGO's, co-operatives, private, Commercial & industrial sectors for appropriate mass awareness campaigns
- Source separation: by keeping recyclables and organics waste separate at source, i.e., at the point of generation facilitate reuse, recycling, and composting.

- Segregate the waste in the house -keep two garbage bins and see to it that the biodegradable and the non-biodegradable is put into separate bins and dispose-off separately. Biodegradable waste can be recycled.
- Dry waste consisting of cans, aluminium foils, plastics, metal, glass, and paper could be recycled.
- There should be recycling plant at local level.

10.2 Decentralized waste management system

Over a period of time, it has been realized that the real solution to the menace of MSW in India by providing De-centralized Municipal Solid Waste Management facilitates near the origin of waste generation.

Once decentralized waste recycling becomes a mass movement, it would reduce burden on Municipal authorities to transport and manage waste at disposal sites. Further, waste generating communities will realize need for effective segregation in order to make composting & recycling efficient & cost-effective. This would eventually promote the concept of community based "Pay & Use" facility and offer livelihood opportunity for urban poor through waste recycling services with better accountability to resident beneficiaries.

The Bulk Waste Generators accounts for about 40% of total MSW generated in India. The micro measure by all those falling under bulk waste generator category, by adopting "at source composting" or "community based composting" would have significant macro impact in reducing carbon foot prints from organic waste generated as also transported to waste disposal sites.

Some of progressive ULBs / State Govts. have raised the compliance norms to include "**at source composting**" or "**community based composting**" using organic waste converter for composting of organic waste and reduce ill-effects of garbage. Such initiatives will have visible impact with appropriate incentives / disincentives from ULBs & State Pollution Control Boards.

Further, some state govt. offers capital subsidy for setting up Decentralized Biogas Plants which indeed is a progressive policy initiatives by State Govt. in order to encourage **innovation on decentralized waste recycling solutions**,

De-centralized Waste Management is the only sustainable solution to the menace of garbage in the country. De-centralized Waste Management is a process of segregating the waste at source into dry and wet waste, treating the wet waste using simple composting methods at the source of generation while recycling the inorganic waste such as paper, plastic, glass and metal. Since the

waste is segregated at source, the cost of collection is completely eliminated and better value is recovered by treating or recycling various components of waste.

Advantages of De-centralized Waste Management

Following are the major advantages of De-centralized Waste Management

- Better and more effective segregation of Waste at Source
- Elimination of transportation of waste over long distances
- Better value of compost produced by treating organic waste at source of generation
- Better value recovery from recyclables
- Higher onus on the community and hence better community participation
- More respectable and remunerative employment opportunities to rag pickers and urban poor
- Facilitate better and efficient management of waste at a local level

Areas of Application of De-centralized Waste Management

De-centralized Waste Management finds its application in practically all generators of waste such as residential communities, commercial establishments such as large industries, IT companies, hotels and hospitals, multi utility complexes such as malls and IT Parks, large vegetable markets, slaughter houses and large agriculture produce markets. Some waste processing systems appropriate to decentralized waste management are given below which can be considered on case to case basis considering its suitability in local conditions.

- (i) Organic Waste Converter (OWC) technology is one such option to solve the problem of garbage treatment at the source of generation. The OWC has a capacity to convert between 100 kg/day to 20,000 kg/day of organic waste into rich compost. The OWC is based on the technology of accelerated bio-mechanical composting. The segregated organic waste is put in the OWC machine along with bio culture Bioculum and an absorbent such as recycled manure or sawdust to produce homogenized material which later is converted into the compost in due course of time.
- (ii) BARC has developed the 'Nisarguna' technology for processing the bio-degradable waste. This technology is based on the process of bio-methanisation and has been used in around 160 projects. It was stated that the technology is best suited for decentralized management of bio-degradable municipal solid waste. This technology can be used to set up waste management plants of processing capacity 1MT to 20MT of waste

per day. The land required for processing around 5MT of waste is around 500 sq.m.

10.3 Financial management

Municipal agencies have to manage various civic services. The number of activities managed by these agencies increase with the size of city. It is observed that smaller towns where the main activity is Solid Waste Management spend up to 70% of their budget on Solid Waste Management. Metropolitan cities on the other hand due to wider resources base and responsibility of provision of larger number of services spend only around 10% of their budget on Solid Waste Management. A majority of urban centres however spend 5-40% of their budget on Solid Waste Management. This is approximately Rs.50-250 per capita per year. It is observed that a large proportion on this expenditure is incurred on salaries and only a limited amount is spent on Operation & Maintenance (O&M) and development works.

Shortage of funds is one main barrier for achieving a proper MSW Management. Due to this lack of efficiency is evident at all stages of SWM i.e. collection, transportation, treatment and disposal. Due to lack of funds local bodies fail to set up adequate number of composting or other disposal plants of different capacities which will reduce organic load to sanitary landfills and also the GHG emissions from landfills. Available funds are not utilized in efficient manner. More expenditure is incurred on waste collection & transportation than disposal. Funds must be allocated to analyse the collected waste, dominating area of particular waste type. According to type of waste & quantity of waste generated, if decentralized disposal facilities are provided, it will definitely reduce the burden on landfills as well as overall expenditure required.

The present solid waste cleansing tax is charged as a percentage of property tax. It is observed that this proportion cannot be raised further due to legal restrictions. The revision of property tax is also carried out only infrequently. It is hence desirable to provide for levying of an additional dedicated tariff for solid waste services. It should be based on the frequency of service, volume/ weight of the waste or combination of both or on family basis.

Separate structure of tariff will have to be specified for community bin system and for house to house collection system. It should also lay down the method of charging and recovery of charges for transportation of acceptable industrial solid waste and demolition waste. There should be a provision for revision of the rates at specific intervals. For specific identified occupations, contracting out of work should be considered. However, such contracts should be appropriately framed within built monitoring and penalty mechanisms.

10.4 Public-Private-Partnership (PPP) in municipal solid waste

There is ample scope for involving Public-Private-Partnership (PPP) in Municipal Solid Waste Management. This may be considered in the areas of door-to-door collection, transportation, setting-up and Operation & Maintenance of waste treatment plants, waste-to-energy plants and sanitary landfills. The PPP may also be roped in the implementation of integrated municipal solid waste management project from door-to-door collection upto safe disposal of municipal solid waste.

The Private Entrepreneur within the country as well as from abroad could be encouraged, by giving suitable incentives, by way of long-term contracts, assured supply of garbage at the plants site, long-term lease of land at nominal rates, payment of tipping fees by local bodies for disposal of waste etc. For successful private sector participation in the waste management sector, there is a need for amendments in the municipal bye-laws, suitable regulatory framework and pilot projects to demonstrate the proven technologies.

10.5 Financial viability of the project

Operating Revenue

For solid waste systems, it is essential that the operating and maintenance costs be carefully assessed for any project. SW collection equipment is relatively short-lived and operating and maintenance costs are substantial. Operations and maintenance costs may be obtained from two sources: current general revenues (dependent upon the resources base of the ULB) and SWM operating revenue (essentially user charges).

Tax financing

Traditionally funding for solid waste systems comes from the general fund. Most ULBs use a percentage of the property tax to support the solid waste management system. This tax, known as conservancy tax, is easy to administer since no separate billing or collection system is needed. However, the disadvantage is that in most Indian cities assessment and collection of property tax is poor and this poor base provides for very little income. Further, such tax financing is completely divorced from income and expenditure of service and provides no incentive to local bodies to instituted efficiencies. Bangalore proposes to introduce a sanitary tax and has moved a bill to this effect.

User charges

User charges can be an equitable means of funding SWM services if properly administered. These are an excellent means of placing explicit costs on each household's contribution to the waste stream. Further, these may be used as an incentive to reduce waste generation and encourage recycling, especially if structured so that those who pollute more pay more. Increased public awareness of solid waste issues and public involvement in decision-making process may provide the opportunity to adjust user charges to reflect real costs of providing solid waste services. User fee can be assessed at a uniform or variable rate, depending on the amount and kind of service provided.

Cities are increasingly proposing to introduce user charges, for example Vijayawada (Hyderabad) and Gandhinagar (Gujarat) propose to establish user charges for all category of user. Mumbai has introduced establishment charges for commercial outfits as a first step and though the implementation and collection of the same is weak at this point, the city proposes to improve the same as also extend user charge to other categories.

Primary problems with user charges are billing, difficulties in administration, and the fact that if they truly reflect costs; they may be too high for low income or fixed income persons and may lead to littering/open dumping.

In large cities the NGOs are coming forward to organise rag-pickers and introduce through them house-to-house collection of waste by charging a monthly fee ranging from Rs. 10 to Rs. 25. At some places it is given Rs. 40 per month. This information arrangement is working quite satisfactorily at many places and reduces the burden of the urban local body. This system needs to be encouraged and NGOs may be promoted to take up such activities. Resident welfare associations are also being involved in primary collection of waste by giving incentives to them. This has worked very well in the city of Ludhiana where 65% of the city waste is being managed by the resident welfare associations.

Similarly, provision of adequate user charges of beneficiaries/ Tipping Fee/ Gate Fee, as the case may be, may be made and levied to ensure that the systems work efficiently. It should be sufficient not only to meet operating cost but also sufficient to replace the aging assets as and when needed.

Fines (administration charges)

The SWM income for Mumbai shows income from administration charges. These charges are essentially fines imposed for dumping/littering of waste.

Revenue form recovery programmes

Waste recycling, composting, waste-to-energy, and methane gas recovery programmes may generate operating revenues. Such programmes provide direct paybacks in terms of tangible financial benefits associated with recovered materials and conserved energy, and additional benefits due to avoided costs of land filling. Further these help increase the life of landfill facility. In India, waste composting facilities are beginning to see much success. Many such facilities have been set up under joint initiatives by local governments and private sector. Waste-to Energy projects are also beginning to draw the attention of local governments.

Disposal site fees

Typically Indian cities resort to open dumping of waste and sanitary landfills are conspicuous by their absence. It is only in the few years that waste recovery facilities (composting, waste-to-energy) have begun to emerge. However, at the end of such treatment there still remains waste has to be disposed in a sanitary landfill. At present no city in India charges a disposal site fee such as tipping fee etc. Typically such fee is charged based upon the quantity of waste dumped for landfill at the disposal site. Such fee must be designed to reflect operating costs, especially the costs of environmental control as, closure, post closure maintenance and liability. Fees calculation may also depend on the type of refuse received.

Expenditure

Operating expenditure

Solid waste management may constitute upto 20 to 50 percent of municipal budget expenditure. The main expenditure heads under SWM are as follows: salaries and wages, consumables, vehicles repair, contingencies and others.

Salaries and wages

As much as 30 to 50 percent of municipal staff in a local body may be engaged in SWM activities. Most of this staff is engaged in waste collection and transportation. A recent survey by the National Institute of Urban Affairs shows “salaries and wages” for SWM in Class-I cities, may constitute as much as 75 percent of total SWM expenditure. This is still higher at 85 percent in Class-II cities.

Capital investments

Typically, in Indian cities, capital fund allocations for SWM are made on an as and when required basis. Further, interagency coordination and city level planning with related budget estimates, is usually absent in most local bodies. This leads to reduced efficiency in capital spending. As a result systems are not always synchronized and there have been instances where money has been ill spent on mismatched equipment.

Current general revenue capital financing

Typically capital costs for SWM in India are met from the current revenue and borrowings, with allocations being made on an as and when required basis. Such use of current revenues for capital financing essentially depends on the local body's resource base. Capital investments may be for: equipment, vehicles, treatment and disposal facilities.

Borrowing - municipal bonds, bank/ FI loans, leasing

Borrowings are another source of capital financing. Cities are increasing beginning to access the capital market by issuing municipal bonds. Though no city has used such borrowing for SWM projects so far, this remains a potential source for capital financing. Cities borrow from financial institutions such as HUDCO, for financing equipment and vehicles.

Private financing

Over the recent years the country has seen an increased role of the private sector in financing resource recovery (composting, waste-to-energy) facilities. As many as 35 composting facilities have been set up in the country with Private Sector Participation, over the past five years prior to launching of JNNURM. Private sector funding is a potential source for the sector. It is also need of hour to develop bankable projects on solid waste management and involve private sector also for managing the city waste.

Grant funding

Grant funding has been used in a number of cities for financing procurement of equipment and vehicles for SWM. However such funding had limited impact, since interagency coordination and city level planning is absent in most local bodies, and in cases such money has been ill spent on mismatched equipment. Grant funding must be linked to development of city plans for SWM to better utilize the same. Further the donor must monitor such expenditures. Further, in

addition to equipment compatibility, local bodies must also ensure ease of replacement upon end to useful life of equipment.

- State and Regional Programme Management and Coordination (Regionalisation)

Regionalisation/ resource pooling is another potential source for capital financing. Under this arrangement local bodies may come together to: develop/ construct common facilities, to access capital market to raise financing for such projects, or conduct waste characterization studies etc. This helps distribute costs. Resource pooling may also enhance the cost-effectiveness of recycling and recovery efforts. Such arrangements may be applicable in suburbs of cities such as Mumbai etc. where land is at a premium and there is direct advantage in developing common treatment and disposal facilities.

In the year 2000 the Vijayawada Municipal Corporation tied up with an entrepreneur for setting up a waste palletisation project on a BOO basis.

10.6 Awareness generation

Community participation

Community is in the centre of all the activities, yet it is ignored by the decision makers and made to merely wait and watch and ultimately what people get in hand is what they do not want or what is not in their priority. This creates a void between the administrators and those administered and an atmosphere of apathy is created which distances people from government initiatives.

Littering and poor collection, segregation, processing and disposal of municipal solid waste remains everywhere in most of the cities of the country which is not only due to financial constraints and inadequate capacity of these ULBs to manage the municipal solid waste generated from the cities as per MSW Rules, 2000 but also due to lack of public awareness as well as due to lack of sufficient land for disposal of waste in a scientific and hygienic manner. Public awareness, effective community participation, transparent and clean administration, introduction of citizen charters and accountability at all levels can only bridge this gap.

Solid Waste Management (SWM) is one such activity, where public participation is key to success. The local body can never be successful in Solid Waste Management without active community participation, whatever may be the investments made from the municipal or Government funds. The local bodies are the institutions of grass root democracy having elected members representing a small group of electorate. It also has an outreach service at the ward level

through which it can easily interact with the people on almost all-important issues. The local body should therefore, seriously consider involving community in all programmes through a consultative process and variety of other communication approaches dealt with in this chapter later and adopt the strategy which has the acceptance of the community.

11.0 Management Information System

Good Municipal Solid Waste management practices is the key to keep a city clean. This requires collection of critical information which is not just for keeping the records up-to-date but used effectively for taking corrective measures as well as proper planning for future. Some information is, therefore, required to be collected to have an overall idea of the prevalent situation, deficiency in the system and likely requirements of the further information which would could highlight deficiencies in the system on day-to-day basis and could be used for taking corrective measures has to be collected at regular intervals to monitor the services. Computerisation of such information helps at all the levels of administration to work not harder but smarter, increases the level of job satisfaction, and also to establish strong and reliable information data base necessary to facilitate the decision making and monitoring process for management.

With the advancement of information technology, Geographic Information System (GIS) could be introduced in large cities and integrated with Management Information System. Similarly, there is a need for a citizen interface to seek comments, suggestions etc., in respect of utility services.

12.0 Toolkit and Advisory for Municipal Solid Waste Management

The Ministry has brought out toolkit/report and service level benchmarks on municipal solid waste management to improve the sector which may also be referred are as under:

- Municipal Finance Improvement Programme: A primer for Accessing Institutional Finance
- Toolkit for Solid Waste Management, JNNURM
- Handbook of Service Level Benchmarking
- Some of the Advisories earlier forwarded to States by the Ministry alongwith some good practices on collection, transportation, treatment and disposal for improving solid waste management in their States/ULBs (Annexed).

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Dear Shri

You are aware that rapid urbanization and industrialization in India has resulted in over-stressing of urban infrastructure services including Municipal Solid Waste Services. Due to budgetary constraints, lack of equipment and planning, the house-to-house collection, transportation, treatment and disposal of municipal solid waste in most of the Urban Local Bodies (ULBs) are very poor. The wastes are strewn all over the streets & drains and the cities resort to indiscriminate dumping of domestic, commercial, industrial and hospital wastes in low lying areas. This leads to deterioration of the city environment and contamination of surface and ground water. There are some cities where even finding landfill sites are increasingly becoming difficult due to fast urbanisation and citizens not wanting such sites close to their habitations.

As per the Municipal Solid Waste (Management & Handling) Rules, 2000 every municipal authority is responsible for collection, segregation, storage, transportation, processing and disposal of municipal solid wastes. The deadline for implementation of Rules was December 2003, but hardly any ULB could implement these rules in letter and spirit.

Looking at the pathetic situation of solid waste management practices being adopted by urban local bodies in the country and lack of action plan to solve the problem and to provide technical and financial assistance to the urban local bodies in management of municipal solid waste in a scientific and hygienic manner, Government of India has undertaken several initiatives to address the problem. However, much larger coordination and initiatives are needed to be taken by the concerned ULBs, especially the Class-I Cities, which have more than two-third of urban population, so that the municipal solid waste is handled properly in order to reduce the pollution and contamination in the urban environment and to improve the health and well-being of the community.

You may be aware that the Ministry (Central Public Health Environment Engineering Organization) has brought out the Manual on Municipal Solid Waste Management in May 2000, which is a guidebook for planning, design and implementation of solid waste management facilities in the cities and towns. The manual inter-alia gives an account of the typical urban waste in India such as, per capita generation of waste, its composition, physical and chemical characteristics, collection efficiency, transportation, processing and disposal of the wastes.

You may be also aware that the Ministry constituted the 'Technology Advisory Group' in August 1999 and it submitted its report in May 2005. This report gives information relating to various proven technologies on waste processing / treatment, waste handling equipment and vehicles, financial resources, sectoral lending by financial institutions and potential for private sector participation in this endeavor. The report also highlights the support rendered by the Central and State Govts. to the ULBs in capacity building, R&D and the role of NGOs, CBOs and public in the management of urban wastes.

Pursuant to the affidavit filed by the Union Of India In the Honourable Supreme Court of India in February 2003, the Ministry also constituted the 'Inter-Ministerial Task Force on 'Integrated Plant Nutrient Management using City Compost' to prepare a policy, strategy and action plan for promoting 'Integrated Plant Nutrient Management using City Compost' along with synthetic fertilizers in the areas of agriculture, horticulture and plantation crops etc. The task force has given its report in which many valuable recommendations have been made. The recommendations include action points pertaining to various Central Ministries, State Govts., ULBs, chemical fertilizer companies, role of the private entrepreneurs, funds required in setting of compost plants, quality of the organic fertilizers/ compost, design of compost plants of different sizes etc. the recommendations have been accepted by the Supreme Court and they have desired that all the stakeholders should implement these recommendations in toto.

All the aforesaid manual, TAG Report and the Task Force reports have been uploaded in the Ministry's web-site, viz. www.urbanindia.nic.in for wide publicity and usage.

Just like matter is indestructible, the municipal solid waste is not really a waste, but it can be transformed into other forms of wealth. The waste needs to be properly segregated into organic and inorganic components at source/ household level. The organic portion consisting of paper, plastic, rubber etc. can be recycled; the remaining wet waste can be subjected into useful compost which can be used as soil conditioner in the gardens, etc. the inorganic portion having metals, glass etc can be recovered and recycled. The bulky and heavy building material and debris can be separately collected and used in the low lying areas or to cover the landfills. Some of the ULBs have adopted some good practices in source segregation, collection etc. details of which are given at Annex-I. Likewise, transportation of solid waste also has been effectively managed by some of the ULBs with the involvement of private contractors, who has brought in efficiency and economy in management of solid waste. The details are at Annex-II.

Treatment of Municipal Solid Waste is almost absent in many cities and towns except composting in a limited way in some cities. The main method of disposal of solid waste is by crude dumping in about 94% of the cases. The cities resort to indiscriminate dumping of domestic, commercial, industrial and medical wastes in low lying areas. This leads to contamination of surface and ground water by the leachate.

The problem of urban waste management is significant, not only because of large quantities involved, but also its spatial spread across 5161 cities and towns and enormity and variety of problems involved in setting up and managing systems for collection, transportation and disposal of waste.

Therefore, it is enjoined upon the ULBs to implement Solid Waste (Management & Handling) Rules, 2000 for management of municipal solid waste. The deadline for implementation of Rules was December 2003, but hardly any ULB could implement these rules in letter and spirit (these rules are under revision at present by the Ministry of Environment and Forests).

Information received from Central Pollution Control Board (CPCB, M/o Environment & Forests) reveals that:

- (i) Local bodies in States have taken initiatives to organize waste collection, segregation, storage and transportation.
- (ii) Regarding setting up of waste disposal (landfilling) facilities, landfills have been constructed in 38 towns, is under construction in two towns and 20 States have taken initiatives to set up such facilities in 90 towns. In 23 States, ULBs have identified the sites for landfilling
- (iii) Several ULBs have established waste processing particularly composting facilities and many more are in process of doing so.
- (iv) State Pollution Control Boards (SPCBs) have made efforts to undertake monitoring of standards for waste processing and disposal facilities including those for ground water and ambient air. SPCBs of Andhra Pradesh, Chhattisgarh, Delhi, Gujarat, Karnataka, Tamil Nadu, Maharashtra, Punjab, Orissa, Assam and Kerala have indicated for undertaking /planning for monitoring studies.
- (v) CPCB has also undertaken studies on assessment of ground water quality around a few landfill sites through National Environmental Engineering Research Institute (NEERI). Studies have been executed at Kolkata, Delhi, Chennai, Jammu, Srinagar, Thiruvananthapuram, Coimbatore, Kochi and Hyderabad
- (vi) As per the compliance report of MSW Rules furnished by CPCB, door-to-door collection is being carried out in some zones of Delhi. The Municipal Corporation of Delhi (MCD) has already implemented transportation of the MSW through private concessionaires in six zone of MCD, namely, Central, South, West, West, S.P. and City. Now, the MCD is likely to implement the door-to-door collection of waste in various parts of Delhi in phased manner. In first phase EOI is likely be called for Civil Line Zone and Rohini Zone, Dwarka, Vasant vihar, ward No.164, 165 of South Zone. Thus the city shall be free from dust bins/dhalao.

Some of the major issues concerning waste management are:

- (a) Absence of segregation of waste at source
- (b) Lack of funds with ULBs for waste management
- (c) Lack of technical expertise and appropriate institutional arrangement
- (d) Unwillingness of ULBs to introduce proper collection, segregation, transportation and treatment / disposal systems
- (e) Indifference of citizens towards waste management due to lack of awareness
- (f) Lack of community participation towards waste management and hygienic conditions

The following are the possible waste management options:

At least 50% to 55% of municipal solid waste is a valuable resource, which can be recovered profitably using different technologies through following processing options:

- o Recyclable materials like paper, cardboards, plastics, polythene bags, pieces of metals and glass are recycled to recover useful resource.
- o The Organic fraction of municipal solid waste contains bio-degradable matter ranging from 30% to 55%, which can be profitably converted into useful products like compost (organic manure), methane gas (used for cooking, heating, lighting, production of energy) etc. through the following processes:-

(a) Waste to Compost

- (i) Aerobic / Anaerobic Composting
- (ii) Vermi-Composting

(b) Waste to Energy

- (i) Refuse Derived Fuel (RDF) / Pelletization
- (ii) Bio-methanation
- (iii) Incineration (but difficult due to low calorific value and high moisture)
- (iv) Pyrolysis / Plasma Gasification (energy intensive)

- o Rejects from compost plants, recycling and other inorganic materials like construction debris in Municipal Solid Waste are sent to scientifically engineered landfills.

However, the success of the above mentioned options largely depends on segregation of waste at source.

Some of the ULBs have adopted a few good practices for treatment and disposal and awareness campaign including PPP arrangement, the details are given at **Annex-III**

The Ministry of Urban Development on its part has made unstinted efforts to persuade the States and ULBs for effective solid waste management in urban areas. Under the Urban Infrastructure and Governance (UIG) component of the Jawaharlal Nehru Urban Renewal Mission (JNNURM), so far 31 projects for SWM for 30 cities have been sanctioned at a total cost of Rs.2123.96 crore and Additional Central Assistance (ACA) to the tune of Rs.762.83 crore has been released for the sanctioned schemes. List of these projects is enclosed at **Annex-IV**. The Ministry has also formulated and circulated Service Level Benchmarks in water supply and sanitation sector including SWM for guidance and adoption which has been circulated vide D.O. No. N-11025/33/2008-UCD dated the 12th September, 2008. Further, it has also brought out the National Urban Sanitation Policy (NUSP) which was circulated vide D.O. No. Q-11011/2/2007-PHE II dated the 25th November, 2008 needs to be kept in view. Support for Solid Waste Management Projects is available under JNNURM and UIDSSMT (Urban Infrastructure Development Scheme for Small and Medium Towns). Under the NUSP, support is available for drawing up the City Sanitation Plan and Detailed Project Reports (DPR). Support is also available under the 12th Finance Commission grants.

Keeping all the above in view and in order to bring about a total change in approach and attitude to waste collection and disposal, thereby aiming at litter free/sanitary cities across the country, I would request you to direct all the ULBs of your State to undertake the following measures to improve the situation of SWM in the urban cities/ towns:

1. The recovery of recyclables presently being done in an unorganized manner needs to be replaced with informal arrangements of rag pickers and NGOs/CBOs also being involved for effective door to door collection. The case of Kudumbshree in Kerala could serve as an example (**Annex – V**)
2. Appropriate collection vehicles such as push carts, tricycles should be introduced for effective primary collection.
3. Street sweeping/ non-organic wastes should be collected and kept in separate containers and transported to the landfill site without mixing with organic waste
4. The secondary collection receptacles, such as easily liftable dumper placer etc (to avoid manual handling of waste) should be kept at strategic locations and the wastes should be regularly removed/placed/transported to the bigger vehicles to be transported to the transfer stations or disposal/landfill sites.
5. Manual handling of solid waste should be eliminated.

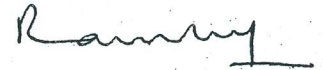
6. The workers should be provided with uniforms, shoes, gloves and other implements etc., for their safety and easy working. They should be subjected to periodical health checks and health insurance.
7. PPP may be explored / introduced for functions such as door to door collection, street sweeping, transportation, treatment etc.
8. Acquisition/earmarking of land required for the project should be facilitated by proactive guidelines/direction from the State level. Master Plan process should actively address this requirement.
9. Waste characterization has to be done properly taking representative samples from the city for various types of wastes and the treatment process should be selected accordingly.
10. Appropriate technology options for treatment of the organic content of the wastes should be chosen based on the physical and chemical characteristics of the wastes and local conditions etc.
11. IEC (Information, education, and Communication) in order to educate households, municipal staff as well as personnel engaged in collection and management of waste about need for segregation at source and improved sanitation is the most important element in success of a SWM project. This must be accorded due and adequate priority.
12. Polluter Pay Principle should be implemented in a calibrated manner in order to instill a sense of discipline with respect to throwing of litter by people without any concern for cleanliness. The examples of Ahmedabad and Surat in Gujarat and Suryapet in Andhra Pradesh could serve as a reference. (Annex - VI)

I hope with the intervention of various stakeholders at the helm of affairs related to SWM in your state, it would be possible to bring about positive transformation in bringing a clean environment in the cities/ towns. I would like to request you to undertake review of existing solid waste management practices in Urban Local Bodies of your State and chalk out a programme for better management. The cities should draw a city sanitation plan in accordance with the National Urban Sanitation Policy and make an attempt to move towards National Benchmarks in respect of solid waste management. A proactive role on behalf of the States is critical to galvanizing various stakeholders in this endeavor. The Ministry of Urban Development can provide support for drawing up of the city sanitation plan and can also support projects under JNNURM and UIDSSMT. I shall also like to emphasize that the states themselves need to

provide greater support for achieving these objectives. A review at your level would be desirable to impart necessary momentum to this process. I shall be grateful if you could revert to me within three months about action taken in this regard.

With regards,

Yours sincerely,



(M. Ramachandran)

To

All Chief Secretaries of States / Administrators of UTs.

Some good practices carried out by certain ULBs in Source segregation and collection:-

- ◇ **Chandigarh Municipal Corporation** has started a novel 'dial-a-debris-removal scheme'. It is mandatory for citizens to get their debris removed through this helpline system. For this, the debris generators are charged Rs. 400-500 per truck.
- ◇ **Navi Mumbai** has been using debris to fill up low lying areas which are prone to breeding of mosquitoes. It has helped in reducing incidence of malaria in the city. Bricks and tiles are manufactured from demolition debris with the help from an NGO (Yuva). Such bricks can be used for surfacing pavements.
- ◇ In **Mumbai**, 5 tonne of organic wastes from Dadar Market is processed by vermi-composting. The Corporation has allotted one acre land to a private company which brings segregated waste and processes the same through vermi-composting. It has the right to sell the compost. This is one of the four demonstration projects in Mumbai for popularizing vermi-composting at the point of bulk generation.
- ◇ **Suryapet town in Andhra Pradesh** has achieved a zero garbage status. The municipality undertakes collection of segregated waste from the doorsteps and processes wet garbage while recycling dry waste and selling it. This not only covers the cost of sanitation services but also earns the municipality some income.
- ◇ **Namakkal town in Tamil Nadu** has got the distinction of clean and green city under the Japan Eco-city programme. The city has achieved 100% door to door collection, segregation at source through an NGO and has set up a vermi compost plant of 2 MT capacity through a private operator. The project has been formulated and implemented with the help of NPC.
- ◇ **Mahabaleshwar Municipal Council** collects plastic bottles and prepares granules using a crusher through people's participation.
- ◇ **Surat city** gets its roads cleaned at night and keeps close vigilance on cleanliness during the day too. Surat has earned a reputation of the cleanest city in country.
- ◇ In **Amravati**, road sweeping, nalah cleaning and public toilet cleaning contracts have been given out to private contractor.
- ◇ **Kalyan** has constructed a facility for processing of biodegradable waste collected from vegetable markets, hotels and marriage halls. This is run by a NGO (Stree Mukti Sangathan). An advance of Rs. 1 lakh was given for procurement of equipments and wages. The workers segregate plastics and other non-biodegradable material before spraying the waste with a culture and water. NGO has repaid the advance from the Corporation.

- ◇ In Kodagu (Coorg) district of Karnataka, a very successful drive required school children to bring all the dry recyclable waste from their homes to the school (plastic bags, rags, glass) once a week. Class wise sale to kabadi-walas is organized every week and the funds are used for Eco-Club activities. This has resulted in substantially increased segregation of dry and wet waste in the town.
- ◇ In Nagpur, hotel owners initially agreed to pay for bulk waste collection from their premises, but later went to the court challenging the levy of this charge. This is because the awareness drive was not sustained. The High Court finally directed the Corporation to frame byelaws before forcing the hoteliers to pay the service charges.
- ◇ In Rajasthan, the government has issued orders to Municipal bodies to give contracts for door to door collection, where preference is given to rag pickers.
- ◇ In Akola, the Corporation provided tricycles to local CBO's who undertake to collect household waste. They cover the houses from 7.00 a.m. to 2.00 p.m. and empty the waste into community bins. They are allowed to sell the recyclables. The beneficiary households pay Rs. 10-15 per month as service charge. A part of this is used to repay the loan for the tricycle. Each volunteer earns approximately Rs. 1200-1500 per month under the scheme.

Some good practices carried out by some ULBs on Transportation

- ◇ In **Latur**, SJSRY groups have procured a vehicle for transporting the waste. The vehicle design is such that it can be used for transporting other goods in the evening, thus providing the group additional means to generate income. The group members have also been given identity cards.
- ◇ In **Nashik**, since the contractor directly takes the garbage to the dumping ground, almost all the dustbins were removed. This reduced the menace of cattle, dogs and pigs. It has also freed space, earlier occupied by these dustbins, for the pedestrians and vehicles.
- ◇ **Nanded** has allowed the Contractor a complete freedom in deciding the quantum of manpower to be deployed. This allows the contractor to choose his own technology and gives him scope to improve efficiency and thus bring down costs (which finally get passed on to the local body).

Some good practices on Treatment & disposal and Awareness campaign including PPP arrangement

- ◇ Akola has signed a 20 year contract with a private operator who is making investments of about Rs. 1.15 crore for setting up a plant to process waste. The Corporation is responsible to supply 50 MT of waste daily (about 40% of the city waste). The operator sells the compost and pays a royalty of 4%. The rejects are lifted by the corporation and taken for land filling.
- ◇ Bangalore Municipal Corporation has entered into a composite contract with a private operator to process and then land fill the rejects to an engineered sanitary landfill. The operator developed the facility on land provided by the corporation. The operator was given freedom to adopt any suitable technology to process municipal waste. He is to ensure that the project conforms to the relevant laws and has to obtain and maintain all necessary clearances from the authorities. The operator shall try to obtain carbon credits by adopting greenhouse gas mitigation measures and share the benefits of such carbon credits with the Corporation, if and when available.
- ◇ Kalyan Dombiwali Municipal Corporation invited tenders for a private operator to set up a plant for treatment and disposal of bio-medical waste on BOOT basis. The contract period is of ten years and the services provided by the contractor include collection, transportation, treatment and disposal as per BMW Rules in the corporation area.
- ◇ In Bhopal, a bio compost plant treats 100 tonnes of rich organic waste from weekly haats, bazaars and sabzi mandis. An operator is responsible for running the plant and also sale of compost. The Corporation receives 4 per cent royalty every three months (between Rs. 20,000 and Rs. 40,000) from the sale of compost.
- ◇ Foliage and green waste from gardens is converted into vermi-compost by Pimpri Chinchwad and Pune Municipal Corporations.
- ◇ In Mumbai, Advance Locality management program is implemented in over 200 residential complexes. Wet waste is processed into manure which is used in the gardens, pots within the complex. Corporation allows composting pits on top of municipal drains for decentralized composting by resident associations.
- ◇ Kamptee has developed a facility for composting 21 tonnes of waste before landfill. The total cost of the project is approximately Rs. 12.5 lakh. This includes provision of roads, electric and water supply, a platform to segregate the waste and 15 windrows (of size 10'x3'x2') for composting. An underground-interconnected drainage system is provided to avoid leachate formation. Fencing to prevent stray animals and tree plantation/landscaping has been done.

- ◇ Panvel Municipal Council has set up 19 small composting plants in the city. These decentralized plants are able to substantially reduce transportation costs as well as reduce the amount of waste reaching the land fill site.
- ◇ Yavatmal Municipal Council engaged the services of the private operator who is providing similar BMW management service to Amravati Municipal Corporation, thus saving the cost of separate set up. Both cities' BMW is managed at the common facility set up by this operator entirely at his own cost.
- ◇ In Mumbai, the corporation appointed 102 of its own employees as nuisance detectors giving them a mandate to fine people spitting, littering public places and causing such other nuisance.
- ◇ Singapore uses an innovative system to create awareness amongst tourists, school children and local people by organizing shows in various tourist destinations like night safaris, bird parks, etc. for stopping littering of waste.
- ◇ Awareness campaigns are being taken up in Bangalore through participation by the Corporation, Bangalore Agenda Task Force, Swabhimani and other NGOs.

| Sl.No. | Sector | State | City | Project Name | Date of approval by CSMC | Approved Cost (Rs. in Lakh) | ACA committed (Rs. in lakh) | Funds released | % of release | Release date |
|--------|------------------------|-------------------|--------------------|--|--------------------------|-----------------------------|-----------------------------|----------------|--------------|----------------------------------|
| 1 | Solid Waste Management | Arunachal Pradesh | Itanagar | Setting up of Municipal Solid Waste Management in a scientific way for capital complex | 22-Feb-07 | 1194.38 | 1074.94 | 268.74 | 25 | 6/28/2007 |
| 2 | Solid Waste Management | Assam | Guwahati | Solid Waste Management for Guwahati | 22-Jan-07 | 3516.71 | 3165.04 | 791.26 | 25 | 5/8/2007 |
| 3 | Solid Waste Management | Bihar | Patna | Municipal Solid Waste Management for Patna town | 26-Mar-07 | 3695.40 | 1847.70 | 461.93 | 25 | 5/8/2007 |
| 4 | Solid Waste Management | Gujarat | Rajkot | Strengthening of Solid Waste Management (Phase-I) | 14-Jul-06 | 867.00 | 433.50 | 325.14 | 75 | 04/01/2008 & 17.03.08 & 21/07/06 |
| 5 | Solid Waste Management | Gujarat | Surat | Upgradation of Solid Waste Management in Surat. | 26-Mar-07 | 5249.72 | 2624.86 | 656.22 | 25 | 5/8/2007 |
| 6 | Solid Waste Management | Gujarat | Vadodara | Solid Waste Management for Vadodara | 20-Jul-07 | 3098.54 | 1549.27 | 387.32 | 25 | 8/29/2007 |
| 7 | Solid Waste Management | Haryana | Faridabad | Solid Waste Management Scheme for Faridabad | 20-Jul-07 | 7650.00 | 3827.00 | 956.75 | 25 | 8/29/2007 |
| 8 | Solid Waste Management | Himachal Pradesh | Shimla | Solid Waste Management for Shimla | 9-Mar-07 | 1604.00 | 1283.20 | 320.80 | 25 | 28/03/2007 & 31/03/07 |
| 9 | Solid Waste Management | Kerala | Cochin | Solid Waste Management for Kochi | 5-Mar-07 | 8812.00 | 4406.00 | 1101.50 | 25 | 3/31/2007 |
| 10 | Solid Waste Management | Kerala | Thiruvananthapuram | Solid Waste Management in Thiruvananthapuram | 18-Jan-08 | 2456.00 | 1964.80 | 491.20 | 25 | 7/18/2008 |
| 11 | Solid Waste Management | Madhya Pradesh | Indore | Solid Waste Management for Indore | 28-Dec-07 | 4324.66 | 2162.33 | 540.58 | 25 | 1/4/2008 |
| 12 | Solid Waste Management | Maharashtra | Greater Mumbai | Solid Waste Management Project Greater Mumbai | 23-Nov-07 | 17879.00 | 6257.65 | 1564.41 | 25 | 5/29/2008 |
| 13 | Solid Waste Management | Maharashtra | Nashik | Solid Waste Management for Nashik | 22-Dec-06 | 5999.23 | 2999.62 | 2249.73 | 75 | 10/08/2007 & 31/01/07, 01.10.08 |
| 14 | Solid Waste Management | Maharashtra | Pune | Solid Waste Management - Pimpri-Chinchwad | 22-Dec-06 | 4240.80 | 2120.40 | 530.10 | 25 | 1/31/2007 |
| 15 | Solid Waste Management | Manipur | Imphal | Solid Waste Management for Imphal | 18-May-07 | 2580.71 | 2322.64 | 580.66 | 25 | 12/20/2007 |
| 16 | Solid Waste Management | Rajasthan | Jaipur | Solid Waste Management for Jaipur | 8-Dec-06 | 1319.74 | 659.87 | 329.94 | 50 | 20/12/2006, 26.9.08 |
| 17 | Solid Waste Management | Tamil Nadu | Chennai | Solid Waste Management for Chennai | 2-Feb-07 | 25532.00 | 8936.20 | 2234.05 | 25 | 21/03/2007 & 31/03/07 |
| 18 | Solid waste Management | Tamil Nadu | Chennai | Solid Waste Management of Alandur, Pallavapuram and Tambaram Municipality | 19-Jun-08 | 4421.25 | 1574.43 | 386.85 | 25 | 15-Jul-08 |
| 19 | Solid Waste Management | Tamil Nadu | Colimbatore | Solid Waste Management for Colimbatore | 2-Feb-07 | 9651.00 | 4825.50 | 1930.19 | 40 | 10/08/2007 & 22/02/07 & 31/03/07 |

| Sl.No. | Sector | State | City | Project Name | Date of approval by CSMC | Approved Cost (Rs. in Lakh) | ACA committed (Rs. in lakh) | Funds released | % of release | Release date |
|--------|------------------------|----------------|------------|--|--------------------------|-----------------------------|-----------------------------|----------------|--------------|-----------------------|
| 20 | Solid Waste Management | Tamil Nadu | Madurai | Solid Waste Management for Madurai | 2-Feb-07 | 7429.00 | 3714.50 | 929.00 | 25 | 2/22/2007 |
| 21 | Solid Waste Management | Uttar Pradesh | Agra | Municipal Solid Waste Management in Agra | 5-Mar-07 | 3083.99 | 1542.00 | 385.50 | 25 | 29/08/2007 & 31/03/07 |
| 22 | Solid Waste Management | Uttar Pradesh | Allahabad | Solid Waste Management for Allahabad | 22-Feb-08 | 3041.49 | 1520.74 | 380.18 | 25 | 3/25/2008 |
| 23 | Solid Waste Management | Uttar Pradesh | Kanpur | Municipal Solid Waste Management in Kanpur | 26-Mar-07 | 8483.87 | 2811.90 | 702.98 | 25 | 29/08/2007 & 31/03/07 |
| 24 | Solid Waste Management | Uttar Pradesh | Lucknow | Municipal Solid Waste Management in Lucknow | 5-Mar-07 | 8717.06 | 2146.19 | 536.55 | 25 | 29/08/2007 & 31/03/07 |
| 25 | Solid Waste Management | Uttar Pradesh | Mathura | Municipal Solid Waste Management in Mathura | 8-Dec-06 | 8950.26 | 793.28 | 198.32 | 25 | 1/23/2007 |
| 26 | Solid Waste Management | Uttar Pradesh | Meerut | Municipal Solid Waste Management | 8-Dec-06 | 9183.46 | 1129.70 | 282.43 | 25 | 1/23/2007 |
| 27 | Solid Waste Management | Uttar Pradesh | Varanasi | Solid Waste Management of Varanasi | 26-Oct-07 | 9416.65 | 2433.87 | 608.47 | 25 | 12/20/2007 |
| 28 | Solid waste Management | Uttarakhand | Dehradun | Integrated Solid Waste Management in Dehradun | 16-May-08 | 9649.85 | 1968.00 | 492.00 | 25 | 30-Jun-08 |
| 29 | Solid Waste Management | West Bengal | Asansol | Municipal Solid Waste Management in Asansol Urban Area | 8-Jan-07 | 9883.04 | 2178.64 | 1089.32 | 50 | 23/01/2007, 24.10.08 |
| 30 | Solid Waste Management | West Bengal | Kolkata | Municipal Solid Waste Management of Municipal Towns | 22-Jan-07 | 10116.24 | 1980.49 | 495.12 | 25 | 14/02/2007 & 31/03/07 |
| 31 | Solid Waste Management | Andhra Pradesh | Vijayawada | Solid Waste Management Improvement Scheme | 14-Oct-08 | 10349.43 | 29.02 | 0.00 | 0 | |
| | | | | | | 212396.48 | 76283.25 | 22207.24 | | |

Rough estimates indicate that Kerala generates about 2,800-3,000 tonnes of solid waste every day. It is estimated that only 50% of the Waste generated is collected for disposal. To overcome the problem of poor solid waste management and promote segregation and primary collection at source, the State Poverty Eradication Mission-KUDUMBASHREE -has initiated an innovative enterprise namely, 'Clean Kerala Business' under which women from the financially backward families who are the members of the Community Based Organizations (CBOs) of Kudumbashree are engaged in door to door household waste collection and transportation to the transit points fixed by the Urban Local Bodies. The initiative provides a means of livelihood to the urban poor especially women, apart from better waste management and reduction in pollution. For collecting waste from the households, the entrepreneurs charge Rs 30/- per month from each household. The women entrepreneurs engaged in solid waste collection are earning Rs 3,000 to Rs 5,000 per month. Now 155 Kudumbashree solid waste management groups are in operation in 18 urban local bodies in the State.

Polluter pays/Penalty for indiscriminate littering

Following the principle of 'Polluter Pays', the Municipal Corporation of Ahmedabad & Surat have passed a resolution vide which they levy cleaning charges on the spot for littering. These charges can be collected by the Sanitary Inspector on administrative charges ranging from Rs.500 – Rs.5000/- (higher for commercial establishments). The word 'penalty' is not used here since there is no legal provision for the ULB penalizing residents.

Similarly, another town 'Suryapet' in Andhra Pradesh has passed a resolution of collecting penalty from Rs.100-500/- from the defaulter who will be throwing the waste on streets.

डॉ. एम. रामचन्द्रन
Dr. M. RAMACHANDRAN



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सचिव, भारत सरकार
Secretary to the Government of India

D.O. No.Z-14013/3/2009-PHE.II
March 22, 2010

Dear Chief Secretary,

You are aware that the Urban Local Bodies are responsible for providing municipal services and civic amenities including Municipal Solid Waste Management right from the collection, segregation, transportation, scientific treatment and disposal of the waste generated in the cities/towns in accordance with the Municipal Solid Waste (Management and Handling) Rules, 2000, which were notified under the Environment Protection Act, 1986 by the Ministry of Environment & Forests, Government of India.

The MSW Rules require all the municipalities to organize door-to-door collection of solid waste and citizens' education for source segregation. It is also an opportunity to promote a safe and decent livelihood for those involved in the recycling industry. Volume reduction at source by adopting the 3 Rs – Reduce, Recycle & Reuse – is a key factor in Municipal Solid Waste Management. Of these, recycling is at the core of a good solid waste management model. Much of the recycling is carried out by the informal recycling sector which needs to be recognized, regulated and incentivized and integrated with the mainstream.

In many cities & towns waste recovery is an important unorganized private industry employing thousands of waste pickers who are working and earning their livelihood in refuse dumps. They are referred to as scavengers or waste pickers but are often ignored in urban project planning although their activities are vital to the life of the city. These rag pickers constitute abandoned children, poor and destitute women. They live and work under significant health risks, which are largely undocumented and suffer from severe exploitation and deprivation. Their possible health hazards include increased infant mortality, hand / leg injuries, intestinal and respiratory infections, eye infections, lower back pain, malnutrition, skin disorders and exposure to hazardous waste. They do not have access to safe water supply and sanitation facilities.

Waste collectors make a substantial contribution to municipal solid waste management. They reduce the volume of waste by 10-20% by recycling the recovered portions. However, private collection at source may only operate in the wealthy neighbourhoods where refuse contains items of value. Independent observers agree that the recognition of waste collectors contribution to keeping cities clean cannot be evaded. Their positive role in the management of municipal solid waste should be recognized and their lot improved.

Sustainable and Integrated Solid Waste Management requires inclusion of the informal sector into the process of solid waste management, keeping in mind the larger goals of an environmentally sustainable and decentralized waste management practice. It is imperative that the waste management plan of each urban/rural, semi-urban local body should incorporate an inclusive approach for

the waste collectors who are engaged in the collection, transportation and conversion of waste into various products and depend on recycling of waste for their livelihood.

The informal waste recycling sector includes:

1. Self employed waste-pickers who retrieve paper, plastic, metal, glass and scrap from waste bins or receptacles kept on the streets and from landfill sites where the collected waste is transported and dumped.
2. Itinerant waste buyers (bhangar feriwalas) who purchase small quantities of scrap from households, offices, shops and other small commercial establishments.
3. Informal refuse collectors who collect waste from households and establishments.
4. Retail scrap dealers or small junk dealers (bhangar dukandars) who purchase scrap commodities (by weight or unit)

Urban Local Bodies would need to recognize the importance and value of the informal recycling sector. The waste management plan of each Urban Local Body must include the four categories of the informal recycling sector as above. They must enumerate and register informal workers engaged in collecting, grading, transporting and recycling waste for their livelihood. Urban Local Bodies must provide adequate safeguards to the people involved in this work and promote safe and hygienic waste handling, sorting and conversion of waste. Urban Local Bodies must protect the rights of waste pickers to access, collect, and sell recyclable scraps and put it as a clause in all waste collection contracts.

The ULBs should hire / outsource only those registered workers, who are part of the pool of waste pickers for door to door waste collection and transportation of wastes through reputed contractors. The workers shall have the right to collect and retain for use or sale any item of scrap material or used goods that they may collect or retrieve from the collected waste and to retain proceeds from the sale of the collected scrap at the primary level i.e. door-to-door collection and at the secondary storage level.

The earnings from the sale of scrap should be considered as a recycling incentive for the workers and should not be adjusted against the wages due to them for carrying out door to door collection. While engaging the waste pickers, the sanitary workers who are part of the process shall also be protected through legal / institutional arrangements.

Keeping the above in view and in order to integrate the informal waste recycling sector into the mainstream and give incentives, I would like to request you to consider directing all the ULBs of your State to protect the rights of waste pickers to access, collect, and sell recyclable scraps and to put it as a clause in all waste collection contracts. The NGO / CBO / contractor shall ensure the credentials of the rag pickers through their institutional arrangements. A system of independent verification of waste pickers by the police or third party needs to be explored.

Each worker (including Supervisor) deployed on this work shall be provided the following personal facilities by the CBO / NGO / contractors:-

- (i) A set of Uniform – (two sets per annum) of approved design and colour (visible distinctly at night).
- (ii) The name of the person and designation shall be either knitted on the pocket of the uniform or name embossed on plastic badge, in both the local language and English.
- (iii) A set of hand gloves, mask and safety shoes – durable mask once in three months, hand gloves once a month and safety shoes once in 12 months.
- (iv) A set of gum boots and rain wear every year in rainy season.
- (v) A duty reporting place be established by the Municipality within each locality/ward.
- (vi) Adequate training may be imparted to the waste pickers to have exposure on the scientific management of MSW.

Besides, "Non-Biodegradable Waste Collection Centres" be provided by the Municipality to the Contractor, till the time the Agreement is in place at a nominal lease as deemed fit by the ULB. Separate meters for water supply and electricity be provided under domestic category. The water supply and electrical charges of the regular bills from respective agencies be paid by the Contractor / CBO / NGO. Decentralized waste management practices need to be promoted in the cities and towns so as to facilitate the recycling of waste material by the waste pickers and onsite composting. A model of co-operatives for intermediaries in the sector may be explored along with recognition of door step collection as the main domain with informal sector.

I would like to request you to undertake a review of the existing situation of the informal recycling industry and chalk out a programme for integrating informal recycling sector especially with reference to the SWM projects sanctioned under JNNURM and UIDSSMT.

I shall be grateful, if you could revert to me within three months about the action taken in this regard.

With regards,

Yours sincerely,


(M. Ramachandran)

Chief Secretaries of
All the States/UTs