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Solid waste management in Indian cities: Issues and challenges

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Abstract
The problem of solid waste management (SWM) is acquiring an alarming dimension in India. The high rate of industrialization and urbanization has resulted change in the life style, because of which the quantity of solid waste generated has increased significantly and its characteristics have changed. Lack of financial resources, institutional weakness, improper choice of technology and public apathy towards SWM has made this service far from satisfactory. According to the 2001 census, population of India was 1,027 million out of which 28% live in cities and it is projected that by 2050 half of the Indians will live in cities. Urban India is facing a huge challenge to cope with the infrastructural requirements of its ever-increasing population. Municipal Solid Waste Management (MSWM) despite being the primary responsibility of the urban local bodies still remains as a major obligation that has to be improved. Various studies reveal that about 90% of MSW is disposed of unscientifically in open dumps and landfills, creating problems to public health and the environment. In the present study, an attempt has been made to provide a comprehensive review of the municipal solid waste management practices in Indian cities (generation, collection and transportation, disposal and treatment technologies). The collection and transportation system is far from satisfactory. Currently, at the level of waste generation and collection, there is no source segregation of compostable waste from the other non-biodegradable and recyclable waste. Most of the MSW in India is dumped on land in an uncontrolled manner. Such inadequate disposal practices lead to problems that will impair human and animal health and result in economic, environmental and biological losses. The current regulations (MSWM rules, 2000) are very stringent. Norms have been developed to ensure a proper MSWM system. Unfortunately, clearly there is a large gap between policy and implementation. The study pertaining to MSWM for Indian cities has been carried out to evaluate the current status and identify the major problems. The study is concluded with a few fruitful suggestions, which may be beneficial to encourage the competent authorities/researchers to work towards further improvement of the present system.

Keywords: environmental problems, MSWM, ULBs, transportation of waste, biomethanation

Introduction
Municipal solid waste management in developing countries has given alarming signals because of their improper waste management. The urbanization, industrialization, and an increase in economic status and activities have increased the quantity of municipal solid waste and altered its contents. Although the developing countries generate less solid waste per capita in comparison to developed countries, the collection, storage, transportation, processing and disposal of solid waste is highly ineffective, and consequently damaging to the environment. A poor understanding of solid waste management leads to different kinds of environmental problems within urban metropolises. The emission of greenhouse gases and air pollutants, the pollution of ground water, occupational hazards etc. are other areas of concern.

In developing countries per capita waste generation has increased nearly three-fold over the last two decades. The waste production in some of the cities of the world shows as high as 960 kg/y per capita in Guelph, 875 kg/y per capita in San Francisco and 220 kg/y per capita in Delhi (Sanyal *et al*, 2009). Increasing population levels, rapid economic growth and rise in community living standards accelerates the generation rate of solid waste in Indian cities. Arising quality of life and high rate of resource consumption patterns have had an unintended and negative impact on the urban environment. Cities are now facing the problem of high volume of waste, huge costs involved, the disposal technologies and methodologies, and the impact of wastes on the local and global environment. As a result today solid waste management is an important topic for all local and global consensuses.

In India municipal solid waste management is unscientific and chaotic. Uncontrolled dumping of wastes on dumping yards in towns and cities has created overflowing landfills. There are also serious environmental implications in terms of ground water pollution. The mismanagement of waste is a cause for diseases like cholera, dysentery, jaundice, typhoid and diarrhoea. Therefore, MSWM is one of the major environmental problems of Indian cities. It involves activities associated with generation, storage, collection, transfer and transport, processing and disposal of solid waste. The average MSW generation in India is approximately 100,000 MT/day. Out of that, only 60-65 percent (60,000-65,000 MT/day) is collected by municipal corporations and councils. The rest is dispersed of in an unscientific manner. However, lifestyle changes, especially in the larger cities, are leading to the use of more packaging material and per capita waste generation is increasing by about 1.3 percent per year. With the urban

population growing at 2.7 percent to 3.5 percent per annum, the yearly increase in the overall quantity of solid waste in the cities will be more than 5 percent. The Energy and Resources Institute (TERI) has estimated that waste generation will exceed 260 million tons per year by 2047-more than five times the present level. **C**ities with 100,000 plus population contribute 72.5 percent of the waste generated in the country (Table 1.) as compared to other 3955 urban centers that produce only 17.5 percent of the total waste (Asnani, 2006) [3]. The management of MSW requires proper infrastructure, maintenance and upgrade for all activities. This becomes extremely expensive and complex due to the continuous and unplanned growth of urban centers. In the present study, an attempt has been made to provide a brief review of MSWM for Indian cities and identify the problems and issues of MSWM.

Table 1: Waste Generation in Class I Cities with Population above 1, 00, 000

Type of Cities	Population	Tones/day	Percent of Total garbage
The 7 Mega Cities	>4 million	21, 100	18.35
The 28 Metro Cities	1-4 million	16, 643	17.08
The 388 Class I towns	0.1-1 million	42, 635	37.07
Total		**83, 378**	**72.50**

Note: Mega cities are above 4 million population and metro cities are the same as the identified cities under the census of India. Class I cities with population in the 1, 00, 000 to 1 million ranges are 388 in number.
***Source*:** TERI (2005)

Municipal Solid Waste Management (MSWM) being the statutory responsibility of the Urban Local Bodies (ULBs), it is usually looked after by the Public Health and Sanitation Department, as one of its many fold duties. However, on a pan India scale till about a decade ago, most ULBs did not have the adequate infrastructure or funds to cater to the various systems needed to manage a good municipal waste management system including, collection, transportation, storage, processing and disposal.

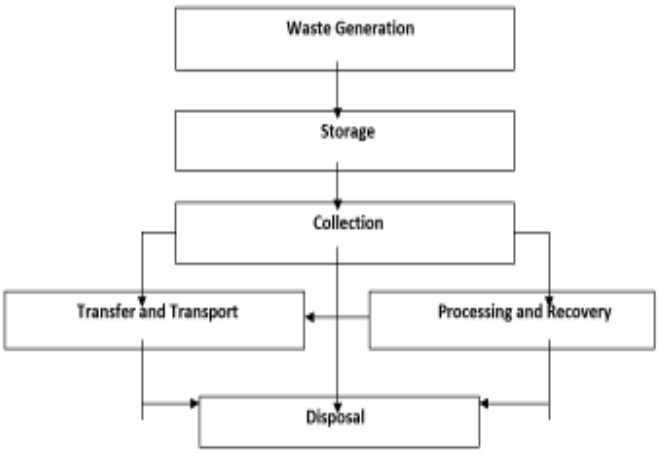

Fig 1: Interrelationship between the Functional Elements in Solid Waste Management

Objectives of the Study

The study was undertaken with the following objectives:

- To assessment of waste quantity and waste characteristics.
- To assessment of existing status of collection, storage, transportation, treatment and disposal activities.
- To Review the existing legislation.

Concept of Solid Waste

Solid waste can be defined in terms of unwanted residues, solid or semi–solid that is thrown away by domestic, industrial and commercial sectors. According to World Health Organization, the term "Solid Waste" is applied to unwanted and discarded materials from houses, street sweepings, commercial and agriculture operations arising out of mass activities. Urban solid waste consist of household wastes, construction and demolition debris, sanitation residues, industrial and hospital waste (Planning Commission, 1995).

Classification of Solid Waste

The solid waste generated in cities can be classified on the basis of its source of origin are as follows:

A. Domestic Waste: Kitchen and food wastes, plastics, papers and floor sweepings.
B. Market Refuse: Generally wastes from vegetable and non vegetable matters, packing materials such as bamboo baskets, leaves, plastics cardboard, timber boxes.
C. Hospital Refuse: Wastes such as syringes, needles, ampoules bottles, cotton, plasters and spoiled medicines.
D. Road Sweepings: Wastes such as leaves, animal dropping, human wastes, litter and dust.
E. Garden Refuse: Wastes such as leaves, branches, plants and broken pots.
F. Business Area Refuse: Various types of paper, cigarette and beedi butts, match sticks and bus tickets etc.
G. Cattle Shed Refuse: Animal wastes and general litters.
H. Trade Refuse: Cloth cuttings from tailoring shops and waste from auto repair centers.
I. Building Construction Refuse: Earth, concrete, brick and plaster.
J. Industrial Wastes: Oil soaked racks, timber scant lings, and chemical refuse including toxic matter. (Rao, 2006)

Waste Generation in India

The increasing population, urbanization and changing lifestyles, the Indian cities now generate eight times more waste than they did in 1947. The amount of waste generated per capita is estimated to increase at a rate of 1 percent to 1.33 percent annually (Sharholy *et al*, 2008) [11]. The quantum of waste generation varies between 0.2-0.4 kg/capita/day in

urban centres and it goes up top 0.5 kg/capita/day in metropolitan cities. The urban population has increased from 17.6 percent to 28 percent in the last 50 years and is expected to rise to 38 percent by the year 2020. The increased MSW generation can be ascribed to our changes in living standards.
Per capita waste generation ranges between 0.2 kg and 0.6 kg per day in the Indian cities amounting to about 1.15 lakh MT of waste per day and 42 million MT annually. As the city expends, the per capita waste generation is also increases. Table 2 shows the per capita generation is very high in some of million plus cities like Ludhiana, Vishakhapatnam, Agra, Allahabad, Jamshedpur, Indore and Bhopal. The Fig.1 shows the per capita waste generation in some Indian cities, here Madras (0.657), Kanpur (0.64), Lucknow (0.623), and Ahmadabad (0.585) are high generator of waste. This may be perhaps to high level of urbanization and rapid economic growth in these cities.

Table 2: Waste Quantities and Generation Rates in 1 million plus Cities and State Capitals

City	Waste Quantity (MT/d)	Waste Generation rate (kg/c/d)
Vadodara	157.33	0.12
Kohima	12.48	0.16
Nashik	200	0.19
Lucknow	474.59	0.21
Guwahati	166.25	0.21
Gandhinagar	43.62	0.225
Jabalpur	216.19	0.23
Ranchi	208.27	0.246
Nagpur	503.85	0.25
Dehradun	131	0.29
Raipur	184.27	0.3
Indore	556.51	0.35
Bhubaneshwar	234.46	0.36
Patna	510.94	0.37
Ahmedabad	1302	0.37
Faridabad	448.01	0.38
Dhanbad	77.12	0.387
Bangalore	16669	0.39
Bhopal	574.07	0.4
Agartala	77.36	0.4
Asansol	206.65	0.425
Daman	15.2	0.43
Meerut	490	0.46
Agra	653.57	0.49
Allahabad	509.24	0.51
Ludhiana	734.37	0.53
Jamshedpur	387.98	0.59
Vishakhapatnam	600	0.62

***Source*:** Akolkar (2005) [2]

Characteristics and Composition of MSW

The composition and the quantity of MSW generated from the basis on which the management system needs to be planned, designed and operated. The composition of MSW at generation sources and collection points was determined on a wet weight basis and it consists mainly of a large organic fraction (40-60%), ash and fine earth (30-40%), paper (3-6%), and plastic glass and metals (each less than 1%) (Table 3). In the physical composition of waste the maximum part of compostable matter and ash, fine earth and other, so it shows that a huge amount of raw material for composting plants in Delhi. In this composition paper, plastic and metal is also in great quantity. These are recyclable matter, so it can be said that a huge amount of raw material for recycling industry.

Table 3: Physical Characteristics of MSW in Indian Metrocities.

Characteristics (% by weight)								
Name of Metro-city	Paper	Textile	Leather	Plastic	Metals	Glass	Ash, fine earth and others	Compostable matter
Ahmedabad	6.0	1.0	-	3.0	-	-	50.0	40.00
Banglore	8.0	5.0	-	6.0	3.0	6.0	27.0	45.00
Bhopal	10.0	5.0	2.0	2.0	-	1.0	35.0	45.00
Mumbai	10.0	3.6	0.2	2.0	-	0.2	44.0	40.00
Calcutta	10.0	3.0	1.0	8.0	-	3.0	35.0	40.00
Coimbatore	5.0	9.0	-	1.0	-	-	50.0	35.00
Delhi	6.6	4.0	0.6	1.5	2.5	1.2	51.0	31.78
Hyderabad	7.0	1.7	-	1.3	-	-	50.0	40.00
Indore	5.0	2.0	-	1.0	-	-	49.0	43.00
Jaipur	6.0	2.0	-	1.0	-	2.0	47.0	42.00
Kanpur	5.0	1.0	5.0	1.5	-	-	52.5	40.00
Kochi	4.9	-	-	1.1	-	-	36.0	58.00
Lucknow	4.0	2.0	-	4.0	1.0	-	49.0	40.00
Ludhiana	3.0	5.0	-	3.0	-	-	30.0	40.00
Madras	10.0	5.0	5.0	3.0	-	-	33.0	44.00
Madurai	5.0	1.0	-	3.0	-	-	46.0	45.00
Nagpur	4.5	7.0	1.9	1.25	0.35	1.2	53.4	30.40
Patna	4.0	5.0	2.0	6.0	1.0	2.0	35.0	45.00
Pune	5.0	-	-	5.0	-	10.0	15.0	55.00
Surat	4.0	5.0	-	3.0	-	3.0	45.0	40.00
Vadodara	4.0	-	-	7.0	-	-	49.0	40.00
Varanasi	3.0	4.0	-	10.0	-	-	35.0	48.00
Vishakhapatnam	3.0	2.0	-	5.0	-	5.0	50	35.00
Average	5.7	3.5	0.8	3.9	1.9	2.1	40.0	41.80

Source: CPCB, 2000 [4]

Collection of Waste

The waste collection in India is very unorganized. The community bin collection system is adopted in most of the cities. The bins are common for both decomposable and non decomposable waste (no segregation of waste is performed). The collection bins are neither properly designed nor properly located and maintained. Storage bins can be classified as movable bins and fixed bins. In a few cities, the waste generated from various sources such as residential, street sweepings, garden, parks, offices and shopping complexes is collected separately. A number of open collection spots exist in many cities, and these cause poor sanitary conditions and pose health hazards to the workers and nearby populations (Sunil *et al*, 2009) [14].

The collection of MSW is the responsibility of corporations/municipalities. The traditional system of collection is adopted in most of the Indian cities is through communal bins placed at Various points along the street corners and points along the street corners and points along the roads. In some of the Indian cities house-to house collection is just starting (Delhi, Banglore, Chennai, and Hyderabad). In this collection system some NGOs, RWAs and government citizen's partnerships are working. A role of sweepers is also important in collection of waste, a sweeper who sweeps the roads and streets manually is allotted a specific area (around 250 m sq.). The sweepers put the waste to dustbins or collection points (Sharholy *et al*, 2008) [11]. In most cities, a fraction of MSW generated remains unattended

on streets. The average collection efficiency for MSW in Indian cities and States is about 70 percent (Neema 2004, Rathi 2006, and Siddiqui *et al*, 2006) [9]. Most of the cities are unable to provide waste collection services to all parts of the city and most cities, a fraction of MSW generates uncollected on streets. Many studies on urban environment have revealed that MSW collection efficiency is a function of two major factors: manpower availbality and transport capacity (Sharholy *et al* 2008) [11]. Table 4. shows that the collection efficiency is higt in the cities and states capitals where private contractors and NGOs are employed for the collection and transportation of MSW. Generally a number of settlements are often illegal and the inhabitants are unwilling or unable to pay for the services. So here in these areas, it is very difficult to collect and transport the waste (Nema, 2004) [9].

Table 4: Per Capita Generation, Disposal and Collection Efficiency of MSW for Indian States

States	Per capita generation (g/cap/day)	Per capita disposal (g/cap/day)	Collection efficiency (In %)
India (sample avg.)	377	273	72
Andhra Pradesh	346	247	74
Bihar	411	242	59
Gujarat	297	182	61
Haryana	326	268	82
Karnataka	292	234	80
Kerala	246	201	82
Madhya Pradesh	229	167	73
Maharashtra	450	322	72
Orissa	301	184	61
Punjab	502	354	71
Rajasthan	516	322	62
Tamil Nadu	294	216	73
Uttar Pradesh	439	314	78
West Bengal	158	117	74

***Source*:** (Nema, 2004) [9]

Transportation of Waste

Transportation is the main part of the waste management practices. The collected waste from dustbins and collection points is transported to the processing and disposal sites using a variety of vehicles. Tractor-trailers, Motor vehicles, Lories, Trucks, and Modern Hydraulic vehicles are generally used in transportation of MSW. In most of Indian cities is lacking proper transportation system for SWM. Transport capacity to carry municipal solid waste in 44 Indian cities is shown in Table 5. it is clear about 70 percent of Indian cities do not have such capacity. Collection vehicles are very old and are performance very poor in most of Indian cities. In most of cities modern automatic system are not used. Collection and transportation activities consists approximately 80-95% of the total budget of MSWM. So, it forms a key component in determining the economics of the entire MSWM system

Table 5: Transport Capacity to Carry Municipal Solid Waste

Capacity (cubic meters/ million population)	Cities (%) 44 cities
<100	4.5
100-200	34.1
200-300	29.6
300-400	25.0
>400	6.8

Segregation of Waste

Segregation of recyclables (i.e paper, cardboard, and plastics) by rag pickers was observed to be practiced in 22 cities. Rag pickers were not observed in cities like Kolkata, Chennai, Surat, Kanpur, Coimbatore, Kochi, Vishakhapatnam and Panjim. In a few cities, NGOs were observed to be involved in the collection of waste through the services of rag pickers. Proper segregation of waste would lead to better options and opportunities for its scientific disposal (Singahal and Pande, 2000) [10].

Waste Disposals and Treatment

MSW is normally disposed of in an open dump in many Indian cities and towns, which is not a proper method of disposal because open dumps pose environmental hazards which cause ecological imbalances with respect to land, water and air pollution (Kansal, 2002) [7]. In India more than 90 percent of MSW is directly disposed through landfilling. Major limitations of this method are the costly transportation of MSW to far away landfill sites. Down gradient surface water can be polluted by surface runoff in the absence of proper drainage systems and groundwater aquifers may get contaminated by polluted leacheate in the absence of a proper leacheate collection and treatment system. An inefficient gas recovery process emits two major green house gases, carbon dioxide and methane, into the atmosphere. It requires large land area. At times the cost of pre-treatment to up-grade the gas quality and leacheate treatment may be significant. Sanitary land filling is a necessary component of solid waste management, since all other options produce some residue that much be disposed of through land filling. However, it appears that land filling would continuing to be most widely adopted practice in India in coming few years, during which certain improvements will have to be made to ensure the Sanitary Land filling (Das *et al*., 1998).

Urban local bodies generally facing a major problem in finding new landfill sites. The cost of construction and operation and maintenance of an engineered landfill is also high. The Maharashtra SWM Cell has estimated that a small landfill may cost over Rs. 1000 per MT of waste as compared to Rs. 200 per MT of waste disposed at a commonly shared facility (Asnani, 2006) [3].

Composting

Composting is a biological process of decomposition carried out under controlled conditions of ventilation, temperature moisture and organisms in the waste themselves that convert waste into humus-like material by action on the organic portion of the solid waste. Composting is considered when biodegradable waste is available in considerable fraction in the waste stream and there is use or market for compost.

This is a popular technique in Europe and Asia, where intense farming creates a demand for the compost (Rajput R. *et al*., 2009). Centralized composting plant for sector may only be undertaken if adequate skilled manpower and equipment are available, hence at household level and small level composting practices could be effective which needs the people's awareness. Many large scale compost plants with capacities of ranging from 150 to 300 tons/ day were set up in the cities of Bangalore, Baroda, Mumbai, Calcutta, Delhi,

Jaipur, and Kanpur during 1975-1980 (Sharholy *et al*., 2008) [11]. Now about 9 to 10 percent of solid waste is treated by composting. After composting the final product obtained is called compost, which has very high agricultural value. It is used as fertilizer, and it is non-odorous and free of pathogens (Ahsan *et al*., 1999).

Incineration

Incineration is much suitable answer for the municipal solid waste management, but it further chances of environmental pollution increases due to toxic emissions if proper measures are not taken. Incineration method is commonly used in developed countries. It is most suitable for high calorific value waste with a large component of paper, plastic, packaging material, with energy recovery. India waste has a low calorific value between 700 and 1000 kilocalories.

Therefore, it is not suitable for incineration (Zhu *et al*., 2008). The first large scale MSW incineration plant was constructed at Timarpur, New Delhi in 1987 with a capacity of 300 t/day and a cost of Rs. 250 million by Miljotecknik Volunteer, Denmark. But after some time it was shut down due to its poor performance. After it in many cities, small incineration is used for burning hospital waste (Sharholy *et al*, 2005). However, two power plants using refuse-drived fuel are in operation in Andhra Pradesh-Hyderabad and Vijayawada. Both produce 6.5 megawats of power, but these plants mey be using more agro waste than MSW.

Biomethanation

Anaerobic digestion is the process used for the biological decomposition of organic waste. The organic wastes are hydrolyzed, liquefied and gasified with the help of methanogenic bacteria. There exists a large potential for generating power from urban and municipal waste and also from industrial waste in India. The potential is likely to increase further with economic development (Saxena *et al*., 2010).

Gasification

The objective of gasification has generally been to produce fuel gas, which would be stored and used when required. In India, there are very few gasifiers in operation, but they are mostly for burning of biomass such as agro-residues, sawmill dust, and forest wastes. Gasification can also be used for MSW treatment after drying, removing the inert and shredding for size reduction (Sharholy *et al*., 2006). There are two designs of gasifiers that exist in India, the first one is installed in Rajasthan by Narvreet Energy Research and Information (NERI) and the second one is installed in New Delhi by Tata Energy Research Institute (TERI) (CPCB, 2004; Ahsan, 1999) [5].

In India these some technologies are continuing for the municipal solid waste management. Table 6. shows the relative capital cost of MSWM technological comparison.

Table: 6: Relative Capital Cost of MSWM Technological Comparison

Technology	MSW Quantity (T)	Land Required (Acers)	Cost (cr.)
Biomenthanation	150	6-7	6-7
Incineration	100	2-3	6-7
Composting	150	7-8	1.5-2

***Source*:** The World Bank Report (Improving management of municipal solid in India overview and challenges)

Financial Aspects

Municipal Solid Waste Management system requires a lot of financial resources for its efficient functioning. Urban Local Bodies spent only 10 percent of their total financial resource on SWM service, because they have to depend on the state government for financial support. Funds for SWM activity are assigned in the general budget, and the percentage of expenditure for various services is not well distributed.

To improve SWM services in urban areas the Supreme Court appointed committee had estimated a cost of Rs. 1.5 crore per 100,000 populations in 1999. This includes collection, transportation, processing and disposal of waste in a scientific manner. This amounts to a total expenditure of Rs. 4275 crore consisting of Rs. 1710 crore spent on vehicles, tools, equipment, and Rs. 2565 crore for the treatment and disposal. The Ministry of Urban Development appointed an expert committee which wrote the manual on solid waste management, has given standard cost estimates as under for modernization of solid waste management practices in various categories of cities and towns in India (Asnani P.U., 2006) [3]. Table 7. Shows the estimated cost for the vehicles, tools, equipments and composting.

Table 7: Estimated Cost for Vehicles, Tools, Equipments and Composting

City population (in millions)	Cost of vehicles, tools, and equipment (in Rs. Lakh)	Cost of Composting (Rs. Lakh)
<0.1	50.97	20
0.1-<0.5	295.00	150
0.5-<1.0	511.00	500
>2.0	948.00	1000

***Source*:** (Asnani P.U., 2006) [3]

MSWM rules in India

The Ministry of Environment and Forest notified Municipal Solid Waste (Management and Handling) Rules 2000 after widely circulating the draft rules in 1999 inviting objections and suggestions if any and made it mandatory for all municipal authorities in the country, irrespective of their size and population, to implement the rules. To improve the systems the following seven directives are given:

1. Prohibit littering on the streets by ensuring storage of waste at source in two bins; one for biodegradable waste and another for recyclable material.
2. Primary collection of biodegradable and non-

biodegradable waste from the doorstep, (including slums and squatter areas) at pre-informed timings on a day-to-day basis using containerized tricycle/handcarts/pick up vans.
3. Street sweeping covering all the residential and commercial areas on all the days of the year irrespective of Sundays and public holidays.
4. Abolition of open waste storage depots and provision of covered containers or closed body waste storage depots.
5. Transportation of waste in covered vehicles on a day to day basis.
6. Treatment of biodegradable waste using composting or waste to energy technologies meeting the standards laid down.
7. Minimize the waste going to the land fill and dispose of only rejects from the treatment plants and inert material at the landfills as per the standards laid down in the rules.

(Notification, Ministry of Environment and Forests September, 2000).

Problems and Issues

In Indian cities a typical municipal solid waste management system is continuing, so a number of problem faced by the urban local bodies. Some of these are as follows:

- Low collection coverage and irregular collection services.
- Transportation facility is irregular and inefficient.
- Lack of waste receptacles.
- Non-availability of primary collection vehicles and equipments.
- Lack of sufficient knowledge on benefits of segregation.
- Lack of financial resources for procurement of tools and modern vehicles.
- Non-availability of appropriate land for landfilling sites.
- Lack of financial resources as well as lack of government support for development of composting plants.
- Lack of public awareness, motivation and education.
- Non-cooperation from household, trade and commerce in waste management practices.

Future Strategies

The Government of India is being made various efforts in the field of Solid Waste Management. But these efforts are not sufficient as required, this is due to Public Interest Litigations (PILs) with respect to SWM in the Supreme Court, the court constituted Dr. Burman's committee to review all aspects of solid waste management and directed the central/state/local bodies to review solid waste management practices. This consisted of a survey that was carried out in class I and II cities. In addition, the Supreme Court directed the formation of a technology advisory group (Tag) to update SWM practices. To prepare future plans and policies, a SWOT (strength/weakness/opportunity/threat) analysis of SWM was carried out. The Burman committee report were taken an basis of measure of the said committee, these are as follows:

- The Central Pollution Control Board and State Pollution Control Boards are to identify the solid waste processing options depending upon the solid waste composition.
- A law relating to solid waste recycling for a sustainable environmental management system with targets and a time frame set for municipalities for solid waste reduction and recycling is being framed at the central government level.
- The government of India in close coordination with the World Bank (WB) and the Asian Development Bank (ADB) is trying to arrange for more funds for solid waste management.
- The Central Government/States Government is carrying out awareness campaigns and proposes to reach more people through print and electronic media campaigns.
- The government has planned to increase the sanction/grant-in-aid to various institutions engaged in research/study on municipal solid waste.

Conclusion

The urbanization continues to take place, the management of solid waste is becoming a major public health and environmental concern in urban areas of many developing countries. Solid waste management is therefore a vital, ongoing and large public service system, which needs to be efficiently provided to the community to maintain aesthetic and public health standards. In Indian cities the municipal solid waste management system is the most poorly rendered, the systems applied are unscientific, outdated and inefficient. Waste is littered all over leading to insanitary living conditions. Municipal laws governing the urban local bodies do not have adequate provisions to deal effectively with the ever-growing problem of solid waste management. So we should improve the MSWM system through proper and suitable planning Presently, searching of new landfill sites is a major problem, so Government must encourage composting, vermin-composting, incineration, refused derived fuel etc. processing and treatment methods for reducing the solid waste disposal problems because the processing of the waste is only the answer of municipal solid waste. The involvement of people and private sector through, RWA's, CBO's and NGOs could improve the efficiency of MSWM. Public awareness should be created among masses to inculcate the health hazards of the wastes.

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