A Note on Bio-degradable Waste in India

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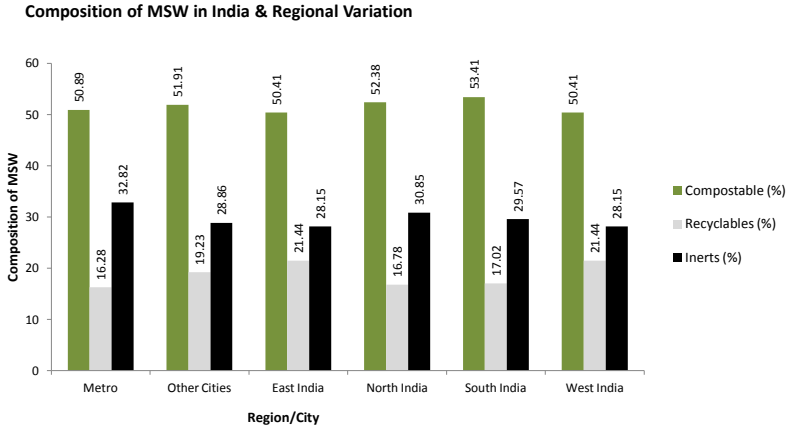
Generation and Composition of municipal solid waste management

According to the Planning Commission's report of the Task Force on Waste to Energy (2014), 62 million tonnes of municipal solid waste generated annually by 377 million people in urban areas and it is projected that by 2031 these urban centers will generate 165 million tonnes in 2031 and 436 million tonnes by 2050. These projections are based on an average per capita waste generation of 450 gm per person per day. The waste generation is increasing by 1.33 percent per annum. The composition of solid waste includes 51 percent bio-degradable waste (wet waste), 32 percent inert waste (C&D, dirt, debris) and non-organic waste and 17 percent recyclable waste (plastic, paper and glass). It is observed that the percentage of bio-degradable waste is high in Indian waste and is a source of contamination of soil, water and air, if disposed indiscriminately.

Composition of Municipal Solid Waste (MSW)



Source: Earth Engineering Centre, 2012

Collection & Transportation and Segregation of waste at source

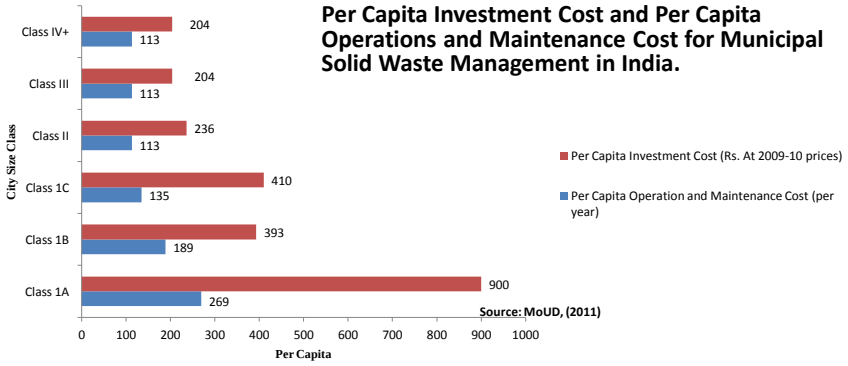
According to the HPEC report and the guidance note on MSWM by MoUD in 2011 and 2012, about 70-80 percent of the municipal waste gets collected and only 22-28 percent of this waste is processed and treated. The low collection efficiency is due to non-uniformity in the collection system. Nearly 100 percent collection is observed in only those areas where the private contractors and NGOs are engaged in the waste collection activity. The uncollected waste is generally burnt in open areas or on the streets.

Different types and size of vehicles are used for transportation of bio-degradable waste in India. The selection of the vehicles depends on various factors such as the quantity of waste, distance, road widths

and conditions and process technologies. To save travel time, minimize human errors and improve the monitoring system, many ULBs have installed Global Positioning System (GPS), Geographic Information system (GIS) and Global System for Mobile Communication (GSM) system in their trucks to collect waste from secondary sources for the waste disposal. According to the Toolkit for Solid Waste Management prepared by MoUD in 2012, transport stations are used where disposal sites are more than 10 km away from the city. Only few transfer stations in India are used and that too in some metropolitan cities. Ensuring 100 percent waste collection is still a big challenge for ULBs despite these technologies. Another significant challenge is to deal with corruption and lack of commitment in the solid waste transport sector.

Devolution of 12th Finance Commission Grants for SWM

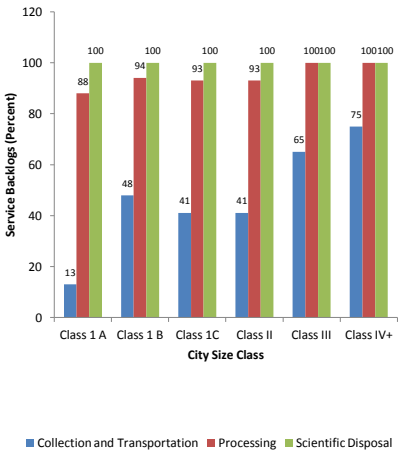
Sl. No.	Particular	Amount (in Crore)
1.	Collection & Transportation equipment & Machinery	386.44
2.	Compost Plants	1001.23
3.	Sanitary Landfill Development	1056.88
	Total	2444.55



Segregation of waste at the door step is almost absent although door to door waste collection is improving in some Indian cities and towns. In the absence of segregation of waste, the quality of recycled products is generally poor and incapable of finding markets which is occupied by virgin materials based products. The responsibility of waste generator has been introduced in the 'Solid Waste Management Rules' of 2016 by Ministry of Environment, Forests, and Climate Change, to segregate waste into three categories – Wet, Dry and Hazardous waste. Under these Rules, the waste generator will have to pay 'User Fee' to the waste collector and a 'Spot Fine' for littering and non-segregation, the quantum of which will be decided by the ULBs. However, there is no separate policy as yet for the segregation and utilization of waste in India.

Backlogs of Service Level Benchmarks

Sl.No.	Performance Indicator	Service Level Benchmark (in percent)	Current Average Performance (in percent)
1.	Complaint Redressal	80	89.1
2.	Collection Efficiency	100	75.3
3.	Household Coverage	100	47.7
4.	MSW Recovery	100	31.7
5.	User Charges Collection Efficiency	90	31.4
6.	MSW Segregation	100	19.5
7.	Scientific Disposal	100	8.0
8.	Cost Recovery	100	17.3



Source: MoUD, (2011)

Processing & Recycling of Bio-degradable Waste

Research documents show that the biodegradable waste must be processed either through bio-methanation or composting technology for generating biogas, electricity and compost for use as nutrient and prevent such waste from reaching the landfill. The aerobic composting and vermi composting are commonly adopted for the treatment of bio-degradable waste. According to the study done by Raj Kumar Joshi and Sirajuddin Ahmed of Cogent Environmental Science (2016), a municipal solid waste composting center installed at Indore is one of the best maintained facilities. Mechanical composting units of 150 to 300 tons per day capacities were installed at Bengaluru, Vadodara, Mumbai, Delhi and Kanpur. India's largest vermi-composting plant of 100 million tonnes per day capacity is located in Bengaluru, while there are smaller plants in Hyderabad, Bengaluru, Mumbai and Faridabad. The kitchen waste derived biogas has 55-60 percent methane and it can be used as cooking fuel, Bio-CNG or fuel for power generation. The Indian government encourages bio-methanation technology by utilizing industrial, agricultural and municipal wastes.

The biggest constraints in composting lie in separating, collecting and transporting this component to the location where decentralized or centralized large scale composting or biogas generation plus composting can be carried out. Efficiency of recycling and composting is greatly reduced due to the absence of source separation. Mixed waste can neither be recycled nor composted. Reusable and recycling waste that constitute 18-20 percent of the total waste are not separated because the process of separating them from mixed waste is highly energy and time intensive and is generally not carried out. Segregation of waste at source would help in recovering and utilizing a higher percentage of recyclable waste than presently, which is estimated to be about 50% of the generated dry waste in the country.

Economics of Composting and Recycling for Class I cities in India

- If you take one lakh population cities in India, on an average, they will produce 50 tons of waste per day @ 0.5 kg/person/day. Of this waste, 70 per cent is **wet waste**, which is 35 tons. If this is composted directly or after producing methane gas from it, it will yield 7 tons of compost per day because in the composting process, the wet waste reduces to one fifth its weight. Therefore, 42 tons of compost can be obtained every month, which if sold at Rs.3/kg, will yield Rs.1,26,000. In addition methane gas will give additional revenue or savings.

- Furthermore, about 8 to 10 tons of **dry waste** can be sold or converted into useful products every day to the tune of Rs.20,000 per day.

- Both these together can earn a minimum of upto Rs.2,50,000 per month for the ULB, i.e. Rs.30,00,000 annually. Generally the revenue is higher even after investment.

- On the other hand, mixed solid waste management requires the Municipality or Corporation to pay tipping fee ranging from Rs700-800/ ton, which is a minimum expenditure of Rs.1,26,00,000 annually without any return on investment except pollution and ill health.

Government Rules & Policies

The Swachh Bharat Mission is a bold and visionary response to one of India's key challenges. The focus of the Mission on sanitation and solid waste management is seen as an important initiative as it highlights the issue of toilets and cleanliness. The Mission seeks to attain this vision of a clean India by October 2019. Target of the Mission in urban areas includes construction of 1.04 crore individual household toilets, over five lakh community and public toilet seats and 100 percent door to door collection of solid waste, its transportation and disposal.

The Ministry of Environment, Forest and Climate Change has revised Solid Waste Management Rules-2016 after 16 years. The Rules are now applicable beyond municipal areas and will extend to urban agglomeration, census towns, notified industrial townships, areas under the control of Indian Railways, airport, airbase, port and harbor, defence establishments, special economic zones, State and Central Government organizations, place of pilgrims, religious & historical importance. The source segregation of waste has been mandated to channelize the waste to wealth by recovery, reuse and recycle. The bio-degradable waste should be processed, treated and disposed of through composting or bio-methanation within the premises (Press Information Bureau, 2016).

The Central Public Health and Environmental Engineering Organizaton (CPHEEO) of Ministry of Urban Development, Government of India has prepared the 'Municipal Solid Waste Management Manual-2016. It reflects, among others, recent organizational and new technological developments, financial sustainability, public-private partnerships and all aspects that are implemented within the concept of integrated municipal solid waste management, including relevance to climate change and gender. The Manual is compulsory for all ULBs, orientation, awareness, and hand-on-knowledge to municipal

officials, elected representatives, NGOs, RWA etc., is needed for achieve improvement in waste management.

Incentives and New Incentives such MDA for City Compost

The Ministry of Environment, Forest and Climate Change provides financial support of upto 50 percent of the capital cost to set up pilot demonstration plants on MSW composting. The Ministry of New and Renewable Energy (MNRE) has designed schemes to promote waste to energy projects. Currently, only five pilot projects based on MSW to energy are supported. Under this scheme, a minimum amount of Rs.2 crores and a maximum of Rs.10 crores per project are available as capital subsidy. Some of State Governments of Andhra Pradesh, Haryana, Gujarat, Karnataka, Maharashtra, Madhya Pradesh, Rajasthan, Tamil Nadu and Uttar Pradesh have announced policy measures pertaining to allotment of land, supply of garbage, and facilities for evacuation, sale and purchase of power to encourage the setting up of waste to energy projects. Greater incentivization and operational support is required for promoting bio-methanation based waste to energy.

The Ministry of Chemical and Fertilizers in collaboration with MoUD has released operational guidelines to an amendment in the policy on the 'Promotion of City Compost' released in Feb 2016, which will allow ULBs to market compost directly to farmers and claim Market Development Assistance (MDA) of Rs.1500/- per tonnes. MoUD will help ULBs to market compost. MoUD has been stepping up efforts to encourage conversion of bio-degradable waste into compost for use as fertilizer, and reduce the amount of waste going to landfill sites. It also called for an appropriate BIS standard/ Eco-Mark to be developed in consultation with BIS for enabling better market acceptance. It is to be branded appropriately in a way that reflects clearly that particular initiative is part of Swachh Bharat Mission. It also stated that the expenditure towards market development assistance for scaling up production and consumption of City Compost will be met out form the budget provisions for Department of Fertilisers.

Most importantly the Bureau of Indian Standards (BIS) has brought out Indian Standard ICS No. 13.030.10, 65.080 for MUNICIPAL SOLID WASTE COMPOST, MANURE GRADE – SPECIFICATION, which specifies the content and its concentration in the city compost. The Ministry of Agriculture has also specified the quality of compost especially the permissible limit of heavy metals and other contraries that can be present in the city compost through their Fertiliser Control Order (FCO). Compost not meeting FCO standards cannot be sold to farmers for use in their farms and fields. They may however be used as soil conditioners in degraded forest lands for regeneration and growth.