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12. Understanding Solid Waste Management System in Gurugram City, Haryana (India)

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Abstract:

Solid waste management is an increasing problem for Municipal corporations across the country, both because of expanding waste generation and a failing supply of adequate disposal sites. The Solid Waste Management is an integral tool for every waste generating activity. This chapter reports the solid waste management in Gurugram City, Haryana by MCG. The reason of studying the current situation is that within the town there is large area and population which results in indiscriminate dumping. Additionally, there is unbalanced collection of waste generated thereby causing heaping of wastes and consequently, out breaks of communicable diseases such as cholera, dysentery and typhoid. In the present study, an effort has been made to provide a wide-ranging review of MSWM for Gurugram city to estimate the current status and recognize the problems of MSWM. The study also aims at inspiring competent authorities/researchers to work towards the improvement of the present system through suggestions and recommendations.

Keywords: Waste Management, Disposal, Dumping etc.

12.1 Introduction:

Solid Waste Management (SWM) is one of the major areas of concern all over World. In developing country like India, there is rapid increase in quantity of solid waste generation due to increase in population growth and urbanization. In general, solid waste is defined as any substance that is discarded by the user and not of any use at the point of its generation. Waste means any garbage, refuse, sludge from a waste water treatment plant, water system treatment plant, or pollution control facility and other unwanted materials including solids, liquid, semi-solid, or containerized gaseous material. Composition of solid waste varies with different factors like climatic conditions, socio-economic background, family size etc. Samples of solid waste includes waste tires, rubbish, latex paints, furnishings and toys, garbage, appliances and vehicles, empty aerosol cans, paint cans, construction and demolition junk, amphibole etc. Haryana is one of the most reformist States in India.

Gurgaon, officially named Gurugram, is a city located within the northern Indian state of Haryana. Gurugram is one of the most promptly urbanizing cities in India, where there are tasks in dealing with different phases of handling solid waste management. The municipal corporation of Gurugram (MCG) created a replacement wing to observe over environment and sustainability. The new wing will cover and monitor regulation in construction sites to see to see dust pollution, enforcement of GRAP, micro STPs, reuse of treated waste water, pond rejuvenation, parks, Green belts and concrete forestry, among other work areas.

12.2 Municipal Solid Waste Management Scenario in India:

The urban growth in India is quicker than the typical for the country and much higher for urban areas over rural. The proportion of population residing in urban areas has increased in 2001 to 31.80 and certain to succeed in 50% by 2030. The quantity of cities has accrued from 5,161 in 2001 to 7,935 in 2011. The rapid climb in urban areas has not been backed adequately with provisioning of basic sanitation infrastructure and thus leaving many Indian cities deficient in services as water system, sewerage, storm water voidance, and solid waste management. It is calculable that Urban India generates regarding 1.5 Lakhs Tonnes waste per day. The per capita waste generation in major cities ranges from 0.20 Kg to 0.6 Kg. Typically, the gathering potency ranges between 70 to 90% in railway system cities whereas in many smaller cities the gathering potency is below 50%. The gathering and disposal of municipal solid waste is one among the pressing problems of city life, which has assumed great importance within the recent past. Treatment of waste and scientific disposal of urban waste isn't only absolutely necessary for the preservation and improvement of public health but it's an immense potential for resource recovery.

The composition of MSW at generation sources and collection points in India is observed to mainly contains an outsized organic fraction (40–60%), ash and fine earth (30–40%), paper (3– 6%) and plastic, glass and metals (each but 1%). About 60-70% of total budget for waste management is spent on street sweeping of waste collection, 20 to 30% on transportation and fewer than 5% on final disposal of waste, which shows that barely any attention is given to scientific and safe disposal of waste. Landfill sites haven't yet been identified by many municipalities and in several municipalities, the landfill sites are exhausted and therefore the respective local bodies don't have resources to acquire new land. Due to lack of disposal sites, even the gathering efficiency gets affected. The Energy and Resources Institute (TERI) has estimated that by 2047, waste generation in Indian cities will increase five-fold to the touch 260 million tonne per annum (Asnani 2006). A study by the planet Bank (2006) puts India’s annual generation of municipal solid waste to be somewhat lower, i.e., within the range of 35 to 45 million tonne, amounting to about 100,000 to 120,000 metric tonne a day. It is also estimated that the annual increase in overall quantity of solid waste in India’s cities are going to be at a rate of 5 % once a year.

12.3 Solid Waste Management Concept of Gurugram City:

Municipal solid waste is refused from households, non- hazardous, waste from industrial, commercial and institutional, market waste, yard waste, and waste from street sweeping and all of these comprehend the role of collection, transfer, treatment, recycling, recovery and disposal. Solid wastes are some things that has no worth and no additional use and that we have a tendency to want to induce eliminate. MCG appointed Eco-green Energy for the initiative.

Eco-green Energy may be an outstanding privatized waste management and waste-to-energy company in India. It not solely gather and transport Municipal Solid Waste (MSW), process it into adequate quality organic Compost and RDF. All its processes and technology are in strict compliance with all the restrictive and emission norms.

The waste collected by Eco green vehicles are dumped into dumping sites or landfills. Dumping is outlined as "a spot used to dispose of solid waste while not environmental controls". There is a legal dumping site in Gurugram in Bandhwari near Pali, Gurugram road.

Fig.12.1: Bandhwari landfill

12.4 Landfill information:

Bandhwari Landfill receives approximately 1800 TPD of waste from the twin cities of Gurugram and Faridabad in state of Haryana. Refuse compactors and dump trucks either owned by Municipal Corporation or under a contractual arrangement, bring mixed waste from various parts of the cities for disposal at the land fill. Out of the total 1800 TPD of waste received at the landfill, Gurugram contributes about 1050 TPD of waste. Based on inputs from Municipal Corporation of Gurugram, this study considered the waste being received from Gurugram to be coming from two broad waste generating sectors:

- Old Gurugram, and
- New Gurugram.

While Old Gurugram mainly comprises individual households, marketplaces and commercial complexes, New Gurugram area includes housing societies, resident welfare associations (RWAs), and high-rise buildings. A National Highway serves as a virtual division of Old and New areas of the city of Gurugram. MCG estimates that about 60% of waste at Bandhwari landfill is received from Old Gurugram and the remaining 40% comes from New Gurugram.

12.5 Waste Composition:

In this section, the waste composition profiles for Old and New Gurugram areas have been described. Also, the overall waste composition profile for the city of Gurugram has been described for a broader picture. Statistical parameters such as mean percentage composition, standard deviation, and best estimates of uncertainty in data have been used to evaluate the presence of each material type in the waste originating from Gurugram.

Table 12.1: Broad MSW Characteristics at Gurugram (Source: Teri Report, 2019)

Material category	Outputs		
	Old Gurugram	New Gurugram	Overall Gurugram
Paper	7.505 ± 1.612	6.857 ± 2.545	7.246 ± 1.355
Plastics	13.730 ± 1.142	10.872 ± 2.127	12.587 ± 1.095
Metal	1.223 ± 0.331	0.674 ± 0.327	1.003 ± 0.242
Glass	1.074 ± 0.304	0.872 ± 0.489	0.993 ± 0.258
Organics	28.747 ± 3.866	38.618 ± 8.989	32.695 ± 4.210
Others	47.722 ± 4.691	42.108 ± 7.048	45.476 ± 3.900

12.6 Waste Management for Legacy Waste:

Methodology: A complete station assessment or drone mapping of any landfill/dumping site should be done previous for handling & discarding of Legacy MSW by Bio-remediation and Bio-mining. Hence, it is suggested to confirm precursor study of the location. Site surrounding parameters like baseline study of significant metals in surface and underground soils and water, rainfall, soil type, surface geophysical science, topography, wind direction etc. shall be studied when bio-mining. When completion of bio mining, there ought to be a periodic study to visualize for any adverse effects within the close space.

12.7 Bio-remediation & Bio-mining of Old Municipal Dumpsites:

It is suggested that we should excavate of old dumped waste and make windrows after stabilization of the waste through bio-remediation followed by its sustainable management through recycling, co-processing, road making etc.

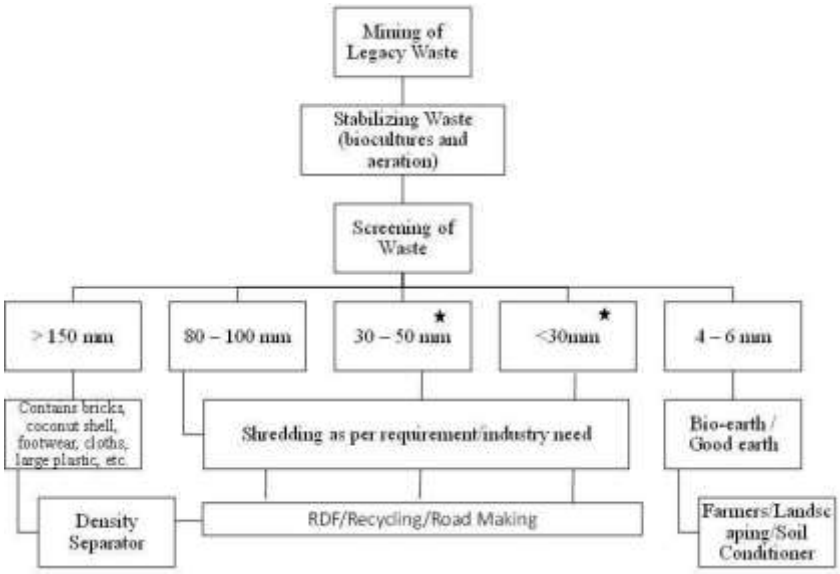

Fig. 12.2: Overview of Bio-mining & Bio-remediation of Legacy Waste (Source- Legacy waste guidelines)

The first step includes excavation of legacy waste, loosen it and making windrows for drying up through open air and sun exposure so that entrapped methane can be removed. All biodegradable waste needs air to decompose. So, the legacy waste is to expose as much of it as possible to air (Fig. 2). Addition of composting bio-cultures quickens decomposition and speedily creates biological heat among the waste that helps to dry it out and cut back its volume by 35-40%. This happens through loss of wet and by decomposition of a number of the aerated waste to carbon dioxide and water vapor. This is often referred to as bio-remediation and makes the waste dry enough for screening. Waste is named stable there is no more generation of warmth or low land gas or leachate, and seeds are able to germinate init. [2] After stabilization, the waste is subjected to screening. Screen sizes commonly used are following: 150 mm. 80 to 100 mm, 24 to 50mm, 1216 mm and 4-6. The finest fraction is called bio-earth or good earth. The coarsest fraction contains bricks, stones, coconut shells, footwear, cloth and larger plastics. Density separation helps recover combustibles which can be used as fuel replacement. The lighter mid-fractions are mostly plastics and can be shredded as per industry requirement for use in bitumen hot mix plants to make Plastic Roads and RDF. Fractions up to 50mm do not require shredding for use as RDF. The heavier mid-fractions are mostly stony inert which can be used in the lowest layers of road-making. Less than 10% of the original waste remains as totally unusable residual rejects and may remain onsite in a small heap [2]. The land is now fully recovered for alternate uses. Bio- mining and Bio-remediation processes ought to be adopted as early as attainable to confirm holistic solid waste management.

12.8 Process of Bio-remediation and Bio-mining:

The legacy waste is exposed to air so that it gets stabilize. After stabilization, there is Formation of long low heaps of about 2-meter height called wind-rows, to get maximum surface area to volume. Repeated turning is necessary so that the whole waste gets exposed to air. Turnings of legacy waste are essential to stabilize it.

1. Use a tractor-tiller to loosen the topmost 150 mm layer of legacy waste. Mist-spray the waste with bio-cultures to control odour and decomposition of waste. Hand-pick out large objects. Then make the windrows of waste using JCB. Turn windrows every 5 days. After 5-6 weeks the waste or heap is sent for screening. [2]

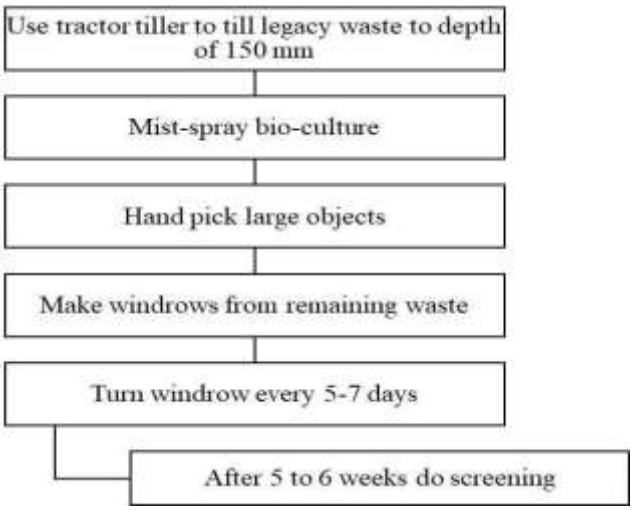

Fig. 12.3: Schematic representation of Bio-mining through Tractor Tiller by Windrows (Source- Legacy waste guidelines)

2. Use a JCB to dig 2-2.5-meter-deep trenches at 1.5-to-2-meter intervals. This is a rapid and cost-effective way. Mist-spray the sides of the trenches so that microbesreach to exposed waste surfaces. Bring down legacy waste slices, do turning of windrows and repeat the process until almost ground level is reached. When waste moisture is low, there is screening of waste. [2]

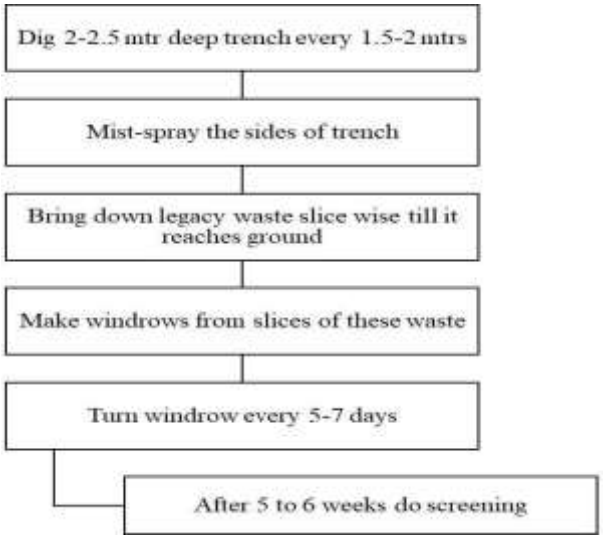

Fig. 12.4 Schematic representation of Bio-mining through Trench Method (Source-Legacy waste guidelines)

3. Use a JCB to lift legacy waste from top of landfill and drop this waste from height to loosen the waste for aeration and form 2–3-meter cones. Mist-spray bio culture on the cones. Every day or 2-3 days, turn this cone for aeration. After 5-6 weeks, do screening.

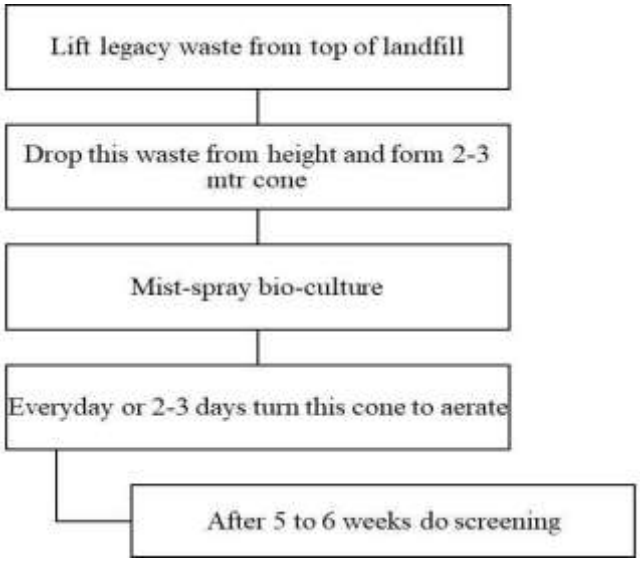

Fig. 12.5: Schematic representation of Bio-mining through Cone Method (Source-Legacy waste guidelines

4. Lift legacy waste from top of landfill using JCB. Make several long parallel windrows and turn them on weekly basis for proper aeration. Joint two windrows when the volume decreases. After 5 to 6 weeks, do screening.

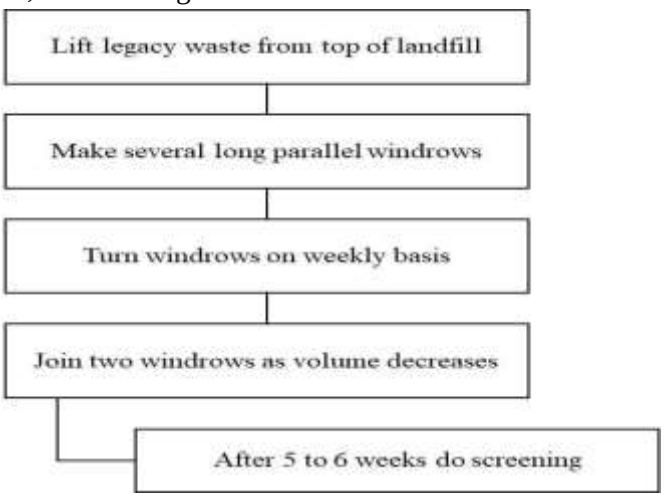

Fig. 12.6: Schematic representation of Bio-mining through Windrow Method for Spacious Landfill Sites (Source- Legacy waste guidelines)

5. If waste needs to be moved from one location to another part of the same site, then lift the waste make several parallel windrows and mist-spray bio cultures. For turning move them to new places. Make new windrows of height 150mm and mist-spray bio-culture. After 5 days of aeration one layer is added to the next one and mist-spraying bio cultures on that also. Turning is not required when waste is spread thin like this. After 5 to 6 weeks, the waste is subjected to screening.

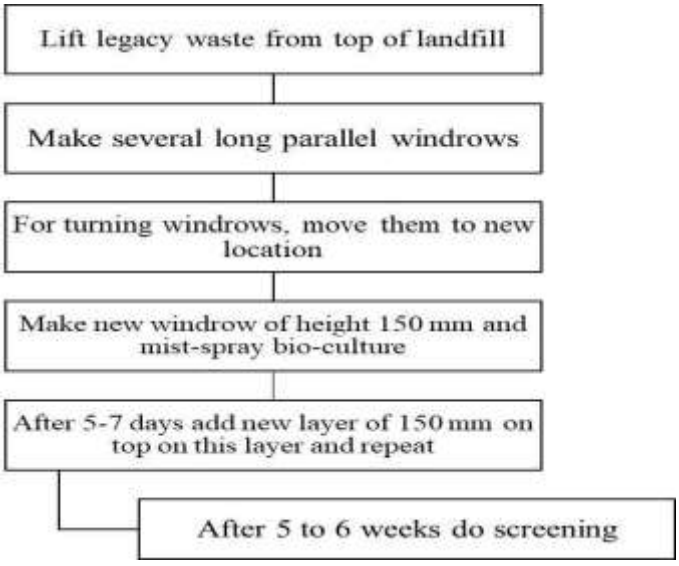

Fig. 12.7: Schematic representation of Bio-mining through Thin Layer Spreading Method (Source- Legacy waste guidelines)

12.9 Processing Equipment's for Processing of Legacy waste:

The major equipment falls under the following processes like excavation, shredding, screening, air classification and ferrous separation. As per appropriateness and condition the suitable choices should be made.

12.9.1 Screening:

- Trommel
- Vibrating Screen
- Disc/Star

12.9.2 Handling Equipment:

- Loader (Front Load)
- Conveyers
- Fork Lifts

12.9.3 Treatment Process:

Processing of gathered waste shall be done in following way as given below:

a. There ought to be a time bound plan for execution of the bio-mining process to clear the old waste.
b. Volume of waste ought to be determined through Total Station Survey and site measurements.
c. Do baseline survey of landfill soils and waters and conjointly leachate present, to check for heavy metals and toxics if any. Samples should be drawn by an NABL or MOEF research laboratory.
d. Mist-spray bio-culture on the heap. This may manage smell and speed up decomposition.
e. Hand picks out bulky waste like coconut shells, banana stems, tyres and rocks prior to screening for bio-mining. Store in isolated heaps for sale or use.
f. Turn these windrow heaps once a week until no more volume reduction is observed in the heaps and no more heat is generated. If the garbage is stabilized, there will be no smell or leachate formation and the material will be dry enough forsieving.
g. Agencies may deploy Trommels and/or Horizontal Screens for screening.
h. The recyclables recovered from the bio-mining method ought to be sent for employment. Non-Recyclable plastic material ought to be sent for road creating or to RDF units or cement plants.
i. The recovered earthy fines shall rather be used for landscaping or agriculture.
j. The recovered construction and demolition waste recovered from the bio-mining method could also be sent to a C&D process facility if appropriate for production of building materials.
k. Typically, the best fractions are going to be organic matter and fine soil, known as 'bio-earth', which may be accustomed grow some vegetation for erosion management.

l. There could also be some (maximum 5-10% of total) left over waste together with lumps of heterogeneous nature. The waste could also be soaked with leachate and troublesome to disintegrate. This waste is oftensent to scientific lowland for disposal (near zeroresidues).
m. The recovered land from the bio-mining method shall be utilized for any purpose deemed acceptable. Ideally rescued area ought to be reused for waste process, otherwise for alternate non-habitationuses.

12.10 Conclusion and Recommendations:

From the above study, we have found that on an average the waste fraction contains – Paper – 7%, Plastic – 11-14%, Metal – 1%, Glass – 1%, Organics – 29-38% and others –42-48%. The role of civil society and institutions (RWAs, NGOs etc.) can be instrumental to make SWM efficient and effective by encouraging reduction in waste generation and segregation at source. There should be utilization of waste in a manner to create alternate energy source instead of making it aburden. Municipal Solid Waste consists of Household Waste, Construction and Demolition Debris, Horticulture, and Waste from Streets.

Municipal Solid Waste should be segregated into groups of bio-degradable, recyclables and hazardous waste. Biodegradables like organic waste from kitchen and market to be converted into rich organic manure or energy.

Plastics, papers, glass; metals are to be recycled into new products. "Segregation" shall remain to be centric approach solution. These further creates an opportunity to order the sequence of collection and processing of waste – for instance vegetable market waste which is high on organic content can be collected and processed on a daily basis and on a decentralized model with the facilities being set up at the markets itself or at centralized processing unit.

In case of recyclables or dry wastes, there should be segregation of waste by sorting them into plastics, paper, metal, glass, and fuel (coco nut shells) and rubber. Bio-medical, hazardous and e -Waste should be managed by concerned authorities as per the existing legislations. The non-recyclable waste components and inert should be dispose of into scientifically designed sanitary landfills. Waste disposal of polythene, iron and metal should be done using densifiers and magnetic system. Between bio-degradable and non-degradable, inert material is dumped, while degradable waste will be processed to make manure.

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