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Challenges and Management of Waste Disposal In India

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Abstract

Each year human society produce mountains of waste they are municipal solid waste, medical waste, agriculture waste, e-waste, hazardous waste, sewage waste etc. waste is the unwanted or useless solid materials which is generated from combined of residential, industrial, and commercial activities of human being. Various methodologies and techniques have been developed for managing these waste properly within increase in population growth. With huge volume of solid waste have been generated in large quantity. In developing country like India efficient management of solid waste is a major challenge. There should be urgent need of proper collection, transportation and disposal of waste because current population of India is 1.32 billion and this population is equivalent to 17.74% of the total world population. Estimated quantity of municipal waste generated in India is 48 million tonnes/years which is calculated 0.4 kg /capita/day and this is important for Indian population they have to learn how to effectively reduce, reuse and recycle the amount of waste which is a great challenge for our country. Government order to plan various treatment and disposal techniques for waste management, they form various rules, regulation, act and policies etc. for managing these waste. India is facing many problems of managing, handling and disposal of waste according to health sector as well as sustainable environment. Waste handling and disposal is not free from challenges because lack of collection of municipal solid waste, lack of analysis the toxic waste, lack of segregation practices, lack of proper operational strategy, poor regulative measures, lack of storage of waste, lack of adequate transportation facilities, lack of institutional arrangements, financial constraints, inadequate awareness and training programs and many more. If individual follows some rules like use only as much as you need natural resources, segregate your waste into wet and dry garbage, as possible avoid using of non-biodegradable materials, do not through garbage in public place etc , if we aware of these things then we cut down the waste generated and ensure that the minimal residual waste does not harm our environment as well as our health. This article has showed the different needs and education related to waste management.

Keywords : Hazardous , disposal, handling, management, challenges, waste,

INTRODUCTION

- Waste is any substance which is discarded after primary use, or it is worthless, defective and of no use.
- Examples include municipal solid **waste** (household trash/refuse), hazardous **waste**, wastewater (such as sewage, which contains bodily **wastes** (feces and urine) and surface runoff), radioactive **waste**, and others.
- With rapid urbanisation, the country is facing massive waste management challenge. Over 377 million urban people live in 7,935 towns and cities and generate 62 million tonnes of municipal solid waste per annum. Only 43 million tonnes (MT) of the waste is collected, 11.9 MT is treated and 31 MT is dumped in landfill sites. Solid Waste Management (SWM) is one among the basic essential services provided by municipal authorities in the country to keep urban centres clean. However, almost all municipal authorities deposit solid waste at a dumpyard within or outside the city haphazardly. Experts believe that India is following a flawed system of waste disposal and management.

TYPE OF WASTE



SOLID WASTE

solid waste means any garbage, refuse, sludge from a wastewater treatment plant, water supply treatment plant, or air pollution control facility and other discarded materials including solid, liquid, semi-solid, or contained gaseous material, resulting from industrial, commercial, mining and agricultural operations, and from community activities.



SOLID WASTE MANAGEMENT IN INDIA IS A MAJOR PROBLEM

A solid waste management (SWM) system includes the generation of waste, storage, collection, transportation, processing and final disposal. As all of these activities are combined together in this management thus it is known as **Integrated Municipal Solid Waste Management (IMSWM)** in India. It is a basic public necessity and this service is provided by respective urban local bodies (ULBs) in India. Indian cities are still struggling to achieve the collection of all MSW generated. Metros and other big cities in India collect between 70- 90% of MSW. Smaller cities and towns collect less than 50%.

INTEGRATED MUNICIPAL SOLID WASTE MANAGEMENT (IMSWM)

The process takes care of waste from the place of origin/generation to the final disposal. In India, due to unavailability of staff and funds; IMSWM activity is privatized by the Government and ULBs. Generally one operator manages all the activities together with small units. Presently two major players in India for this industry are **Ramky Enviro Engineers and ILFS private limited**.



Some of the cities and towns in India has achieved success in solid waste management and have enrol their name in success stories of solid waste management; however few have failed due to either financial or political issues.



IMSWM follow this hierarchy for waste management; the waste is first collected from household and all possible sources. The waste is than segregated; metals, glass and recyclable are removed from the waste. The waste is stored in temporary storage areas where waste is compacted and shredded if necessary to make transportation effective. The waste is then transported to dump yards/landfills where it goes through various processing and treatment and rest of the waste after all recovery is disposed in landfills. It becomes very important to know the type and source of waste; it helps in evaluation the potential health risks. The study of volume of waste is important to decide the collection methodology and transportation requirement.



Various Sources of waste for IMSWM are:

- Household waste
- Road sweeping waste
- C & D waste
- Horticulture waste
- Treated Biomedical waste
- Sludge (STP & ETP)
- Slaughter house waste
- Institutional & commercial waste
- Drain Silt etc

WASTE MANAGEMENT PREFERENCE:INDIA

Based on the physical, chemical, biological characteristics and possible best environmental alternative, the waste goes through a series of treatment preferences.

Landfill is considered to be the least preferred alternative in waste management. The reason is being; huge land requirement, ground water contamination by leachate and methane emission adding to environment causing global warming.

Waste transformation without recovery is the second last preferred option as it just reduces the quantity of waste but do not provide any product.

Waste Processing with recovery is the preferred option in hierarchy due to the usable product received during waste processing i.e. compost, vermin-compost, biogas, energy etc.

Recycling is one of the most preferred options as it gives good output without much of investment. Glass, metals, cans, newspaper once collected are used by the respective users and industries as raw material.

Waste minimisation and reduction is considered to be best preferred alternative as it reduces all other problem and cost of collection, segregation, transport and disposal. The option is most environment friendly way with more sensitization towards environment.



WASTE MANAGEMENT PROCESS: INDIA

Waste collection process is broadly classified into five main steps:



- Waste Generation
- Primary Collection (door-to-door collection)
- Secondary Collection & Transportation(dumped in nearby dumper bins and community collection units)
- Waste Treatment
- Waste Disposal

IMSWM PRINCIPLE AND BASIC

IMSWM – Principle

The basic and most important principle behind successful operation of Integrated Municipal Solid Waste Management is 3R/5R concept of waste management.

- 3R Reduce, reuse and recycle
- 5R Reduce, reuse, recycle, refuse and recover

Details about the concept will be discussed separately in the tutorial. The other very important principles of waste management are equity, effectiveness and efficiency, following these principles is

must for success of waste management.



Equity: all citizens are entitled to an appropriate waste management system for environmental health reasons

Effectiveness: the waste management model applied will lead to the safe removal of all waste **Efficiency**: the management of all waste is done by maximising the benefits, minimising the costs and optimizing the use of resources on sustainable basis.

IMSWM – BASIC CONCEPTS

The management of solid waste mainly depends on three main concepts and technique; Life – cycle assessment (LCA), waste generation and waste management. As we have already discussed waste generation; let us talk about other concepts. One of the very important concepts in waste management is LCA.

Life cycle assessment - LCA consists of four phases:

- 1. Goal and scope definition
- 2. Life Cycle Inventory (LCI) inventory of chain in production and consumerism
- 3. Impact assessment impacts on environment and health
- 4. Interpretation effect of studies impacts on environment and health

It is known to be a Cradle to Grave Process

Lifecycle assessment is the assessment of a product from its production (cradle) to consumption and dumping (grave).



Material Recycling

The reduction in consumption, and utilization of discarded products within the production system as a substitute for new resources, can lead to reduced end-of-cycle waste generation; thus, less efforts and resources would be required for the final disposal of the waste. This concept is mostly applicable to industries. The diagram shows how we always need input/energy and release pollutant at every stage of production and consumption. If managed properly we can get energy as output and material recycling can reduce the cost of input raw material.



Waste generation

Waste generation is from different sources such as domestic, commercial and industrial. This waste could be further classified as hazardous and non-hazardous waste. The former has to be segregated at source and treated for disposal in accordance with the regulations.



5R approach i.e reduce, reuse and recycle, refuse and recover is applicable both at source as well as at the different levels of solid waste management chain including collection, transportation, treatment and final disposal.

Waste management

Waste management is dependent on generators, Government & ULBs and service provider means the company hired for waste management by Government (the sector is privatized by Government in India).

The generation, collection, and treatment disposal depends on the innovative techniques installed for waste generation. The process can gain monetary returns if done properly and registered under **Clean Development Mechanism (CDM)** project of UNFCCC



Management systems may evolve over a period of time depending on the variations in solid waste, political and administrative structures, socioeconomic situation and geo-climatic conditions. Hence, it is useful to capture the evolving process with respect to laws, institutions, financial mechanisms, technology, and infrastructure & stakeholder participation (Sahu *et al.* 2020).

IMPLEMENTATION OF IMSWM

Waste management is not only a subject of environment but also best possible management. We will now discuss some of the methods which can if implemented improve the solid waste management process:

Reuse & Recycling – proper implementation of 5R concept; encouraging people to reduce, reuse and recycling of waste can lead to successful IMSWM. The practice can reduce waste at source thus can help the whole hierarchy of waste management.

Improving waste collection - As waste collection is one of the most expensive and visible elements in waste management, it is necessary to improve the efficiency in this area. Waste collection and street cleaning often consumes 10-20% of the total budget of a municipality. In spite of this, on average up to 50% of urban dwellers in cities in low- and middle-income countries have no regular collection service. Improving the collection efficiency can actually help us to get rid of unattended waste dumps and related problems.

Vehicle Productivity - Vehicle productivity is usually the most important factor influencing collection efficiency, because the cost of operating vehicles is usually much higher than the cost of labour. Improving vehicle productivity means increasing the total number of generators served and the total amount of waste transported each day per vehicle.

Maintenance – Maintenance of vehicles is an important factor influencing vehicle productivity. It is not uncommon to find more than 30% of vehicles out-of service at any time. The vehicles selected should be available locally, easily repairable and with domestically manufactured parts. Workers would be consulted to develop a participatory plan for preventive maintenance. This will maximise the use of labour and minimise the use of materials. Low cost regular maintenance such as frequent checks of fluid levels, washing, removal of sand and grime, and regular inspection for early problem detection would go a long way in better maintenance of the fleet.

Transportation Efficiency - A traditional technology-intensive approach to improving transportation efficiency would almost certainly focus on getting better, more efficient vehicles, or moving to high-input transfer stations, which would prevent waste picker access. But this might conflict with existing institutional and commercial agreements. A transfer station with recycling would be a practical option as it would improve the livelihood of the waste pickers and motivate them to co-operate with the collection, rather than obstructing it. It would also promote resource conservation.

Improving waste treatment - Waste treatment takes place in the final stages of the whole waste management system, which is related to disposal, and partly an alternative to it. In IMSWM terms, working on waste treatment requires understanding the technical, environmental and economic aspects.

Improving waste disposal - IMSWM strategy would mobilise stakeholders, i.e. consumers,

manufacturers and local authorities to identify opportunities for prevention, reduction, reuse and recycling of waste, as this will reduce the amount of waste to be landfilled. Mobilising the community, providing incentives and developing a set of sanctions for excess disposal will strengthen the initiative. Likewise, the use of transfer stations which allow for the segregating and subsequent recycling of waste will contribute to reduction of the use of landfilling (Barik *et al.* 2015).

BENEFITS, ISSUES AND CHALLAGES: INDIA

BENEFITS OF IMSWM

Benefits of proper waste management are simple to understand as we have already studied the environmental and health problems that we can face if we don't manage our waste properly. Listed below are some of the benefits of IMSWM:

- Lower costs of waste management applying 5R concept in initial stages of waste generation will reduce the cost of waste management.
- Less environmental pollution the environmental problems associated with soil, water and air will automatically reduce if we manage our waste.
- **Conservation of raw materials** recycling will reduce the raw material quantity exploited from nature. Example paper recycling can reduce the cutting of trees.
- More active and environmentally sensitive citizens who contribute to urban development
- Better image of the city, aesthetically more attractive urban space
- Fewer health hazards due to least contamination
- Better cost management and higher cost recovery during waste management
- Better performance by waste management departments
- More income from tourism, fishing and agriculture etc.

ISSUES IN IMSWM: INDIA

Implementation of IMSWM in places with huge population is a herculean task for Government. Solid waste management is impossible without the support of people; in big cities convincing people and implementing stringent rule is very difficult task. Listed are some of the ground problem and issues faced by ULBs in IMSWM:

- Low priority for waste management leads to low investments in the sector.
- Coping with informal solutions in waste disposal rag picking and socio economic implications resulting in loss of recyclables and high calorific value waste
- Technology imported for waste treatment are not adapted to Indian local circumstances
- Choice of technologies without due analysis of waste characteristics
- Financing and marketing issues; product of treatment technology don't have market for example compost etc.
- **Poor quantity of process outputs** due to the use of mixed MSW; un-segregated waste gives low grade product. Example compost from mixed waste rather than causing benefit to plants cause heavy metal contamination and biomagnifications.
- Low skill/ managerial inputs; lack of expertise in the solid waste management sector.

CHALLENGES FACED IN IMSWM

Apart from various issues; many practical solutions are intricate to implement and comply.

- NIMBY (Not in my backyard) phenomenon people don't want community bins/dumper bins or any waste processing unit near homes.
- Land acquisition for landfills and waste processing.
- Developing 'Regional' approach is practically good option but difficult to implement.
- Lack of willingness to charge user fee; people don't want to pay money even Rs30/- per month
- Weak contractual agreements and poor project structure between government and private players.

WHAT NEEDS TO BE DONE???

- Many things are required at personal and Government level for proper solid waste management. Some of the important implementations are required to get sustainable and effective waste management.
- We need an individual **State Policy of MSWM** and specific body/institution for technically guidance in IMSWM. Capacity building of municipal staff / other stakeholders is very important before starting any IMSWM project. **Municipalities need to get clustered** for effective waste management with least investment. **Reclamation of existing dumpsite for**

re-uses to avoid misuse of new land for dumping waste. Street sweeping, non-organic and C&D waste should be collected and transported separately.

• The things in books and in ground are very different, these are just the glimpses of the problem faced by ULBs, the dump of challenges is no less than waste dump in solid waste management.

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