



ISSN Print: 2394-7500  
ISSN Online: 2394-5869  
Impact Factor: 5.2  
IJAR 2019; 5(12): 184-189  
www.allresearchjournal.com  
Received: 02-12-2019  
Accepted: 20-12-2019

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## A systematic review on waste management system

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### Abstract

One of the significant issues of urban communities is the management of waste. Improper management of waste leads to several menaces to the residents. Many surveys have revealed that around 95% of waste is thrown out inappropriately into landfills and dumping yards left openly, creating an unhealthy environment to the people and nature. The present article has made an attempt to give a complete picture of the waste generating sources, collection and transportation, removal and management approaches of waste produced overall. The current review article focuses on Waste management in urbanized areas to verify the present situations and recognize the serious concerns. Many approaches on treating the waste are basically looked into, alongside their pros and cons. Finally the study has concluded with a couple of productive proposals, which shall add value to support the equipped specialists/analysts to move in the direction of further improvement of the present framework.

**Keywords:** Waste management system, unhealthy environment, ecology balance

### Introduction

Sophisticated life styles of people and resource usage trends have an undesired and unexpected adverse effect on waste generation in the modern societies - which is far beyond the mitigation limits by urban governments and agencies. Presently, urban people have become serious on the problems associated to increased amounts of waste produced, money involved, the removal methods and approaches, and the issues created by dumping wastes in the locality and global condition<sup>[1]</sup>.



**Fig 1:** Cans and bottles waste

Yet, to the city dwellers these issues have likewise given a chance to look for solutions - comprising both the private and community sector; creating innovations and removal strategies; and creating awareness campaigns. These issues can be mitigated practically has been proven by many countries in the world. There is a complete need for total reexamining of "waste" - to examine if this waste is really unwanted or not<sup>[2]</sup>.

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Good management of waste is significant for:

- Business notoriety
- Ecology balance
- Securing business contracts
- Controlling expenses of waste

There is an clear requirement for development in the current procedure of waste expulsion that is focused on regions and use increased amounts of fuels and new technologies, to work in the direction of reuse of waste generated (that incorporate open public affiliations, concentrating on minimizing waste production in possible ways-driven at the populace level, and using less resources <sup>[3]</sup>. some of the principles behind management requires peoples support, financial support, focusing much on the recycling and recovery of the waste, organizing, limiting ecological side effects, predicting the cost beforehand on this subject etc. and all these need to be done by keeping in view the long term goals of waste management <sup>[4]</sup>.

### Goals of waste management

The good management of waste incorporates certain objectives for decreasing and killing antagonistic impacts of waste materials on human health and the ecology to facilitate monetary improvement and to have a higher life quality. This is to be done in the most effective way conceivable, to minimize expenses and avoid waste development <sup>[5]</sup>.

Useful Components of the Waste management are <sup>[6, 7]</sup>



**Fig 2:** Waste containers

### Sources of waste generation

There are a variety of materials considered as waste, for e.g., waste from Industrial facility, Local waste, E-waste, Development waste, oil plants Waste, food waste, waste from Agricultural, Slaughterhouse wastes, Atomic waste, Bio-therapeutic waste, and so on <sup>[9]</sup>. Waste has been characterized as follows:

Solids waste

- Waste from kitchens, Vegetables, family unit waste and so forth.
- Plastic materials like sacks, broken bottles, broken buckets, and so on.
- Waste from metals like metal sheets, and unused pieces and so on.
- Liquids waste-water refineries, tanneries, thermal plants.
- E-waste- for e.g., television, PC, materials related to music tools and so forth.

**There are six functional segments of the waste management, as sketched below**

- **Generation of waste:** This incorporates any activity associated with distinguishing materials that are never again can be used and sometimes the waste kept in an organized way to dispose it later.
- **Storage and handling:** This is related to any activity at the location of production of waste. For case, waste tubs are kept at points that produce ample waste.
- **Collection:** It is an essential stage of management of waste, this comprise of certain works, for e.g., placing collecting tubs at points, and then collection of waste from those points or locations. And amassing garbage in the places into collecting trucks are empty <sup>[8]</sup>.
- **Transport and transfer of waste:** These are the works engaged with moving waste from the near waste collecting places to the provincial removal sites in enormous transporting vehicles.
- **Processing and recovery of waste:** This is attributed to the facility, and equipments employed to recover certain articles or materials that can be reused or recycled for usage and to improve the feasibility of further components of managing waste.
- **Disposal:** disposal stage is the last stage of managing waste. It comprises on the works focused on systematic removal of rubbish materials in places, for e.g. waste-to-energy centers or landfills.

- Nuclear waste-atomic facilities also generate atomic waste.

Further, the waste has been divided into two types Biodegradable (wet waste) and Non-Biodegradable (dry waste).

Biodegradable (Wet waste) incorporates the accompanying:

- Green waste from vegetable and organic product merchants/shops.
- Garden clearing waste comprising of leaves either dry or greenish.
- Cleaning wastes
- Waste generated from food shops and tea shops and so forth.
- Flower and organic product waste including juice strips and house-plant waste.

### Non-biodegradable (Dry waste) incorporates the accompanying

1. Cardboard and containers
2. Paper and plastic, different sorts
3. Packaging of different sorts
4. Glass of different sorts
5. Metals of different sorts
6. Containers of different sorts barring those containing dangerous material
7. House clearing (dust and so on.)
8. Foils, wrappings, pockets, sachets and tetra packs (washed)
9. Ashes
10. Discarded dress, furnishings and hardware
11. Discarded electronic things from workplaces, settlements viz. tapes, PC diskettes, printer cartridges and electronic parts
12. Rags, elastic

### Problems associated with unhygienic conditions

Waste disposals have an unpleasant affect the ecology and health of individuals. Dump yards which are openly left releases a gas called methane from disintegration of organic waste in oxygen deficit conditions. Flames and blasts are caused by release of methane gas and is a significant supporter of worldwide global warming <sup>[10, 11]</sup>. There are additionally issues related with smell and transfer of leachates into water. Smell is a major issue, especially throughout the mid-year when normal temperature in India surpasses 40-45 °C <sup>[12]</sup>. Disposed rubber wheels at dump yards gather water, permitting the insects and mosquitoes to grow, expanding the danger of illnesses, for example, intestinal sickness, malaria and other types of fevers. Unrestrained dumping of wastes at places discharges small elements that are a significant reason for respiratory malady and causes brown haze. Burnt solid waste like rubber tyres radiates 22,000 tons of huge amounts of toxins into the climate around Mumbai consistently <sup>[13]</sup>. The effects of poor waste administration on general wellbeing are all around reported, with expanded occurrences of breathing troubles, nose and throat diseases, bacterial contaminations, irritation, decreased resistance, iron deficiency, sensitivities, asthma and different diseases <sup>[14]</sup>.



**Fig 3:** Waste dump in open lands

### Storage and collection

Waste created at homes is generally shifted to collective canisters which are manufactured from metallic materials and concrete sometimes made by using both the materials. The material collected by sweeping roads are collected and shifted to the garbage containers. At certain times these containers kept at community points are used by few business units to extend the awareness of their business by paying some money to the corporate present over the community. This is done as most of the people's movement occurs at those points to dump trash. <sup>[15]</sup>.

### Transfer and transport

The different Methods for transportation of waste in India are: hand rickshaws, bullock cart, dumpers, compactors, tractor, trucks, and trailers. Portable compactor, Stationary compactor, and canvas shrouded automobiles are used for the purpose of transporting solid waste. Approximately 60-70% of waste is transported to the dump yards using only these vehicles. Any repairs raised to these vehicles are rectified at workshops, however these workshops they work only to certain extent. Since these workshops they can fix only small damages but not major. So, it would be a clear indication that whenever these vehicles are broken down then the normal activities related to dumping waste gets reduced. However, some major cities may not face this problem as they have other sources of transportation <sup>[16]</sup>.



**Fig 4:** Waste clearing vehicle

### Removal and treatment of waste

Mostly, either intentionally or unintended waste is dumped without following any formal procedures <sup>[15]</sup>. But rag pickers they pick few items that can be recycled and reused upon processing. Since non-separated waste is thrown into society containers, its best reuse is not so promising. At some instances, waste pickers they sift into the containers and sell the usable items made of glass, paper, plastics and so forth. In most of the places globally, practically all reusable items are sifted by rag collectors and assimilated in objects line through recycling <sup>[17, 18]</sup>.



Source: Public domain

Fig 5: Sewage treatment area

**Organic waste and its biological treatment:** The waste produced in Asian countries has increasingly natural matter about half when contrasted with 31% created by other nations. Following soil fertilizing strategies are usually done in India [19, 20].

**Treating the soil aerobically:** Under moist and warm conditions, the solid waste generated can make the soil fertilized aerobically by conversion of organic matter. The final result of treating the soil, having high supplement esteem, is humus (fertilizer). Treating the soil could be either mechanical or labor-intensive. In small towns treating the soil is done by man power. However in urban communities, power-driven fertilizing the soil units have been introduced [21, 22]. A composting center has been introduced at few cities is extraordinary compared to other

centers in globally. In metro and cosmopolitan cities mechanical soil fertilizing units of 145 to 310 tons/day limits were likewise introduced.

**Anaerobic assimilation:** Anaerobic decay of waste is otherwise called bio-methanation process. It is considered to be the significant and feasible procedures for treating the biodegradable piece of solids in subtropical atmospheres. During this procedure, bio gas is liberated by stabilization process which can further utilized as fuel resource. The biogas has 55-60% methane and it very well may be utilized as fuel for power production. Few nation's legislations boost a bio-methanation technique by using modern, horticultural and city wastes. Various plans for biomethanation are under plan and initiation underway for certain urban areas to use waste produced from vegetables [22].

**Thermal treatment:** Solid wastes can be treated thermally by burning, Pyrolysis and gasification. Treatment of thermal procedures is not very appropriate for sub-tropical countries waste. Since mostly wet waste, contains high amount of moisture, natural substituents, and latent substances in a range of 31 to 61% each. And has a 700-1000 kcal/kg calorific value. Burning this content of wet waste is difficult since it needs more fuel consumption. Instead to treat this bio waste we can go for incinerators as it consumes less energy.

**Legislations to treat the waste**

In many nations waste management is followed very strictly with implementation of certain specific laws and enactments to fortify the directors in issues identifying with waste administration. Few of the significant streams of waste where laws were formed and their impact were briefed in Table below [26, 27]

Table 1: Legislations to treat the waste

Type of waste	Applicable Legislation	Impact
Biomedical Waste	Bio-Medical Waste Management Rules	Pollution Fire hazard
Hazardous waste	Hazardous and Other Wastes (Management and Transboundary Movement) Rules	Entry into food chain
E-waste	e e-waste (Management) Rules	Corrosion of material
Lead acid Battery waste	The Batteries (Management and Handling) Rules	Climate change
Plastic waste	Plastic Waste Management Rules,	Food contamination
Municipal Solid waste	Solid Waste Management Rules	Impact on health
Fly ash	Fly ash notification by MoEF &CC dtd	Resource depletion
Construction and demolition waste	Construction and Demolition Waste Management Rules	Habitat loss and affect flora/fauna
Radioactive waste	Atomic Energy (Safe Disposal Of Radioactive Wastes) Rules	Bio-magnification
		Loss of soil fertility
		Infection
		Choking of sewerage and drainage Choking of digestive system of
		Pollution.
		Lead poisoning
		Pollution Choking of sewerage and drainage
		Impact on health
		Climate change
		Street dog menace
		Rodent menace
		Fire hazard
		Entry into food chain
		Corrosion of material

### Suggestions and Changes required improving waste management

A visionary focus for management of waste is based on the consumption or the deployment of waste as resource with increased dig, reuse, retrieval and recycle. Urban local bodies must be liable for the management of waste, with the ULB Chief and Executive must be directly answerable for execution of management systems of waste. It must be looked upon from the ground level as the basic need of every citizen which requires a justifiable finance. The issues introduced to a ULB for an appropriately subsidized system must exhibit the benefits of sound interest in waste administration.

A solid and free administration is expected to control waste if this situation has to get improved in our country. Without firm guidelines and strict implementation, upgrades do not occur. Firm guidelines on waste management can drive advancements.



**Fig 6:** Sustainable development of ecology

A clear views, predictability and planned ideas about the amount of waste generated and the techniques that can be applied to remove and reuse the waste generally decides the fate and management of waste. Acquirement of tools internally at state level and means of transport is important for primary and secondary assortment with successful systems for assessing collection, transportation and removal. Waste and litter on roads is a significant concern that majorly has an impact on citizen's health in society. One of the cultural cities like Nagpur has stood as a best example in this regard as every responsible individual will clean the streets upto certain range.

All youngsters must comprehend the significance of waste administration, the impacts of improper waste administration on the climate and general health, and the job and obligations of every person in the waste administration framework. This will create dependable residents who view waste as an asset opportunity <sup>[28]</sup>.

### Conclusion

Population growth and the development of big and metro cities are creating waste management as a significant issue in present times. In present circumstances insufficient infrastructure for waste management, and less awareness in public on waste dumping can cause hazards. There are significant concerns related to people's involvement in the management and less responsibility towards this system of waste management. There is a necessity to develop responsiveness and attentiveness in society and

revolutionize the mindsets of people towards waste, as this is major step to create appropriate and reasonable waste administration system. Reasonable and monetarily feasible waste administration have to guarantee extreme digs from trash to resource, joined with secure removal of remaining waste through the advancement of built in landfills and waste-to-energy centers. There are many confronts with respect to waste strategy, selection of specific technology and the accessibility of trained individuals in the waste management area. Till People understands these deficiencies pertaining to waste management it would become difficult for the administrators and public to have a good health and healthy environment.

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