

**IMPACT OF SOLID WASTE ON HUMAN HEALTH AND
ENVIRONMENT IN INDIA – AN OVERVIEW**

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ABSTRACT

Globalization, Urbanization and Population growth are the main reasons and sole responsible for the ever high increasing rate of solid waste worldwide. Proper management of solid wastes is a major problem of the Municipal Corporation's and Municipalities. Improper Municipal Solid Waste (MSW) disposal and management causes all types of pollution: air, water and soil. Indiscriminate dumping of solid wastes contaminates surface and ground water supplies. Green house gases are generated from the decomposition of organic wastes in landfills. Uncontrolled burning of MSW and improper incineration contributes significantly to urban Air pollution. The impacts of solid wastes are not only confined to environment but also affects human health. Insect and rodent vectors are attracted to the waste and can spread diseases such as cholera and dengue fever. Using water polluted by MSW for bathing, food irrigation and drinking water can also expose individuals to disease organisms and other contaminants. Open dumping, open burning and un-engineered sanitary landfills are common practice in many of the countries in the world. Due to improper solid waste disposal and collection systems dwellers

are facing serious negative environmental and health impacts in developing countries. This paper highlights the MSW generation and management in India and major impacts associated with MSW on human health and environment.

KEYWORDS: Solid waste, Municipal Solid waste management, Human Health and Environment.

1. INTRODUCTION

Solid waste is the unwanted or useless or abandoned solid materials generated from various sources such as residential, industrial and commercial activities in a given or specified area. It may be categorized according to its origin (domestic, industrial, commercial, construction or institutional); according to its contents (organic material, glass, metal, plastic paper etc); or according to hazard potential (toxic, non-toxic, flammable, radioactive, infectious etc) [1] Population explosion, urbanization coupled with improved life style of people, results in increased generation of solid wastes in urban as well as rural areas of the country. At present, the municipal solid waste disposal methods followed in many of the cities and towns are unsystematic and unscientific. Most of the dumping sites are in low-lying areas. Most of the disposal sites are just uncontrolled dumps where a mixture of domestic, commercial, industrial and hospital wastes is 'thrown away' at the dumping sites. Apart from creating air pollution, ground water contamination & soil contamination, open dumping of wastes generally becomes breeding ground for various dreadful disease causing pathogens and vectors, particularly in the vicinity of the disposal sites. Further, with increasing awareness of public on environmental and health issues, there is a general opinion that the standard of services with respect to collection and disposal of municipal solid waste is progressively declining. It is also factual that in many cities and towns as half of the solid waste generated remains unattended [2]. Management of solid waste reduces or eliminates adverse impacts on the environment and human health and supports economic development and

improved quality of life. A number of processes are involved in effectively managing waste for a municipality. These include monitoring, collection, transport, processing, recycling and disposal [1].

Improper Municipal Solid Waste (MSW) disposal and management causes various types of pollution: air, soil, and water. Indiscriminate dumping of hazardous and toxic wastes contaminates surface and groundwater supplies. In urban areas, MSW clogs drains, creating stagnant water for insect breeding and floods during rainy seasons. Uncontrolled burning of MSW and improper incineration contributes significantly to urban air pollution. Greenhouse gases are generated from the decomposition of organic wastes in landfills, and untreated leachate pollutes surrounding soil and water bodies. Health and safety issues also arise from improper Municipal Solid Waste Management (MSWM). Insect and rodent vectors are attracted to the waste and can spread diseases such as cholera and dengue fever. Using water polluted by MSW for bathing, food irrigation and drinking water can also expose individuals to disease organisms and other contaminants [3].

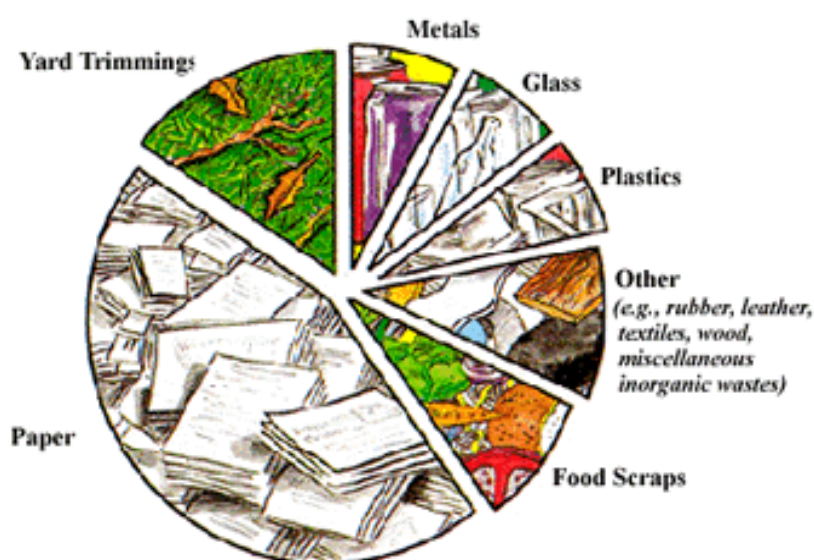


Fig. 1. Various categories of Solid wastes.

Most of the times open dumping of urban MSW can be seen throughout the country and all most all unused public property and sometimes even private property in urban areas become convenient dumps for neighboring wastes. The known fact is that SWM is one of the most neglected aspects, especially in urban areas. In most of the cities and towns these waste dumps create a major problem to the people and even the issues of traffic some times. All the departments like finance, engineering, technical, environment, management and intellectual should coordinate and make necessary action for the improvement of MSW.

2.Generation of Solid wastes in India

India is growing and so are the mountains of waste its cities and villages are producing. The composition of waste is also witnessing a major shift as the use of plastics and paper grow with the rise of the middle class and a consumerist culture. India (urban) produced 48 million tonnes of municipal solid wastes (MSW) annually as per the Comptroller and Auditor General's (CAG) report 2009, calculated at 0.4 kg per capita per day. In 2011, Delhi produced 6,800 tonnes per day (TPD), Mumbai 6,500 TPD, Chennai 4,500 TPD, Hyderabad 4,200 TPD and Kolkata 3,670 TPD of waste. According to a latest Central Pollution Control Board (CPCB) report, in 2016, India produced some 52 million tonnes of waste each year, or roughly 0.144 million tonnes per day, of which roughly 23 per cent is processed—taken to landfills or disposed off using other technologies.

The issue with the data on waste generation in India is that all the figures are extrapolated values taken from the report produced by CPCB. The CPCB with the assistance of Nagpur-based National Environmental Engineering Research Institute (NEERI) in 2004–05 estimated the generation of wastes in 59 cities (35 metro cities and 24 state capitals). This was the last report having real time data and estimates on waste generation within the country. Since then, data on generation of

solid waste is calculated by multiplying the urban population by the amount of waste generated per capita per day. This makes estimates of solid waste generated in the country pretty much a guess which, in turn, confounds management. However, what the estimates do demonstrate is the fact that bigger and richer cities produce more waste than poorer cities. This is not only due to their larger population, but also because their residents are more affluent and bigger generators of waste [4]. The solid waste generation within the cities has increased at a rapid rate especially from the household sector. Among all the sources, households generate the largest amount of waste and largest increase from this source is therefore a point to be noted. The main reason for the increase of household waste is increase in the population drastically within the cities respectively [5].

2.1. Environmental Importance

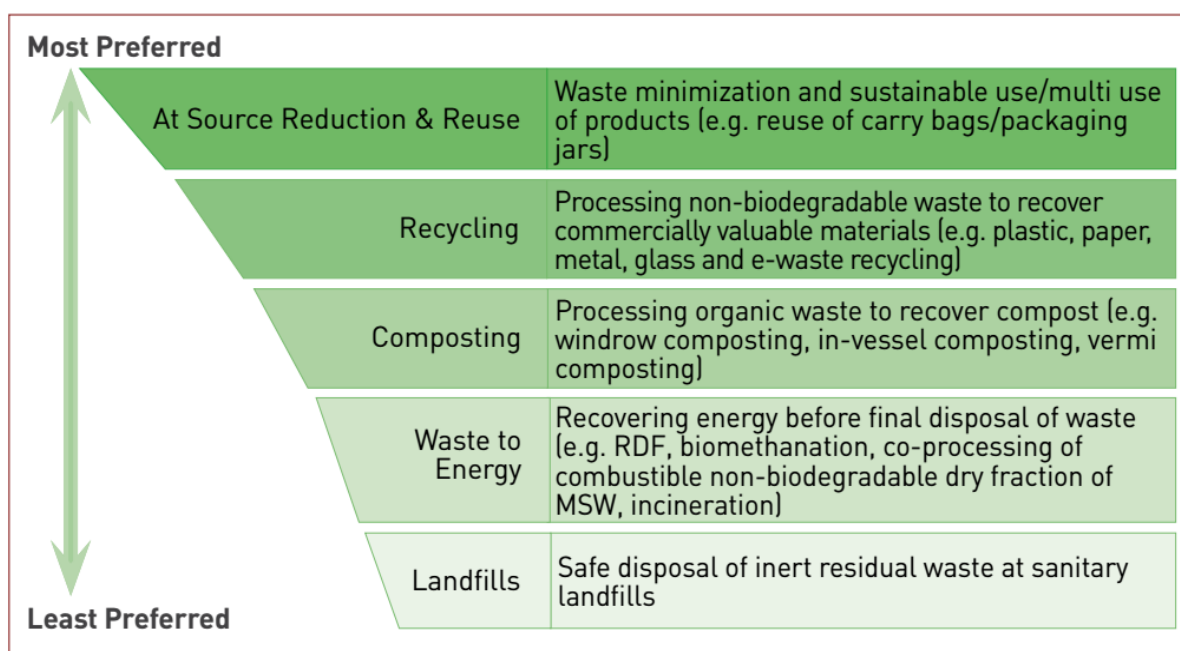
Estimated quantity of wastes generation globally was about more than 12 billion tonnes in the year 2002 of which 11 billion tonnes were industrial wastes and 1.6 billion tonnes were municipal solid wastes (MSW). About 19 billion tonnes of solid wastes are expected to be generated annually by the year 2025. Population growth, increasing urbanization, changes in the standards of living due to technological innovations and advancements are contributing a lot in the increase of both quantity and variety of solid wastes generated by industrial, mining, agricultural, commercial and domestic activities [6]. According to an estimate by the year 2047, MSW generation in India, is expected to reach 300 MT. The land requirement for the disposal of this MSW would be 169.6 km² as against which only 20.2 km² were occupied in 1997 for management of 48 MT [7]. Ultimately all the wastes that are generated from various sources degrade the environment. With strategic MSW we have to effectively utilize all these solid wastes by recycling process or by other means to achieve environmentally sound management.

2.2. Municipal Solid Waste management in India

The MSWM in India has surfaced or continued to be a very severe problem not only because of environmental and aesthetic concerns but also because of the enormous quantities of the various wastes generated every day. Even though only 31% of Indian population resides in urban areas, this population of 377 million (Census of India, 2011) generates a gigantic 1,43,449 metric tonnes per day of municipal solid waste, as per the Central Pollution Control Board (CPCB), 2014-15 and these figures increase every day with an increase in population.

Urban Local Bodies (ULBs) in the country manage municipal solid waste and it is one of the main functions of ULBs. All ULBs are required to meticulously plan, implement and monitor all systems of urban service delivery especially that of municipal solid waste. With limited financial resources, technical capacities and land availability, urban local bodies are constantly striving to meet this challenge.

Government of India, launched the program Swachh Bharat Mission in 2014 that aims to provide basic infrastructural and service delivery with respect to sanitation facilities to every family, including toilets and adopting the scientific methods to collect, process and disposal of municipal solid waste. The mission focuses on quality and sustainability of the service provision as well as emphasising on the commitment on every stakeholder to bring about a visible change in society.



Source: Swachh Bharat Mission, MSWM Manual.

Fig. 2. Integrated Solid Waste Management Hierarchy

The Integrated Solid Waste Management (ISWM) proposes a wastemanagement hierarchy with the aim to reduce the amount of waste being disposed, while maximizing resource conservation and resource efficiency. The ISWM hierarchy ranks waste management operations according to their environmental, economic, and energy impacts. Source reduction or waste prevention, which includes reuse, is considered the best approach (tier 1); followed by recycling (tier 2); and composting of organic matter of waste, resulting in recovery of material (tier 3). The components of waste that cannot be prevented or recycled can be processed for energy recovery (tier 4). Tier 5 is disposal of waste in sanitary landfill, which is the least preferred option. Based on this waste management hierarchy and local conditions, an appropriate system and technology should be selected in the MSWM plan. For example, if the land for composting organic material is close to habitation, biomethanation may be a preferred choice despite the lower ranking and higher cost as compared to the composting in the ISWM hierarchy [8]. ISWM is closely linked to the 3R approach (reduce, reuse, and recycle), which

also preliminarily emphasises the importance of wastereduction, reuse, and recycling over other forms of waste processing ormanagement [8].

2.3. Health Impacts of Solid waste

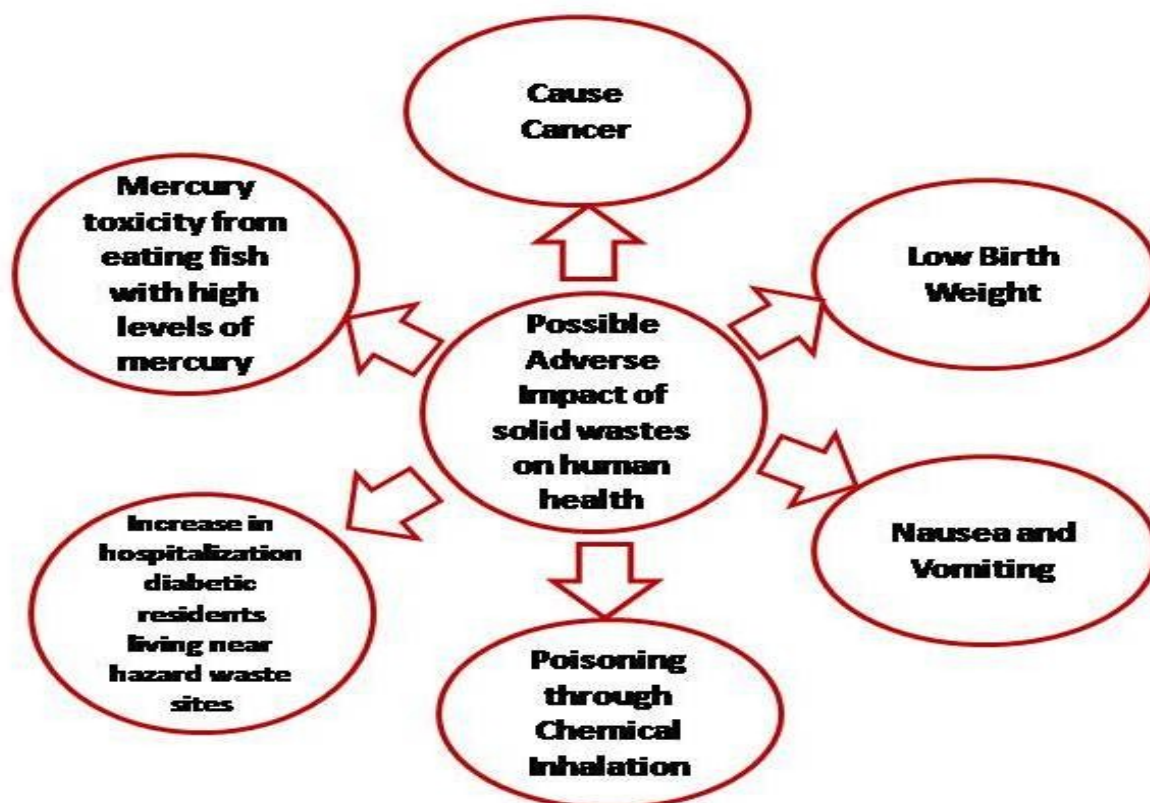


Fig. 2.Impacts of Solid Wastes on Human Health

There are potential risks associated with municipal solid wastes to human health, mainly with improper handling and not following scientific methods of waste management. Mainly the workers working in the fields and the rag pickers are posed to direct health risks, who need to be protected as far as possible from the direct contact with various toxic and hazardous wastes. For the general public the main risks to health are indirect and arise from the breeding of disease vectors, primarily flies and rats. Populations in areas where there is no proper waste treatment method, Children, Workers working under waste management, Populations living very close to the waste dumps and animals are more vulnerable to the adverse impacts associated with the solid wastes. Uncontrolled and untreated hazardous wastes

generating from various industries are mixing up with the municipal wastes and creating high potential risks to human health. There is specific danger of higher concentration of heavy metals entering in the food chain, one of the problem that illustrates the relationship between municipal solid wastes and liquid industrial effluents containing heavy metals discharged to a drainage/sewerage system and /or open dumping sites of municipal solid wastes and the wastes discharged thereby maintains a vicious cycle [9]. In developing urban cities open dumpsites involve indiscriminate disposal of solid waste. They are totally uncontrolled and therefore pose major health threats which affect the landscape of urban cities [10]. The UNEPA stated that wastes that are not managed properly, especially solid waste from households and the community, are a serious health hazard and lead to the spread of infectious diseases [11].

2.4. Impacts of Solid Waste on Environment

The decomposition of solid wastes into other chemical constituents is one of the major problem and leads to the local environmental pollution. Another major environmental concern is gas release by decomposing garbage. These problems are acute in developing nations. One of the major problems with landfills is the release of methane and other gases. Methane is a by-product of the anaerobic respiration of bacteria. These bacteria thrive in landfills with high amounts of moisture. Methane concentrations can reach up to 50% of the composition of landfill gas at maximum anaerobic decomposition. Gases released from landfills contribute to the enhanced greenhouse effect and climate change. Liquid leachate is one of the problems with landfills. Leachate poses a threat to local surface and ground water systems. Burning of solid wastes in open dumps or in improperly (non scientific) designed incinerators emit pollutants (both gaseous and particulate matter). Emissions include particulate matter, sulphur oxides, nitrogen oxides, hydrogen chloride, carbon monoxide, lead and mercury [3].

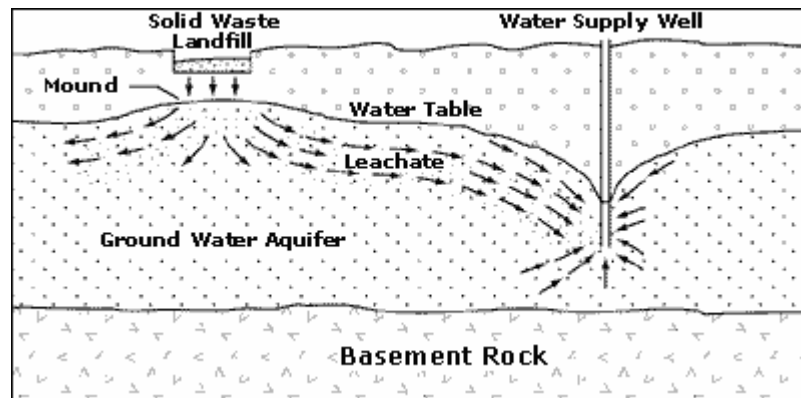


Fig. 3.Land fill leachate contaminating ground water table

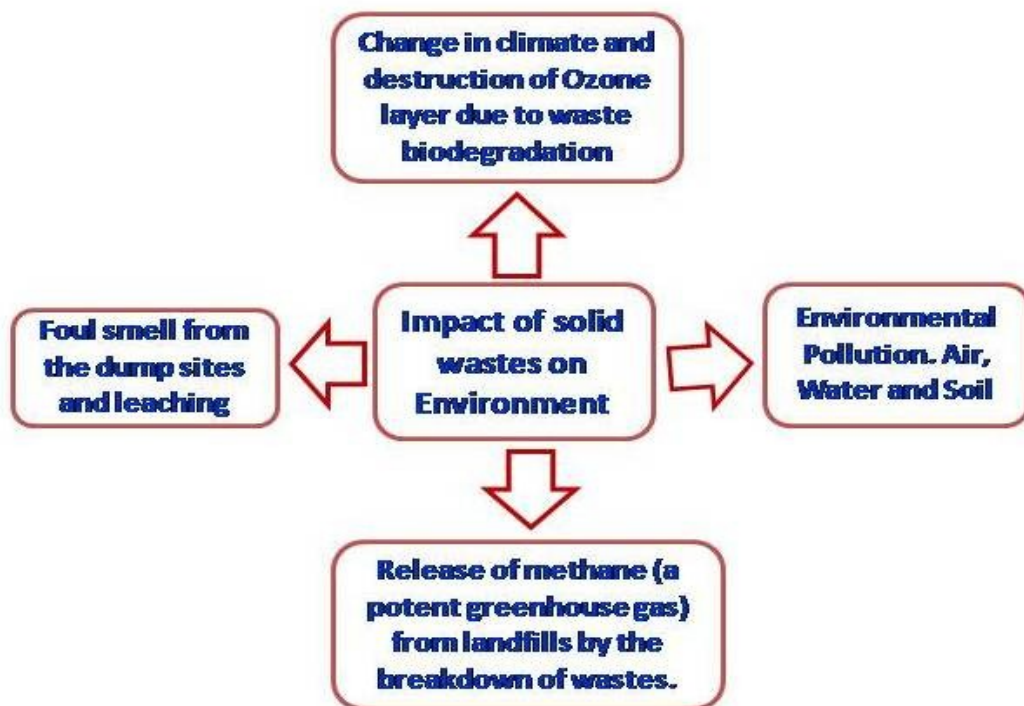


Fig.4. Impacts of Solid Waste on Environment

3. CONCLUSIONS

There are many impacts associated with municipal solid wastes where the impacts on environment and human health are to be considered most as these two aspects are not ignored at any cost. Any municipal solid waste management systems should focus on these issues and reduce the impacts, thus we can protect

environment and human health. The following are some of the suggestions and recommendations for the effective management of the solid wastes.

- Landfills and Dumpsites should be properly located using scientific methods and effectively managed to minimize their effects on the environment.
- The government and municipalities should revise laws and legislations regarding the locations of dumpsites. These laws should include properly managed sites, which are well fenced in and away from human settlements.
- The government should annex laws which should see that dumpsites are located properly and if it is not then action should be taken according to the law.
- There should be a follow up in the functioning of the dumpsites to avoid environment pollution and health hazards.
- Municipalities should open dumpsites on remote areas with no residents closer to them to avoid the effect of the dumpsite on the nearby residents and monitor the dumpsite properly. They also have to control the litter and monitor their volume.
- People need to be educated by health motivators about the effects of dumpsites on their health. This will limit the effect of the dumpsite on the residents. There should also be a follow-up to make sure that what they teach the residents.
- Plastic waste, E-waste and hazardous waste to be handled properly with scientific methods by following safety measures[12].

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