

SOLID WASTE MANAGEMENT ISSUES AND CHALLENGES

ARCHANA SEN

Department of Regional Planning and Economic Growth, Barkatullah University, Bhopal, Madhya Pradesh, India

(Received 3 May, 2022; Accepted 28 July, 2022)

ABSTRACT

Urbanization and population growth are solely responsible for high and increasing rate of solid waste and its proper management is a major problem of Municipal Corporation of every city. Solid waste from households is a serious health hazard and leads to the spread of infectious diseases. Solid waste is the unwanted or useless solid materials generated from human activities in residential, commercial or industrial areas. As we know Solid waste management involves managing activities associated with generation, storage, collection, transfer and transport, processing and disposal of solid wastes. Solid waste problem is big issues at present time, if this problem is not tackled within preventive time, it may create other dreadful, hazardous and incurable problems. In this study, the sources and components of solid waste, type and the quantity of solid waste disposed, methods of solid waste disposal and its impact on health were highlighted.

KEY WORD : Solid Waste, Collection, Disposal, Management, Satisfaction level.

INTRODUCTION

Improper MSW disposal and management becomes causes of all types of pollution such as air, soil, and water. In urban areas, MSW clogs drains and drainage system undependably dumping of wastes contaminates surface as well as ground water supplies. Uncontrolled and unsystematic burning of MSW contributes significantly to urban air pollution. Gases are generated from the decomposition of organic wastes in landfills, and untreated leachate pollutes surrounding water bodies, land and soil. Health and safety issues also arise from improper MSWM. Insect and bacteria are attracted to the waste and can spread diseases such as cholera and dengue etc fever. Due to Using contaminated water can expose individuals to disease and other contaminants. Statistically, urban India produced around 62 Mt of solid waste in 2015.

Approximately 82% of MSW was collected and the remaining 18% was litter. The waste treated was only 28% of the collected waste, and the remaining 72% was openly dumped (Sharma and Jain, 2019).

It is found that due to increase in world population and the rising demand for food and

other essentials things, there has been a rise in the amount of waste being generated daily by each household. Improper Waste especially liquid and solid waste from households and the community, are a serious health hazard and responsible to the spread and increase of infectious and communicable diseases (Alam and Ahmade, 2013).

Solid waste management is a universal issue effecting every single person in the world. Individual and government make decision about consumption and waste management that effect the daily health, productivity and cleanliness of communities. Poorly managed waste is contaminating the worlds oceans clogging drains and causing flooding transmitting disease via breeding of vectors, increasing respiratory problem through air borne particles from burning of waste , harming animals that consume waste unknowingly, and effecting economic development such as through diminished tourism. Unmanaged and improperly managed wasted from decade of economic growth require urgent action in all level of society (Kaza *et al.*, 2018).

Solid waste management is the one thing just about every city government provides for its

residents. While service levels, environmental impacts and costs vary dramatically, solid waste management is arguably the most important municipal service and serves as a prerequisite for other municipal action. As the world hurtles toward its urban future, the amount of municipal solid waste (MSW), one of the most important by-products of an urban lifestyle, is growing even faster than the rate of urbanization. Ten years ago there were 2.9 billion urban residents who generated about 0.64 kg of MSW per person per day (0.68 billion tonnes per year). This report estimates that today these amounts have increased to about 3 billion residents generating 1.2 kg per person per day (1.3 billion tonnes per year). By 2025 this will likely increase to 4.3 billion urban residents generating about 1.42 kg/capita/day of municipal solid waste (2.2 billion tonnes per year) (Hoorweg and Bhada-Tala, 2012).

The western world and parts of Asia have since the early 1980s used the waste hierarchy as the main approach to waste management. The wording used and the name may vary (in Japan the approaches called 3R for reduce, reuse and recover) but the main message is that prioritise in waste management should be like that Waste prevention and cleaner technology, Reuse, Recycling of materials, recovery in terms of material utilisation and energy recovery, Disposal including land filing and mass burning without recovery (Christensen, 2011).

The rapid population growth and an increase in the living standard of inhabitants have caused insurmountable problems and challenge to the municipal solid waste management (MSWM) of Bhopal city. The city generates approximately 800 t/d of municipal solid waste (MSW) and it is estimated to increase to approximately 2735t/d by the year 2035 (Parihar *et al.*, 2019).

Objective

Table 1. Major sources of Municipal Solid Waste (MSW) in Bhopal City

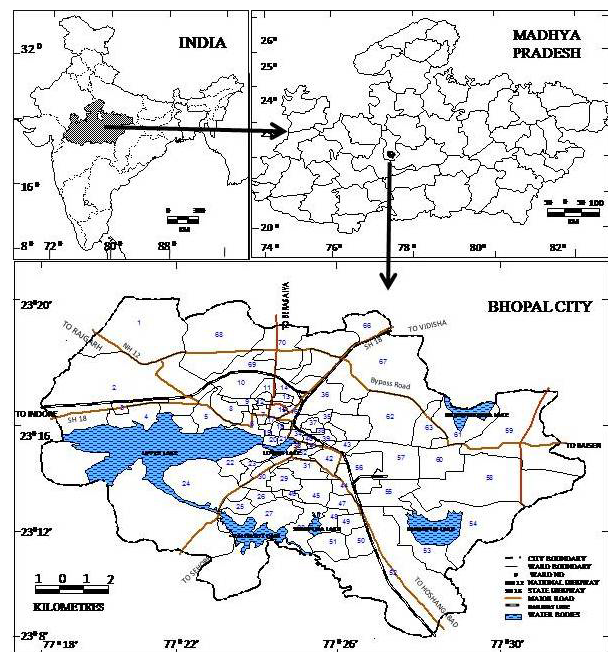
Domestic Waste	Household waste, kitchen, house cleaning, old papers, packing, bottles, crockery, garden trimmings etc.
Commercial Waste	Waste generated at business premises, shops, departmental stores, spoiled discarded goods etc.
Street sweeping	Unconcerned throwing, littering, stray animal, roadside tree leaves, rubbish from drains.
Debris and construction waste	Frequent digging of roads by various utilities comprising earth, brickbats, stones, wooden logs etc.
Dead animal etc.	Waste generated from slaughter house etc.

Source: CPCB, 2017

- To Study the existing solid waste scenario of Bhopal City.
- To Study the Existing functioning of municipal corporation.
- To Study the Existing practices of collection and disposal.

Study Area

Bhopal is the capital and second largest city in the state of Madhya Pradesh situated in the central part of India and widely known as a "City of Lakes". This city is Founded by Raja Bhoj. Bhopal is 20th largest urban agglomeration in India. According to census 2011, the total area of Bhopal city is (287.17 sq



km) with (17.96 lakh) population.

METHODOLOGY

This study is based on primary as well as secondary data that is collected from different source to assess

the Status of existing condition of solid waste scenario in Bhopal city. Area wise survey has been conducted with the help of a structured interview schedule along with purposive random sampling technique used here, from different areas of Bhopal city like slum and non-slum 42 sampling points are selected for primary survey. Sample size was 400, sample distributed in two major parts 144 slum and 256 non slum according to basis of slum and non slum household proportion.

RESULTS AND DISCUSSION

Solid waste can also be defined as unwanted or discarded materials in solid form resulting from normal practice of the communities and it includes garbage, rubbish, street, sweepings, ashes and other industrial wastes (Kumra and Kayastha, 1982).

Waste Generation in Bhopal city

Major sources of waste generation in Bhopal city is from commercial, industrial and residential areas. The waste management system of Bhopal Municipal Corporation (BMC) are not as per norms. BMC adhere to the traditional approaches of collection and disposal of MSW. Due to non-segregation of waste, toxic materials (chemicals) even animal bodies/wastes also landed in the municipal waste stream ending up at the landfills, which serve as dump yards.

Total quantity of municipal solid waste generated in the city is 650 MT/day, out of which only 60-70 percent are collected on daily basis, and rest is left on roads, streets, colony dustbins and drains etc. There are about 250 open collection points in the city. The maximum is in zone 3 were 90.9 percent are reported, followed by zone 8 with 88.9 percent and zone 14 with 85.4 percent.

Out of total solid waste generated, 100 MT of garbage is used in composting plant and the remaining quantity is disposed of in the land fill site (30.4 ha) which is located at about 14 km from the city. Municipal solid waste has low calorific value and its average density varies between 500-600kg/m³ therefore, power generation by solid waste is not a practical solution in India (Table 2).

The Municipal Commissioner is assisted by work force of municipal officers. For the purpose of SWM activities 2-health officers, 4 Chief sanitary inspector, 16 sanitary inspector, 60 sanitary supervisor and 60 sweeper etc. (CPCB, 2017)The SWM department of Bhopal Municipal Corporation has the work force of

Table 2. Present scenario of solid waste management in Bhopal City

Study Area	
Area	285.88 sq.km
Population	1.4 million
Solid Waste Generation	
Total generation	600 ton/day
Waste generation	0.43mg/person/day
Waste composition	50%
Solid Waste Management	
Collection rate	60-70%
Recycling	Carried out by scavengers
Composting	20%
Landfill	75 acres, open dumping
Expenditure	25% of municipal budget

Source: CPCB, Bhopal, 2017

1900 persons for street sweeping, 300 for transportation and disposal of waste and 580 temporary labours for collection and transportation of waste.

The vehicle capacity for transportation of municipal solid waste in Bhopal city is 32 truck (mini), 18 trolleys, 11 refuse, 2 mini compacters, 9 dumpers are used at present for the transportation of solid waste. Every vehicle has two trips per day. Total collection is 450 ton per day. 192 ton from

Table 3. Vehicles used in the transportation of Municipal Solid Waste in Bhopal City

Type	Number	Vehicle Capacity (Avg. in tons)	Trip (Trips/ per day)	Total Collection (Ton/per day)
Trucks (mini)	32	3	2	192
Trollys	18	2	2	32
Refuse Compacters	11	6	2	132
Mini Compacters	02	6	2	24
Dumpers placers each within 5 bins	09	2	2	90
Total	450			

Source: CPCB, Bhopal, Madhya Pradesh, 2017

Table 4. Number of storage bins in Bhopal City

Type of Storage	Number
Kachara Ghar (Dust Bins)	50
Metal Containers	350
RCC Rings	300
Open sites	210
Metal Containers (Auto lifting)	80
Total	990

Source: CPCB, Bhopal, Madhya Pradesh, 2017

trucks, 132 ton from refuse compacters, 32 ton from trolley and 90 ton from dumpers.

Disposal of solid waste

The major landfill site of the Bhopal city is near Bhanpura on Vidisha road, 5 km from main Nadra bus stand of Bhopal. The total area of the site is about 58 acres and at present 36-acre land is used for dumping purpose. During the last 30 years Bhanpura is being used as a trenching ground and about 350-400 MT waste is dumped here every day. The Madhya Pradesh State Agro Industries Development Corporation Ltd. runs an organic manure plant at MSW Dumpsite, Bhopal with the total capacity to process 100 MT of solid waste per day (Environmental status of MSW Dumpsites at Bhopal) (CPCB, 2007) city and Indore 2006-07.

Earlier this dumping site was in the peripheral of the city but due to expansion the site is near to the vicinity of residential localities having hospitals, malls, etc. Today it has become a big problem in Bhopal city because of contaminating ground water and air around the site and degrading the quality of environment. As result of agitation and protest the Government and BMC have decided to shift the site. Addition to this, other non-designated dumpsites are located in different points. The solid waste dumping site in Adampur village under the Raisen district is used for the disposal of waste from Bhopal

city which is situated 16km away from the city.

Perception of respondents towards solid waste

In response to where they dispose of their daily household waste, 12 percent mentioned they dispose of their waste along the road, 6.5 percent in front of their house, 11.5 percent along the street corner and 13.5 percent in open space, while only 25 percent dispose in proper manner either in dustbins or through door-to-door collection (31.5%). This shows lack of awareness about proper sanitation and its effect on health (Fig. 2).

The frequency of collection of solid waste varies among localities of high income to low income group. It is observed that only 39.0 percent respondent mentioned that solid waste is collected once in a day from their locality, 13.5 percent mentioned once in a week, 24.2 percent stated irregular collection and surprisingly 23.3 percent respondent replied that solid waste is never collected. The observation does vary among respondents from different income group as reflected in Fig. 3.

Further, respondents have also given their suggestions for better and speedy collection of waste material. 52.0 percent respondents suggested regular collection, 26.1 percent recommended that community bin should be placed at strategic points, 2.66 percent respondent replied that cooperation

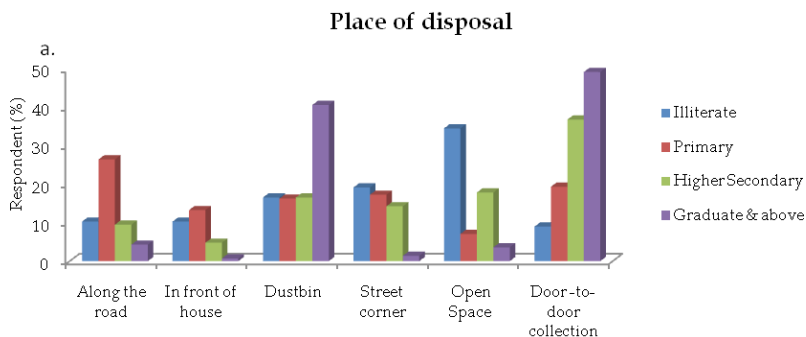


Fig. 2

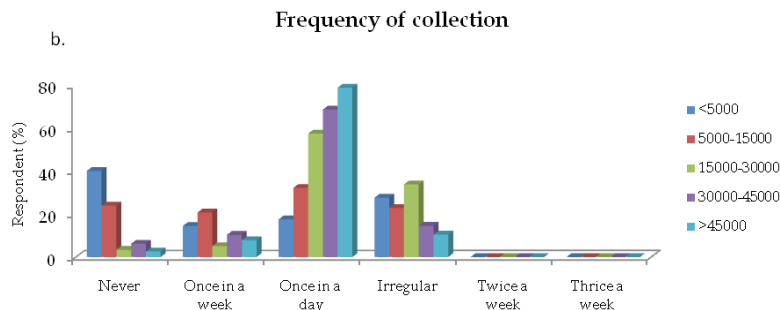


Fig. 3

with municipality cooperation can help to mitigate this problem (Fig. 4).

The zone-wise distribution of respondents regarding satisfaction towards household waste collected by BMC. It is noted that only 33.8 percent respondent satisfied, 13.5 percent partially satisfied and 52.7 percent are unsatisfied towards collection of household waste by BMC.

Similarly, respondent who are satisfied the highest 65.1 percent is in zone 11, followed by 62.5 percent in zone 10 and lowest 7.4 percent in zone 8 and 13.0percent in zone 4. Thus, there is a significant difference in satisfaction level among respondents in different zones (Fig. 5).

Suggestion

There are shortages in the collection systems and adequate vehicles. Many vehicles are very old requiring maintenance. Additional budget for maintenance is also required. The current stationary container system needs to be replaced and modified. Some community bins are not in proper condition and disposal sites are not in preferred locations. Community bins need to be relocated and one or more new disposal sites need to be developed in an appropriate manner with treatment and engineered

land filling (Katiyar *et al.*, 2013).

Collection of MSW

Municipal authority should take proper steps regarding the collection of solid waste. Such as Devising collection of waste from slum and squatter area. Industrial wastes and Bio-medical wastes should not be burnt nor to mixed with Municipal Solid Waste. Dairies waste should be collected separately and disposed according to proper norms.

Segregation of MSW

Bhopal Municipal Corporation should organize awareness Programmes for common people for segregation of wastes and Phased programmes to ensure Community participation in segregation of waste. As well as Promote reuse or recycling of segregated Materials for recycling and produce substitute resource. In slums areas creation of rag pickers' societies should be initiated.

Storage of MSW

Storage facilities should be created according to quantities of Waste generation area & population densities. Storage facility should be placed that it is accessible to users but wastes stored are not exposed

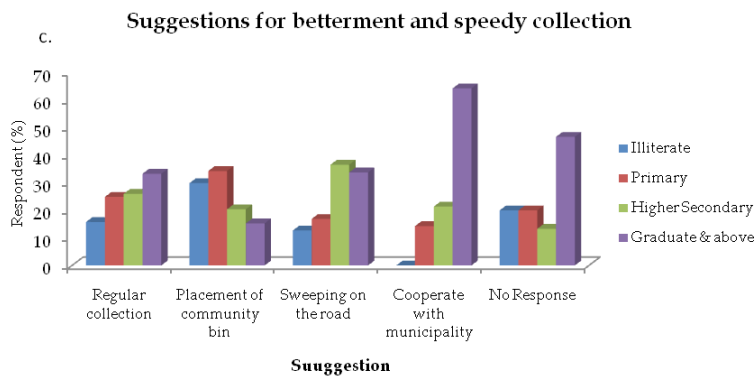


Fig. 4

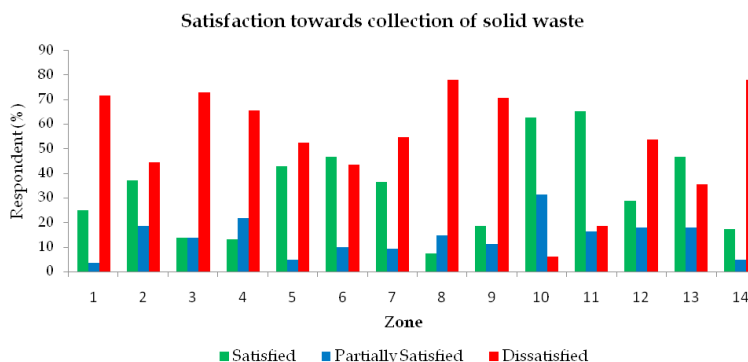


Fig. 5

to open atmosphere. Different colour Bins should be used for storage of different types of waste such as bio-degradable wastes recyclable wastes and other wastes. Handling of solid waste by manual manner should be strictly prohibited if required than should be carried out under proper precaution for the safety of the workers.

Transportation of MSW

Number of Vehicles used for transportation of wastes should be increased. Vehicle should be covered and cleaned every day. Waste should not be exposed to open environment during transportation. Transportation vehicles should be developed for multiple handling of wastes.

CONCLUSION

With the advent of industrialisation and urbanisation waste disposal has become a serious problem. Solid waste may be defined as any solid matter which is discarded as it is no longer useful in economy. It consists of organic and inorganic matter in a wide variety of forms. It is concluded here that Storage of waste at source is not fully taking place as people prefer to dispose the waste as and where it is generated. Peoples are not willing to segregate waste at home (dry and wet waste). Approx 98.5 percent of nearly 800 mt of waste generated in Bhopal is not segregated. Regular garbage collection facility is not properly available in most parts of the city Bhopal specially in north-western and eastern part of city. BMC Providing door to door collection services but is insufficient and people are not satisfied. The waste is disposed off at the landfill site is in orthodox method of dumping. The municipal corporation doesn't have biomedical waste disposal system. SWM is a very important large public service system, to maintain aesthetic and public health standards which required proper training and efficiency to the concerned community. It is the matter of serious concern that Every year in the rainy season infectious diseases spread due to the inefficient solid waste Management, people become ill. The Solid Waste Management in this city is not functioning properly due to lack of collection and improper segregation. Municipal agency will have to plan and execute the system in keeping with the increasing urban areas and population in Bhopal city. Successful Solid Waste Management depends on sufficient financing, enabling legislation, and a supporting institutional and policy from government. Also require changes in the way

government institutions currently operate and necessitate recognition of the importance of effective MSWM for a city sustainable development. Awareness campaigns should be organised for solid waste management such as reuse, reduce, storage and segregation of solid waste because people participation is very important for better management of solid waste.

ACKNOWLEDGEMENT

I am thankful to Director, Central Pollution Control Board, Bhopal, Madhya Pradesh, Mr Sanjay Mukatya, Central Pollution Control Board, Bhopal, Madhya Pradesh and Prof Vipin Vyas, Head Department of Environmental Science, Barkatullah University, Bhopal.

REFERENCES

- Alam, P. and Ahmade, K. 2013. Impact of solid waste on health and the environment. *International Journal of Sustainable Development and Green Economics (IJSDEG)*. 2 (1): 165-168.
- Central Pollution Control Board. 2007. Environmental Status of MSW Dumpsites at Bhopal and Indore. Zonal Office Bhopal, Madhya Pradesh. 1-52.
- Central Pollution Control Board. 2017. Zonal Office Bhopal, Madhya Pradesh.
- Christensen, T. (ed.). 2011. *Solid Waste Technology and Management*. John Wiley and Sons, Chichester. 1-1000.
- Hoornweg, D. and Bhada-Tata, P. 2012. What a waste: A Global Review of Solid Waste Management. Urban Development Series Knowledge papers. Public Disclosure Authorized. The World Bank. 1-116.
- Katiyar, R.B., Suresh, S. and Sharma, A.K. 2013. Characterisation of Municipal Solid Waste Generated by the City of Bhopal, India. *International Journal of Chem Tech Research*. 5 (2): 623-628.
- Kaza, S., Yao, L., Bhada-Tata, P. and Van Woerden, F. 2018. What A Waste 2.0: A Global Snapshot of Solid Waste Management to 2050. World Bank Publications. 1-23.
- Kumra, V.K. and Kayastha, S.C. 1982. *Kanpur City: A study in Environmental Pollution*. Tara Book Agency, Varanasi. 1-202.
- Parihar, R.S., Ahmed, S., Baredar, P., Sharma, A. and Ravi Kiran, T. 2019. MSWM in Bhopal city: a critical analysis and a roadmap for its sustainable management. In: *Proceedings of the Institution of Civil Engineers-Municipal Engineer*. 172 (2): 83-95.
- Sharma, K.D. and Jain, S. 2019. Overview of municipal solid waste generation, composition, and management in India. *Journal of Environmental Engineering*. 145(3): 1-18.