International Journal of Education and Science Research Review
E-ISSN 2348-6457
March- 2018, Volume-5, Issue-1
P-ISSN 2349-1817
www.ijesrr.org Email- editor@ijesrr.org

AIR QUALITY DECLINE AND THE PROBLEM OF SOLID WASTE MANAGEMENT

Chiranji lal meena

Assistant Professor, Zoology

Government college, Tonk(Raj.)

ABSTRACT

Rapid urbanisation, population growth, and inappropriate disposal of municipal solid waste (MSW) all contribute to human and environmental issues. Even when scientific waste management measures are followed, emissions of many dangerous inorganic and organic gaseous pollutants are unavoidable. The purpose of this study was to compare the ambient air quality at several types of solid waste management sites that used various techniques such as composting, mechanical waste management, open dumping, and sanitary landfills. The goal of the study was to determine the air quality of a few selected inorganic gaseous pollutants and non-methane volatile organic compounds (NMVOCs) emitted by five municipal solid waste disposal sites using various management approaches. For inorganic gases and NMVOCs, air samples were collected using a low-volume sampler and analysed using CPCB standard procedures and USEPA TO-17 methodologies, respectively. According to the study, pollutant emissions vary depending on the waste management approach used. Other local sources, such as automotive and residential emissions, do, nevertheless, contribute to the ambient level near management sites. As a result, a complete source apportionment study is required to determine the contribution of the various waste management systems.

Keywords- *Air pollution, Solid waste, Management.*

INTRODUCTION

Both urban and rural areas are seeing increases in the amount of waste that is being produced due to rising populations and the modern lifestyles of those populations. There are several industrialised countries as well as developing countries that have the biggest challenges with their solid waste. The concerns of public health that are caused by global warming, changing climate conditions, and rising temperatures are exacerbated by high human densities and large amounts of industrial waste. The majority of the hazardous solid waste that harms our ecosystem comes from large towns and industrial settings. Because of a lack of financial resources and technological resources, the ability to control solid waste in some countries is severely compromised.

Municipal solid waste management (MSWM) is a serious concern in urban areas all over the world, but its impacts are especially felt in the fast rising cities and towns of developing countries. This is because MSWM requires a lot of resources and manpower. Disposal of waste in an unorganised manner has a negative effect not only on individual components of the environment but also on human health. The expeditious evacuation of garbage from densely populated regions in developing countries is one of the

most significant issues posed by regulations pertaining to MSWM. This is done in order to preserve public health and cleanliness.

When organic materials in municipal solid waste (MSW) break down, a byproduct known as landfill gas (LFG) is produced. It comprises of 45–60 percent methane, 40–60 percent carbon dioxide, 2–5 percent nitrogen, 0.1–1 percent ammonia, 0–1 percent sulphides. Non-methane organic compounds (NMOCs), also known as aromatics (for example, benzene, toluene, ethylbenzene, and xylene), chloro-compounds (for example, 1,1-dichloroethane, dichloroethylene, dichloromethane, trichloroethylene, tetrachloroethylene, and vinyl chloride), carbonyls (for example, methyl eth There is significant cause for worry over the surface emissions of certain of the trace volatile organic compounds (VOCs) that are present in the trash and that are generated as a result of the biological decomposition of the waste. Gases including sulphur oxide, nitrogen oxide, and carbon dioxide all play a significant part in the process of global warming.

India is experiencing rapid urbanisation, just like many other emerging countries throughout the world. The current annual quantity of solid waste generated in Indian cities is expected to increase to 300 million tonnes by the year 2047, having increased from 6 million tonnes in 1947 to 48 million tonnes in 1997 with an annual growth rate of 4.25 percent. This increase is a continuation of a trend that began in 1947 when the quantity was 6 million tonnes. Because waste management facilities are struggling to keep up with the volume of waste that is being produced, the problem has already reached a critical stage in urban and suburban areas. In India, the management of their own municipal solid waste falls under the purview of the respective municipal authorities. They are utilising a variety of management and disposal strategies include composting, mechanical processing, open dumping, and sanitary landfills among others. Every one of these processes results in the release of a number of different inorganic and organic gases into the atmosphere.

Combustible and non-combustible trash are the two primary categories of waste that are classified under the category of solid waste. Wastes that are easily combustible include card, paper, plastics, and wood. Combustible wastes are wastes that can be quickly burned. Cans, metals, and glasses are examples of things that do not easily catch fire, making them examples of non-combustible materials (Nangechi, 1992, page 6).

Despite the many technical advancements that have been documented, the management of waste continues to be one of the most significant difficulties that humanity must confront in the current era. Technology on its own has not been able to successfully regulate the amount of waste that is generated in communities all over the world. Instead, it seems that new technologies introduce new sorts of garbage into the ecosystem, which adds another layer of complexity to the problem of accumulation (Kwawe, 1995:53). "solid waste" can be classified as "a great mixture of substances," including "fine dust," "cinder," "metals," "glass," "paper and cardboard," "textiles," "pesticides," "vegetable ingredients," and "plastics."

Every human culture has always relied on sound administration as an essential component (Shekdar, 2009). This problem has been getting worse as a result of a shift in consumption patterns, including an increase in consumerism as well as a lack of available waste management facilities. One of the most evident effects of fast urbanisation is an increase in the amount of solid trash produced, which presents

numerous municipal administrations with never-before-seen difficulties in terms of managing these wastes, including difficulties in collecting and disposing of them.

Solid Waste

Since the beginning of civilization, both humans and animals have relied on the natural resources available to them in order to maintain their lives and get rid of their waste. In earlier times, there was a smaller population, which resulted in a smaller amount of trash being produced, and there was an abundance of land available for the assimilation of waste. As a result, the disposal of waste did not present a serious difficulty. Since the beginning of human civilization, when people first started living together in communities and waste production became an inevitable byproduct of everyday life, there have been issues with the proper disposal of wastes. The different human and industrial endeavours give birth to the generation of solid waste material. The solid waste is typically a very diverse mass that is thrown away because it is seen to be useless or unwanted. It is produced by the urban community in addition to the more uniform buildup of wastes from agricultural production, industrial production, and mining operations. The wastes can be classified as either solid or liquid depending on their consistency. In today's world, solid trash is by far the most common type of waste that is produced. The following are examples of what can be found in solid waste:

(a) Human pathogens, which include trash from municipalities and hospitals;
(b) animal pathogens, which include waste from pets and other animals; and
(c) soil pathogens, which include waste from gardens and farms.

The majority of the municipal solid waste originates from sources such as industry, agriculture, and mining, while the rest comes from municipal sources. The remainder of the solid trash is disposed of, while a portion of it is recycled or repurposed. Solid waste pollution is commonly referred to as the third type of pollution, following air pollution and water pollution. The creation of solid waste has a number of negative repercussions on the surrounding ecosystem. There are several issues that arise due to waste, including:

a) Inadequacies of existing systems for waste management and disposal that are safe;
b) Pollution of the environment, including the land, water, and air;
c) Breeding grounds for flies and rats;
d) Emission of greenhouse gases, primarily CH4 and CO2; and
e) Lack of available land for landfills in close proximity to the point of production.

Garbage is produced as a byproduct of human activity; nevertheless, the management, storage, collection, and disposal of this waste can present potential dangers to both the environment and to the health of the general population. The problems and issues of Solid Waste Management (SWM) are of vital importance in metropolitan settings, particularly in the rapidly urbanising cities of the developing world. This is a fact that has been recognised by the majority of governing bodies; yet, rapid population expansion exceeds the capacity of the majority of municipal authorities to deliver even the most fundamental of services. In most cases, only one third to two thirds of the solid trash that is produced is collected. As a consequence of this, the garbage that hasn't been collected gets thrown away in the streets and drains, where it is frequently combined with the waste of humans and animals as well. This practise contributes to flooding, fosters the growth of disease-carrying insects and rodents, and exacerbates the problem of

disease transmission. In addition, even waste that has been collected is frequently disposed of in dumpsites that are not under proper control and/or is burned, both of which pollute the air and water resources.

Because municipal authorities have a tendency to allocate their limited financial resources to the wealthier areas of higher tax yields and areas with citizens who exert more political pressure, the urban poor, who often live in the peri-urban areas, are the ones who suffer the most from the life-threatening conditions that result from inadequate SWM. This is the case all over the developing world. Typically, when the income of the people increases, a portion of the wealth is utilised to minimise exposure to the environmental problems that are located close to home. However, because the generation of trash also increases with increasing wealth, the problems are simply moved to another location. Therefore, even while environmental problems on the level of households or neighbourhoods may improve in areas with increased incomes, environmental degradation on the level of the city and region as a result of inadequate SWM either continues or worsens.

Importance's of waste reduction

In wealthy countries, the primary reasons for reducing waste are frequently related to the high cost and scarcity of sites for landfills, as well as the environmental degradation caused by toxic materials deposited in wastes. In developing countries, the primary reasons for reducing waste are frequently related to public health concerns. There is a dearth of encouraging evidence of the positive significance of benefits resulting from waste reduction. The absence of a technological technique and the barrier of money prevent the decrease of solid waste.

1. The elimination of solid waste is the first and most significant step in protecting individuals and children from infectious and chronic diseases.
2. If we reuse things such as paper, plastic, and other recycled materials, we may cut down on the amount of energy that we use.
3. To bring down the warming of the surface air and the overall temperature of the planet.
4. To cut back on the population of mosquitoes, germs, and other potentially dangerous organisms.
5. The release of methane from solid waste can occasionally result in nearby forests and communities becoming engulfed in flames.
6. To ensure the cleanliness and wellbeing of our global community.
7. The presence of toilets in rural areas is necessary to protect people from infectious diseases.
8. The management of hazardous wastes can be accomplished through reuse, recycling, and reclamation, all of which, if carried out correctly, can help prevent environmental risks, protect limited natural resources, and lessen the nation's dependency on raw materials and energy.

OBJECTIVE

- To evaluate the management of solid waste on both the home and the municipal levels.
- To identify the mentality and perspective of people with regard to the management of solid waste.
- Research into the deterioration of air quality and the challenge of managing solid waste.

METHODOLOGY

Data collection

The difficulties associated with the management of solid waste can be understood by taking into account the volume of solid waste that was not collected and disposed of, the volume of solid waste that was not eliminated in accordance with the prescribed sanitary practises, and the volume of solid waste that accumulated at improper disposal sites. According to the ranking, the provinces of Songkhla, Samut Prakan, Kanchanaburi, Nakhon Si Thammarat, Surat Thani, Ratchaburi, Phetchaburi, Prae, Prachinburi, and Phra Nakhon Si Ayutthaya were the top 10 provinces with critical problems of solid waste management. Songkhla came in first, followed by Samut Prakan, Kanchanaburi, Nakhon Si Thamm As a result, households in these 10 provinces were used as a sample for the collection of data using questionnaires in order to obtain the maximum number of households that are confronted with the challenges of solid waste management while also ensuring that the sample is representative of the entire population. This was done in order to obtain the maximum number of households that are confronted with the problems of solid waste management.

Questionnaire Design

In order to obtain information from homes that were located in areas that were administered by LAOs, researchers employed questionnaires as an instrument of research. The format of the questionnaire was developed with the objectives of determining the particular aims of the survey, thinking about how the survey would be administered, defining the population, and determining the study sample. A pilot testing questionnaire was used with small groups (50 samples) in order to obtain answers that were valid and reliable. This helped to identify problems such as issues that were causing low response rates, questions that were not being answered, and questions that were too difficult to answer. Cronbach's alpha was utilised as a tool for doing an analysis of the reliability of a scale's or test's corresponding collection of items. Calculating Cronbach's alpha coefficient involved first establishing a correlation between the score on each scale item and the overall score for each observation, and then contrasting this finding with the variance of the scores on all of the scale items individually. Here are some of the most important questions:

1. How many kilogrammes of solid garbage does your home produce on a daily basis, on average, on average?
2. What kinds of solid waste does your home produce, and what are their components?
3. What are some of the ways that your home and community deal with the management of solid waste?
4. Does the household in your home receive information on garbage, maintaining cleanliness, and the disposal of waste from a local administrative entity, and if so, to what extent does it receive this information?

Sampling Method

According to data provided by the National Statistics Organization (2014) [10], these 10 provinces were home to a combined total of 3,119,050 households. In addition, the Department of Local Administration's Research and Development Division of System Design and Structure [11] reported that there were a total of 1134 LAOs spread over these 10 provinces.

In terms of the selection of the sample, the method of stratified random sampling [12] was selected to carry out the calculations necessary to determine the appropriate size of the sample. After that, the sample was proportionally distributed across the 10 provinces using the method of proportional allocation. In other words, provinces that have a greater number of households or LAOs are going to have a larger sample size as a direct result of this.

Regarding the equation for the estimation of sample size in the event that the questionnaires include a summary of the results expressed in terms of proportion, the sample size, denoted by n, would have an error value of e, and the confidence level would be $(1-\alpha) \times 100\%$, which can be expressed as follows:

$$n_{prop} = \frac{N\sum_{h=1}^{L} N_h P_h Q_h}{\frac{N^2 e^2}{Z^2_{\alpha/2}} + \sum_{h=1}^{L} N_h P_h Q_h} \quad \text{...(1)}$$

where P means the proportion of population units having specific characteristics; Ph means the proportion of population of h and $Q_h = (1 - P_h)$; and N means the entire population when population N is subdivided into L groups (strata), where each stratum has $N_1, N_2, N_3, \ldots$, and N_L unit respectively.

Parameter Estimation

Inferential statistics, which entail an estimation of parameters in order to investigate population characteristics based on the sample, were utilised in order to conduct the analysis of the data collected from the questionnaires. Depending on the type of sample done, different methods such as mean, total, proportion, and variance can be utilised in the process of parameter estimation. As a result of the use of stratified random sampling in this investigation, the estimation of parameters can be accomplished by using the equations presented in Table 1.

Table 1 provides equations for the estimation of parameters that can be used to define characteristics of the population. These parameters include the mean, total, proportion, and variance.

Parameters	Equations
Mean of population ($\overline{y}_{st}$)	$\overline{y}_{st} = \frac{1}{N}\sum_{h=1}^{L} N_h \overline{y}_h$
Variance of population mean ($\hat{V}(\overline{y}_{st})$)	$\hat{V}(\overline{y}_{st}) = \frac{1}{N^2}\sum_{h=1}^{L} N_h(N_h - n_h)\frac{s_h^2}{n_h}$
when	$s_h^2 = \sum_{i=1}^{n_h} \frac{(y_{hi}-\overline{y}_h)^2}{n_h - 1}$
Standard error of population mean (S.E.)	$S.E. = \sqrt{\hat{V}(\overline{y}_{st})}$
Total of population ($\hat{Y}$)	$\hat{Y} = N\overline{y}_{st}$
Variance of population total ($\hat{V}(\hat{Y})$)	$\hat{V}(\hat{Y}) = \sum_{h=1}^{L} N_h(N_h - n_h)\frac{s_h^2}{n_h}$
Standard error of population total (S.E.)	$S.E. = \sqrt{\hat{V}(\hat{Y})}$
Proportion of population ($\hat{p}$)	$\hat{p} = \sum_{h=1}^{L} \frac{N_h \hat{p}_h}{N}$
Variance of population proportion ($\hat{V}(\hat{p}_{st})$)	$\hat{V}(\hat{p}_{st}) = \frac{1}{N^2}\sum_{h=1}^{L} N_h(N_h - n_h)\frac{\hat{p}_h \hat{q}_h}{n_h - 1}$
Standard error of population proportion (S.E.)	$S.E. = \sqrt{\hat{V}(\hat{p}_{st})}$

RESULTS AND DISCUSSION

Household Solid Waste Management

According to the findings from interviews with households on solid waste management, it was clear that the majority of households living in the areas governed by the LAOs generated approximately 2 kg of solid waste per day (kg/day), which is equivalent to 41.7 percent (Standard error (S.E.) = 0.72 percent). This was followed by 1 kg/day, which accounted for 26.2 percent (Standard error (S.E.) = 0.42) of the households (see Figure 2). The standard error of this figure is 0.02 kg/day, which works out to 0.70 kg/capita/day for the average amount of solid trash produced by households. In addition to this, it was discovered that the LAOs collected 63.2 percent of the home solid trash (with a standard error of 0.73 percent), whereas the remaining 36.8 percent (with a standard error of 0.73 percent) was not collected. The local administrative officers (LAOs) were responsible for providing rubbish collection services approximately twice per week.

When considering the management of solid waste based on the composition of the waste, it was discovered that LAOs collected 57.2 percent of wet solid waste, vegetable scraps, and food waste. Other types of waste that were collected by LAOs included vegetable scraps, food waste, and other food scraps. In the meantime, local authority officers collected 62.2 percent of plastic bags, 63.6 percent of polyurethane foam waste and containers, and 62.2 percent of foam containers. An estimated 67.4 percent, 59.0 percent, 63.2 percent, and 61.4 percent, respectively, of the households recycled and managed the solid waste that could be segregated and sold by the households, such as plastic bottles, aluminium cans, glass bottles, and papers. These percentages are estimated to be in order from lowest to highest (see Table 2).

There were a total of 15 ways utilised by the homes for the management of domestic solid trash that was not collected by the LAOs. This is important to note while discussing the subject. The following are the methods that were used to manage household solid waste: (1) collection of solid waste in bags and dumping thereof on authorised sites (23.7 percent); (2) burning of solid waste on their property (34.4 percent); (3) burning of solid waste outside their property (19.3 percent); (4) dumping of solid waste on their property (1.7 percent); (5) dumping of solid waste on the roadside (2.2 percent); (6) dumping of solid waste into a trench or small canal (0.5 percent); and (7) disposal of solid waste directly into (11) the separation of solid waste for the purpose of sale (2.1 percent); (12) the separation of hazardous waste for the purpose of dumping it on authorised sites provided by LAOs or municipalities (0.02 percent); (13) the composting of solid waste (0.4 percent); (14) the separation of food waste for animal feed (8.6 percent); and (15) other types of separation (4.7 percent).

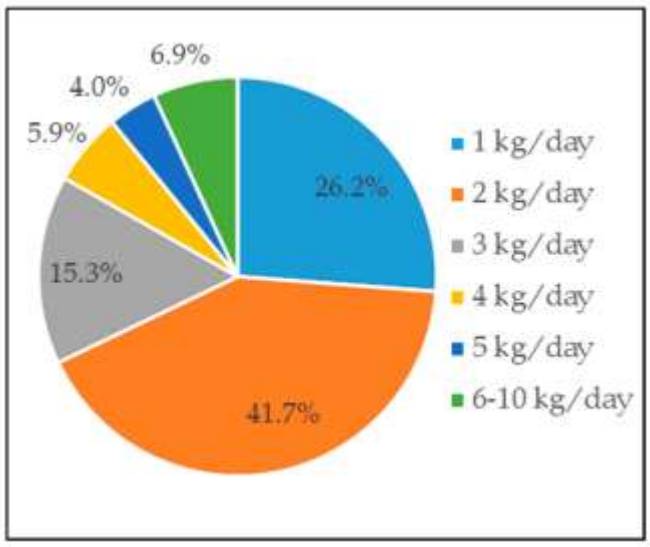

Figure 2. Percentage of municipal solid waste generated

Table 2. Municipal solid waste management analyzed from the interviews with households.

Type of Solid Waste	Management by Municipal/SAO	Self-Management	S.E. (%)
Wet solid waste, plant scraps, vegetable scraps, and food waste	57.2	42.4	0.75
Plastic bags	62.2	37.8	0.74
Polyurethane foam waste, and foam containers	63.6	36.4	0.73
Plastic bottles and plastic products	32.5	67.4	0.71
Papers, newspapers, and paper cartons	38.6	61.4	0.74
Beverage cans	41.0	59.0	0.75
Wooden pieces, leaves, branches, and grasses	37.8	62.2	0.74
Wooden furniture and wooden products	67.0	33.0	0.72
Cloth remnants, clothes, and clothing products	73.1	26.9	0.68
Sanitary napkins	62.6	37.2	0.74
Rubbers and leathers	78.8	21.2	0.62
Metals and steels	49.1	50.9	0.76
Glasses and glass debris	45.8	54.2	0.76
Other types of waste, such as torch batteries and light bulbs	67.0	33.0	0.72

It was recently discovered that there are 7.2 millions of hazardous waste and 150 millions of industrial low hazardous trash lying around in open land in our country of India, and that every year, Square kilometres are filled up by solid waste. The cost of their treatment and disposal was over 1600 billion rupees [3]. Between the years 1981 and 1991, the population of Mumbai rose from 8.2 million to 12.3 million. During this same time period, the amount of municipal solid trash went from 3200 tonnes to 5355 tonnes, representing a 67 percent increase. The city of Bangalore generates 2,000 tonnes of waste on a yearly basis, which places a strain on the hygienic conditions of the city.

CONCLUSION

According to the findings of the study, there are likely differences in the levels of pollutant emissions produced by various waste management strategies. In spite of this, additional local sources such as home emission and automobile emission also contribute to the ambient level in the vicinity of management sites. Therefore, a complete sources apportionment study is required in order to assess the contribution that the various waste management methods have made. Organic matter accounts for between 35 and 40

percent of the total amount of municipal solid trash that is produced in India. Composting, one of the first known methods of waste disposal, was utilised so that this could be reused and repurposed. The natural process of decomposition of organic waste results in the production of manure or compost, both of which are extremely high in nutrient content. Microorganisms, most commonly fungi and bacteria, are responsible for the transformation of biodegradable organic waste into a material similar to humus during this biological process. That not only add more nitrogen and carbon to the soil, but also assist your food decompose more effectively, which contributes to an overall increase in the fertility of the soil. Be sure to segregate your trash in order to make recycling easier, and always use a dedicated trash can for rubbish that has been dumped. To aid in the sorting process, ensure that your solid waste is kept separate from each other. For the benefit of recycles, plastics, glasses, old clothing, cotton, medical, shrapnel, and other items are kept in distinct piles.

REFERENCES

1. Hoornweg, D.; Bhada-Tata, P. What a Waste: A Global Review of Solid Waste Management; Urban Development & Local Government Unit, World Bank: Washington, DC, USA, 2012; p. 9.
2. Diaz, L.F. and C.G. Golueke, “Solid Waste Management in Developing Countries”, BioCycle, 26:46-52, September 1985.
3. CalRecovery, Inc., Metro Manila Solid Waste Management Study - Waste Stream Characterization, prepared for Ad Hoc Committee, Republic of the Philippines, May 1982
4. Nath, K.J., “Solid Waste Management in the Present Indian Perspective”, proceedings of ISWA 1993 Annual Conference, Jönköping, Sweden, September 1993.
5. CalRecovery, Inc., Conversion Factor Study - In-Vehicle and In-Place Waste Densities, prepared for California Integrated Waste Management Board, USA, March 1992.
6. Ahmed, Zubair (May 19, 2006). "Mumbai commuters face travel won" BBC (Mumbai, India).
7. Chen, R., Wang, Y., et al. (2015). N2O emission and nitrogen transformation during window composting of dairy manure. Journal of Environment Management, 160, 121–127.
8. CPCB report 2000. Central Pollution Control Board Report, Ministry of Environment and Forest. (2000). Management of municipal solid waste.
9. CPCB report 2010. Central Pollution Control Board Report, Ministry of Environment and Forest. (2010). Study of urban air quality in Kolkata for source of identification and estimation of ozone, carbonyls, NOx and VOC emission.
10. Das, A., Sanyal, M., et al. (2011). Municipal solid waste management in Kolkata metropolitan areas a case study. Environmental Science: An Indian Journal, 6(5), 247–256.
11. Goel, S. (2008). Municipal solid waste management in India, critical review. Journal of Environment Science and Engineering, 50(4), 319–328.

12. Lemieux, M. P., Lutes, C. C., & Santoianni, A. D. (2004). Emission of organic air toxics from open dumping a comprehensive review. Progress in Energy and Combustion Science, 30, 1– 32.

13. Zou, S. C., Lee, S. C., Chan, C. Y., Ho, K. F., Wang, X. M., Chan, L. Y., Zhang, Z. X. (2003). Characterization of ambient volatile organic compounds at a landfill site in Guangzhou, South China. Chemosphere, 51(9), 1015–1022.

14. Shekdar, A., (2009). "Sustainable Solid Waste Management: an integrated approach for Asian Countries".

15. Williams, R., (2013) "Hazardous and Industrial Waste Compositing. In: Science and Engineering of Compositing." Renaissance Press, Worthington, OH.