

Municipal solid waste disposal: a case study in Guwahati city to mitigate the man made disaster

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Abstract: *Our environment is facing potential threat from unhealthy waste disposal practices prevailing in almost all the urban centers in the country. Though the living standard has significantly changed, the method of public health and sanitation still remains primitive. Vast quantities of waste generation by the cities are one of the serious outcomes of unplanned development. Guwahati is the capital city of Assam and the Gate way to the North East India is also not exception on it. Due to rapid population growth within a short period of time, the city faces many problems. One of the major problems of the city is improper disposal of municipal solid waste. The management of municipal solid waste has become an acute problem due to enhanced economic activities and rapid urbanization. Urban population grows together with the development of markets and new industries resulted in the quantum of a huge amount of hazardous organic and inorganic waste daily. Proper management of the waste is a challenging issue that must be addressed adequately. The sources of waste are multiple and haphazard and disposal method is not a scientific, as a result of it; the environment is getting polluted day by day and gradually. The trace elements polluted the air and poses as a health risk to the city people.*

In this paper, the most polluted area in Guwahati city has been studied from the point of municipal solid waste. Potential vulnerable localities are demarcated for identifying the health affected areas. The most affected aquifer zones are identified through GIS applications and being highlighted for future disaster mitigation action.

Key Words: *Disaster mitigation, Guwahati, health implications, municipal solid waste, pollution.*

I. Introduction

The terminology of solid waste is material, which is not in liquid form, and has no value to the person who is responsible for it. Although human or animal excreta which often ends up in the solid waste stream, generally the term solid waste does not include such materials. Synonymous to solid waste are terms such as "garbage", "trash", "refuse" and "rubbish" [1]. The term municipal solid waste, refers to the solid wastes from domestic sources (household), commercial establishments, hotel and restaurants, markets, school, institution and offices, street sweepings and drain clean and other sources which include temples, parks, exhibition halls, marriage halls, hostels, paying guests which is very often the responsibility of municipal or other governmental authorities. Solid waste from industrial processes is generally not considered "municipal".

Swarup et al, [2] said that waste is an unavoidable consequence of satisfying man's needs for food, water, air, space, shelter, and mobility. In any material process, by product recovery or recycling can substantially alter the waste quantity and quality, but all processes eventually produce some waste.

In 1993, Misra and Mani [3] said that Solid wastes are unwanted materials disposed of by man, which can neither flow into streams nor escape immediately into the atmosphere. These non-gaseous and non-liquid residues result from various human activities. These cause pollution in water, soil and air.

Solid waste disposal poses a greater problem because it leads to land pollution if it is openly dumped, water pollution if dumped in low lying area and air pollution if it is burnt. The quantity of municipal solid waste generated in Guwahati has been consistently rising over the years. This can be attributed to the rapid population growth, mass migration of population from rural to urban areas, increase in economic activities in general in the city and the change in the lifestyle of the people.

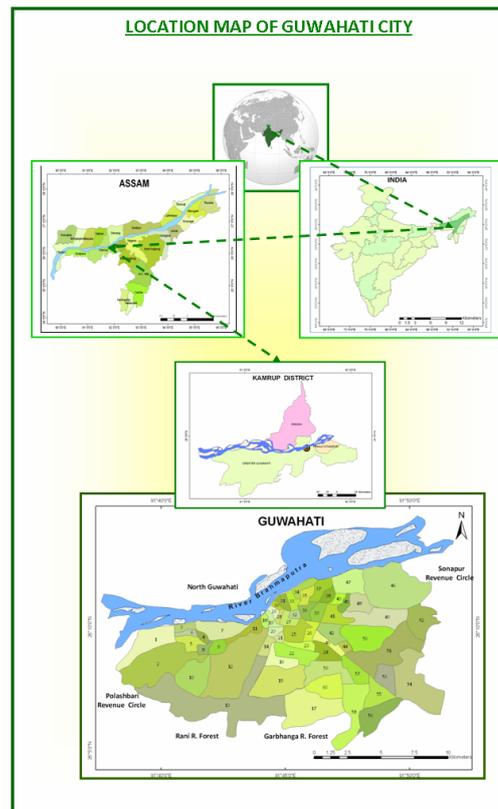
In Guwahati municipal wastes heap up on the roads owing to the improper disposal system. People in most areas clean their own houses and litter their immediate surroundings, thus affecting the neighbouring community and themselves. This type of dumping allows biodegradable materials to decompose under uncontrolled and unhygienic conditions. This produces foul smell and breeds various types of insects and infectious organisms besides spoiling the aesthetics of their environment. Different kinds of vector born diseases are spread and poisonous gases are emitted in these areas.

The methodology adopted to study the municipal solid waste, necessitated the use of primary and secondary data. The unit of observation has been confined within the limits of Guwahati city. The city has been divided by Guwahati Municipal Corporation into five divisions within which twenty zones and sixty wards are

demarcated for better service. The study being geographical, both primary and secondary data have been collected in order to arrive at a clear conclusion.

II. Result and Discussion

Guwahati is the capital city of Assam and gate way of the North east India (Map 1). The absolute location of the city extends approximately from $91^{\circ}38' E$ to $91^{\circ} 51' E$ longitude and from $26^{\circ} 5' N$ to $26^{\circ} 12' N$ latitude. In the northern side, the city is bounded by mighty river Brahmaputra and in the southern side; the city is surrounded by hillocks which is the extension of Khasi hills. In the west and the south west there are in the Rani Reserve Forest, plain with varying altitudes of 49.5 m to 55.5 m above mean sea level. The topography of the city is made up of both high land and low land. At present the city municipal corporation area consists of 60 wards covering an area of 216 sq. km with 809,895 population according to 2001 census. Though the topography of the city is not plain, the distribution of population is uneven. The population density is high in the plain area instead of hillock area [4]. (Map:1).



Map: 1

In the northern side the city is bounded by mighty river Brahmaputra and in the southern side the city is surrounded by hillocks which is the extension of Khasi hills. In the west and the south west there are the Rani Reserve Forest, Deepar Beel wetland and the alluvial tracts of the Brahmaputra plain. The city is situated on an undulating plain with varying altitudes of 49.5 m to 55.5 m above mean sea level. The city covering a municipal area of 216 square kilometer with 809,895 populations according to 2001 census. With the rapid growth of population the city is unable to keep pace with proper management of municipal solid waste.

Guwahati, the historical Pragjyotishpur, is located in between the southern bank of the mighty Brahmaputra River and the foothills of the Shillong plateau is the capital city of Assam and gate way of North East India. Guwahati is the business hub and largest city of Assam and North East. It is also the biggest commercial, industrial, educational and health centre of the region. For Look East Policy of Govt. of India, emerging importance of Guwahati will be phenomenal. For all these reasons there is a tremendous pressure of population in Guwahati city.

The population distributional pattern in Guwahati is not even. The undulating surface, rapid growth of population, different types of socio-economic activities is impact on distribution pattern of population. According to the 2001 census population in Guwahati was 8, 09,895 against the total population of 2, 66, 55,528 in our state, which is 3.19 percent of total population. The geographical area of Guwahati is 216 square kilometer against the total area of 78,438 km of our state which is only 0.28 percent of total geographical area.

This scanty geographical area has to support 3.9 percent of total population of our state. The density of population in Guwahati is 579 persons per sq.km against the average density of 340 persons per sq.km in our state.

The quantum of municipal solid waste varies according to the various sources within the city. As per the primary survey data, the average waste generation in Guwahati city is 2.66 kg per day per household. As the Guwahati city has 184,454 household and a population of 809,895 within the Guwahati Municipal Corporation area according to 2001 census, the total household waste generation is therefore 490.64 tons per day and the per capita waste generation is 606 gram per day.

Table No.1: Total Quantity of Solid Waste Generated in Guwahati.

SL. NO.	SOURCE	UNIT GENERATE/ DAY	TOTAL WASTE, TONS / DAY
1	Domestic Sources	2.66 kg / house hold	490.64
2	Markets	3.0 kg / unit	4.72
3	Commercial Establishments	1.62 kg / unit	62.97
4	Hotels & Restaurants	83.89 kg / unit	11.4
5	Schools and Institutions	2.5 kg/ unit	2.5
6	Street Sweeping and Drain Cleanings	-	48.00
7	Others		6.61
	Total waste generated, tons/day		626.84

Source: Field Survey

Markets, commercial establishments, hotels and restaurants, school and institutions, street sweeping and drain cleaning generate 129.59 tons waste /day. Moreover, hospitals and nursing homes add to the municipal solid waste unofficially which is some times mixed with other wastes from industries, marriage halls, hostels and other paying Guest accommodation. Although the industrial waste is not included in the municipal solid waste category, there are a few industries in the city which are contributing to the total municipal solid waste in the city. Bigger units like Indian Oil Corporation, Guwahati refinery and others have their own treatment system. Only the treated and the non – industrial waste come into the main solid waste stream of the city. The railway colony and the cantonment fall within the Guwahati Municipal Corporation area, they are not under the jurisdiction of Guwahati Municipal Corporation.

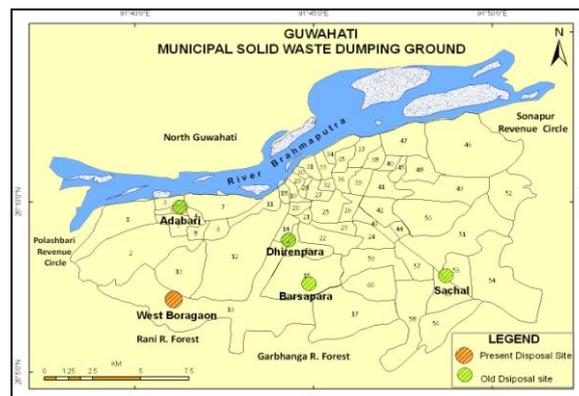
Although the city is witnessing tremendous construction and demolition activities in the city, the consequent waste generation is comparatively low, because most of the debris is used for the filling of low areas. With the absence of an efficient sewerage system in Guwahati, the situation is turning worse. There are open drains spread all across the city. The waste and the silt tend to get mixed up with the solid waste stream.



Despite the Bio-medical waste regulation in India, the biomedical waste finds its way into the municipal solid waste to some extent in Guwahati. Bio- medical waste of the hospitals and nursing homes being generated from their canteens, mess, offices and others usually consist of soiled cotton wool, bandages, and expired medicines. These are considered as a part of the municipal solid waste. The disposal pattern of this waste is also not proper. The other industrial wastes and carcasses are also not disposed in proper manner.



West Boragaon dumpsite is the only disposal ground of the city (Map :2). Now , no proper disposal method has been seen in the West Boragaon dumpsite. The municipal trucks simply carry the wastes to the dumpsite and dispose it without any processing, which has now become a health risk to the local people with the resultant pollution of the air and water .



Map :2

The way municipal waste is disposed of in Guwahati by the citizens poses a greater problem because it leads to land pollution when dumped openly, water pollution if dumped in low lying areas and air pollution if burnt. The quantity of municipal solid wastes generated in Guwahati has been consistently rising over the years. This can be attributed to the rapid population growth, mass migration of population from rural to urban areas, floating population and increase in economic activities in the city together with the change in people's lifestyle. The ever growing amount of municipal solid waste disposed indiscriminately in the city, ultimately stands as a problem to the civil society. It polluted the air , water and soil [5].



The method of disposal by the people differs in many ways. For example, out of the households sampled, 40 percent used the municipal bins for disposal of waste, 35 percent dispose it in their own campus, 11 percent throw it on the road side and only 6 percent give it to private parties on a payment basis. The remaining 2 percent burn it and 6 percent use other methods of disposal (Fig:1).

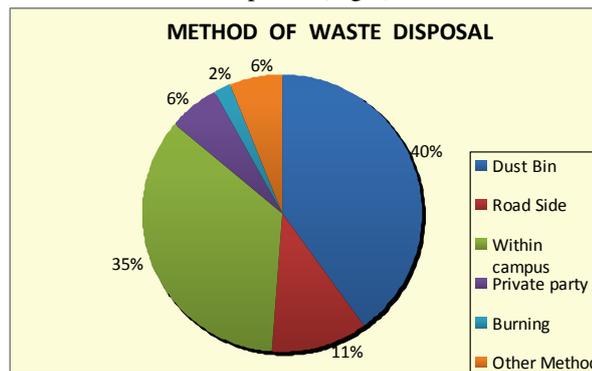
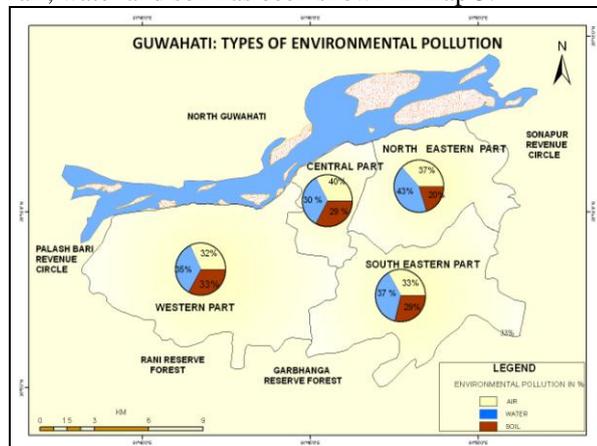


Fig:1

Some of the more commonly reported environmental health issues due to solid waste disposal in Guwahati city relate to the uncollected wastes that are strewn on road sides and drains, retaining water and clogging drains, thus leading to stagnant waters which encourage mosquito vector in abundance. Uncollected wastes provide food and breeding sites for insects, birds and rodents and the disease vectors connected with them. Animals feeding on the solid waste provide a food chain path for transmitting animal and human diseases.

The spatial distribution of the pollution caused by municipal solid wastes also varies within the city. The part wise spatial pollution of air, water and soil has been shown in map 3.



Map : 3

In the Central part air pollution is higher than the water and soil pollution. Primary survey results show that air pollution is 41 percent whereas water and soil pollution is 30 and 29 percent respectively. Again, in the Western part the air pollution is 32 percent and water and soil pollution is 35 and 33 percent. The air pollution in the South Eastern part is 33 percent while water pollution is 37 and soil pollution is 29 percent. In the North Eastern part air pollution is 37 percent and water and soil pollution is 40 and 20 respectively [6].

III. Conclusion:

The proper disposal of waste of any kind is essential for the preservation of the living environment and the maintenance of a high level of public hygiene. The effects on the environment of the treatment and disposal of waste therefore have enormous significance on the maintenance of quality of life and measures to reduce the problem have to be taken in the best possible way to keep the Guwahati city as a clean and healthy place for its citizens. Finally at the core is “MAN”. Without the participation, cooperation and sense of belonging of human being, it will be a challenge to make a place livable, lovable and healthy.

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