ISSN: 2277-3754
ISO 9001:2008 Certified
International Journal of Engineering and Innovative Technology (IJEIT)
Volume 6, Issue 11, May 2017

DESIGN AND ENVIRONMENTAL ASSESSMENT OF LANDFILL IN AURANGABAD CITY

Asst. Prof. A. B. Vawhale[1], Assistant Professor, SYCET Aurangabad
Muhammad Noman[2], UG Student, SYCET Aurangabad
Amol Nagargoje[3], UG Student, SYCET Aurangabad
Ihtheshamuddin Syed[4] UG Student, SYCET Aurangabad

Abstract - Solid waste refers to the range of garbage arising from animal and human activities that are discarded as unwanted and useless. Solid waste is generated from industrial, residential and commercial activities in a given area. As such, landfills are typically classified as sanitary, municipal, construction and demolition or industrial waste sites.

Whatever the origin, content or hazard potential is, solid waste must be managed systematically to ensure environmental best practices. As solid waste management is a critical aspect of environmental hygiene, it needs to be incorporated into environmental planning. Solid waste management is defined as the discipline associated with control of generation, storage, collection, transport or transfer, processing and disposal of solid waste materials in a way that best addresses the range of public health, conservation, economics, aesthetic, engineering and other environmental considerations. In its scope, solid waste management includes planning, administrative, financial, engineering and legal functions in the process of solving problems arising from waste materials. The solutions might include complex inter-disciplinary relations among fields such as public health, city and regional planning, political science, geography, sociology, economics, communication and conservation, demography, engineering and material sciences. Solid waste management practices can differ for residential and industrial producers, for urban and rural areas, and for developed and developing nations. The administration of non-hazardous waste in metropolitan areas is the job of local government authorities; on the other hand, the management of hazardous waste materials is typically the job of the generator, subject to local, national and even international authorities

The objective is to present an evaluation of environmental and social impacts of the Integrated MSW management project with supporting information on baseline environment to assist AMC or developer to take an informed view on environmental and social sensitivity of the project and the level of required mitigations measures to meet environmental and social norms of the Government of India. (GOI)

Key words **- AMC, landfill, leachate, MSW, Solid Waste etc.**

I. INTRODUCTION

Before introducing solid waste management, it is prudent to begin the discussion with outlining the scope of solid waste, the material to be managed. Solid waste refers to the range of garbage arising from animal and human activities that are discarded as unwanted and useless. Solid waste is generated from industrial, residential and commercial activities in a given area. As such, landfills are typically classified as sanitary, municipal, construction and demolition or industrial waste sites.

Waste can be categorized based on its contents, including such materials as plastic, paper, glass, metal, and organic waste. Categorization may also be based on hazard potential, including radioactive, flammable, infectious, toxic, or non-toxic. Categories may also pertain to the origin of waste, such as industrial, domestic, commercial, and institutional or construction and demolition whatever the origin, content or hazard potential is, solid waste must be managed systematically to ensure environmental best practices. As solid waste management is a critical aspect of environmental hygiene, it needs to be incorporated into environmental planning. Solid waste management is defined as the discipline associated with control of generation, storage, collection, transport or transfer, processing and disposal of solid waste materials in a way that best addresses the range of public health, conservation, economics, aesthetic, engineering and other environmental considerations. In its scope, solid waste management includes planning, administrative, financial, engineering and legal functions in the process of solving problems arising from waste materials. The solutions might include complex inter-disciplinary relations among fields such as public health, city and regional planning, political science, geography, sociology, economics, communication and conservation, demography, engineering and material sciences. Growth and development of economy triggers expansion in urbanization. This often induces migration of population from rural & semi urban areas to big towns and cities. Unless a proper planning is undertaken well ahead of time, the uncontrolled growth in urbanization could cause a strain to the municipal infrastructures like water supply, sewage and solid waste disposal causing public health problems. Like most urban cities Aurangabad, the capital of Marathwada is facing these problems.

In India, it is now mandatory for all urban and local bodies to comply with the 'Solid Waste Handling & Management Rules, 2000'. Solid Waste Management (SWM) includes all activities that seek to minimize the health, environmental and aesthetic impacts of solid wastes. Solid waste management is a term that is used to refer to the process of collecting and treating solid wastes. It also offers solutions for recycling items that do not belong to garbage or trash. As long as people have been living in settlements and residential areas, garbage or solid waste has been an issue. Waste management is all about how solid waste can be changed and used as a valuable resource. Solid waste management should be embraced by each and every household including the business owners across the world. Industrialization has brought a lot of good

ISSN: 2277-3754
ISO 9001:2008 Certified
International Journal of Engineering and Innovative Technology (IJEIT)
Volume 6, Issue 11, May 2017

things and bad things as well. One of the negative effects of industrialization is the creation of solid waste.

II. METHODOLOGY

One of the most important causes of environmental pollution is certainly an inadequate waste management. The three factors that have primarily influenced this problem area are: ever increasing amount of municipal solid waste (which causes increasingly pronounced space occupation), increasing amount and types of hazardous waste, as well as lack of awareness on the importance of acting promptly in this field. Particular problems in waste management occur in developing countries, where the awareness of the importance of environmental protection has not yet achieved a satisfactory level and where, out of economic or political reasons, professional guidelines associated with waste management are not observed. Problems emerge either due to a lack of legislation, or obsolete legislation, lack of trained personnel, inadequate waste management infrastructure, financial constraints in the establishment of a modern waste management system, population lacking the awareness about solid waste management, impossibility of selecting appropriate space for landfill development, lack of standards etc. Great problems in waste management in Serbia are caused by increasing amount of waste, lack of sanitary landfills built under international standards (which is inefficient and ecologically acceptable), as well as by the fact that the principle of hierarchy in waste management is not observed at all. Problems emerging in the field of environmental pollution and the manner of responding to pollution through the planning documentation only increase the importance of this problem area. We can use some below methods to control solid waste.

➢ *SEGREGATION OF WASTE*

Waste is constantly generated in apartments, complexes or office buildings etc. It is important to disposal of it appropriately and responsibly. Segregating waste before disposing of it makes it simpler to recycler. Dividing the waste into the categories by which they need to be segregated waste can be segregated as Biodegradable and non-biodegradable.

Photograph 1.1 Segregation of Waste (Central Naka, Aurangabad)

➢ *RECYCLING OF WASTE*

Recycling is the process of converting waste materials into new materials and objects. It is an alternative to "conventional" waste disposal that can save material and help lower greenhouse gas emissions (compared to plastic production, for example). Recycling can prevent the waste of potentially useful materials and reduce the consumption of fresh raw materials, thereby reducing: energy usage, air pollution (from incineration), and water pollution (from land filling).

Photograph 1.2 Recycling of Waste (Central Naka, Aurangabad)

Recycling is a key component of modern waste reduction and is the third component of the "Reduce, Reuse, and Recycle" waste hierarchy. There are some ISO standards related to recycling such as ISO 15270:2008 for plastics waste and ISO 14001:2004 for environmental management control of recycling practice. Recyclable materials include many kinds of glass, paper, and cardboard, metal, plastic, tires, textiles, and electronics. The composting or other reuse of biodegradable waste such as food or garden waste is also considered recycling. Materials to be recycled are either brought to a collection Centre or picked up from the curbside, then sorted, cleaned, and reprocessed into new materials destined for manufacturing. In the strictest sense, recycling of a material would produce a fresh supply of the same material for example; used office paper would be converted into new office paper or used polystyrene foam into new polystyrene.

➢ *COMPOSTING OF WASTE*

Composting is a way of harnessing the natural process of decomposition to speed up the decay of waste. The history of composting dates back to the history of early agriculture. Many find that composting is as much of an art as a science. Recent concern about managing wastes and producing food in an environmentally sound manner has led to a renewed interest in small-scale, backyard composting as well as an interest in developing large-scale, commercial and municipal composting systems.

ISSN: 2277-3754
ISO 9001:2008 Certified
International Journal of Engineering and Innovative Technology (IJEIT)
Volume 6, Issue 11, May 2017

Criteria	CPHEEO Manual Requirements	Description of the Site
Lake/ponds	200m away from the lake/pond	3 Km away from site
River	100m away from the rivers	Not observed within 100m from the site
Flood plain	No landfill within a 100 year flood	Flood plain
Highway	Away from 200m NHAI/state	NH211, 3 km away
Public parks	300m away from public parks	No parks within 0.3km
Wet lands	No landfill within wet lands	No wet land
Habitation	500m away from the notified habitation area	Habitation observed within 500m from the site
Ground water table	Ground water table>2m	2 m
Critical habitat area	No landfill within the critical habitat area. It is defined as the area in which 1 or more endangered species live.	No critical habitat
Airports	No landfill within 20 km	Aurangabad airport 25 km
Water supply schemes/wells	Minimum 500m away	Not observed
Buffer zone	As prescribed by regulatory	The entire area and their surrounding are vacant land can be declared by AMC or state department
Costal regulatory zone	Should not be sited	Far away from sea

Table 1.1 Site locational criteria for Sawangi site

Photograph 1.3 Dumping of Waste (Naregaon, Aurangabad)

III. PRESENT SCENRIO

➢ ***LOCATIONAL CRITERIA FOR SITE FOR LANDFILL***

The baseline environmental status was assessed based on primary and secondary data collected through on-site field observations and obtained from agencies such as Indian Meteorological Department, Geological Survey of India, State Ground Water Department, State Pollution Control Board, Census of India and Local Forest Department. The following environmental components were focused at during this study:

- Air Environment (Meteorology, Ambient Air Quality, Noise Levels, Traffic Pattern, etc.)
- Water Environment (Quality and Quantity of Surface and Groundwater sources)
- Land Environment (Geology, Hydrogeology, Land use, Solid Waste generation and characteristics)
- Ecological Environment (Terrestrial and Aquatic Flora & Fauna) Socio-Economic

A landfill site with low environmental impact, high social acceptance and low costs is the most desirable. The Aurangabad Municipal Corporation has decided site in Tisgaon but as per the survey the site for landfill is preferable is Sawanagi which is 16 km away from the city and 4km away from National Highway (Nagpur-Aurangabad-Mumbai) For 10000 people 1Acre site is decided. Approximately 100 acres site is available. The Salient features of the project for processing & disposal of MSW at Sawangi site are provided below:

Total Project Cost: Rs.110 Crores
Land area: Approximately 100 Acres
MSW processing capacity 400 – 450TPD

IV. DESIGN AND CONSTRUCTION OF LANDFILL

The designer should consider all environmental media that may be significantly impacted through the life of the landfill. The chosen design will have a major influence on the operation, restoration and aftercare of the facility. Aspects that must be considered in the design are briefly discussed below.

1. Nature and quantities of waste
2. Water control
3. Protection of soil and water
4. Leachate management
5. Environmental nuisances.
6. Stability
7. Operation and restoration requirements.
8. Monitoring requirements

➢ ***ESTIMATION OF LANDFILL CAPACITY, LANDFILL HEIGHT, LANDFILL AREA***

BASIC DATA

Location : SAWANGI, AURANGABD
Waste Generation : 400 - 450 tons per day (current)

ISSN: 2277-3754
ISO 9001:2008 Certified
International Journal of Engineering and Innovative Technology (IJEIT)
Volume 6, Issue 11, May 2017

Design Life : Active Period = 20 years
Closure and Post Closure Period : 25 years
Topography : Uneven ground
Subsoil : Hard Strata
Base year : 2017

CALCULATION

Current Waste Generation Per day = 450 TPD

Estimated waste generation after 20year = 875 TPD

Total waste generation after 20 years

$= 0.5(450+875) \times 365 \times 20$

$= 4.83 \times 10^6$ tons

Total Waste Volume (assumed density 0.85 t/cu.m)

$= (4.83 \times 10^6)/0.85$

$= 5.68 \times 10^6$cu.m

Volume of daily cover

$= 0.1 \times 5.68 \times 10^6$

$= 568 \times 10^3$cu.m

Volume of Liner and Cover system

$= 0.125 \times 5.68 \times 10^6$

$= 710 \times 10^3$ cu.m

First Estimated of Landfill Volume

$Ci = (5.68 \times 10^6 \times 568 \times 10^3 + 710 \times 10^3 - 568 \times 10^3)$

$= 6.39 \times 10^6$cu.m

Likely Shape of Landfill

Rectangular in Plan (Length: Width = 2: 1)

Primarily above Ground Level, Partly below ground level.

Area Restrictions : Nil

Possible Maximum Landfill Height = 20m

Area Required = $6.39 \times 10^6/20$

= 319.5x103sq.m

Length: Width = 2: 1

L = 2x

B = x

Length x Breadth = Area

$2x \times x = 318.5 \times 10^3$

$2x^2 = 319.5 \times 10^3$

$x^2 = 319.5 \times 10^3 /2$

x = 399.68 m say 400m

Breadth = 400m

Now, Length = 2x

= 2 x 400

= 800m

Approximate Plan Dimension = 400m x 800 m

V. CONCLUSION

1. As per the survey of different locations in Aurangabad (Maharashtra, India.) i.e. Tisgaon, Jatwada and Sawangi, situated in Aurangabad, Sawangi site is preferable for the solid waste management.
2. As per the survey on the basis of CPCB parameters and CPHEEO criteria for landfill and it is observed that there is public acceptability for the landfill.
3. Now a days conventional energy are going to minimized due to which it is necessary to use non-conventional energy so we can achieve the methane gas and biogas from the landfill by leachate treatment which is non-conventional energy
4. The method suggested for the treatment of solid waste, which is collected from the different locations in the Aurangabad region i.e. Landfill, which gives the manure for the agricultural purposes.

VI. FUTURE SCOPE

There is scope for identifying many more economic variables associated with the economic sustainability of the hazardous waste landfill sites. Thus the identified economic variables will also have an impact on the ranking process. In the Indian context the research has further scope and it is necessary to formulate new guidelines to establish economically sustainable landfills apart from environmentally sustainable landfills, in order to support the industrial growth. Further research work can be done to applying the Delphi technique to fix the attribute weightages for the identified economic variables.

REFERENCES

[1] Amritha P.K., Anilkumar P.P., Development of Landscaped Landfills using Organic Waste for Sustainable Urban Waste Management, International Conference on Solid Waste Management, 35 (2016) 368 – 376.

[2] Chiara D'Alpaosa,, Michele Morettob, Landfills sizing in metropolitan areas, 2nd International Symposium New Metropolitan Perspectives, 223(2016) 95-100.

[3] MazifahSimis, AzahanAwang, KadirArifin, From Ex-landfill to Public Park: Impact on local community's quality of life and living environment, Annual Serial Landmark International Conferences on Quality of Life, 222 (2016) 763 – 771.

[4] MazifahSimis, AzahanAwang, KadirArifin, From Ex-landfill to Public Park: Impact on local community's quality of life and living environment, Annual Serial Landmark International Conferences on Quality of Life, 222 (2016) 763 – 771.

[5] MazifahSimis, AzahanAwang, KadirArifin, From Ex-landfill to Public Park: Impact on local community's quality of life and living environment, Annual Serial Landmark International Conferences on Quality of Life, 222 (2016) 763 – 771.

[6] Scott Weichenthal, David Van Rijswijk, Ryan Kulka, Hongyu You, Keith Van Ryswyk, Jeff Willey, Rose Dugandzic, Roger Sutcliffe, Jamessee Moulton, Maureen Baike, Luc White, Jean-Pierre Charland, Barry Jessiman, The impact of a landfill fire on ambient air quality in the north: A case study in Iqaluit, Canada, Environmental Research, 142 (2015) 46–50.

[7] Safaa M. Raghab , Ahmed M. Abd El Meguid, Hala A. Hegazi, Treatment of leachate from municipal solid waste landfill, Housing and Building National Research Center, 9 (2013) 187–192.

ISSN: 2277-3754
ISO 9001:2008 Certified
International Journal of Engineering and Innovative Technology (IJEIT)
Volume 6, Issue 11, May 2017

[8] Hala A. Effat, Mohamed N. Hegazy, Mapping potential landfill sites for North Sinai cities using spatial multicriteria evaluation, The Egyptian Journal of Remote Sensing and Space Sciences, 15 (2012) 125–133.

[9] F.W. Shen, H.C. Guo, C.L. Xin, The environmental assessment of landfill based on stakeholder analysis, The 18th Biennial Conference of International Society for Ecological Modeling 13 (2012) 1872 – 1881.

[10] Fang Ronga, GuoZhaoguib, FengTugenb, Analysis of Stability and Control in Landfill Sites Expansion, International Conference on Advances in Engineering, 24 (2011) 667-671.

[11] Aurangabad Municipal Corporation (AMC).

[12] Central Pollution Control Board (CPCB).

[13] Central Pollution Health Environmental Engineering Organization (CPHEEO).

ABOUT AUTHORS

Asst. Prof. A. B. Vawhale[1], he received his Degree and Master Degree in Civil Engineering & Structural Engineering from Dr. Babasaheb Ambedkar Marathwada University, Aurangabad, Maharashtra, India. He is currently working in Shreeyash College of Engineering and Technology, Aurangabad as Assistant Professor.

Mr.Muhammad Noman[2], UG Student, Shreeyash College of Engineering and Technology, Aurangabad in Civil Engineering Department.

Mr. Amol Nagargoje[3], UG Student, Shreeyash College of Engineering and Technology, Aurangabad in Civil Engineering Department.

Mr. Ihtheshamuddin Syed[4] , UG Student, Shreeyash College of Engineering and Technology, Aurangabad in Civil Engineering Department.