International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 11 Issue 04, April-2022

Evalution of Municipal Solid Waste Management Challenges and Opportunities

Pemankumar Gangboir[1] , Komal Sable[2],
Khushali Manakar[3], Omprakash Gharpinde[4],
Pavan Chavhan[6]
Reaserchers in Civil Engineering Department,Wainganga College of Engineering and Management,
Nagpur, Maharastra, India

Dr. Snehal Abhyankar[1]
Professor in Civil Engineering Department, Wainganga College of Engineering and Management,
Nagpur, Maharashtra, India

***Abstract*— India faces major environmental challenges related to waste generation and inadequate waste assortment, transport, treatment and disposal. Current solid waste management (SWM) systems in India are not efficient to manage volumes of waste generated by an increasing urban as well as rural population and this impacts on the atmosphere, environment and public health. Mostly different activities of solid waste management (SWM) viz. the gathering, segregation, transportation, disposal, processing, exercise and treatment don't seem to be effectively handled and managed in cities and cities in India. In India, today we face nearly 75 % of solid wastes are rest unprocessed. Evaluation of municipal solid waste management (MSWM) could be a difficult issue as a result of it involves complicated, reticular criteria and so concerns correct modelling approaches to obviously establish the crucial criteria and their interrelationships to initiate simpler ways for up MSWM activities. Waste segregation at supply and use of specialized waste process facilities to separate reusable materials features a key role. Disposal of residual waste when extraction of fabric resources wants engineered lowland sites and/or investment in waste-to-energy facilities. The potential for energy generation from lowland via methane extraction or thermal treatment could be a major chance, but a key barrier is that the shortage of qualified engineers and environmental professionals with the expertise to deliver improved waste management systems in Asian country. This paper aims to develop a gradable analysis framework for the MSWM issues.**

Keywords—Solid Waste Management (MSW); Waste Generation; Waste-to-Energy; Sustainable Development; CSIR; NEERI

I. INTRODUCTION

The generation rate of Municipal Solid Waste (MSW) in India increasing day by day. Municipal solid waste (MSW) could be a major waste supply generated from varied activities of human daily lives. It's long been making serious environmental impacts and inflicting damaging health risks, especially in urbanized areas, because the waste disposal volume is usually proportional to the expansion of income and population, the impacts and risks become additional serious in mega cities with higher density colonized however less lowland on the market. so as to ease the pressing demands for lowland house, incinerators are unremarkably designed to greatly cut back the ultimate disposal MSW volume. Despite important development in social, economic and environmental areas, SWM systems in Republic of India have remained comparatively unchanged. The informal sector contains a key role in extracting worth from waste, with just about 85% of residual waste presently drop instead of properly landfilled. Improper MSWM activities will deteriorate our living environments and eventually threaten the public health. An indiscriminate merchandising of wastes, on one hand, will contaminate the soils further because the surface/ground waters. The solid wastes will clog the drain systems, that successively creates stagnant water for insect breeding or causes flooding throughout the rainy seasons. Uncontrolled burning of wastes and improper burning, on the opposite hand, may also contribute a great deal to urban air pollutions. If the activity of waste assortment isn't well managed, it might conjointly accompany with different environmental problems, and this is often why MSW is ofttimes considered one major theme of environmental pollutions and a good treatment of MSW mostly begins with a correct management.

II.SOURCE OF GENERATION AND TYPES OF SOLID WASTE

Table (1.1) There are various types if solid waste generated from various sources such as:[1].

Source	Typical waste generators	Types of solid wastes
Residential	Single and multifamily dwellings	Food wastes, paper, cardboard, plastics, textiles, leather, yard wastes, wood, glass, metals, ashes, special wastes (e.g., bulky items, consumer electronics, white goods, batteries, oil, tires), and household hazardous wastes.).
Industrial	Light and heavy manufacturing, fabrication, construction sites, power and chemical plants.	Housekeeping wastes, packaging, food wastes, construction and demolition materials, hazardous wastes, ashes, special wastes.
Commercial	Stores, hotels, restaurants, markets, office buildings, etc.	Paper, cardboard, plastics, wood, food wastes, glass, metals, special wastes, hazardous wastes.
Institutional	Schools, hospitals, prisons, government centers.	Same as commercial.
Construction and demolition	New construction sites, road repair, renovation sites, building demolition.	Wood, steel, concrete, dirt, etc.

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 11 Issue 04, April-2022

Municipal services	Street cleaning, landscaping, parks, beaches, other recreational areas, water and wastewater treatment plants.	Street sweepings; landscape and tree trimmings; general wastes from parks, beaches, and other recreational areas; sludge.
Process (manufacturing, etc.)	Heavy and light manufacturing, refineries, chemical plants, power plants, mineral extraction and processing.	Industrial process wastes, scrap materials, off-specification products, slay tailings.
Agriculture	Crops, orchards, vineyards, dairies, feedlots, farms.	Spoiled food wastes, agricultural wastes, hazardous wastes (e.g., pesticides).

Evaluation of municipal solid waste management is a challenging issue because its evolutes to complex interrelated criteria and these calls for proper moulding approaches to clearly. Identify the crucial criteria and them enter relationship to imitate more effective strategies for improving municipal solid waste management activity [2].

Tabel (1.2) Potenssial application of various types of waste in building application [3]

Waste Category	Waste type & Source	Potential building applications
Agriculture Waste (organic) Pappu et. al.(2007)	Baggage, rice and wheat straw and husk, coconutshell, fibers and husk Cotton stalk, Saw mill waste, ground nut shell, banana stalk and jute, sisal and vegetable residues.	Particle boards, insulation boards, wall Panels, printing paper and fillers, roofing sheets, fuel, binders, fibrous building panels, bricks, acid proof cement, coir fiber, mats, reinforced composite, Polymer composites, cement board.
Industrial waste/ Municipal waste (inorganic) Pappu et. al. (2007), Sharma and Reddy (2004)	Coal combustion residues, steel slag, bauxite red mud, Construction debris	Cement, bricks, blocks, tiles, paint, aggregate, concrete, wood substitute products, ceramic products.
	Fly ash	Mineral filler in asphalt paving mixtures, soil stabilization and structural fill
	Glass	Used in place of aggregates
	Plastics	Many uses for recycled plastics such as fencing, furniture and outdoor landscape elements.
Construction and demolition debris	Recycled Concrete	Raw material in cement clinker, admixture in cement and as aggregates in concrete. Can be used as aggregate base for pavements, sub base for new
Hazardous waste	Metallurgical residues, galvanizing waste, Tannery waste	Cement, bricks, tiles, ceramics and board

II. LITRATURE REVIEW

1. Chi-Horng Liao, Anthony SF Chiu, (2011). In this paper ISM technique is used to evaluate municipal solid waste management problems. The theory of ISM is based on discrete mathematics, graph theory, social science, group decision making, and computer assistance [2].

2. Naveeen BP, Malik PK, Shubhra Puri, (2018). In this paper scenario of Gurugram city is taken for solid waste management. Gurugram is one of the most rapidly urbanizing cities in India, where there are challenges in dealing with different aspect of handling SWM. At present management practice for solid waste carried out in Gurugram are not to the desired level due to various reasons manly due to lack a proper MSW in time. The number of solid waste management professional is very less in comparison to the required strength and there is a lack of conduct of training and awareness workshop for MSW [4].

3. Sunil Kumar, Stephen R. Smith, Geoff Fowler and et al. There is a need to cultivate community awareness and change the attitude of people towards waste, as this is fundamental to developing proper and sustainable waste management systems. Sustainable and economically viable waste management must ensure maximum resource extraction from waste, combined with safe disposal of residual waste through the development of engineered landfill and waste-to-energy facilities. India faces challenges related to waste policy, waste technology selection and the availability of appropriately trained people in the waste management sector. Until these fundamental requirements are met, India will continue to suffer from poor waste management and the associated impacts on public health and the environment [11].

4. Zaini Sakawi University Kebangsaan Malaysia: Generally, MSWM problems are due to non-effective and improper handling. Some problems have reached critical level and need urgent action for planning, designing and implementation. These problems are closely related to the problems of adequate funds, manpower, management system and expertise. To obtain systematic and accurate data for each area for waste generation several procedures must be achieved. The collector must register andbe under the control of the local authorities or else fully privatized. The management must come from one administrator (mono administrator). In this case, every local authority or private collector can monitor how much waste will be collected in one day and source of waste. The effort to develop database for waste much easier, and effort to identify composition for waste much better [12].
5. . ED Adamides, P Mitropoulos, Giannikos and Mitropoulos: This paper considered the development of a regional SWM system as a policy-making issue requiring a multimethodological intervention. With the help of a real problematic situation, both the

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 11 Issue 04, April-2022

entirety of the problem content and its (re)solution process was addressed. Initially, SSM and system dynamics were used for analyzing the different facets of the situation and for defining the systems necessary for achieving feasible and sustainable solution based on the notion ecological modernity. hent he dynamic coherence of the output of SSM was assured by means of a system dynamics model that also helped in the conceptualization f the objectives and actions of a more specific transition land. Finally, a bi-objective model was developed and employed in association with a GIS to determine locations for treatment facilities and transfer stations that may form the basic infrastructure or the implementation more specific policies as far as collection and treatment technologies re concerned [13].

***Review summary*—**The section focuses to review the theoretical composition of MSWM literature described in multicriteria evaluation with management approaches, which are guided from strategic, decision-making perspectives with status quo needed further improvements.

***Aim*—**
This paper reviews the problems, challenges and opportunities associated with waste management. It is the output from a global seminar on 'Sustainable solid waste management for cities: opportunities in the South Asian Association for Regional Cooperation (SAARC) countries organized by the Council of Scientific and Industrial Analysis-National Environmental Engineering Research Institute (CSIR-NEERI) and control in Nagpur, Republic of India in 2015. SAARC's includes Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, Sri Lanka and Afghanistan.

III. METHODOLOGY

There are mainly four methods of waste management as follows:

A. Landfill
B. Incineration
C. Bioremediation
D. Other thermal methods

A) Landfill

This is the foremost common solid waste disposal technique used nowadays. Garbage is largely unfolded in skinny layers, compressed and lined with soil or plastic foam. Modern lowlands are designed in such the simplest way that rock bottom of the landfill is roofed with associate run-resistant liner, that is typically product of many layers of thick plastic and sand. This liner protects the groundwater from being contaminated thanks to natural action or percolation. When the lowland is full, it's lined with layers of sand, clay, surface soil and gravel to stop ooze of water.

B) Incineration

This technique involves the burning of solid wastes at high temperatures till the wastes square measure was ashes. Incinerators square measure created in such the way that they are doing not provide off extreme amounts of warmth once burning solid wastes. Incinerators that recycle heat through chamber and boiler square measure referred to as waste-to-energy plants. These waste-to-energy systems square measure dearer to line up and operate compared to plain incinerators as a result of they need special instrumentation and controls, extremely consummate technical personnel, and auxiliary fuel systems. This technique of solid waste management will be done by people, municipalities and even establishments. The great thing regarding this technique is that the proven fact that it reduces the quantity of waste up to 20 to 28 of the total volume.

C) Bioremediation

The bioremediation process is a biological process that stimulate helpful microbes to use harmful microbes to use harmful contaminates as their source of food and energy. Certain microorganisms it toxic chemicals and pathogens, digesting them and eliminating through changing their composition into harmless gases like ethane and carbon dioxide. Some contaminated soil and water conditions already have the right counter-microbes. here, human entervention can speed up the natural remediation by boosting microbial action. In other cases where the right microbes are low in numbers or entirely absent, bioremediation is introduced by adding amendments – microbial actors like fungi and aerobic bacteria that are mixed into the soil or water. This simple process is called bioaugmentation, and it's highly effective to correct conditions quickly, as long as the right environmental conditions are present.

D) Other thermal methods

Thermal waste treatment refers to heat processes to treat waste materials. Thermal methods for waste management aim to reduce waste volume, convert waste into harmless materials, and utilize the energy hidden within waste as heat, steam, electrical power, or combustible material. There are many thermal methods like gasification, gasifier, pyrolysis, etc.

IV. CONCLUSION

- Population growth and notably the event of megacities is creating SWM in India is a major issue. The scenario is that India don't have adequate on inadequate waste infrastructure, the informal sector and waste dumping.
- In this project we try to evaluate municipal solid waste management challenges and opportunities. We suggested number of methods for waste management such as landfill, incineration, bioremediation and other thermal methods.
- There are major problems related to public participation in waste management and there's typically an absence of responsibility towards waste within the community. There's a desire to cultivate community awareness and alter the angle of individuals towards waste, as this is often basic to developing correct and sustainable waste management systems.
- sustainable and efficient viable waste management should guarantee most resource extraction from

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 11 Issue 04, April-2022

waste, combined with safe disposal of residual waste through the event of built lowland and waste-to-energy facilities.

- India faces challenges related to waste policy, waste technology selection the availability of appropriately trained people in the waste management sector.
- Until these basic necessities are fulfilled, India will still suffer from poor waste management and therefore the associated impacts on public health and the surroundings.

V. REFERENCES

[1] Hoomweg, Daniel with Laura thomas.1999, working paper series Nr.1. "Urban development sector unit east Asia and pacific region pages."
[2] Chi-Horng Liao, Anthony SF Chiu, 2011, Evaluate municipal solid waste management problems using hierarchical framework, (353-362).
[3] A.K. KASTHURBHA, K.R. REDDY, AND D. VENKAT REDDY, 2014, sustainable approaches for utilizing waste in building construction: two case study in India, (838-844).
[4] Naveen BP, Malik PK, Shubhra Puri, (2018) "Waste management: Issues and solution for a rapidly growing satellite city in national capital region, India.
[5] Hans-joachim Gehrmann, Markus Hiebel, and Franz Georg Simon (2017) Methods for the Evaluation of waste treatment processes."
[6] Massoud Sofi, Ylias Sabri, Zhiyuan Zhou, And Priyan Mendis, (2019), "Transforming municipal solid waste into construction materials," (2661)
[7] Hossein Asefi, Shahrooz Shahparvari and Prem Chhetri, (2019), "Advances in sustainable integrated solid waste management systems: lessons learned over the decade." 2007-2018.
[8] H. W. Gottinger, 1985, "A computational model for solid waste management with applications."
[9] Mahmood Zohoori, Ali Ghani, (2017) "Municipal solid waste management challenges and problems for cities in low-income and developing countries."
[10] Nachalida Yukalang, Beverley Clarke and Kirstin ross (2018) "Solid Waste Management Solutions for a Rapidly Urbanizing area in Thailand: Recommendations Based on stakeholder Input."
[11] Sunil Kumar, Stephen R. Smith, Geoff Fowler, Costas Velis, S. Jyoti Kumar, Shashi Arya, Rena, Rakesh Kumar and Christopher Cheeseman (2017). "Challenges and opportunities associated with waste management in India."
[12] Zaini SakawiUniversiti Kebangsaan Malaysia, (2011), "Municipal solid waste management in Malaysia: Solution for sustainable Waste management."
[13] ED Adamides, P Mitropoulos, Giannikos and I Mitropoulos (2009), "A multi-methodological approach to the development of a regional solid waste management system,"758-770.