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REVIEW ARTICLE

The Importance of Waste Management to Environmental Sanitation: A Review

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ABSTRACT
Within the past few years we have been suddenly awakened to the dangers caused by the mismanagement of wastes. We are now faced with dealing with past accumulations of wastes, and also with the tremendous task of establishing new guidelines and solutions to combat with ever increasing amount of waste [1].There are various types of waste but municipal waste can be properly managed without causing any pollution. Municipal solid waste is now called 'solid waste' [2]. Increasing solid waste management problems and its disposal strikes environment and health hazards. An integrated waste management in sustainable approach is presented as a response to necessary waste management strategy needs. Waste minimization in the form of proper waste segregation and utilization, the importance of pre-treatment of organic waste and combustible waste fraction does not only manage the waste but also generates products such as compost and renewable energy. Direct land filling of commingled waste in Asian countries should be discouraged due to its high organic waste fraction which causes potential environmental emissions.
Keywords: *Dangers, integrated waste management, sustainable, segregation, environmental emissions*

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INTRODUCTION

Human activities always generate waste. This was not a major issue when the human population was relatively small and nomadic, but became a serious problem with urbanisation and the growth of large conurbations. Poor management of waste led to contamination of water, soil and atmosphere and to a major impact on public health. The characteristics of waste material evolved in line with changes in lifestyle and the number of new chemical substances present in the various waste streams increased dramatically. The long-term health effects of exposure to substances present in the waste or produced at waste disposal facilities are more difficult to measure, especially when their concentrations are very small and when there are other exposure pathways (e.g. food, soil) [3]. Waste management and disposal is an alarming problem encountered by many of the urban and industrial areas in developing economies in Asian countries. Waste generation has witnessed an increasing trend parallel to the development of industrialization, urbanization, and rapid growth of population. The problem has become one of the primary urban environmental issues. Sometimes it is burnt to reduce its volume and to minimize attraction of animals and also to retrieve recyclable items. Despite the degradation of valuable land resources and creation of long-term environmental and human health problems, uncontrolled open dumping is still prevalent in most developing countries which indeed desperately need an immediate action due to the associated harmful impacts (Table1). Moreover, in South and Southeast Asia, more than 90% of all landfills are non-engineered disposal facilities [15].

Table 1: The three landfills in Delhi occupy a total of 150 acres (approx.) and are a fire hazard, say experts (Source: Delhi faces fire risk from overflowing landfill sites as tall as a 10-storey building, By Baishall Adak, Published: 2 February 2016).

OVERFLOWING DANGERS				
Landfill Site	**Area (In acres)**	**Waste Received In metric tonnes per day**	**Catering To Delhi Population**	**Year of Commencement**
Ghazipur	70	2100	30.8%	1984
Okhla	32	1200	18.9%	1994
Bhalswa	40	2700	50.3%	1993
Total	142	6000		
Total waste generated by Delhi daily is 8360 tonnes per day Status of all 3 landfills : Saturated in 2006				

Aside of the concern on increasing waste generation, and inefficient collection and transportation infrastructure system, the composition of waste (high organic matter and high moisture content) and climatic condition were among the other factors that need to be considered in waste management. Moreover financial constraints and weak implementation of waste management policy with poor cooperation of government, public and private sector, educational institutions, and civil society complicates the issues [15].

GENERATION OF WASTE

Over the years, there has been a continuous migration of people from rural and semi-urban areas to towns and cities. The increase in the population in class I cities is very high as compared to that in class II cities. The uncontrolled growth in urban areas has left many Indian cities deficient in infrastructural services such as water supply, sewerage and municipal solid waste management. In many cities nearly half of solid waste generated remains unattended, giving rise to insanitary conditions especially in densely populated slums which in turn results in an increase in morbidity especially due to microbial and parasitic infections and infestations in all segments of population, with the urban slum dwellers and the waste handlers being the worst affected [16]. Waste Management is a part of public health and sanitation, and according to the Indian Constitution, falls within the purview of the State list. It is estimated that the total solid waste generated by 300 million people living in urban India is 38 million tonnes per year. The proper disposal of urban waste is not only absolutely necessary for the preservation and improvement of public health but it has an immense potential for resource recovery [5].

Table 2 MSW Generation from The Metropolitans City of India

State/Union Territory	City	Urban Population in Lakhs (2001)	MSW Generated (MT/Day)
Andhra Pradesh	Hyderabad	3829753	957
	Visakhapatnam	982904	246
Bihar	Patna	1961532	588
Delhi	New Delhi	350000	272
	Delhi	13363471	6000
Gujarat	Ahmedabad	4215497	1265
	Surat City	2433835	730
	Vadodara	1491045	447
Karnataka	Bangalore	1304008	326
Kerala	Kochi	275225	69
Maharashtra	Mumbai	11914398	7500
	Nagpur	2040175	700
	Pune	2540000	1000
Madhya Pradesh	Bhopal	1482718	445
	Indore	1550880	465
Punjab	Ludhiana	1429709	500
Rajasthan	Jaipur	1870771	561
Tamil Nadu	Chennai	4343645	1086
	Coimbatore	1501373	375
	Madurai	1233083	308
Uttar Pradesh	Kanpur	2725207	954
	Lucknow	2262369	792
	Varanasi	1250039	438
West Bengal	Kolkata	4572876	1143
Grand Total		**70924513**	**27167**

A large metropolis such as Mumbai generates about 7000MT of waste per day, Bangalore generates about 5000MT and other large cities such as Pune and Ahmadabad generates wastes in the range of 1600-35—MT per day. Collecting, processing, transporting and disposing this waste is the responsibility of urban local bodies in India. The national and state governments have provided an impetus to improve the waste management in urban areas under various programmes and schemes [6]. action from metropolitans of India. Waste generation in major cities, 2015, CPCB [18].

Figure 1 Data source: Assessment and quantification of plastics

Urban India is now the world's third largest garbage generator. But the amount of waste generated is not as much of an issue as the fact that over 45 million tonnes (or 3 million trucks worth) of garbage is untreated and disposed of by municipal authorities each year in an unhygienic manner (Figure 1).
Cities like Pune, Mumbai, Ahmadabad, Agra, Bengaluru, Bhopal, Chennai, Delhi, Hyderabad, Jaipur, Kanpur, Kolkata, Lucknow, Nagpur and Surat, among others have an estimated waste generation of more than 500 tonne per day (Table 2). Out of the total municipal waste collected, 94 per cent is dumped on land and only five per cent is composted. In India, around 3 million trucks worth of garbage is untreated and disposed of by municipal authorities every day in an unhygienic manner [7].
Poorly managed waste serves as a breeding ground for disease vectors, contributes to global climate change through methane generation and even promotes urban violence.

PRODUCTION OF SOLID WASTE ON WORLDWIDE SCALE

The mass of waste produced in the world has been growing considerably for many decades especially in affluent countries. In 2006, the USA produced more than 228 million tonnes of MSW or 750 kg per capita. The quantity of MSW generated in the OECD area in 2006 was more than 619 million tonnes or 580 kg per inhabitant. As developing countries such as China and India industrialize and their population urbanised, huge amounts of municipal waste are disposed of, though the production per capita (less than 0.5 kg/day/capita in India and less than 0.9 kg/day/capita in China) is still relatively small compared to the production in most individual OECD countries (up to 2.1 kg/day/capita in the USA) [14].

HEALTH ISSUES

Health issues are associated with every step of the handling, treatment and disposal of waste, both directly (via recovery and recycling activities or other occupations in the waste management industry by exposure to hazardous substances in the waste or to emissions from incinerators and landfill sites, vermin, odours and noise) or indirectly (e.g. via ingestion of contaminated water, soil and food) [20]. Pointed out that the frequency of landfill failure in the UK was quite high, resulting in surface and groundwater pollution, despite the fact that about one third of 4000 sites surveyed had a clay liner. Despite important technological advancements, improved legislation and regulatory systems in the field of waste management and more sophisticated health surveillance, the public acceptance of the location of new waste disposal and treatments facilities is still very low due to concern about adverse effects on the environment and human health [9].
Emissions from incinerators are associated with respiratory sickness. Acute and chronic symptoms of respiratory failure are associated with incinerator emissions. There is association between developing certain cancers symptoms in people living close to incinerator sites. Specific cancers include primary liver

cancer, laryngeal cancer, soft-tissue sarcoma and lung cancer, excess of bladder, lung and leukaemia and stomach cancer. Reports of increased risk of respiratory, skin and gastrointestinal illness are based mainly on self-reported symptoms [21]. There is a gradual Increase in risk of adverse health effects near landfill sites and in some multisite studies and although biases and confounding factors cannot be excluded as explanations for these findings, they may indicate real risks associated with residence near certain landfill sites (Figure 2). A general weakness in the reviewed studies is the lack of direct exposure measurement. More interdisciplinary research can improve levels of knowledge on risks to human health of waste disposal in landfill sites [10].

Waste management issues are a highly emotive topic. Their disposal costs need to be balanced against environmental impact, which often results in heated public debate. Disposal options such as incineration and landfill, whilst unpopular with both the public and environmental pressure groups, do not pose the same environmental and health risks as, for example, recycling plants [11].

Figure 2 Landfill Effects on The Environment & Human Health [19].

WASTE MANAGEMENT PRACTICES AT GLOBAL LEVEL AND FUTURE WORKS

A number of serious and highly publicized pollution incidents associated with incorrect waste management practices, led to public concern about lack of controls, inadequate legislation, environmental and human health impact. In many countries, a large percentage of waste cannot presently be re-used, re-cycled or composted and the main disposal methods are land- filling and incineration.

WASTE INCINERATION

Incineration of waste (with energy recovery) can reduce the volume of disposed waste by up to 90%. These high volume reductions are seen only in waste streams with very high amounts of packaging materials, paper, cardboard, plastics and horticultural waste. Typically, incineration without energy recovery is not a preferred option due to costs and pollution. Waste incineration is expensive and poses challenges of air pollution and ash disposal. Incineration requires waste placed outside for collection to be containerized to stay dry and much of the waste stream is not combustible [12]. It can be used to reduce the original volume of combustibles by 80 to 95 per cent and this is its one of the most important feature. Air pollution control remains a major problem in the implementation of incineration of solid waste disposal. Incineration is used to lessen medical and municipal waste. Unfortunately, approximately one ton of carbon dioxide results from one ton of municipal solid waste (MSW) incineration; however, if the same amount was land-filled, 62 cubic meters of methane would be produced. This is possibly twice the global warming potential than one ton of carbon dioxide. Heat and electrical energy can be produced from the incineration process: 600 tons of waste per day will produce 17MW of electrical power and 1200MWh of district heating per day [17].

LAND FILLING

Landfills are a common final disposal site for waste and should be engineered and operated to protect the environment and public health. Landfill gas (LFG), produced from the anaerobic decomposition of organic matter can be recovered and the methane (about 50% of LFG) burnt with or without energy recovery to

reduce GHG emissions. Proper land filling is often lacking, especially in developing countries. Prevention, re-use and recycling should be promoted over disposal. Materials should not be land filled if an alternative option is available that is practically, economically and environmentally more sensible. There are some types of waste for which landfill are the best waste management option. Moreover, treatment of waste results in residues for which there is very often no option other than landfill available. Landfill is also a 'safety net' for other waste management operations experiencing a lack of capacity. Landfill will continue to play role in future waste management systems [13].

CONCLUSION

This exercise look over the present status of waste management practices in India, its effects on public health and on environment, and also the probability of introducing improved means of disposing solid waste in India. The techniques include Recycling, Composting, Anaerobic Digestion, Incineration and Land filling etc. The objective was to study and find out the ways in which the enormous quantity of solid wastes currently disposed of. Since 2008, the numbers of composting facilities are increased from 22 to 40. Currently, India has more than 80 composting plants. During the same period, the number of landfills has increased from 1 to 8. Up to 60% of the input waste is discarded as composting rejects and land filled the rest consists of water vapour and carbon dioxide generated during the composting processes. All municipalities have a waste plan which covers all types of waste, specifying the measures needed to deal with it in a sustainable, resource-efficient manner. Waste plans often include strategies for various waste flows, although they focus on household waste too. Waste Management organization can provide important benchmarking data that can help and control the generation of waste this is known as benchmarking and goal setting.

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