

A REVIEW ON THE COMPOSTING OF THE SOLID WASTE IN THE DEVELOPING COUNTRIES

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Abstract

The growth of populations, high urbanization and improved living standards have caused rapid changes in solid waste generation quantities and material compositions worldwide. Until recently, solid waste disposal has been considered more economical in landfills and open dump sites, and is the most commonly used technique in developed countries. The potential of other alternative approaches, such as the recovery and recycling of resources and their incorporation into waste management, has therefore been scarcely evaluated. Nevertheless, the ever rising challenges presented by the rapidly growing quantity and composition of solid waste in developing countries have led to the search for alternative methods of waste disposal. The paper provided an evaluation of the resource capacity of municipal solid waste materials from cities in developed countries as a strategy for municipal solid waste. Sustainable administration of solid waste. The paper established that high composting potential exists in the solid waste stream from cities in developed countries, using published data on solid waste composition. In conclusion, the rehabilitation recommended. Food waste products and composting and recycling papers for plastic, metals, textiles and others to discover their potential for resource recovery. This would minimize the final quantity of solid waste for disposal to a significant degree and lower maintenance costs. Sustainable waste management in developed nations can be accomplished through this policy. The paper is intended to provide a valuable guide for decision-making on waste management policies in developing countries.

Keywords: *Resource potentials, Organic waste composting, Municipal solid waste composition, Sustainable waste management, Developing countries.*

I. INTRODUCTION

Municipal solid waste comprises household waste, agricultural, commercial, institutional sources of non-hazardous waste such as markets, schools, street sweepings, and yard waste.

The collection, transport, sorting, treatment and disposal of solid waste are the functions of solid waste management. Five phases in the process were defined by Downmore (2011), namely: generation, sorting, storage, collection, Disposal and transport. Solid waste management therefore typically refers to the processing, storage, collection and transport of discarded items, normally in sanitary landfills, either for recycling or for final safe disposal. The term generally refers to the method of managing discarded materials produced within human settlements from different land use activities. Thus, waste management aims to provide human housing with a clean, safe and balanced environment. Protecting public health and environmental sustainability is the primary aim of solid waste management[1]. In addition, Schübeler, Christen & Wehrle (1996) clarified that the priorities include: protecting public health and safety, promoting environmental quality and sustainability, promoting economic productivity and generating jobs[2].

Solid waste management therefore plays a key role in human health and sustainable growth. Bad solid waste management may be a possible cause of illness and infections. Aliyu, Kasim & Martin (2011) noted that the possible health hazards associated with the exposure to toxic chemicals, dirty air and contaminated water to residences in the vicinity of hazardous waste treatment, storage and disposal facilities (TSDFs) in Los Angeles County, USA, are greater[3]. Many authors correlated disease incidences with inefficient collections of solid waste in Zimbabwe and India, respectively (Downmore et al. 2011 and Ross, 2013). Similarly, incidences of diseases associated with inadequate solid waste management in African cities were also cited by Nzeadibe & Ajaero (2010), Kadafa (2012) and Nabegu (2010). These include Nigeria (Stephens & Harpham, 1992; Ekugo, 1998 and Ogbonna et al., 2002); Ghana (Songsore & McGanahan, 1993) and Tanzania (Yhdego & Majura, 1988), respectively, citations of disease incidences[4][5]. Effective waste management must also be preserved in the cities in order to ensure the protection of public health and the environment.

Table 1: Solid waste collection rates in regions of the world

World Regions	African*	*Arab States	Asia*	Latin America	Industrial Nations	Transition Nations	All Cities Average
Waste Generation Tons/Cap/Year	0.27	0.28	0.29	0.30	0.51	0.49	0.35
Collection Rate %	36.2	64.9	67.0	84.8	99.4	91.4	68.7

The lack of adequate provision of facilities and services, including solid waste management, is one of the problems for developing countries. Municipal solid waste management (Butu, Ageda & Bichi 2013) is a global problem which is a growing concern for cities in developing countries [6]. The most critical aspect is the effective storage and safe disposal of waste in cities, but this is apparently the most complicated and costly aspect of waste management in developing countries. Municipal solid waste consumes approximately US\$25 billion annually in Asia and is estimated to cost about US\$47 billion by 2025. It is also a significant component in assessing the cost of programs for waste management. Ineffective collection systems are also cited in the majority of cities in developing countries. Solid waste collection in India is less than half the quantity generated in many cities and between 40 and 50 percent

is collected in Dhaka City, Bangladesh [7]. According to Barton, Issaias, & Stentiford (2008), just 25 per cent of solid waste is collected in Nairobi, Kenya. In the towns of Accra, Kumasi, Tema, Tamale and Sekondi-Takoradi in Ghana, a study by UN HABITAT 2001 in Barton, Issaias & Stentiford, 2008 found that average waste collection rates are around 40 percent. Similarly, Achi (1993) cited in Bogoro & Babanyara (2011) that 25-40% of solid waste in Nigerian cities is not collected. Solid waste is then disposed of in drains, streams or valleys, roadsides, and other open spaces. All these disposal habits are possible sources of contamination of air, water and land and also act as infection and disease agents. The annual collection rates of solid waste across regions of the world is seen in more detailed data (Table 1) from the United Nations, (2005) in Bogoro & Babanyara, (2011). Solid waste collection rates in Africa, Asia and the Arab areas, which primarily consist of developing countries, range from 36.2 percent to 67 percent, which is lower than (68.7 percent) the average collection rate for cities around the world. In developing regions, the rate of solid waste collection is much lower than the rate of development.

Benefits of Solid Waste Compositing:

Composting is a regulated biological process that increases the rate of biological decomposition of organic materials using natural aerobic processes [8]. The composting process simply requires the piling of organic materials such as fruit. Under sufficient humidity and temperature, waste, leaves and others cause the materials to naturally decompose into humus within short periods of weeks or months. The environmental advantages of waste composting as an alternative to waste disposal in landfills and open dump sites are numerous. The atmospheric emissions of GHGs, particularly carbon dioxide (CO₂) and methane (CH₄), are responsible for global warming that has caused extreme climate events. Extreme conditions such as drought have serious effects on crops and animal production, impacting the majority of rural people in developing countries who depend on agriculture as their main source of income. Similar studies have cited landfills as the largest source of CH₄ in the United States and Nabegu (2011) and Bhalla, Saini & Jha (2013) have stated that the key sources of GHG emissions are open dump sites. In Farrell & Jones (2009), according to Adani et al. (2004), waste composting generates about 82 percent less GHG emissions than untreated waste disposed of in landfills. Waste composting is therefore critical in reducing GHG emissions in developing countries because it is capable of diverting large quantities of organic materials from the flow of municipal solid waste in the regions.

Composting solid waste can decrease the mass of solid waste significantly. In Saheri, et al. (2012), Renkow et al. (1994) noted that the loss of water and carbon dioxide by composting organic waste content would usually reduce the volume by 25-60%. Composting solid waste also lowers the volume of waste for disposal, resulting in lower running costs [9]. A significant fraction of the overall cost of processing and transporting solid waste for disposal is Waste management profile in developed countries [10]. The recovery and composting of high fractions of organic solid waste (Table 1) may therefore have substantial advantages in terms of waste minimisation and cost reduction. This means that composting has high

economic potential and is therefore very necessary for developing countries to achieve sustainable waste management. Compost manure production can minimize chemical fertilizer demand and save foreign exchange and increase economic productivity in developing countries. The process of manufacturing and selling composting has involved a chain of economic activities involving manufacturing, distribution, transport and other labour that will create jobs and generate income. The use of compost manure as a replacement for chemical fertilizer would result in cost savings in output. Agriculture, and thereby raising the profits of farmers. In developing countries, this would increase poverty reduction, provided that 70% of the world's poor earn their main income from agriculture; and the rest are around 69% from the least developed countries (World Bank, 2014). In addition, one of the most effective ways to reduce rural poverty is to improve agriculture.

Recovery Capacity of the Developing Countries:

In developed countries, the composition of urban solid waste showed organic materials and paper as the dominant fractions around the globe. This has meant high composting capacity in developing countries. Solid waste composting, as currently practiced in developing countries, at the lowest expense, low technology and less emissions effect and more environmentally appropriate process compared to the conventional system of waste disposal in open dumps. Composting is also suggested to be most appropriate for organic materials and papers, while recycling is most suitable for other waste materials such as plastic, metals, as contained in the solid waste stream in developed countries, and glasses.

II. CONCLUSION

In developing countries, composting is sustainable, taking into account the various advantages such as the production of organic compost, the reduction of the quantity of waste for final disposal, the reduction of air pollution and leaching of groundwater, as well as the development of jobs and income and others. Due to the low cost; low technology; low pollution effect; and it has more environmental and economic benefits compared to the dumping of organic waste into open dumps, as is generally done in developed countries, composting is the most appropriate for developing countries. However, while composting is the most suitable for organic waste materials, it is better to recycle other waste such as plastics, metals, leather and textiles. In addition to the various multiplier advantages of composting and recycling reviewed in this paper, the huge organic materials and other recyclables in the total waste stream compositions are proof that high resource recovery capacity is inherent in the urban solid waste stream from cities in developing countries. However, in order to realize the potential, in addition to adequate public education on the need to reduce inadequate waste management, sufficient government policy on composting and recycling would need to be complemented. Composting and recycling were also proposed in the paper as a policy for effective waste management in developing countries.

III. REFERENCES

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- [1] D. E. Ross, "Safeguarding public health, the core reason for solid waste management," Waste Management and Research. 2011, doi: 10.1177/0734242X11416558.
- [2] P. Schübeler, "Conceptual Framework for Municipal Solid Waste Management in Low-Income Countries," UMP/SDC Collab. Program. Munic. Solid Waste Manag. Dev. countries. Urban Manag. Progr. (UMP). Working Pap. Ser. number 9, 1996.
- [3] A. A. Aliyu, R. Kasim, and D. Martin, "Siting of hazardous waste dump facilities and their correlation with status of surrounding residential neighbourhoods in Los Angeles County," Prop. Manag., 2011, doi: 10.1108/02637471111102941.
- [4] T. C. Nzeadibe and C. K. Ajaero, "Informal waste recycling* and urban governance in Nigeria: Some experiences and policy implications," in Handbook of Environmental Policy, 2011.
- [5] T. C. Ogwueleka, "Municipal solid waste characteristics and management in Nigeria," Iran. J. Environ. Heal. Sci. Eng., 2009.
- [6] A. O. Adeolu, O. V. Ada, A. A. Gbenga, and O. A. Adebayo, "Assessment of groundwater contamination by leachate near a municipal solid waste landfill," African J. Environ. Sci. Technol., 2011, doi: 10.5897/AJEST11.272.
- [7] A. Matter, M. Dietschi, and C. Zurbrügg, "Improving the informal recycling sector through segregation of waste in the household - The case of Dhaka Bangladesh," Habitat Int., 2013, doi: 10.1016/j.habitatint.2012.06.001.
- [8] "Solid Waste Management By Considering Composting Potential In Malaysia Toward A Green Country," e-BANGI J. Sains Sos. dan Kemanus., 2009.
- [9] L. A. Guerrero, G. Maas, and W. Hogland, "Solid waste management challenges for cities in developing countries," Waste Manag., 2013, doi: 10.1016/j.wasman.2012.09.008.
- [10] A. Z. Alagöz and G. Kocasoy, "Improvement and modification of the routing system for the health-care waste collection and transportation in İstanbul," Waste Manag., 2008, doi: 10.1016/j.wasman.2007.08.024.