Urban Solid Waste Management in Ghana: an Assessment of Zoomlion's Approach to Waste Management in the Wa Municipality

Patrick Aaniamenga Bowan[1*] Aliata Issahaque Mumuni[2]
1. School of Engineering, Department of Civil Engineering, Wa Polytechnic, P. O. Box 553, Wa, Upper West Region, Ghana
2. School of Business, Department of Secretaryship and Management Studies, Wa Polytechnic, P. O. Box 553, Wa, Upper West Region, Ghana
* E-mail of the corresponding author: bowanaania@yahoo.co.uk

Abstract
Waste management has become a major challenge confronting rapidly growing economies, urban cities and developing countries including Ghana. Notably, poor waste management systems, inadequate equipment militate against efficient waste management. The objective of this paper is to examine the approach employed by Zoomlion in ensuring effective solid waste management in the Wa municipality. Interviews, questionnaires and focus group discussions were used to collect data. The study adapted an interpretivist approach in research using exploratory research strategy. The targeted population was 11,369 people with a sample size of 386 and a 5% margin of error. Tables, charts and percentages were employed in the analysis of data. Communal containers comprised the leading method of waste collection. Also, the conventional method of waste management and use of illegal dumping site was the practice with Zoomlion. The study thus recommended the composting of putrescible waste and move toward an integrated approach to waste management.
Keywords: Solid waste, Waste management, Urbanisation, Zoomlion, Wa Municipality

1. Introduction

In developing countries and countries in transition, waste management often emerges as a problem that endangers human health and the environment. To make matters worse, waste management usually has a low priority on the political agenda of such countries, as they are struggling with other important issues such as hunger, health problems, water shortages, unemployment and even civil war. In such situations, it is easy to understand why waste problems have a tendency to grow steadily (United Nations Environment Programme, 2002).

Rapid population growth and uncontrolled industrial development are seriously degrading the urban environment in many countries in the South. One of the most serious environmental consequences of the process of urbanisation is the ever-growing amount of solid and liquid wastes generated by cities. As the world's population continues to increase, it is becoming increasingly urban. Whilst this is a global trend, urbanisation rates are particularly high in the South. Between 1950 and 1990 the urban population doubled in developed countries. During the same period the growth was five fold in the developing countries. In many parts of the world the urban population already exceeds that of the rural (e.g. many countries in Latin America 73%, Industrialised countries 75%, and it is predicted that this will be a global pattern within a few years (Hofny-Collins, 2006).

According to official data and the 2005 Revision of World Urbanization Prospects, by 2030, half or more of the African population is expected to live in cities. In Ghana, 43.8 % of the population already lives in cities and by 2030; it is expected to reach over 70 % of the population. Ghana has experienced rapid urbanisation over the past four decades. The population of Accra for instance in 1960 was 450000, which doubled by the 1970 census and reached 1.3 million in 1984 (Greater Accra Metropolitan Area (GAMA), 1992; Ghana Government, 1984). By 1990 the estimated population of the city was 1.6 million (Leitman, 1994) and in the year 2000, the metropolis had an estimated population of 2 million (GSS, 2000). Population growth in Accra has led to the rapid expansion of the city which has resulted in urban sprawl and uncontrolled expansion from the municipal boundary of Accra into marginal lands (Benneh *et al.*, 1993 in Kwasi and Markku, 2003). Also, the population of Wa in 1970 was 17825, which almost doubled by the 1984 census to 36,067 and in 2000 census the population of Wa was 66644. The current projected population of Wa is 130123 and the urban population growth rate averaged in Ghana is 4.2 compared to an average of 3.8 for Africa (GSS, 2003).

Often a discrepancy exists between the growing population and the increasing demand for sanitation and solid waste collection services on one hand and the capacity of the local government to provide these services on the other hand (UWEP, 2001). A rising quality of life and high rates of resource consumption patterns have had an unintended and negative impact on the urban environment - generation of wastes far beyond the handling

capacities of urban governments and agencies. Cities are now grappling with the problems of high volumes of waste, the costs involved, the disposal technologies and methodologies, and the impact of wastes on the local and global environment (Srinivas, 1998).

One of the most pressing concerns of cities in the South is the problem of solid, liquid and toxic waste management. By almost any form of evaluation, waste management is a growing environmental and financial problem in Ghana. The main objective of this paper is to examine the approach Zoomlion employs to ensure effective solid waste management in the Wa municipality.

2. Literature review

Conceptualising waste management, it is commonly misconceived that environmental protection and sustainable initiatives must come at the expense of economic growth and development (El-Haggar, 2007). She asserts further that this is particularly true for managing wastes, a process which depletes natural resources and pollutes the environment if not done correctly. Proper waste management can be costly in terms of time and resources involved. Therefore it is important to understand what options exist for managing waste in an effective, safe and sustainable manner. According to Tchobanoglous and Kreith (2002), Municipal solid wastes (MSW) is often described as the waste that is produced from residential and industrial (non-process wastes), commercial and institutional sources with the exception of hazardous and universal wastes, construction and demolition wastes, and liquid wastes (water, wastewater, industrial processes). Commercial and institutional firms typically produce waste as a result of conducting trade and business (Smith and Scott, 2005), whereas the waste streams of industrial firms (manufacturing, repair, production) are typically characterized as liquid wastes, solid wastes, or air pollutants with each typically being managed and regulated differently (Woodard and Curran Inc., 2006).

According to McDougall et al. (2001) and Scharfe (2010), waste management methods cannot be uniform across regions and sectors because individual waste management methods cannot deal with all potential waste materials in a sustainable manner. This is because conditions vary and therefore procedures must also vary accordingly to ensure that these conditions can be successfully met. Waste management systems must remain flexible in light of changing economic, environmental and social conditions. Staniškis (2005) noted that in most cases, waste management is carried out by a number of processes, many of which are closely interrelated; therefore it is logical to design holistic waste management systems, rather than alternative and competing options.

Integrated waste management (IWM) has emerged as a holistic approach to managing waste by combining and applying a range of suitable techniques, technologies and management programs to achieve specific objectives and goals (McDougall et al., 2001; Tchobanoglous and Kreith, 2002). The concept of IWM arose out of recognition that waste management systems are comprised of several interconnected systems and functions. Following United Nations Environment Programme (1996), this framework has come to be known as "a framework of reference for designing and implementing new waste management systems and for analysing and optimising existing systems". Just as there is no individual waste management method which is suitable for processing all waste in a sustainable manner, there is no perfect IWM system (McDougall et al., 2001). Individual IWM systems will vary across regions and organizations. However there are some key features which characterize them.

Waste Management Organizations from all areas within the institutional, commercial and industrial (ICI) sectors are required to manage traditional solid waste and residential waste. Also, the onus lies on them to manage that which is not typically produced in residential settings. This causes significant differences and presents unique challenges in waste management within the ICI sector versus municipal level solid waste management (El-Haggar, 2007; Tchobanoglous and Kreith, 2002). With municipal wastes, general characteristics can be common across various regions. The ICI sector however, produces a broad range of potential waste streams, including municipal and industrial solid waste. This is summarized in table 1.

Table 1: Waste streams Classified by source

Source	Facilities, activities, or locations where wastes are generated	Types of solid wastes
Residential	Single-family and multifamily dwellings; low-medium, and high-density apartments. Can be included in IC&I sector	Food wastes, paper, cardboard, plastics, textiles, yard wastes, wood, ashes, street leaves, special wastes (including bulky items, consumer electronics, white goods, universal waste) and household hazardous waste.
Commercial	Stores, restaurants, markets, office buildings, hotels, motels, print shops, service stations, auto repair shops.	Paper, cardboard, plastics, wood, food wastes, glass, metal wastes, ashes, special wastes, hazardous wastes
Institutional	Schools, universities, hospitals, prisons, governmental centers	Same as commercial, plus biomedical
Industrial (non-process wastes)	Construction, fabrication, light and heavy manufacturing, refineries, chemical plants, power plants, demolition	Same as commercial
Municipal Solid waste	All of the preceding	All of the preceding

Source: Adopted from Tchobanoglous and Kreith, 2002.

On the legal front, Environmental Protection Laws in Ghana date back to Ghana's colonial era. The laws, then, were mostly related to disease prevention and control. And they were often enforced in the bigger towns where government officers and factories were located. For example, one of the earliest laws in our statute books is the Beaches Obstruction Ordinance (Cap 240) of 29th January 1897. After independence, several laws were passed to help the young nation develop its industrial capability. Environmental Protection, however, became topical in Ghana after the 1972 Stockholm Convention. This led to the establishment of the EPC in 1974. It was later transformed to the Environmental Protection Agency in 1994.The 1992 constitution of the 4th Republic in chapter six specifically article 41 (k) enjoins the citizens of Ghana to protect and safeguard the environment. This is for both employers and employees of Ghana. It is therefore not out of place that parliament passed the Environmental Protection Agency Act 1994.

3. Methods and materials

3.1 Study Area

The Wa Municipal Assembly (WMA) is the only Municipality out of the nine Assemblies in the Upper West Region. It is bordered to the north by the Nadowli District, to the east by the Wa East District, to the west by Wa West District and to the South by both Wa East and West Districts. It lies within latitude $1^0 45$'N to $2^0 45$'N and longitude $9^0 32$' to $10^0 20$'W. It has a land mass area of approximately 234.74square kilometres, which is about 6.4% of the region. According to the 2000 Population and Housing Census (PHC), the Wa Municipality has a total population of 98,675 (Ghana Statistical Service); Wa town alone has a population size of 66,441. By projection from 2000 PHC figures, the current population for the municipality (2009) is 130,123.

3.2 The Research Design

A summary of all the information that was collected and used for the study are shown in figure 1.

The study adapted an interpretivist approach in research using exploratory research strategy because its aim was to know more about the phenomenon of urban solid waste management. Interpretivism was the necessary research philosophy for this study because it allowed the search, of the 'details of the situation, to understand the reality or perhaps a reality working behind them (Remenyi et al., 1998). From the interpretivist perception, it is necessary to explore the subjective meanings motivating people's actions in order to understand their actions. This research strategy was used as the study involved literature review, interview of experts in the field, and survey of respondents.

The approach in the study employed both quantitative and qualitative methods. As such, Primary and secondary research was conducted in the study.
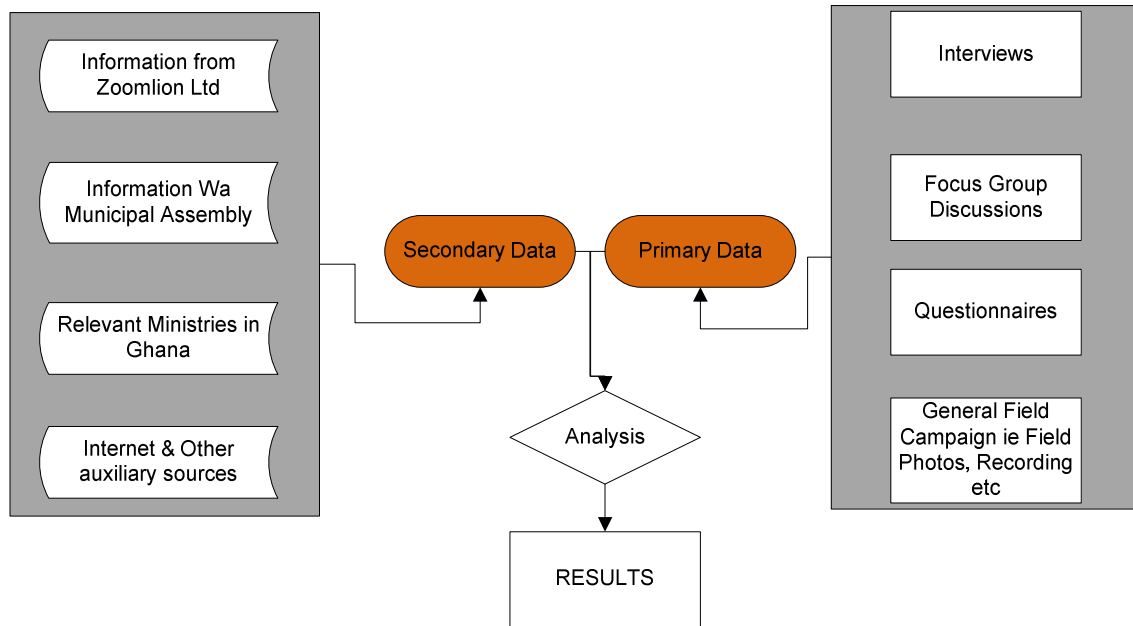
Figure 1: Summarized data collection and general approach to research work
Source: Authors' construct

3.3 Sample Size

Six residential areas were selected through the simple cluster sampling method namely, Kambale and Dondoli; Airport Residential and Dobile Residential; and SSNIT and Jazedayiri - Tampalepani Residential areas to represent two each of the low, middle and high income residential areas respectively in the Wa municipality. The

formula used to select the sample size is stated as: $n = \dfrac{N}{1 + N e^2}$, where

N is the target population (Total number of households in Wa Municipality) = 11,369
e is the margin of error = 0.05 and
n is the sample size= 386

However, the study considered sample size of 180 respondents; 120 for household respondents (20 respondents for each of the six residential areas), 30 respondents for business/shop owners in and around the central business district; and 30 market traders. Key targets and focus groups in the study area were also involved in this study through interviews but not with use of questionnaires.

4. Results and discussions

4.1 Household Respondents

Six residential areas; Kambale and Dondoli; Airport Residential and Dobile Residential; and SSNIT and Jujeidayiri - Tampalepani Residential areas, representing low, middle and high income residential areas respectively with 20 respondents each were sampled for the study.

4.1.1 Household respondents' solid waste disposal methods
The residents of the municipality have resorted to different modes of solids waste disposal. Figure 2 below shows the percentages of solid waste disposal methods of the households in the Wa Municipality.
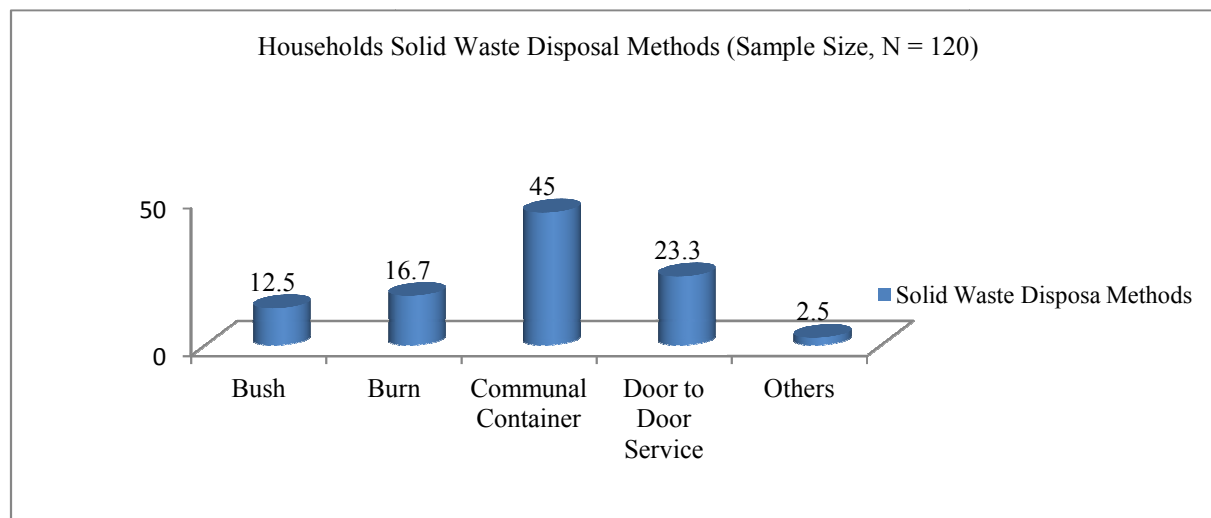
Figure 2: Solid waste disposal methods by household respondents

Majority of the household respondents use the communal system of waste collection (45%) as a means of waste disposal, 23.3% of the household respondents are covered by Zoomlion door to door collection service and remaining percentages; 16.7%, 12.5% and 3% (see figure 2) have resorted to burning, throwing of waste into the bush and other improper waste disposal methods respectively, which pollute the environment and have detrimental effect on humans and animal welfare. The total percent of 32.2 of household respondents resorting to inappropriate methods of solid waste disposal is an indication that waste managers in the municipality have failed to educate the public on proper waste disposal methods.

4.2   Business/Shop Owners solid waste disposal methods
The percentages of the various modes of solid waste disposal methods practiced by business/shop owners in the Wa Municipality are shown in figure 3.
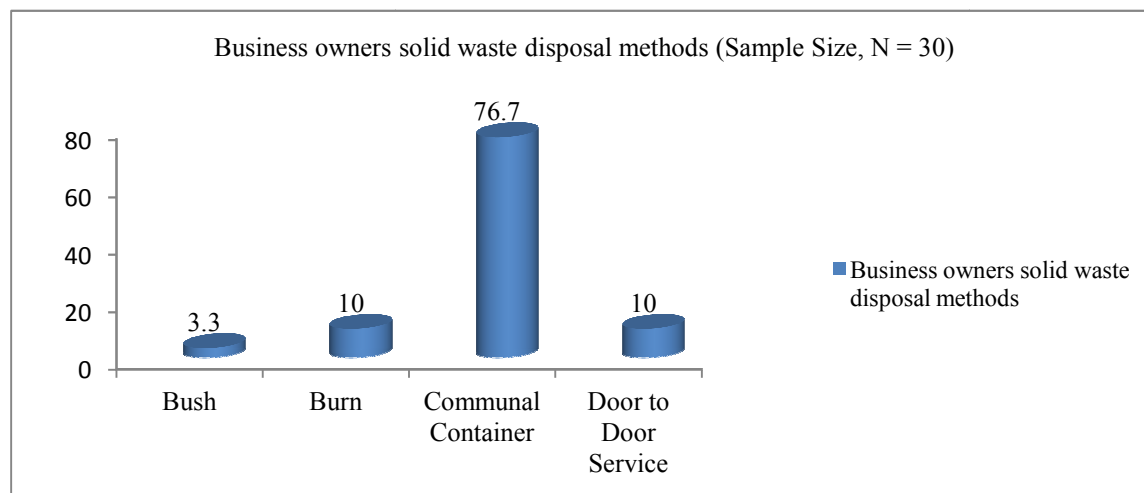

Figure 3: Solid waste disposal methods practiced by business/shop owners
Majority of the business/shop owners (76.7%) depend on the communal collection system of solid waste. However, during the researchers' field work it was realised that most of the businesses in and around the central business district were accessible to collection vehicles and as such could be covered by the door to door service.
4.3   Market Traders Solid Waste Disposal method
The ways that market traders dispose their solid waste in the Wa Municipality are shown in figure 4.
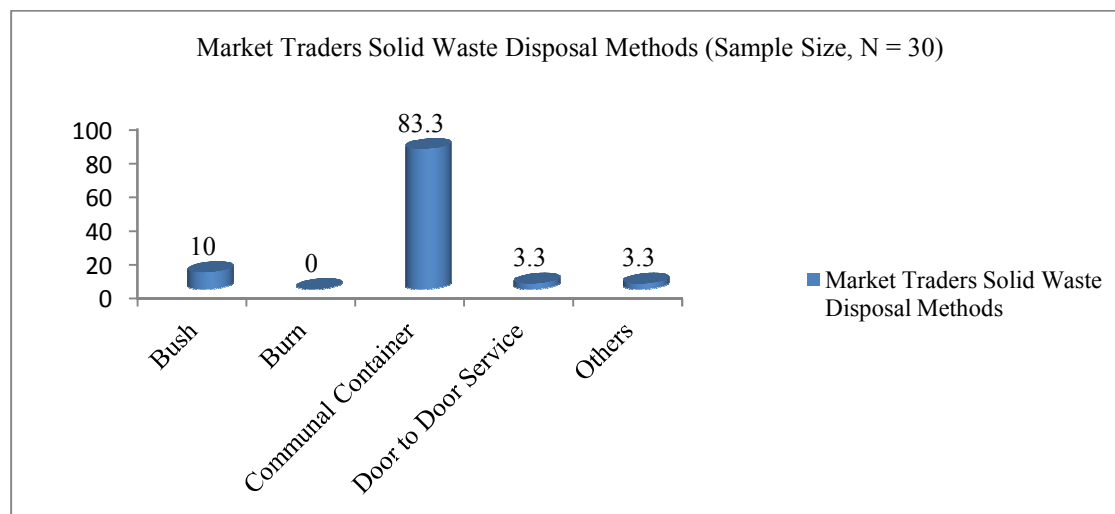
Figure 4: Market traders' solid waste disposal methods

Majority of the market traders (83.3%) depend on the communal collection method of waste. This can be attributed to their long stay in the market and the availability of the communal containers in the market.

4.4 Zoomlion's Approach to Urban Solid Waste Management in the Wa Municipality

Analysis of the collected data showed that Zoomlion employs the conventional approach to waste management, which according to Demanya (2007) primarily focuses on the collection and disposal of waste, and ignores other aspects such as waste generation, and the alternative practices of recycling and reuse. Thus, the approach struggles to cope with the nature, quality, and complexity of waste produced, as in most developing countries; the essential components of this approach are storage, collection and disposal. It is clear that the disposal practice carries the greatest threat to human health. The prevalent disposal type in African cities under this approach is the open pit dumping with no leachate control, no application of cover material to limit odor, exposure to particulate, flies and refuse being blown, and no control of methane emissions.

The approach has been noted to be both expensive and unsustainable (Sicular, 1993). Many cities that adopt this approach spend between 30 to 50 percent of their operating budgets on managing their waste (Arlosoroff and Bartone, 1987). Also, the approach suffers from a lack of public participation (Soerjani, 1984).

Plate 1: Zoomlion's illegal dumping site on the Wa – Busa road
Source: field survey

5. Conclusion

The research has shown that the presence and operations of Zoomlion in the Wa municipality has improved solid waste management in Wa Municipality. Hitherto, solid waste management was a monster in the municipality like all Ghanaian cities staring the authorities in the face while they look on rather helplessly. However, lack of the required legal strength to enforce existing by-laws on waste disposal, and to check the rather poor waste-handling attitude of the populace as well as the inability to enforce standards on land use and shelter development within the municipality continue to frustrate the efforts of Zoomlion in her attempt to keep the municipality clean and safe. The frustrating waste problem, however, has also been caused by poor governance

practices in the organisation of waste management; Zoomlion has failed to promote partnership with the waste-producing public and to involve them in the various aspects of waste management including needs assessment, financing, waste collection and final disposal; this can be attributed to the fact that Zoomlion is always sure of payment for her services from the Wa municipal Assembly share of the Common Fund. Though there is a cordial relationship between Zoomlion and Wa municipal Assembly, the Municipal authorities seems to be dissatisfied at times with the operations of Zoomlion but look helpless because they do not play any supervisory role over Zoomlion's operations in the municipality. According to Municipal authorities, Zoomlion was contracted by the Ministry of Rural and Local Government without the due consultation with the municipal Assembly.

Solid waste management embraces the storage, collection, transportation, treatment and final disposal of the solid waste. Zoomlion is doing quite well in the storage, collection and transportation of solid waste but faces challenges with the treatment and final disposal. Zoomlion's approach to managing waste has mainly focused on getting rid of the trash, with very little or no attention paid to waste minimization or recovery efforts. From the researchers' fieldwork however, most of the solid waste generated in the households and the markets are putrescible. The researchers' therefore recommend that all the putrescible waste collected in the Wa Municipality should be composted into manure for agricultural use; composting the putrescible waste in the municipality would be a method of solid waste treatment before final disposal. This approach to waste management will be the integrated approach to solid waste management which to other researchers is the most suitable approach to managing waste in Africa.

References

Arlosoroff, S. and Bartone, C. (1987), "Assisting Developing nations", *Biocycle*, 28 (6), 43-45.

Demanya B. K. (2007), "The Role of Local Knowledge in planning and managing urban solid waste: the tale of two (2) West African Cities, Accra and Kumasi, Ghana", *PhD thesis*, University of Waterloo, Canada.

El-Haggar, S. M. (2007), "Sustainable industrial design and waste management: Cradle-to-cradle for sustainable development", Oxford: Elsevier/Academic Press.

Fobil, J. N., Caboo, D. and Armah, N. A. (2005), "Evaluation of municipal solid wastes (MSW) for utilisation in energy production in developing countries". *Int. J.Environmental Technology and Management,* 5(1), 76-86.

GAMA (1992), "Strategic Plan for the Greater Accra Metropolitan Area", *Context Report*, 1, 19-29.

Ghana Statistical Service, (2000) "Census Report"

Ghana Statistical Service, (2003), "Ghana Living Standard Survey"

Hofny-Collins, A. H. (2006), "The Potential for Using Composted Municipal Waste in Agriculture: The case of Accra, Ghana". Sweden: Swedish University of Agricultural Sciences *Uppsala*.

Kwasi, O. B. and Markku K. (2003), "Municipal Solid Waste Management in the Accra Metropolitan Areas, Ghana", *The Environmentalist*, 23(3), 211-218.

Leitman, J. (1994), "Rapid Urban Assessment: Lessons from Cities in the Developing World", Washington D.C. World Bank Publications.

McDougall, F. R., White, P. R., Franke, M., & Hindle, P. (2001), "Integrated solid waste management: a life cycle inventory". Oxford: Blackwell.

Remenyi, D., et al. (1998), "Doing Research in Business and Management", London: Sage Publications.

Scharfe, D. (2010), "Integrated Waste Management Plan", report at www.pecounty.on.ca/government/.../IWMMPReport-June2010_002.pdf, accessed on 20th June, 2011.

Sicular, D.T. (1993), "Scavengers, recyclers, and solutions for solid waste management in Indonesia", *Journal of Southeast Asian Studies*, 24(2), 418-420.

Smith, P. and Scott, J. (2005), "Dictionary of water and waste management",2nd ed., Amsterdam: Elsevier Butterworth-Heinemann.

Soerjani, M. (1984), "Present waste management in cities in Indonesia'. *Conservation and Recycling*, 7(2-4), 141-148.

Srinivas, H. (1998), "Solid Waste Management: A Policy and Programme Matrix", Unpublished report at www.gdrc.org/uem/waste/swm-matrix.html, accessed on 24th August 2010.

Staniškis, J. (2005), "Integrated Waste Management: Concept and Implementation". *Environmental research, engineering and management*, 3(33), 40-46.

Tchobanoglous, G., and Kreith, F. (2002). "Handbook of solid waste management", New York: McGraw-Hill.

United Nations Environment Programme (1996), "International source book on environmentally sound technologies for municipal solid waste management". United Nations Environmental Programme, New York

United Nations Environment Programme, (2002), "Global Environment Outlook 3", London: Earthscan Publications Ltd.

Woodard and Curran Inc. (2006), "Industrial waste treatment handbook",. Oxford: Elsevier.

This academic article was published by The International Institute for Science, Technology and Education (IISTE). The IISTE is a pioneer in the Open Access Publishing service based in the U.S. and Europe. The aim of the institute is Accelerating Global Knowledge Sharing.

More information about the publisher can be found in the IISTE's homepage: http://www.iiste.org

CALL FOR JOURNAL PAPERS

The IISTE is currently hosting more than 30 peer-reviewed academic journals and collaborating with academic institutions around the world. There's no deadline for submission. **Prospective authors of IISTE journals can find the submission instruction on the following page:** http://www.iiste.org/journals/ The IISTE editorial team promises to the review and publish all the qualified submissions in a **fast** manner. All the journals articles are available online to the readers all over the world without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself. Printed version of the journals is also available upon request of readers and authors.

MORE RESOURCES

Book publication information: http://www.iiste.org/book/

Recent conferences: http://www.iiste.org/conference/

IISTE Knowledge Sharing Partners

EBSCO, Index Copernicus, Ulrich's Periodicals Directory, JournalTOCS, PKP Open Archives Harvester, Bielefeld Academic Search Engine, Elektronische Zeitschriftenbibliothek EZB, Open J-Gate, OCLC WorldCat, Universe Digtial Library , NewJour, Google Scholar