International Journal of Management, IT & Engineering
Vol. 7 Issue 8, August 2017,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

SOLID WASTE MANAGEMENT METHODS IN KAWEMPE DIVISION

Kato Geoffrey Kiwuwa

Jimmy Alemiga

Kato Geoffrey Kiwuwa has been working as a physical planner for 8 years now at Kira Municipal Council in Wakiso District. He holds a Bachelor of Urban Planning (MUK); a Post-Graduate Diploma in Urban Governance (UMI); Master of Management Studies with a specialty in Urban Governance (UMI); and Master of Public Infrastructure and Management (MUK).

Jimmy Alemiga is a Lecturer of International Relations and Diplomatic Studies at Cavendish University, Uganda since 2011. He also previously worked for the Uganda Media Center (Office of the President as the Public Affairs Assistant (Radio). He holds a Bachelor of Urban Planning (MUK); Post-Graduate Diploma in Project Planning and Management (UMI); Master of Art in International Relation and Diplomatic Studies (MUK); Master of Management Studies with a specialty in Project Planning and Management (UMI); a Post-Graduate Certificate in Monitoring and Evaluation (MUK); and is currently a PhD student at the Uganda Management Institute (UMI)-specializing in Institutional Management and Administration.

LIST OF ABBREVIATIONS

KCCA	Kampala Capital City Authority
UNEP	United Nations Environmental Programme
SWCFs	Solid Waste Collection Facilities
KCC	Kampala City Council
WMT	Waste Management Theory
SWMS	Solid Waste Management Strategy
SWM	Solid Waste Management
WHO	World Health Organization
GoU	Government of Uganda

PURPOSE OF THE STUDY

The issue of solid waste management (SWM) has long created several challenges to so many governments and municipal authorities across the globe particularly in developing and less developed countries (LDCs). This has gradually presented both public health and environmental effects despite the existing legal instruments. Currently, SWM in Ugandan urban centers' for example Kawempe Division has continued to worsen given factors like: increasing population growth, poor financing of infrastructure development, weak legal and regulatory framework among many. The general objective of this study was to investigate the solid waste management methods used in Kawempe Division. The key questions to be addressed were:

1) What are the existing inventory solid waste collection facilities?
2) What are the transfer and transport systems used in solid waste management?
3) What is the importance of education and training in solid waste management?
4) What are the impacts of solid waste on the health and environment?
5) What are the challenges of solid waste management?

INTRODUCTION AND BACKGROUND

SWM generally means the management of unwanted garbage. The problem of SWM is as old as the human race. Traditionally, SWM was the responsibility of urban councils as part of effective public service delivery (Ramachandra, 2006; Sara & Lisa, 2010). Before Uganda's independence in 1962, the responsibility of SWM was entirely a communal responsibility. After independence, complex series of SWM were introduced which resulted into inventions aimed at successful management of solid waste. Some of these methods included among others: recycling and re-use, resource recovery and process, closed and sanitary landfills, inventory of some of the existing solid waste facilities, education and training, transfer and transport among others which were legally under the Public Health Act (1964), Local Government Act (1997), and the National Environmental Act (1995) to mention but a few for the effective service delivery in urban areas (Mugagga, 2006; UNEP, 2011).

Presently, the challenge of effective and efficient SWM is highly manifested in poor or LDCs of the world that are faced with high rates of population growth linked to the high rural-urban

migration and industrial development rates among others. These and others have greatly led to a high consumption relation that results in environmental, social, and economic problems hence contributing to a poor solid management systems and legal instruments (challenge). This is caused majorly by problems like poor financing and infrastructure development (Mugaga, 2006). Many authorities spend more than 50 percent of the available operational budgets to serve less than 70 percent of the urban populations with no success on SWM (Nyakana, 2012). SWM includes all actions that seek to reduce the health, environmental and aesthetic impacts of solid wastes. This generally is concerned with the control of the generation, storage, collection, transfer and transport, processing, and disposal of solid waste in a way that is in accordance with the best principles to avoid any harm or danger to the public and the environment (UNEP, 2011). In addition, SWM requires the creation, reducing, categorizing, supervising, handling, treatment, reprocessing and enduring of solid waste in the most effective and efficient methods possible (Nabukeera, 2014). This can only be possible if major cities like Kampala accept to design well-planned collection and transfer process (inception to its final disposal) that can easily lead to significant reductions in the overall cost of waste management (UNEP, 2013).

The Kampala City Council (KCC) Act Section IV (2) thus on the (Solid Waste Management) Ordinance (2000) placed the responsibility of solid waste collection in the hands of Councils in divisions. Further, section IV (7) puts emphasis on the frequency of collection while Section IV (4) gives authority to the Council to determine collection fees using the different methods (informal and some formal). In addition, the Kampala City Council Authority (KCCA) admits that the amount of solid waste generated overwhelms the capacity of the authority to collect and dispose given the high costs of SWM. Only about 40% is managed and another 60% continues not to be managed (remains uncollected) despite being generated on a daily basis. The private solid waste collectors' joined to collect solid waste but has so far been unsuccessful as well (GoU, 2010; Liyala 2011). This failure is caused by among others: high cost of SWM, ignorance, poor legal instruments, cultural aspects and lack of adequate sensitization (education and training) of the masses among other factors (UN-habitat, 2010; GoU, 2003). These failures (challenges) are blamed on the urban or municipality and city authorities Uganda and other countries that face inadequate provision of proper facilities, access, collection, transportation and

disposal of solid waste despite the increasing population growth rates and costs (Okot-Okumu & Nyenje 2011).

The case in point of Kawempe Division which is one of the five divisions in Kampala City where the study was conducted continued to suffer poor SWM characterized by among others: breeding of vectors, offending odor and poor littering of solid waste (Andrea, 2013). This exposes people to public health risks and diseases like: typhoid, cholera, typhus and other diseases caused by vectors and rodents (Tukahirwa, 2011). The annual municipal waste generation of Uganda is up to 350.975.38 tonnes which calls for proven cost effective processes and methods of SWM if there is to be any meaningful averting of human and environmental concerns (Government, 2013). In Kamapala City, about 70% of the waste collected and transported to Kiteezi land fill is handled by KCCA and about 30% by private operators (Kinobe et al, 2015). Unfortunately, KCCA which is currently in charge of Kampala City lacks an adequate combined system to effectively and efficiently manage the ever increasing rates of solid waste generation within the cities' five divisions that includes Kawempe Division standing at 37,039 tonnes in financial year 2012-13. This figure of generation more than doubled in 2014/2015 financial year. Kawempe Division's solid waste is mainly composed of food related stuff such as peelings (banana, cassava, and potato peelings (66.1%), plastics (5.7%), dust and sweepings (9.1%), Debris (11%), paper (3.7%), metal and glasses (1.5% and 0.7% respectively) and others (2.2%). The major challenges of SWM in this division ranged from political, economic, social, technological, and environmental to legal issues among others (Namata, 2009). The budget of SWM in Kawempe Division clearly inadequate thus underperforming. It has more than 57 illegal dump sites (landfills) making it very risky for humans and environment sustainable (Aijuka, 2016).

METHODOLOGY

This study was conducted using a qualitative research approach because the research was primarily exploratory used to gain an understanding of the underlying reasons, opinions, and motivations of respondents' (Creswell, 2012). The advantages of this approach included among others: providing an in-depth analysis of the phenomenon and helped use subjective information, eliminated biased, used to ask complex questions, dealt with value laden questions, helped to

explore new areas of research and can be used to build theory (Denzin & Lincoln, 2011; Hammersley, 2013). The research design was both descriptive and case study designs. Data was collected using oral interviews directed to key respondents' and focused group discussions. These had a more than 98% response rate. In addition, secondary documents among them: minutes of meetings, government reports, books both hard and soft copies, the Internet, prospectus, promotional brochures, mission statements, and strategic plans were used to generate more evidence to support the study findings (Bryman, 2012).

The study was conducted in Kawempe Division between the period of 30th November 2016 to 12th March 2017. It the respondents' were extracted from the Town clerk's office; Makerere III Ward which has zones or villages that include: (Ssebina, Dobbi, Good hope, Kiggundu, Kibbe and Mayinja respondents); Makerere II Ward zones include; A, D, B and C and Bwaise II Ward with zones; Jamula, Lufula, Tebuyoleka Mukulazi, Nakamiro, Katale and Nakulalu. These are directly concerned with the issue of SWM and are divided as: The Town Clerk (1), Administrators (20), Community and development officer (1), Public Health and Environment (6), Community based organizations (11). Community Based Organizations composed of; the general assembly (2), executive committee below the assembly (3), operational committees including executive committee (2), project management committee (2) and (2) project procurement committee (Primary data, 2016).

THE WASTE MANAGEMENT THEORY

The Waste Management Theory (WMT) was advanced by Love (2002) aimed at providing a unified body of knowledge about both waste and waste management founded on the assumption that the only way to manage waste from causing a danger to the public and the environment is to promote optimum use of resource for waste minimization. The focus of the theory is to provide ways of channeling environmental sciences into engineering design hence integrating diverse theories most notably the Design Theory. Love (2002) further believed that merging of theories from other bodies of knowledge as well as the clarification of the definitions of core concepts, and mapping out key issues (such as domains, epistemologies and ontologies) could provide a lasting solution to the problem of SWM by building strong, reliable and sustainable processes and systems that match the high generation rates of solid waste across the globe (Fewtrell, 2012).

The importance of the theory to the study is that it can help Kawempe Division and other cities to: adhere to strict avoidance of waste creation or prevention at source. This could be: reduction of solid waste by application of more efficient production technologies; source-oriented improvement of waste quality; re-use of products or parts of products; internal and external recycling; and disassembling of complex products among others (Chandrappa & Das, 2012). However, critics of the WMT argue that it is based more on theory than practice and cannot provide the most appropriate methods of SWM given the fact that even the theory's background has yet to be established. This has continued to expose both public and environmental to high risks that may never be reversed despite all the existing legal instruments (Ekere, 2009). Further the theory appears have a gap between management science and technology, one that can be bridged by scientific theories which have to be practical and operational (Mubatsi, 2013).

FINDINGS AND DISCUSSIONS

Inventory of existing solid waste collection facilities

Solid waste containers

The findings showed that the facilities (containers) for SWM in Kawempe Division sighted by majority respondents' faced problems in effective solid waste disposal and management given the high population growth rates coupled with increased solid waste generation rates. They stressed that the containers were poorly placed; made of poor non water weak mental material that is not durable and can easily rust; and they are too small to accommodate the amount of solid waste generated. These were not suitable for collection of solid waste and does not allow for sorting at the source. The other problem residents' also faced was that the containers used by the division were not fire resistant; heavy and lacked convenient handles yet are not washable.

Other respondents' claimed that attaining the main objective of SWM in the division was impossible unless if the containers are improved immediately to match the demand of the people (quality and quantity). This problem can fail control, collection, processes, utilization and dispose of solid wastes that highly contribute to environmental and public health risks. In addition, the respondents' confirmed that Kawempe Division had solid waste facilities that did not support the fundamental principles of "reduce, reuse, and recycle" which were also not highly applicable "(compliant). The negative effects of poor facilities was that given the poor

street cleaning routine, most of the solid waste ends up being dumped just outside of the collection facilities hence littering the container stations. One respondent argued;

Despite poor solid waste collection facilities, most of the waste is also dumped just besides the containers instead of dumping it inside the containers. Worse still, there is poor reliable and regular street cleaning system to help in the removal of the poorly dumped solid waste which has become a breeding place for disease spreading vendors.

The findings above indicated that the mandate of SWM lies with the Kawempe Division to provide remedial action sites located close to the generation points. Among such actions includes: providing of strong and adequate sizeable storage containers made in durable materials with tight covers; fire-resistant; light in weight; and with side handles. Above all, these containers have to be maintained in clean conditions and yet washable as supported by findings of Water Aid (2011). This is supplemented by the fact that solid waste collection facilities (SWCFs) in all urban centers have to be centrally stationed with wide access routes coupled with a good traffic flow; land for expansion; good topology; and access among others (KCCA, 2013). However, Mugaga (2006) argues that the size of facilities cannot be well determined given the high rates of population growth coupled with the high rates of urbanization; underfunding; poor supervision; poor research and dissemination among others as supported by Nyakana (2012). This means that the communal containers do not match the type and quantity of solid waste and this was worsened by the fact that they are poorly placed far from the solid waste generators forcing people to dump as they wished without care for any risks (public and environmental).

Empting of solid waste containers

The majority of the respondents' agreed that Kawempe Division has weak legal instruments for the disposal of empty solid waste containers to the landfills. Many of the containers over flooded with solid waste forcing residents to dump outside the container. The containers were not emptied on time and took days to be returned if taken for empting (not taken regularly, periodically and timely), something which created an environmental and public health risks. In addition, there was no arrangement on the best alternative of dumping as the containers delayed

for example plastic bags that could temporarily be used to hold solid waste until when the container is returned.

Other respondents' added that the authority lacked commitment of both the organization and expertise to ensure containers were readily emptied and replaced. Others' thought that the placement of containers was not consistent as the locations changed many times which also confused the people especially in poor areas. Sometimes when the containers are not emptied for beyond the scheduled time table, people end up littering the streets during transportation due to over filled containers coupled with the poor technologies used to empty them.

This finding on empting of solid waste containers shows that there is still a very big challenge as emphasized by the results of a study by Kinobe et al (2015) who found out that in Kampala City, about 70% of the waste collected and transported to Kiteezi land fill is handled by KCCA and about 30% by private operators hence highly contributing to the poor routine of emptying of containers. This was caused by among other factors political, economic, social, technological, and environmental to legal issues coupled with the inadequate budgeting in Kawempe Division (Namata, 2009). This means that the poor schedules by both the division and private collectors for emptying and returning the containers greatly affected the solid waste disposal habits which was promoted by inadequately routines in the timetabling of emptying containers which caused delays forcing people to dump in unauthorized manner and in illegal places.

Sites for solid waste dumping

The majority of respondents advanced that the solid waste dumping sites in Kawempe Division were mainly placed with communal containers that served as center collection points. However, they added that communal collection bins had some difficulties to access given the narrow roads; poor topography or low-lying land terrain; scattering of solid waste by human scavengers; very small sites among others that encouraged poor SWM. This resulted into diverse environmental and human health hazard effects. Others added that the good (sizeable and accessible) solid waste sites were mainly found in middle and rich areas in the division which had better solid waste collection sites and systems as opposed to the poor neighbor hoods.

Other responses showed that the option of dumping solid waste directly on the car was marred with corruption where the truck managers charged money which many claimed they could not afford. Many of these trucks were not well fitted with lifting gear. These trucks also failed to access narrow roads within 10 feet or so of each property served which was a typical dream in most parts of this division. This was manly blamed on the weak legal instruments that failed to regulate the very minimum standards in urban planning which highly affected comprehensive land use, monitoring and evaluation of dumping sites.

The findings above on sites for solid waste dumping related to the one by Aijuka (2016) who found out that there was serious deficiency of SWM methods and sites in Kawempe Division which has promoted unauthorized or illegal dumping, and unlicensed collectors. This continued to increase the cost of SWM. According to WaterAid (2011), high charges of fees ranging from between (1000 to 3000) shillings for private collectors was very high for the majority poor people in Kawempe Division. There were also unauthorized and illegal dump sites thus creating high danger for humans and the environment impacts (Aijuka, 2016). This means that the costs charged by the collectors cannot be afforded by the majority poor people and yet there was also very few designated dumping sites in the division leaving a big percentage of solid waste uncollected. This was coupled with poor access and terrain which proves that many houses predominantly in poor neighborhoods showed weak supervision of legal instruments on the side of the authority (laxity).

Transfer and transport

Transfer stations

Majority of the respondents in Kawempe Division confirmed that solid waste transfer stations, sites or buildings for temporary storages were inadequate in some places. Others were small and in some areas, they totally lacked them. This hence contributed to piling of such solid waste before the trucks collected them for loading into larger vehicles which finally transferred them to the final disposal end points for incineration or burying (landfills) or for recycling. One respondent who worked at one of the facilities agreed;

In our division, there was off loading of solid waste, some level of pre-screening and sorting at the stations for compaction before being finally loaded on bigger vehicles among them included trucks and tippers that transferred to their final destination. However, this was only effectively done in middle and rich neighborhoods.

Others responses showed that Kawempe Division had many unauthorized (illegal) stations and landfills although the main Kiteezi and Mpelerwe landfills were operational but overwhelmed with large volumes of solid waste generated per day. They added that the locations of solid waste stations was generally inconvenient to the people (far, costly, small, and smelly) among others. However, some others cited that there was need and important benefits of transfer stations if they were adequately provided. They can be cost saving and can also make it easy to transfer solid waste from the local stations in each areas in Kawempe Division onto bigger (larger) transportation vehicles (trucks and tippers).

Respondents' added that proper location of transfer stations can be useful in fuel saving; avoid littering waste on the roads; reduces traffic congestion in communities during transfer to bigger vehicles; reduces bad odor (air, land and air pollution); and makes it easy to sort among others were responses that dominated the answers. They agreed also that each community should have at least a simple transfer station where skips are situated (but not too close to people's homes or factories, hospital, commercial places of business and schools among others) to avoid causing a nuisance to communities around. They advised that these should also have access to major roads leading to the sorting or disposal sites. But their key worry was if such solid waste will be collected by the authorities on time and the containers returned on time to avoid all environmental and public health implications.

The findings above showed that the method of recycling as one of the ways of managing solid waste was inadequately being used and yet this trend could actually be very useful not only to protect and promote public health and the environment but also create incomes for the majority of the people in the division. Recycling, re-use, and other methods were not highly encouraged or improved or legitimized and well-implemented by the Kawempe Division authorities and other private solid waste managers through methods like capacity building and sensitization. It is

even worse that private solid waste companies do not operate in the low- income areas (Rick, 2017). The temporary SWCFs are far from each other and from the points of collection like stationary compactors, recycling bins, material recovery facility, transfer containers and trailers, transfer packer trailers, or mobile equipment (GoU, 2010). This means that transfer stations (both temporary and permanent) and transport systems are inadequate to accommodate the large quantities of solid waste generated either due lack of information or poor service delivery methods. This highly increased to the cost of SWM in the division.

Transportation of solid waste

According to the respondents' Kawempe Division had very few solid waste collection vehicles (trucks and tippers) for transportation of solid waste on time and in safety. Most of the vehicles also faced so many mechanical problems coupled with poor expertise to repair and maintain these vehicles; and yet those which were weakly moving on the roads were not adequate to serve the division. These vehicles are open in that they keep dropping solid waste during transportation to the final disposal. Some respondents' informed that the local people had resorted to transferring and transporting solid waste using wheel barrows, people and bicycles among others which are not adequate to manage solid waste in the division. Majority respondents' attributed these unfortunate transportation systems (transfer and transportation) of solid waste in Kawempe Division to among others a poorly integrated weak legal instruments that are also fragmented and poor institutional management and administration.

The majority of respondents' generally agreed that the transportation of solid waste in the division was still alarming and mainly failed by lack of adequate manpower and funds; constant breakdown of trucks and tippers due to poor maintenance, inadequacy of trucks and tippers, use of illegal transport means and facilities by private collectors; lack of education and training of the communities' as required by the SWM Strategy of 2006 Para.7. Others believed that the type of transportation (truck, trailer and motor-tricycles) broke down most times because they are designed to transport solid waste of developed countries from where such vehicles were purchased. Thus, the quality and quantity of the solid waste produced from where such vehicles are imported from (developed countries) is far different with the one is developing and less developed countries. The solid waste in poor countries like Uganda is not sorted at the source

and majorly from foods; the same vehicles are also used on poor access and potholed roads; and at the same time poor terrain among others which also increased operational costs and constant breakdowns. They believed that simpler and cheaper methods like animal carts hand carts and humans were more appropriate for developing countries like Uganda.

The findings above related to the ones by Aijuka (2016) whose study results confirmed that there was deficiency of SWM in the division that was mainly caused by poor transportation systems and dynamics without remorse the high rates of solid waste generation. This was no different from Kinobe et al (2015) who argued that the division had no integrated legal framework to deal with waste management rates coupled with very weak legal instruments which allowed transportation of solid waste openly on (truck, trailer and motor-tricycles) among others littering the streets during transportation. According to Katja et al (2012), effective transportation of solid waste requires planning of the routes for waste collection vehicles. This requires appropriately identifying the pickup points; traffic level; safety measures (environment and public health); and the likely amounts of waste to be collected from each point among others.

According to the section V (4) of the SWM ordinance of (2000), it is an offence for any person to haul (transport) or cause to be hauled (transported) on or along any public street; right of way or alley (passage) in the city; any solid waste, unless that waste is in a vehicle or receptacle (container) so constructed or covered as to prevent the contents from falling; leaking or spilling and to prevent any obnoxious (unpleasant) odor escaping from waste. It is also an offence under section 20 (d & e) of the SWM Ordinance, 2000 to collect; transport; remove or dispose refuse for a fee or other consideration without a valid permit from the Council (Water Aid, 2011). The results mean that efficient and effective methods of transportation of solid waste improve public service delivery. It also means that either transport facilities have to be designed according to the type (quality and quantity) of solid waste generated based on the local conditions thus access roads; terrain and traffic flow among others or resorted at the source which is a cheaper and efficient method as opposed to the use of animal carts, hand carts and human which are more appropriate for developing countries that were earlier suggested by the people in Kawempe Division as alternative methods of SWM.

Privatization of the transport systems

Respondents' managed to list some of the private solid waste transporters in Kawempe Division and they included: The Orient City, Cleaner Urban Cleaners LTD, Home Care General Enterprise LTD, Nusonic LTD, Nabugabo Up, Deal Joint Venture, Task Cleaning Services Ltd, Rwene Expert Cleaners and Hill Top Enterprises Ltd among others. However, respondents' confirmed that most of these companies had between 1 to 5 vehicles (trucks or tippers) which were not adequate in transporting all the solid waste in the division. Although the division was empowered under section IV (4) of SWM ordinance of (2000) to charge for the collection and final disposal of solid waste, responsnds argued that the private companies charged very high and unrealistic fees (1000-10000) shillings which could not be afforded by the majority poor. This attracted illegal collectors and transporters' who charged very low fees (between 200 shillings to 1.000 shillings) using poor methods (wheel barrows, bicycles and humans). Therefore private, collectors and transporters only satisfied the demands of the rich people who could afford the charges. This forced many people who could not afford the charges in Kawempe Division to dump dumped solid waste aimlessly. Findings also showed that the division did not have clear regulations and guidelines, leaving that authority to the private companies whose aim were purely aimed at profit maximization than public service delivery.

The findings on privatization of the transport systems of solid waste matched those by WaterAid (2011) which concluded that the private solid collection companies charged fees at will given the fact that they were mandated by legal instruments to prescribe fees for the collection and final disposal of solid waste by the council under section IV (4) of SWM ordinance of 2000. They charged between 1,000 shillings to 3,000 shillings which was also considered quite inflated for the urban poor while the illegal collectors charged very low fees (between 200 shillings to 1.000 shillings) for collection but unfortunately still a fee high for others hence many dumped solid waste indiscriminately. Another study reported that private SWM in Uganda generally was ineffective and inefficient since it was privatized. This stimulated competition but did not solve the problem of effective and efficient SWM. However, (i) the division can allocate a contract to any firm (s) to offer the service through collecting, transporting and disposal; (ii) Concession; where the district allocates a contract to build and operate a waste management facility to assign stations, develop landfill facility, recycle and generate power; (iii) Franchising, where the district

gives exclusive license to private company to provide services to specific village, zone or ward and charges the residents fees and in return pays a license fee to the government. This has left the division in charge of monitoring and evaluation of the performance of private collectors (Tukahirwa et al, 2010; KCCA, 2013). This means that the causes of poor SWM are closely associated with the high cost of operation on the side of the providers' which forced them to charge high costs only affordable to the rich areas. No wonder private collectors only collected solid waste from rich neighborhoods only since they could afford the exorbitant fees.

Education and training

Education

The majority of the respondents' agreed that education can actually help the masses by encouraging all stakeholders' to adopt a participatory approach towards effective and efficient SWM to help protect and promote the public health and the environment through among others facilitating learning for the acquisition of knowledge; skills; values; beliefs; and promotes awareness on proper habits of SWM methods. However, others argued that the there was no effort by the authorities in the division towards workshops or seminars to promote sensitization and awareness of the people in both English and local languages (among them Luganda that is the main local dialect in Buganda that houses the capital city of Uganda, Kampala); there was minimal use of mass media (radios, televisions, newspapers, posters and market loud speakers among others); and building of community structures that help people to keep their environment clean and safe are simply but applicable issues that are ignored.

The findings are similar to those by the WaterAid (2011) which agreed that the Solid Waste Management Strategy (SWMS) of 2006 Para.7, stipulates that members of the public are supposed to be educated in matters of SWM as regards the sorting; recycling; energy recovery; use of skips; home composting; waste minimization and adherence to waste management laws. According to Tukahirwa (2011), the type of education given to the people must be able to help all the stakeholders' to exchange ideas and knowledge; follow-ups to resolve any complaints that relate to the best practices based on the five collection process that includes: house to dustbin; dustbin to truck; truck from house to house; truck to transfer station; and truck to disposal in this order to encourage good citizen cooperation in SWM. This means that education can help in

creating and developing a positive attitude towards proper SWM methods which reduces the costs of managing solid waste in the division.

Training

In addition, others added that training offered by the authorities in the division relates to developing the potential or empowering people to acquire any skills and knowledge to mange solid waste in the most efficient and effective ways despite all difficulties in capacity building initiatives. Some respondents thought that it was essential to invest in training and development of communities in Kawempe Division as regards to effective and efficient SWM methods. Others agreed that such training programs help to provide vital information and knowledge to the people thus helped avoid making mistakes on (poor collection, storage, transfers, transportation, and final disposal among others) and better methods of reuse; recycling and energy recovery. Others' believed strongly that training would solve the problem of illiteracy; ignorance; and poor cultural attitudes to empower them and develop their potential to better SWM. One respondent argued;

A training program on SWM can among others develop and strengthen the skills of the local community members; increase community satisfaction; boosts performance; give them confidence in doing the right thing about solid waste. However, this can be less effective if the authorities in Kawempe Division do not purchase the modern technologies that support the type and quantities of solid waste generated given the high population growth rates.

The findings are supported by De Grauwe (2009) who instead that the kind of training offered to the people must relate to developing the potential (empowering) them to acquire any skills and knowledge for the best practices in SWM despite all difficulties. According to Jan-Hendrik (2016), training can help in SWM given the high rates of population growth and urbanization. This means that that continuous training enabled community members to quickly adapt to the SWM methods without looking at solid waste as offending which helps to save costs; use solid was for generating incomes; protect and promote environmental and public health safety.

HEALTH AND ENVIRONMENTAL IMPACTS OF SOLID WASTE

Many respondents' agreed that solid waste was generated from among others (residential, industrial, institutional, commercial, construction, and municipal solid waste have been inadequately managed causing pollution (air, soil, and water). The others' added that improper (illegal) dumping of solid waste given few facilities for collection in Kawempe Division. Others' argued that the increase in the population and the rising demand for food and other scarce resources have highly contributed to increase solid waste being generated daily by each household in Kawempe Division.

Impacts of solid waste on health

Responses showed that the people at the greatest risk from illegal and poor SWM is the general population (both children and adults) who live in areas that faced the worst forms of poor solid waste disposal, those using unscientific disposal methods and those who stay around inadequately uncovered landfill sites. Many agreed that these forced many people to dump in drainages, pit latrines, water sources due to excessive breeding for rodent vectors, flies mosquitoes, cockroaches, animals and birds among others that transfer disease to people and can also cause injuries and infections. Reports from the field also showed that solid waste contributes highly to contamination of surface water sources which end up in ends up in water bodies, and yet some of these have dangerous chemical from among others tyres that affects the ecosystems (flora and fauna). Others added that hazardous chemicals also contaminate the soil and harm plants through their roots, and some roots serve as medicine and foods to people hence causing health risks to the people.

The findings above are similar to Chioma (2015) who confirmed that poor SWM and disposal indeed causes disease like fevers among others among them (malaria, typhus and typhoid). In addition he added that some substances like spare parts have dangerous and untreated chemicals untreated like (cyanides and mercury) which are highly flammable and improper disposal of such can lead to fire. This is in relation to findings by Sara & Lisa (2010); Mubatsi (2013) supports that poor SWM causes body injuries from among others broken bottles, rusted metal objects as a result of cuts and piercings. This was also confirmed by the WHO (2006) poor health from denies a person of any state of complete physical, mental and social well-being and not merely

the absence of disease or illness. This means that poor SWM methods can have advanced effects on public health and deter peoples' ability to preventing disease, prolonging life and promoting human health through organized efforts and informed choices of all stakeholders.

Environmental impacts of solid waste

Majority respondents' agreed that Kawempe Division lacks both short and long-term solutions on environment conservation and preservation that has caused pollution due to bad SWM methods that is not compatible with the legal instruments on environmental safety. Others believed that poor solid waste disposal which they blamed for poor planning and funding making it difficult to collect most of the solid waste. Others blamed this mess on all stakeholders' especially civil society organization who have failed to educate and train the community on methods of environmental conservation and preservation. However, a few others agreed that despite the strategy of reduce, reuse, and recycle, the results on the protecting and promoting the environment has not yielded much positive results coupled with poor monitoring and evaluation.

The findings by Adam (2009) and Sintana & George (2012) confirmed that unhygienic use and disposal of plastics has advanced effects the environment especially if they have a colored dye as it contains heavy metals (copper, lead, chromium, cobalt, selenium, and cadmium) that are highly toxic. Some of these solid waste end up in water bodies and pollutes the water, something which affect all ecosystems existing in the water. In support Moeller (2005) and Ejaz et al (2010) added that given the poor sorting methods in many parts of poorly developed countries, components of biodegradable can emit greenhouse gases (predominantly methane and carbon dioxide) in the transformation processes hence causes climate change (Brebbia, 2017). This means that while cities in Uganda and elsewhere continue to grow, the environment continues to be destroyed given the high amounts of solid waste generated as a result of the increasing population.

THE CHALLENGES OF SOLID WASTE MANAGEMENT

The challenges of ensuring effective and efficient SWM in Kawempe Division were so many but the following were key and ranked the highest: increased population growth rates; high rates of urbanization; poor funding (budgeting) of SWM despite the increasing quantity of solid waste;

unwillingness of local community to pay for solid waste collection fees due to lack of guidelines on the amount of fees to be charged; manually loading of solid; poor/weak institutional politics between the elected local leaders and civil servants, poor expertise; weak legal policies and legal instruments which are also inadequately implemented due to (poor conceptualization of the principles, standards and policies); rapid industrialization; improper solid waste dumping; poor attitudes towards solid waste; poor research and dissemination on the best practices of SWM.

Other challenges presented by respondents' included: lack of coordination on the part of stakeholders engaged with SWM; lack of communication; poor formulation of policies; short term in office especially on the part of the elected leaders; high levels of corruption that slow or decay service deliver; mismanagement and fulfillment of personal interests; poor functionality of committees; weak penalties on those who dump illegally; sites are not planned with proper (access roads, land for expansion, favorable terrain); unfortunate (regrettable) schedules for (collecting and replacing containers); poor technology imported which does not fit the local conditions given the type and quantity of solid waste (causing constant breakdown of transfer and transportation facilities due to poor maintenance); inadequacy of trucks and tippers; inadequate continuous education and training of the communities' as required by the SWM Strategy of 2006 Para.7; weak monitoring and evaluating of SWM; ignorance and poverty among others were recurrent points of dissatisfaction among the people in the division.

CONCLUSION AND RECOMMDATION

In conclusion, the study found out that despite all the efforts put in place by Kawempe Division to manage solid waste, it has not been very successful match the new high rates of generation. Among the causes of such a trend of poor SWM included: inadequate financing; increased population growth coupled with high rates of urbanization. Indeed, the Kawempe Division and the country (Uganda) at large need to tackle these challenges and more that are yet to surface if the authorities are any serious to adopt and institute better SWM to be able to avert both public health and environmental impacts. As they delay, it becomes too late adopt workable SWM for future generations. In the opinion of the researchers' the government of Uganda (GoU) needs to take the following steps in order to rectify the situation immediately.

i. The GoU must effectively and efficiently ensure that the legal instruments on both public health and the environment are enforced without any fear or favor by among others implementing the tough penalties/fines (punishments) for those caught dumping in authorized or illegal sites and regulating fees that must be charged for solid waste collection to avoid irregularities in the poor communities.

ii. The GoU must also immediately ensure the upgrading and expanding of existing service stations or procure new sites and stations, with proper or wide access roads, flat terrain (topography) to avoid contaminating water sources in the rainy seasons which normally attracts flies; rodents and others disease carrying vectors that cause diseases to the people and save the environment from being destroyed.

iii. The GoU must ensure that all stakeholders (private and public) engaged in SWM procure or import transportation (truck, trailer and motor-tricycles) among others are designed for the type and quantities of the Ugandan generators'. These must be fuel effective and fixed with GPS tracking systems to monitor them during transportation to avoid being dumped by the drivers' or managers' they are broken down or requesting for a spare part that is still functional for purposes of defrauding the service providers (Kawempe Division and private operators). These vehicles must also be fixed with some durable and rain resistant materials to cover the solid waste during transportation to avoid littering on the roads and the bad odor that follows after the vehicles have passed.

iv. The GoU must also consider the option of using cheaper solid waste couriers like: animal carts, bi or tri-cycles, hand carts, wheelbarrows and human especially in poor areas that cannot be accessed by trucks, tippers and tractors) to transport it to the stations which can immensely help in averting public and environmental risks.

v. The GoU must do structural campaigns using all types of mass media that can rich both the poor and rich people in all the local languages encourage people to strongly and willingly adopt the re-use; recycle; and energy recovery and sorting solid waste at the source. This is not only for better SWM but also for income generating for many especially the youth and women who current face high levels of employment coupled with protecting and promoting public health and the environmental.

REFERENCES

Adams, W. M. (2009). *Green Development: Environment and Sustainability in a Developing World, 3rd Ed.* Routledge Publication.

Aijuka N. (2016). *The deficiency of solid waste management in Kawempe vicinity2nd World Congress and Expo on Recycling July 25-27, Berlin, Germany*. Makerere University Kampala, Uganda College of Engineering Design Art and Technology, Uganda. At: At:https://www.omicsonline.org/proceedings/the-deficiency-of-solid-waste-management-in-kawempe-vicinity-48472.html

Andrea M. B. (2013). *Uganda's National Urban Policy: the emerging response to Poverty, Food security and gender in Urban Uganda.* CIGI- Africa initiative Policy Brief Series, No.6, May. At: https://www.cigionline.org/sites/default/files/ai_pb_6.pdf

Brebbia. C.A. (2017). *The Sustainable World* Wessex Institute of Technology, United Kingdom.

Bryman, A. (2012). *Social Research Methods*, 4th edition. Oxford University Press Publication.

Chandrappa, R. & Das, D.B. (2012). *Solid waste management principles and practice*. Springer Publication.

Chioma O. (2015). *How improper waste disposal damages health.* At: http://www.vanguardngr.com/2015/08/how-improper-waste-disposal-damages-health/

Creswell, J, W. (2012). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research*. Upper Saddle River, NJ: Prentice Hall.

De Grauwe, A. (2009). *Without capacity, there is no development.* Paris: UNESCO-IIPE

Denzin, N. K., & Lincoln, Y. S. (2011). *The SAGE Handbook of qualitative research (4th ed.)*. Los Angeles: Sage Publications.

Ejaz, N et al. (2010). *Environmental impacts of improper solid waste management in deve loping countries: A case study of Rawalpindi City, University of Engineering & Technology, Taxila, Pakistan.* WIT Press

Ekere, W. (2009). *Assessment of waste situation and potential for reuse in urban and pre-urban areas in Lake Victoria crescent*. Ph.D. Thesis, Makerere University, Kampala.

Fewtrell, L. (2012). *Municipal Solid Waste and Health. Research Report For Regional Visions of Integrated Sustainable Infrastructure Optimized For Neighborhoods (Revisions).* CREH, Aberystwyth University.

GoU. (2013). *Statement of issues in Kamapala Capital City Authority*. Government of Uganda.

Government of Uganda. (2003). *Poverty and Environment Case Study, Uganda Participatory Poverty Assessment Process.* Kampala District Report Ministry of Finance, Planning and Economic Development.

Hammersley, M. (2013) *What is qualitative research?.* London, Bloomsbury.

Jan-Hendrik V. (2016). *The strategic importance of continuous training.* TrainTool BV https://www.traintool.com/blog/the-strategic-importance-of-continuous-training

Katja B. (2012). *The Waste Collection Vehicle Routing Problem with Time Windows in a City Logistics Context.* Elsevier Ltd

KCCA. (2013). *Registration Checklist for Solid Waste Management in Kampala. Directorate of Public Health.* Retrieved at www.kcc.go.ug

Kinobe, J, R. (2015). Mapping out the solid waste generation and collection models: The case of Kampala City. *At: Journal of the Air & Waste Management Association Volume 65, 2015 - Issue 2.* At: http://www.tandfonline.com/doi/full/10.1080/10962247.2014.984818

LeBlanc, R. (2017). *What Is a Waste Transfer Station?* https://www.thebalance.com/what-is-a-waste-transfer-station-2877735

Liyala C.M. (2011). *Modernizing Solid Waste Management at Municipal Level: Institutional arrangements in urban centers of East Africa*. PhD Thesis. Environmental Policy Series. Wageningen University. The Netherlands

Love T (2002). *Constructing a coherent cross-disciplinary body of theory about designing and designs: some philosophical issues.* Design Studies 23(3): 345-361

Moeller, D. W. (2005). *Environmental Health (3rd ed.).* Cambridge, MA:Harvard University Press

Mubatsi, C. (2013). *A glance at challenges in Uganda's health sector. The Independent, Uganda.* Retrieved at https://futurechallenges.org/local/a-glance-at-challenges-in-ugandas-health-sector.

Mugagga, F. (2006). *The Public-Private Sector Approach to Municipal Solid Waste Management. How does it Work in Makindye Division, Kampala District, Uganda?* Trondheim: Department of Geography, Norwegian University of Science and Technology.

Nabukeera M et al. (2014). Sustainable Management of KCCA Mpererwe Landfill: History, present, future possibilities and solutions. A qualitative study. *Journal of Environmental*

Science, Toxicology and Food Technology, Volume 8, Issue 11 Ver. III (Nov. 2014), PP 87-95. At: http://repository.um.edu.my/98191/1/sustainability%20and%20iosr.pdf

Namata, T. (2009). *The challenges of solid waste management: a case study of Kawempe and Rubaga Division, Kampala District, Uganda.* Makerere University. At: http://makir.mak.ac.ug/handle/10570/2571

Nyakana, J, B. (2012). Solid Waste Management in Urban Centers. The Case of Kampala City - Uganda. Department of Geography Makerere University Kampala, Uganda.

Okot-Okumu, J. & Nyenje. R. (2011). Municipal solid waste management under decentralization in Uganda. *Habitat International 35, pp. 537 543.*

Ramachandra, T.V. (2006). *Management of municipal solid waste*. TERI press.

Sara/Bergqvist, S & Lisa/Wieslander, L.(2010). *Waste management and health. A case study in Mbale, Uganda. Degree project in Public Health*. Malmö University: Health and Society, Public Health department.

Sintana E. V & Tchobanoglous' G. (2012). Municipal Solid Waste and the Environment: *A Global Perspective. Annual Review of Environment and Resources, Vol. 37:277-309, Volume publication, November.*

Tukahirwa, J. T. et al. (2010). *Civil society participation in urban sanitation and solid waste management in Uganda*. Local Environment, 15(1), 1-14.

Tukahirwa, J.T. (2011). *Civil Society in Urban sanitation and Solid waste Management. PhD Thesis. Wageningen University*. The Netherlands not published.

UNEP. (2011). Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication. United Nations Department for Economic Affairs. At: https://sustainabledevelopment.un.org/index.php?page=view&type=400&nr=126&menu=35

UN-habitat (2010). United Nations Human Settlements Programme: Situation analysis of informal settlements in Kampala: Kivulu (Kagugube) and Kinawataka (Mbuya 1) Parishes.At:https://unhabitat.org/books/situation-analysis-of-informal-settlements-in-kampala/

United Nations Environmental Programme. (2013). *Guidelines for National Waste Management Strategies Moving from Challenges to Opportunities.* United Nations.

Vartanian, T.P., (2010). *Secondary Data Analysis.* Oxford University Press.

Water aid Report (2011). *Solid Waste Management: Study in Bwaise II Parish, Kawempe Division.* At: https://www.google.com/search?q=Water+aid+Report+%282011%29.+Solid+Waste+Management%3A+Study+in+Bwaise+II+Parish%2C+Kawempe+Division&ie=utf-8&oe=utf-8&client=firefox-b-ab

World Health Organization. (2006). *Public health principles and neurological disorders. In: Neurological Disorders: Public Health Challenges. Geneva.* At: http://www.who.int/mental_health/neurology/neurodiso/en/index.html

KCC. (2000). *Solid Waste Management Ordinance 2000.* Uganda, 1(1), 18.