

**ASSESSING THE EFFECTIVENESS OF MEDICAL WASTE MANAGEMENT
STRATEGIES; A CASE STUDY OF MWANZA DISTRICT, TANZANIA**

BY

DAVID KULWA

BEM/14497/62/DF

SUPERVISOR: DR.TWAHA ALI BASAMBA

**A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF
REQUIREMENTS FOR AWARD OF A BACHELOR OF SCIENCE
DEGREE IN ENVIRONMENTAL MANAGEMENT OF
KAMPALA INTERNATIONAL
UNIVERSITY**

2010

DECLARATION

I, **David Kulwa**, hereby declare that the work contained in this dissertation entitled, **“ASSESSING THE EFFECTIVENESS OF MEDICAL WASTE MANAGEMENT STRATEGIES; A CASE STUDY OF MWANZA DISTRICT”** with the exception of the acknowledged references, ideas and concerns, is my original work and it has never been submitted for fulfillment of the requirement of a degree award or other education qualification in any institution of learning.

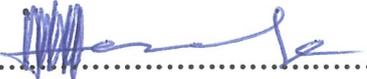
Signature..........

Date.....*13th/09/2010*.....

David Kulwa (BEM/14497/62/DF)

APPROVAL

This research report entitled “ASSESSING THE EFFECTIVENESS OF MEDICAL WASTE MANAGEMENT STRATEGIES” A CASE STUDY OF MWANZA DISTRICT, is submitted to Kampala International University, Faculty of Engineering and applied sciences with my approval as the Supervisor.

Signature 

Date 13.9.2010

Dr.Twaha Ali Basamba
(Supervisor)

DEDICATION

This book is dedicated to my late grandfather Rev. Enock Kulwa, and late grandmother Rachel Mlata. I also dedicate this piece of work to my present grandparents Rev. David Mlata and Naomi Mwananyanda, my lovely parents without forgetting mum Ruth and all friends around me whose their loves, supports and interest in what I was doing enabled me endure and still remains a source of inspiration in my heart. I Love you all and God bless you!

ACKNOWLEDGEMENT

The duty of writing this project was not easy but success of it was through efforts from various individuals who participated in different ways enabling me to achieve my goal. My special thanks go to God first without whose mercy and grace I wouldn't be here today, my parents and friends Mwaliko, Hashim, Josiani, Violet, and Maganga among the others, through their overwhelming support, and prayers in my academic struggle made my project so perfect only God can repay you guys.

Am particularly giving my thanks to Dr. Twaha Ali Basamba my supervisor for mentoring me academically and gave me the benefit of knowledge and went beyond the call of duty in guiding me through in this research project.

Special dedication goes to the entire Mwanza community particularly Bugando division whose valuable contribution enabled me obtain relevant data and information necessary for production of this research project.

THANKS ALOT MAY ALMIGHT GOD REWARD YOU ABUNDANTLY!

TABLE OF CONTENTS

Contents	Page
DECLARATION.....	i
APPROVAL.....	ii
DEDICATION.....	iii
ACKNOWLEDGEMENT.....	iv
TABLE OF CONTENTS.....	v
LIST OF TABLES.....	vii
LIST OF FIGURES.....	viii
LIST OF PHOTOS.....	ix
ABSTRACT.....	x
CHAPTER ONE.....	1
1.0 INTRODUCTION.....	1
1.1 Background of the study.....	1
1.2 Statement of the problem.....	2
1.3 General objective.....	2
1.4 Specific Objectives.....	2
1.5 Research Questions.....	3
1.6 Significance of the Study.....	3
1.7 Scope of the study.....	3
CHAPTER TWO.....	4
2.0 LITERATURE REVIEW.....	4
2.1 Medical waste generations.....	4
2.2 Medical waste management.....	5
2.3 Classifications of medical wastes.....	6
2.4 Challenges in medical waste management.....	7
2.5 Plastics and Glass in Medical waste management.....	8
2.6 Medical wastes treatment.....	9
2.7 Medical wastes Incineration.....	9
2.8 Monitoring and Control of medical wastes.....	9
CHAPTER THREE.....	12
3.0 MATERIALS AND METHODS.....	12
3.1 Geographical location.....	12
3.2 Sampling design.....	12
3.3 Sample selection and size.....	12
3.4 Instruments of Data collection.....	13

3.4.1 Questionnaires	13
3.4.2 Oral Interviews	13
3.4.3 Direct Observation.....	13
3.4.4 Literature review.....	14
3.5 Data analysis and presentation	14
3.6 Limitations.....	15
CHAPTER FOUR	16
4:1 Demographic characteristics	16
4.2 Identified medical waste management strategies existing in the study area	17
4.3 Effectiveness of the identified strategies	19
4:4 Challenges in medical wastes management	20
4:5 Solution to the identified challenges in Medical waste management.....	22
CHAPTER FIVE	24
5.0 CONCLUSION AND RECOMMENDATIONS	24
5:1 Conclusion.....	24
5:2 Recommendations	24
REFERENCE	26
APPENDECES.....	29

LIST OF TABLES

Table 1: Categories of infectious wastes	6
Table 2: Categories of respondents	16
Table 3: Strategies for Medical waste management existing in the study area	17
Table 5: Effectiveness of the identified strategies	19
Table 6: Established challenges associated with medical waste management	20
Table 7: Solution to the identified challenges in Medical waste management	23

LIST OF FIGURES

Figure 1:Shows data on Africa’s urban population	4
Figure 2: A time-line of Tanzanian national legal and regulatory framework for Medical waste management.....	10

LIST OF PHOTOS

Photo 1: Medical waste collecting can	18
Photo 2: Poor medical waste disposal due to land shortage	22

ABSTRACT

Medical wastes are highly infectious and hazardous wastes that may carry pathogens of dreadful diseases hence its management is vital not only because human health is important but also quality of the environment has to be kept into consideration. Mismanagement of Medical waste implies combinations of improper handling of wastes during generation, collection, storage, transport and treatment or disposal. However proper strategies for effective management are still the problem in urban areas and are becoming a potential public health risk and an environment burden as well.

A study was guided by four objectives aiming on identifying strategies existing, effectiveness of identified strategies, challenges associated with medical waste management and to find out measures to those challenges in medical waste management, where a number of sixty (60) respondents were included and categorized into doctors, nurses, waste department members, private waste collectors companies and local communities where by methods such as interview, questionnaires and observation were used to collect information regarding waste management.

Results showing that the identified strategies used to manage medical wastes were frequent collection, privatization, waste separation, waste treatment and incineration as well as to train workers. And their effectiveness seen was such as improves sanitation and quality of environment, improves health of local communities, controls diseases and reduction of wastes volume.

However there some challenges that facing medical waste management these were high operational costs, human population increase, inadequate facilities for medical waste management, poor medical waste management technologies, poor government policy and planning, lack of disposal sites and lack of education and awareness among waste handlers.

On the other hand the following were recommendations made for the effective medical waste management strategies such as increase budgeting, increase stakeholders participation, encourage public education and awareness, appropriate information and technology in medical waste management and emphasizing training to waste handlers.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background of the study

Medical waste is defined as any solid waste generated in the diagnosis, treatment, or immunization of human beings or animals. They cause serious illness or pose a potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed (US-EPA, 1986).

Medical waste has the potential to cause diseases and is a health risk. It is a by-product of health care that includes sharps and non-sharps objects, blood, body parts, chemicals, pharmaceuticals, medical devices and radioactive materials (WHO, 2002). Medical wastes include all infectious waste, hazardous waste that are generated from all types of healthcare institutions, including hospitals, clinics, doctor (dental and veterinary) offices, and medical research laboratories. Medical waste is infectious and it acts as an agent in the infections' transmission of diseases because it contains microorganisms (bacteria, viruses, fungi etc), which can be communicated in body tissues transmitted pathogens can cause disease or diverse health impacts to human (US-EPA, 1986).

The Medical waste is very serious environmental health concern in urban areas in developing countries where population density is high and the health facilities are increasing, and is becoming the most pressing challenging environment problem because poor management contribute to poor environment condition that may threaten health of the people and quality of the environment therefore requires special tension and management from generating points to its final disposal.

There is serious inadequacy in handling medical wastes in Tanzania and improper waste deposition is becoming a potential public health risk and an environment burden. The increase urbanization, rising standard of living and rapid social and economic development associated with population growth has resulted into waste generation while most areas has not been accompanied by equivalent increase in capacity of the relevant urban authorities to deal with this environment problem (NEMC, 1999).

It should be noted that, there is no single management scenario that can “solve” all medical waste problems; rather, each medical waste problem must be assessed independently to develop a viable and sound solution (Ahmed, 1997). Currently, Tanzania is undertaking strong measures to combat the problems posed by medical waste, with financial assistance from the World Health Organization (WHO).

1.2 Statement of the problem

Mismanagement of Medical waste is not only practiced in Tanzania, but also in other developing countries it implies a combination of improper handling of wastes during generation, collection, storage, transport and treatment or disposal where the proper strategies for effective management are still the problem in urban areas (Morgan, 1998). The level of awareness on Medical waste among waste handlers is not good enough to manage the waste efficiently and systematically. In Mwanza the procedures for safe waste handling were not adhered before. For example there are deficiencies in designation and identification of infectious wastes, segregation, packaging and storage, as well as in transportation. Proper Medical waste management is a very essential component of environment sanitation which is very important with regard to the improvement of health in any population.

1.3 General objective

The general objective of this study was to assess the effectiveness of medical waste management strategies and their adoption in Mwanza district.

1.4 Specific Objectives

The specific objectives of the study were;

- i. To identify the various medical waste management strategies existing in Mwanza district
- ii. To study the effectiveness of the strategies used for managing medical waste
- iii. To establish the challenges associated with medical waste management strategies
- iv. To find out measures put in place to ensure efficiency of medical waste management strategies

1.5 Research Questions

This study was based on the following research questions;

- i. What are the strategies used for managing medical wastes in Mwanza district?
- ii. What are the effectiveness of identified strategies in managing medical wastes in Mwanza district?
- iii. What are the challenges associated with medical wastes management strategies in Mwanza district?
- iv. What measures are put in place for efficiency management of medical waste in Mwanza district?

1.6 Significance of the Study

The study aimed to benefit the government hospitals, private hospitals, clinics, policy maker and researchers because it would be useful in creating awareness on managing medical wastes through proper planning and strategies that ensure efficiency in protection of human health and environment quality.

The study also aimed to facilitate the Government through its formulating strategies and budgeting, this is helpful in allocating enough resources aim for proper medical waste management programmes.

The proposed study was beneficial to donors and other healthy agencies who want to give a support in terms of financial and technology assistance and proper approaches to deal with medical waste management for improving human health and environment.

Also it was a basic academic requirement at Kampala International University for the attainment of a bachelor's degree in science of environmental management.

1.7 Scope of the study

The research was carried out in Mwanza district at Lake Zone North West part of Tanzania in Bugando division to four sampled health facilities where doctors, nurses, private waste collectors companies, and local community members were involved in the study. The researcher collected data that elaborated and explained the effectiveness of medical waste management strategies and their adoption in area of study.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Medical waste generations

The Medical waste is very serious to environmental and human health in urban areas particularly in developing countries where population density is high and the health facilities are keeping on increasing. There are several factors influencing the amount or volume of wastes generated in an area namely population, economic and social activities of the habitat (Oketch et al, 2000).

According to statistics on Africa's urban population by the World Bank group, projections were set at 55% of the total African population being urban based by the year 2030.

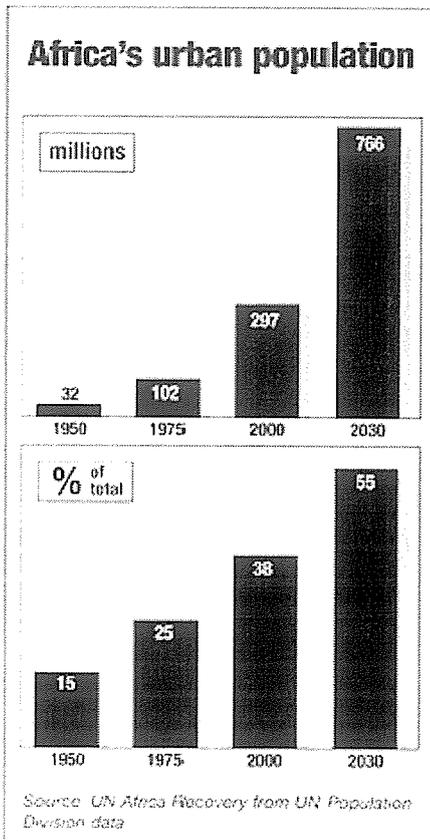


Figure 1: Shows data on Africa's urban population

Source: UN population division data (1995)

From figure 1, is showing that as population increases also number of health facilities tend to increase and generation of Medical waste increases as well. The type and amount of waste generated varies from one urban to another, per healthy facility per day.

However in Mwanza district the rate of hospital waste generation is between 0.5kg and 1kg per capital per day averaging to about 900tonnes of waste per day (MCC, 2000) of all solid waste generated in Mwanza, plastic account 1.6%, 0.8% glass, 5% medical waste while 73.8% are vegetative matter and the rest being papers, metals, and disposed of (MOH, 2002). The amount of medical waste generated in Mwanza has increased drastically from 98tonnes per day in 1969 to an estimated 1200tonnes per day in 2005.

And unfortunately it has not been accompanied by an equivalent improvement in Medical waste, currently the management is inadequate that only about 45-50% of the solid waste in total generated, is collected and disposed of and while the rest is indiscriminately dumped or burnt in an open space (MCC, 2000).

2.2 Medical waste management

Medical waste management is the continuous process that involves generation, storage, collection, transportation and disposal of medical wastes, therefore urban authorities have the responsibilities of ensuring safe, reliable and cost effective removal and disposal of Medical waste which takes up a large proportion of their resources. Sorting Medical waste from the other wastes has been pointed as a major factor contributing to poor medical waste management (NEMC, 2002). Proper management is quite difficulty particularly in developing countries where regular effective management of Medical waste begins with assessment of their impacts on human health and the environment and that depend on the available technologies and financial resources.

According to Mato and Kaseva (1999) in their paper on “Critical review of industrial and medical waste practices in Dar es Salaam City” focused on the disposal of both the industrial and medical waste practices in Tanzania revealed that there is serious inadequacy in handling medical and solid wastes as well. There are several health hazards which are related to poor Medical waste management both to environment and human health (Tavera, 1993). Indiscriminately dispose wastes pauses a danger of polluting water, leads to transmission of infectious diseases like Aids, syphilis also foul odor from gases (UNEP, 2000).

In developing countries and Tanzania among them in particular, hospitals have adopted management methods pertaining to Medical waste management and currently, proper waste management techniques are being promoted and Mwanza is among of the districts given the priority, especially during the training sessions started in 2003 (Manyele et al, 2003).

2.3 Classifications of medical wastes.

Proper classification of wastes should be included as an important part of waste management as well as the best strategy in dealing with wastes generated in an area. Mainly there are two major classifications of Medical waste that are infectious and non-infectious. Infectious Medical waste is liquid or solid waste that contains pathogens in sufficient numbers and with sufficient virulence and quantity that exposure to the waste by a susceptible host could result in an infectious disease (US-EPA, 1986; Ahmed, 1997; Blackman, 1996).

The categories of waste designated as infectious are summarized below;

Waste category	Examples
Isolation wastes	Wastes generated by hospitalized patients who are isolated to protect others from communicable diseases
Waste from production of biological	Cultures and stocks of infectious agents from clinical, research, and industrial laboratories; disposable culture dishes and devices used to transfer, inoculate and mix cultures
Human blood and blood products	Waste blood, serum, plasma, and blood products
Pathological waste	Tissues, organs, body parts, blood, and body fluids removed during surgery, autopsy, and biopsy
Contaminated sharps	Contaminated by hypodermic needles, syringes, scalpel blades, Pasteur pipettes, and broken glass
Contaminated animal carcasses, body parts, and bedding	Contaminated animal carcasses, body parts, or blending of animals that were intentionally exposed to pathogens

Table 1: Categories of infectious wastes

Source: US-EPA, (1986)

From Table 1 above, Medical waste classification is based on the type of waste generated. However based on infections, it is important for healthcare staff to take precaution on handling sharps objects and pathological wastes, which comprises only about 21% of the total infectious wastes. Different classifications will give different results. For example, Blackman (1996) reported that 60% of the medical waste is infectious while 40% is non-infectious, depending on the classification used. Non-infectious Medical wastes includes disposable medical supplies and materials that do not fall into the categories of infectious medical waste such as used personal hygiene products such as facial tissues, sanitary napkins, rubber gloves, rubber dams, cotton and paper.

2.4 Challenges in medical waste management

For proper Medical waste management, several challenging issues must be overcome to each hospital, for example, must establish the correct amounts and composition of the wastes they generate. The great challenge is been related to storage, collection, transport and disposal are real major concern where insufficient and proper strategies for effective management is still the problem in many urban areas (Morgan, 1994).

The increased number of health facilities due to drastic increase in population has increasing generation of Medical waste in an alarming rate and become one among the challenges, the operation cost on other hand is a challenge since institutions requires enough capital to invest in the management strategies, for instance Kampala in year 2000 its estimated that about more than 1.52 million US \$ per month is spent and yet remove only 30% of the total Medical waste generated (MCC, 2000).

Urban authorities have the responsibility of ensuring safe, reliable and cost effective removal and disposal of MW which takes up large portion of their resources. The material and financial resources are not adequate to solve the problem (Nyage'chi.G.N, 1992).

Moreover shortage of land for locating disposal site is been among the serious challenges, the increased urbanization, rising standard of living and rapid social and economic development associate with population growth has created competition for the available land.

Apart from that the stored Medical wastes should be collected using vehicles, labor and delivered to disposal site it should be done early enough, however several factors affecting the efficiency and effectiveness collection like number of personnel or vehicle, location of storage facilities, types of roads and network, population density and weather condition (Flintoff, 1976).

The medical waste is not very different from the municipal solid waste, except in some details there are items found in both Municipal solid waste and Medical waste like plastics, glass and food waste these items are very challenging in waste management without any kind of separation. In case food remains and glass adversely affect the incinerator performance, while plastics pose a threat to the environmental health and safety of the personnel through emissions in the flue gas, therefore sorting Medical waste from the other wastes has been pointed as major challenge and factor contributing to poor Medical waste management (NEMC, 2002).

2.5 Plastics and Glass in Medical waste management

Plastics are complex organic compounds produced by polymerization, capable of being molded, extruded, and casted into various shapes. A major concern in waste reduction efforts is the plastics content in the Medical waste especially the polyvinyl chloride (PVC) plastics constitute about 40 % of the total waste by volume. In terms of large volumes and concerns on environmental pollution during incineration, plastics are threatening the management systems for both Municipal solid wastes and Medical wastes. In the US, for instance, about 4% of the chlorofluorocarbons (CFCs) released into the atmosphere come from medical waste. Currently the plastic entering the hospitals in large amounts, and making it difficult to control different types of plastics, such as polyethylene (PE), polypropylene (PPE), Polyvinyl Chloride (PVC) have high heating value especially important in the startup of incinerators however, chlorinated plastics cause high concentration of the hydrogen chloride (HCl) gas in the atmosphere (Nyang'echi G.N, 1992).

In Tanzania, however, there is no clear data on the life cycle of the glass with no proper landfill, such materials are thrown everywhere and the knowledge about glass recycle is still rare and very few individuals are involved in glass recycle business (NEMC, 2002).

2.6 Medical wastes treatment.

Treatment of toxic and infectious waste is defined as any method, technique or process designed to change the biological character or composition of waste to render it non-toxic or non-infectious (US-EPA, 1986). Treatment methods do not destroy the waste but can destroy the pathogens. Such methods are useful for treatment of medical waste that is not combustible, for instance ampoules and glass bottles. Such methods comprise of steam autoclaving, microwave irradiation, chemical treatment, and radio frequency irradiation (Blackman, 1996).

It is recommended that all infectious waste have to be treated prior to disposal and there are several factors to consider when selecting among the medical waste treatment methods one must know the waste type and the corresponding treatment method, moreover the operating costs are also high due to the running cost of pollution control and waste preparation equipment. Other cost factors include operating charges, sterilization efficacy, maintenance and higher operator skills.

2.7 Medical wastes Incineration

Incineration is currently one of the best available technologies for disposing of various medical wastes. It is the best because of highest reduction of waste volume, assured destruction, and it has an ability to treat and manage different types of wastes. The first principal of Medical waste management is waste reduction, which means reducing the quantity and toxicity of waste at the source. As mentioned earlier, recovery of useful material requires well-planned waste management programs. Such efforts have been recently reported in Pakistan and India (Ahmed 1997; Iyer 2001).

2.8 Monitoring and Control of medical wastes

Medical waste as a hazardous waste requires monitoring, mean to make sure that the whereabouts of such wastes are known at all times that is from cradle to grave. (Van Veen, 1988). Medical waste can be fully achieved when adequate monitoring facilities are available. Control means that competent authorities can act rapidly to ensure that the possibilities for inappropriate handling of wastes or dumping are minimized. This means also that the authorities have the power, both legally and financially, to act quickly in order to reduce dangers posed to human health and the environment (van Veen, 1988).

For adequate monitoring and control it needs proper legislation on hazardous waste. Thus as to develop legal framework on Medical waste management well-synthesized laws must be acquired by critically looking into the details of the laws from developed countries. In Tanzania efforts into regulatory response (problems of biomedical and hazardous waste) comprised the Local Initiative Facility for the Urban Environment (LIFE) carried out a project in aiming the waste management of clinics in Tanzania cities with the financial assistance of the United Nations Development Programmes (UNDP). There is a need for classifying wastes as less toxic or more toxic and put corresponding efforts on its management. Legislation must include permit requirements for waste management activities, regulations for hazardous waste incineration, and requirements for the landfill of wastes forms (MOH, 2003).

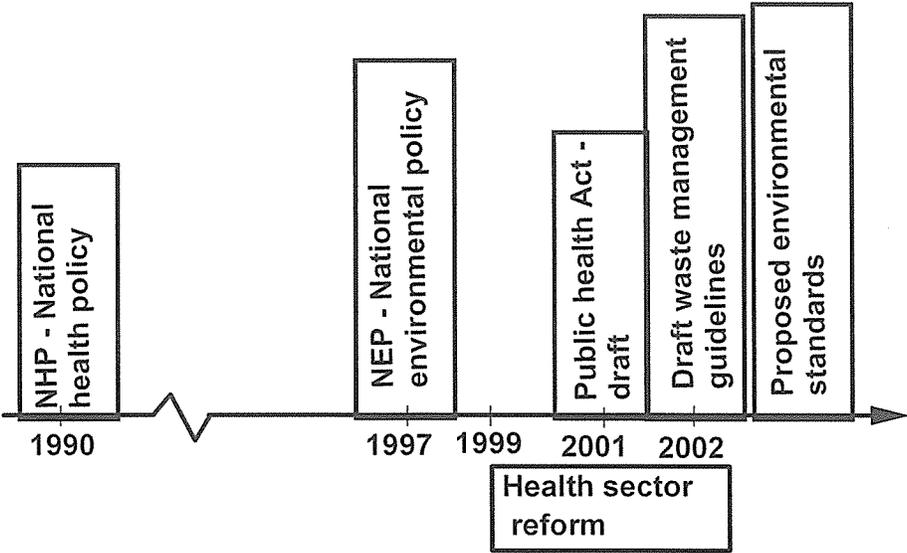


Figure 2: A time-line of Tanzanian national legal and regulatory framework for Medical waste management.

Source: Ministry of health, MOH (2003)

From the figure 2 above, Tanzania has drafted a national legal regulatory framework for Medical waste management that includes the national health and environmental policy, public health act, waste management guidelines and proposed environmental standard; these can be entered into law and being implemented to all waste handlers for the safe guide of human health environment quality.

In 2003, the same case World Bank produced a report on “Health Facility Waste management Study in Bangladesh” where the report focused on the present status of health care facility waste management in Bangladesh for the informed decision-making process regarding appropriate future legislation, policies and programmes activities that will significantly improve the present situation. The study also assessed in details the existing legislation, especially, the Bangladesh Environmental Conservative Act, 1995, and the Environment Conservation Rules, 1997. To regulate the medical or hazardous waste, one must first define what a hazardous waste is (van Veen, 1988), and such must be something that can be determined or tested. The definition must also be protective of human health and the environment. It is important to create regulations that have the spirit of law but that does not result in expensive and time consuming testing requirement.

CHAPTER THREE

3.0 MATERIALS AND METHODS

3.1 Geographical location

Mwanza region lies in the northern part of Tanzania located between latitude 1°30' north and south of the equator and longitudinally between 31° 45' and 34° 10' east of Greenwich. It's just bordering some regions to the east, west and south but the north part is surrounded by the water of Lake Victoria which in turn separates regions from neighboring countries of Uganda and Kenya. Mwanza is relatively small region occupying 2.3% of the total land area of Tanzania mainland that make 35,187 km square, out of this area 20,095 km square is dry land and 15,092 km square is covered by Lake Victoria water, Thus 43% of the region's surface area is water. The area of study is in Mwanza district that has eight divisions and the one I got interested in study is Bugando where many health facilities are largely concentrated.

3:2 Sampling design

Different ten (10) household members were chosen by using simple random sampling that represented the local communities where questionnaire was given to them, five (5) doctors and five (5) nurses were purposively sampled to give information through interview in their working places, also questionnaires given to twenty (20) waste department members, twenty (20) private waste collector members in different companies were also included to represent the total population of the study area.

3:3 Sample selection and size.

The study represented all stakeholders within Bugando division in Mwanza district, the researcher targeted principle health doctor and nurses, private waste collectors, hospital waste department members, and local communities around health facilities within the division, all these were put into consideration due to their direct involvement in environment management issues on the district and provided the relevant information that research was mostly intended to obtain from the area of study.

Due to the nature of the study and time frame work, a total of sixty (60) individuals were included within this division in four sampled health facilities. The research investigated

five (5) doctors and five (5) nurses from different hospitals, clinics and other health centers, ten (10) individuals from the community on household basis around sampled hospitals, twenty (20) waste department members from different hospitals, and twenty (20) private waste collectors companies within the district.

3:4 Instruments of Data collection

Data collection involved a combination of tools, whereby primary and secondary sources of data were used. The researcher was directly involved in data collection particularly in the field, through observations, administering questionnaires to the respondents and interviewing them in the area of study.

The following tools were used during data collection process in the field area;

3.4.1 Questionnaires

Questionnaires administered to local communities around sampled hospitals in an area of the study, members of waste department and private waste companies were also given questionnaires. These were selected because they have professional knowledge to the areas, environmental status of past and emerging issues regarding to waste management in which medical ones are inclusive thus enabling easier interpretation in the questionnaire.

3.4.2 Oral Interviews

The interviewing process involved principle head doctors and nurses in their working places where it was a face-to-face instance with respondents. Thus, the idea of interviewing was one of the best alternatives used in obtaining information from these individuals. Through interviewing, the researcher was able to probe respondents in giving in-depth information regarding to medical waste management in the study area.

3.4.3 Direct Observation

This method was specifically used to view the situation on the medical wastes management. Observation involved visiting various areas within division particularly in hospitals, clinics and research laboratories. Such information added in this research and helped to enhance accuracy of the study through direct interaction with the environment. This helped the researcher to acquire additional information which was not availed from other methods.

3.4.4 Literature review

This included detailed review of already existing literature on the same issue done before; this tool was selected because it gave accurate and up to date data, which also used for future aspects. The tool involved the use of other related literatures from universities libraries, National Environmental Management Authority (NEMA), internets and journals. This will helped to supplement on the primary data collected on background of the study area and medical wastes management done in other countries.

3.5 Data analysis and presentation

The following formula was used to find the general reference point on assessing the efficiency of medical waste management strategies to the four sampled health facilities in Mwanza district in terms of percentage.

$$\text{Thus mean } \check{Y} = \frac{\sum fX}{\sum f}$$

Where \check{Y} - Mean

$\sum f$ - Total number of observation

$\sum fX$ - Summation product of frequency and class middle point.

Data analysis involved qualitative and quantitative methods. The SSPS software was used to analyze data accurately. Data that obtained from interview and questionnaires were checked to ensure completeness and editing of the information from the respondents was done to give meaningful information. Frequencies and percentages of various variables generated through tables for easy presentation and interpretation of the work covered.

3.6 Limitations

The study faced some of the following challenges;

Within the division there were both literate and illiterate individuals and so instances of language barrier was evident. People with poor educational background were not managed to fill in questionnaires accurately, some were not understood English or the national language Swahili thus was difficult to communicate on them.

Resources such as finances was the limiting factor to the researcher; as the process of conducting a research study was expensive and therefore needed a lot of money to accomplish the work in the convenient time required by the researcher.

Little knowledge on medical waste, many respondents were not well familiar with this kind of wastes as they link it with municipal solid waste which is quite different both in terms of their generation, hazardousness, care, disposal and management in general.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSIONS

4:1 Demographic characteristics

The study considered personal characteristics of the respondents that included in the whole process of conducting this research. From the Table 2 below the research made a detailed study on a well balanced gender group that comprised of 38 male respondents that form 63% and 22 female respondents that form 37% from the whole population study sample size that make a grand total of sixty (60). According to this statistics, respondent had an average age of about 31 this showing that most of them were within their working areas for long enough time; this provided a suitable means to analyze and assess the management of Medical waste because in one way to the other came into contact with the problem. Waste department members, private waste collectors and household members form large number of respondents about 80%. These categories were purposely chosen since they are considered to be having vital information on medical waste and yet they are involved in issues relating to waste management in the district.

Table 2: Categories of respondents

Respondents	Male frequency	Percentage (%)	Female frequency	Percentage (%)	Work experience (years)
Doctors	3	8	2	9	28
Nurses	2	5	3	14	20
Waste department members	8	21	2	9	25
Private waste collectors	15	39	5	23	40
Household members	10	26	10	45	45
Total	38	100	22	100	158

4.2 Identified medical waste management strategies existing in the study area

The research finding revealed that the identified strategies used for Medical waste management existing in the area of study are frequent collection, privatization, waste separation, and provision of public education, provision of storage facilities, waste treatment and incineration and training of workers.

Table 3: Strategies for Medical waste management existing in the study area

Strategy	Respondents frequency	Percentage (%)
Frequent collection	18	30
Privatization	15	25
Waste separation	6	10
Provision of public education	3	5
Provision of storage facilities	7	12
Waste treatment and incineration	8	13
Training of workers	3	5
Total	60	100

From the table 3 above, study showed that 30% of the total respondents reported frequent collection is mostly practiced from an area that is accessible to by garbage trucks followed privatization that counts about 25%. The research also indicated that about 13% either could not be accessed by garbage collection trucks or could hardly be accessed with other strategies insisted that provision of storage facilities as well treatment and incineration is the best alternative towards Medical waste management in an area, however 12% said provision of storage facilities such as bins can be the best way and some other of about 10% emphasized that waste separation is the good way of managing the Medical waste while some other few of about 5% revealed public education provision and training of workers are also necessary in management. As many respondent reported that frequent collection is mostly done this is accompanied with privatization of waste collection services to ensure wastes are being transported to the final disposal site.

According to NEMC (2002) sorting of Medical waste from other wastes has been pointed as major factor contributing to poor management, hence for the need of sufficient and sustainable management system to meet the challenges requires involvement of private sectors which is seen as a key participant in Medical waste management. One of the officer said “there is no clear policy of how the private companies are to cooperate and collaborate with the local authorities” The stored Medical waste should be collected using travel requirements like vehicles, labors and delivered to the disposal site and should be done early enough for the safety of human health and environment (Flintoff, 1976).

In year 2000 its estimated that Mwanza City Council spent more than about US dollar1.52 millions per month and yet remove only 30% of the total Medical waste generated this showing that privatization is necessary for adequate services such as supplying storage facilities which are sufficient and effective in collecting, transporting and disposing off all the Medical waste generated to Igoma landfill.

With the current privatization process of waste management in Mwanza City Council, 5 private companies dealing with wastes collection within Bugando division had been brought on board as of June 2002 tender to provide services pertaining to waste management. These companies include the Kishimba, Mecco, Metro, Mwananchi and Shivco that operate in different zones within the area of study.

Photo 1: Medical wastes collecting can



However, from the photo1 above suitable collecting and storage facilities like plastic bags, cans, among other with proper identification and labeling should be provided at the point of generation but depends with categories of different Medical waste generated. On the other hand some sharp objects like needles, scalpels, and syringes is a problem to waste handler hence should be provided with training and based personal protective equipment such as gloves, gum boots and face musk's to protect them from the dangers (Saravanan, 2005).

Provision of public education and awareness is also very important toward waste management, one officer from Community Based Organizations (CBOs) reported that “we sensitize communities about dangers of poor Municipal solid and Medical waste and we mobilize people to actively participate in management by instilling in them a sense of ownership and in the process that earn a living”.

4.3 Effectiveness of the identified strategies

From the identified strategies the effectiveness seen are such as improves sanitation and quality of environment, improves health of local communities, controls water borne and infectious diseases, reduction of wastes volume

Table 4: Effectiveness of the identified strategies

Effectiveness	Respondent frequency	Percentage (%)
Improve sanitation	7	12
Improve quality of environment	10	17
Improve health of people	15	25
Controls infectious diseases	18	30
Reduce wastes volume	10	17
Total	60	100

Effectiveness of these management strategies begin with an assessment of their impacts on human health and the environment. Research revealed that many respondents about 30% reported that effective management tend to control diseases including the infectious ones, is followed by 25% improving the health of the people as well as 17% improve

quality of environment and reduce the wastes volume and some few others of about 12% said that strategies are effectively on improving the sanitation. From the table 5 above has to be noted that successful management of Medical waste through adoption of technologies, use of available resources and assistance of financial has delivered the efficiency and effectiveness benefits to reduce dangers posed to human health and the environment from the Medical wastes (van Veen, 1988).

Treatment methods do not destroy the waste but can also destroy the pathogen that cause polluting water and leads to transmission of infectious diseases like AIDS, syphilis also foul odor from gases (UNEP, 2000).

Proper management of Medical waste also improves sanitation and health of people simply because poor management results to contamination of soil, surface and ground waters. And poor children and women are highly prone to such infections (Saravanan, 2005).

In case of incineration the Medical waste it reduced in amount and besides help to minimize the polluting effects that in the other hand can result into eruption of diseases and threats both health and environmental quality.

4:4 Challenges in medical wastes management

The effectiveness of proper and sufficient management of Medical waste is been faced with some difficulties and challenges and in the area of study many of challenges were revealed.

Table 5: Established challenges associated with medical waste management

Challenges	Respondent frequency	Percentage (%)
High operational costs	15	25
Human population increase	13	21
Inadequate facilities	10	17
Shortage of land	08	13
Poor government support	10	17
Lack of awareness	04	7
Total	60	100

According to Morgan, 1998 challenges of Medical waste management that relate to storage, collection, transport and disposal are major concern where by insufficient and proper strategies for effective waste management is still the problem in urban areas to developing nations. Operational costs are the major challenging issue in effectiveness Medical waste management that form about 25%, followed by 21% of population increase, inadequate facilities and poor government forms about 17% and others of about 13% of respondent suggested that shortage of land is the challenge and lowest percent of about 7% said lack of awareness is still challenging. From the table 6 above, case of operational costs in year 2000 for example a lot of capital was spent where about 1.50 million US \$ used per month paying public workers that are paid less than private workers and yet removed only 30% of the total Medical waste generated in Mwanza City Council, and yet in developing countries there is a narrow tax base and this affects the service delivery toward medical waste management (Cointean, 1982). For effective and sufficient Medical waste management authorities take up a large proportion of their resources though materials and financial resources to solve the problem (Nyage'nchi G.N. 1992).

Another challenge is increasing population in the area that accompany increasing healthy facilities such as hospitals, nursing rooms, dental institute, research laboratories, and blood banks that keep generation of wastes on increasing (Saravanan, 2005). According to Oketch et al 2000 there is several factors influence the amount of waste generated in an area and it includes population, economic and social activities.

Also inadequate facilities for storage and transport are the challenging issues, apart from that even shortage of land for waste disposal is a challenge due to increasing population that require land for other activities such as settlement among other economic activities and investments a report from Mwanza City Council in 2002 indicated that disposal site at Igoma landfill had come under attack exposing many people to toxics as infectious wastes are dumped openly on land. Though government is now giving hand on the Medical waste management but still not enough because the policy are not well coordinated with effective strategies such as sorting and treatment, also budgeting is not given first priority toward waste management. In case of awareness many health facilities still have the tendency of I don't care attitude and many they still lack technical

knowledge toward proper management of wastes they generate. Inadequate facilities also is still the challenge, different types of containers with proper color coding are to be used for different categories of Medical waste in generation point, should be transported in a prescribed and approved vehicle only but due to the inadequacy different vehicles and other facilities are used without authorization and this is quite dangerous as far as human and environment healthy is concerned.

Photo 2: Poor medical waste disposal due to land shortage



4:5 Solution to the identified challenges in Medical waste management

For proper and efficiently management of Medical waste there are some solution revealed to overcome the identified challenges that tend to hinder the complete processes of dealing with waste management including collection, storage, treatment and transporting them to the final disposing site.

Table 6: Solution to the identified challenges in Medical waste management

Solutions	Respondent frequency	Percentage (%)
Increase budgeting	17	28
Proper planning	10	17
Increase stakeholders participation	12	20
Provision of education and training	08	13
Adoption of science and technical knowledge	13	22
Total	60	100

From the table 7 above, the study identified that in order to overcome challenges is to increase budgeting since different operation requires a lot of resources including capital so as to ensure monitoring, mean to make sure that such wastes are known at all times and can be fully achieved when adequate monitoring facilities are available. All these come through proper planning ways that enables the nation to come up with a policy toward examining its own wastes and the potential for extending waste reduction. According to World Bank in 1989 suggested that about 70% of the municipality's budget has to be spent on collection and cleaning of wastes as well as recycling and decomposing. Also increasing participation is important because in most cases the resulting municipal strategy will be a mix of private and public sector activities involved in the process of waste management. In addition to that adoption of scientific and technical knowledge is also needed when the problem of poor Medical waste management is clearly addressed and strategies are well identified. Provision of education and training both to waste handlers and societies is important apart from sensitize them also it increases their awareness to Medical waste since the hazardous of wastes is not harmful to environment only but also to human health (Tavera, 1993).

CHAPTER FIVE

5.0 CONCLUSION AND RECOMMENDATIONS

5:1 Conclusion

Medical wastes are highly infectious and hazardous, they may carry pathogens of dreadful diseases such as hepatitis and HIV/AIDS therefore management is very important not only because human health is concerned but also quality of the environment is kept into consideration. The study revealed that there is no proper and systematic management of medical wastes except a few private companies that separate their infectious but many still dispose of their waste at the same site as the civic wastes.

The level of awareness on Medical among waste handler is not good enough to manage the waste systematically, however provision of practical training to waste handlers on how to handle the waste through proper planning, integrated perspectives that involve different key players and absorption of science and technical knowledge and provision of education toward Medical waste management will make the whole process efficient and successful that protect and improve both human health and environmental quality.

5:2 Recommendations

The following recommendations were made;

Health facilities such as hospitals, clinics, and laboratories among others should be able to budget larger portion of their expenditures in terms of financial resources to pay workers, to improve facilities as well as to provide training and more capacity building to its workers.

Government through its municipalities should come up with the long term planning and policy toward MWM that look for ways of sustainable management particularly monitoring waste generation and waste reduction including promoting recycling programmes.

Healthy institutions should involve participation of various stakeholders both private and public sectors engaging in MWM and privatization is the good way that support source separation, treatment and recycling and trading networks with information sharing and forum stakeholders.

Government should promote training and education to both private and public waste

handler as well to local communities involved in waste management to increase awareness and technical knowledge toward effective and efficient management of MW. This is the core of health care waste management programmes as was done by MOH in 2003 has to be continued to enable workers and other MW handlers to recognize health and safety hazards and to prevent further exposure to hazards posed by MW. Therefore training must not only be continuous but also comprehensive, integrated and structured with the necessary elements that depends on the nature of the work in hospitals, the hazards and possibility of exposure, and the responsibilities of individual workers.

Government, healthy facilities, private and public sectors as jointed partners should be able to get the scientific and technical information that concerned to proper MWM practiced in other area particularly developed countries that emphasized on waste separation and recycling at the generation point.

However observing exposure limits has to be emphasized, with respect to a wide variety of contaminants related to management of MW, certain exposure levels are allowed by law and the most well known of allowable exposure standards are the threshold limit values (TLVs) currently have been adopted as permissible exposure levels and are legally enforceable in countries where environmental laws are in place, hence if such limits are observed MWM could be more effective.

Establishment enforcement of medical waste management regulations, there must be clearly stipulated rules that apply to all persons who generate, collect, receive, store, transport, treat, dispose of, or handle MW in any form. This will help to maintain the occupational and public health therefore those who generates MW must be legally responsible it should be the duty of every generator of MW which includes hospitals, clinics, dispensaries, pathological laboratories and blood banks to take all steps to ensure that such waste is handled with care from the origin point to the final point of disposal without cause any adverse effects to public and environmental health.

Record keeping also should be kept to all authorized person related to generation, collection, storage, transport, treatment, disposal and or form of handling these MW in accordance with rules and any guidelines issued subjected to inspection and verification by the prescribed authority at any time hence have to be well documented in the hospital's health and safety plan.

REFERENCE

- . Ahmed Westlake, K., (1997). “Waste Management for the Health Sector in Tanzania”, Tanzania Family Health Project, Published by East African Movies Ltd., Mbeya, Tanzania.
- Blackman, W.C, (1996). “Basic Hazardous Waste Management”, 2nd Edition. Chapter 12, Lewis Publishers, CRC Press, New York, USA.
- Cointean, S.S,(1982),”Environmental management of urban wastes in developing countries” A project guide to urban development technology, paper no.5 World Bank, Washington D.C, USA.
- Flintoff, F,(1976).”Management of wastes in developing countries”, World Health Organization, New Delhi, India.
- Huffman, G.L, (1996) “Medical Waste Management/ Incineration”, Journal of Hazardous Materials, pg 1-30.
- Iyer, A.(2001). “Community Participation in Waste Management Experiences: of a Pilot Project in Bangalore, India”, Waste paper.pg 45
- Manyele, S.V, et al, (2003). “Globalization and its Effects on Medical Waste Management in Tanzania”, IET Annual Conference and General Meeting, 4th-5th December, AICC Arusha, Tanzania, (2003), 76-92.
- Manyele S.V, 2004. “Medical hazardous waste management for practitioners” course notes for professionals development programs. Prospective college of engineering and technology, University of Dar es salaam.

- Mato and Kaseva,(1999). “critical review of industrial and medical waste practices in Dar es salaam city” Lewis publisher, CRC press, New York.USA
- Morgan C.D, (1998). “Incinerators and its maintenances”, John-Wiley Inc.New York, USA.
- Mwanza City Council (MCC), (2002). “Environmental report in Mwanza” pg 180
- National Environmental management Council (NEMC), (2008).”The state of the environment report for Tanzania” Government press, Tanzania.pg 250
- National Healthcare Waste Management Plan, Ministry of Health (NHCWMP), (2003) pg 180.
- Nyang’echi G.N, (1992). “Management of solid and liquid wastes” a manual for environmental health worker. Africa medical and research foundation, Nairobi, Kenya
- Oketch et al (2000).”Africa’s wastes dilemma” ISWA time centers for developing countries technology. University of Denmark, Denmark.
- Saravanan, K.(2005). “Environmental science and technology “New age International Publishers Ltd.India
- Tavera,D, (1993). “Urban waste management in central and east Africa urban environment” IDCR workshop, Ottawa, Canada
- United Nations Environmental Protections (UNEP), (2000).”Taking action “An environment guide for you and your community, Washing D.C, USA.

- United States Environmental Protection Agency (US-EPA), (1986). “Guide for Infectious Waste Management”. Office of Solid Waste and Emergency Response, Washington, D.C. EPA 530-SW-86-014.

- Van Veen, F, (1988). “Hazardous Waste: Detection, Control and Treatment” The Issues of Western Europe, Oxford publisher. 75-100.Oxford, Britain.

- World Bank (WB), (2003). A report on “Health Facility Waste management Study in Bangladesh”.kualla lumpur. Bangladesh.

- World Health Organization (WHO), (2002). “Nature of hazardous wastes and its management” technical report Paris, France. Pg 45

APPENDECES

Appendix A: Interview Schedule

Dear sir/madam

You are kindly requested to answer the following questions by providing the most relevant information and to the best of your knowledge on the issues sought by the questions below. This study is aimed at collecting information on assessing the effectiveness of medical waste management in Mwanza district. The information being sought is purely for academic reasons and will be treated with the utmost confidentiality.

PART A: Doctors

1. Medical waste is the major problem in many hospitals that threatens human health and environment. What strategies does your hospital use in managing Medical waste?
2. Do you think those strategies are more effective? If YES how? And If NO why?
3. On your knowledge, do you think which hospital has better and effective strategies in managing Medical waste? Government Private Why so?
4. What are challenges do you face in implementing those strategies for Medical waste management in your hospital?
5. What are your suggestions that can be used to overcome the challenges you had mentioned?
6. How long have you worked so far in this hospital and experience you have particularly in medical waste management?

PART B: Nurses

1. According to your knowledge of nursing what are the effects of Medical waste to human health and environment as a result of ineffective strategies?
2. What strategies do you use to manage Medical Waste you generate in your working sessions?
3. Which strategy do you think is more effective in handling Medical waste in your hospital?
4. Are there any challenges you face in managing Medical waste through those strategies? YES/NO. If YES which are they? If NO why?
5. If YES what are the suggestions will you advice to overcome those challenges
6. How long have you worked so far in this hospital and experience you have particularly in medical waste management?

Thank you, for your cooperation!

Appendix B: Questionnaire

Dear sir/madam

You are kindly requested to fill this questionnaire by providing the most relevant information and to the best of your knowledge on the issues sought by the questions below. This study is aimed at collecting information on assessing the effectiveness of medical waste management in Mwanza district. The information being sought is purely for academic reasons and will be treated with the utmost confidentiality.

PART A: Hospital waste department

1. Do you separate medical waste in your daily working? YES NO If YES is it important for effective Medical waste management?.....

.....
If NO which other methods do you use in handling Medical waste?.....

-
.....
.....
2. a) What are the major strategies does your department use in Medical waste Management?

.....
.....
.....
b) Do you think are more effective?

If YES how?

.....
.....
.....
If NO why?

3. What are the effects of Medical waste on your health and environment in general?.....
.....
.....

4. How does your department handle other wastes apart from Medical wastes?.....
.....
.....

5. How long have you worked here and experience you have in waste management particularly in wastes management?.....
.....
.....

6. a) What are the challenges does your department face in managing Medical waste?.....
.....
.....

b) What are your suggestions to overcome the challenges in managing Medical waste?
.....
.....
.....
.....

Thank you, for your cooperation!

PART B: Private waste collectors companies

Dear sir/madam

You are kindly requested to fill this questionnaire by providing the most relevant information and to the best of your knowledge on the issues sought by the questions below. This study is aimed at collecting information on assessing the effectiveness of medical waste management in Mwanza district. The information being sought is purely for academic reasons and will be treated with the utmost confidentiality.

1. Hospitals are responsible for generating Medical waste, on your working experience which hospitals generates more Medical waste?

Government Private what is the frequency of waste collection to those hospitals? 1....2....3....4....5..... (Tick to an appropriate number of frequency).

2. What are the methods do that hospital handle the Medical wastes they generates before you collect?

.....
.....
.....
.....

3. Do you think those strategies are very effective in managing Medical waste in hospitals? If YES why?

.....
.....
.....

If NO what other strategies are effective in managing Medical waste?

.....
.....
.....

4. Do those hospitals pay for your collecting service in their Medical wastes they generate? YES/NO. If YES how much per (luggage, day, week, month)..... If NO why.....

5. Where do you dispose the Medical waste after collection?
.....
.....
.....

6. What do you think are the effects of Medical waste on your health and environment?
.....
.....
.....

7. What are the challenges do you face in your work particular when dealing with Medical waste in hospitals?
.....
.....
.....

8. What are your suggestions that can be used to overcome those challenges when handling Medical waste?
.....
.....
.....

9. How long have you worked here and experience you have particularly in waste management.....

Thank you, for your cooperation!

Appendix C: Questionnaire for local communities

Dear sir/madam

You are kindly requested to fill this questionnaire by providing the most relevant information and to the best of your knowledge on the issues sought by the questions below. This study is aimed at collecting information on assessing the effectiveness of medical waste management in Mwanza district. The information being sought is purely for academic reasons and will be treated with the utmost confidentiality.

A) Age group

i) 18-25 ii) 26- 30 iii) 31-45 iv) 46- above

B) Sex

Male Female

1. Hospitals are responsible for generating Medical wastes that threatens human health and environment. Are you aware of Medical wastes effects? YES/NO.

If YES which are they?

.....
.....
.....

If NO why?

.....
.....
.....

2. What are the problems do you face being around the hospitals from Medical waste they generates

.....
.....
.....

3. Do you think hospitals do handle Medical wastes effectively? YES NO

If YES what are the methods does hospital use to manage their Medical waste?

.....
.....

If NO why do you think?

.....
.....

4. What are your suggestions on effective Medical waste management?

.....
.....
.....
.....

Thank you, for your cooperation!



FACULTY OF SOCIAL SCIENCES

Date: 05/12/2009

To: Mwanza District

This is to introduce to you DAVID KILWA who is a bonafide student of Kampala International University. He/she is working on a research project for a dissertation, which is a partial requirement for the award of a Degree. I here by request you, in the name of the University, to accord him/her all the necessary assistance he/she may require for this work.

I have the pleasure of thanking you in advance for your cooperation!

Yours sincerely.

for
Dr. Mose Auyeh
Dean
5 DEC 2009
KAMPALA INTERNATIONAL UNIVERSITY
FACULTY OF SOCIAL SCIENCES
P.O. BOX 20000, KAMPALA