FACTORS AFFECTING EFFECTIVE SOLID WASTE MANAGEMENT PRACTICES IN MUKONO CENTRAL DIVISION

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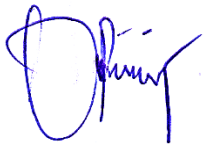
DECLARATION

I, *Samuel Mpiima*, declare that this research entitled, "***Factors affecting effective solid waste management Practices in Mukono Central division***" is the result of my personnel efforts and completed under the supervision and guidance *Dr. Alfred Sebit Lokuji*. This work has not been submitted to any institution for any award.

Signature **Date: 24/05/2024**



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APPROVAL

This is to certify that this research, entitled ***"factors affecting effective solid waste management practices in Mukono Central Division",*** has been submitted with my approval as Uganda Christian University appointed Faculty Supervisor.

Signature :……  …… Date : April 29, 2022

Alfred Sebit Lokuji, **PhD**

University Supervisor

DEDICATION

To my parents, the Late Elijah Lugeya Lubanga and Ms. Nakanwagi Florence who have always encouraged me to put my all in the hands of the Almighty God for guidance in my work and studies. My Wife Mrs. MPIIMA Kafuko, Oweekitibwa Henry Sekabembe Kiberu (Kingdom of Buganda) and FUFA President, Hon. Eng Moses Hassim Magogo who played a key role in the development of this research.

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ACRONYMS

CAO	Chief Administrative Officer
IMF	International Monetary Fund
JICA	Japan International Cooperation Agency
MRFs	Materials Recovery Facilities
MSWM	Municipal Solid Waste Management
NEMA	National Environment Management Authority
OECD	Organization for Economic Cooperation and Development
PHI	Principal Health Inspector
UNEP	United Nations Environmental Protection
AG	Auditor General
MMC	Mukono Municipal counsel
MSW	Municipal Solid Waste
MSWM	Municipal Solid Waste Management
MMC	Mukono municipal council
MCD	Mukono central division

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ABSTRACT

The massive production of solid wastes especially in urban places of developing countries is a common occurrence especially in developing world, these waste products are usually improperly dumped thus posing a huge environmental and public health concerns. This study focused on examining the factors that affects sustainable management of solid wastes in Mukono Central Division. The research undertaking adopted a descriptive survey research design, data was collected using survey, in-depth interviews and observation methods and a stratified sampling technique was used in accessing a total sample size of 219.

The study findings disclosed that a considerate proportion of residents in Mukono central division practiced rudimental solid waste management within their premises, there are also a common practice of illegal dumping and open burning. The residents demonstrated low level of knowledge in properly managing solid waste but indicated positive attitudes towards practicing it. It was further disclosed that there were very few solid waste collection facilities within the study area.

The researcher recommends that Mukono central division should promulgate a comprehensive legal and policy framework with strong penalties for illegal dumping and encouraging incentives for those that practices proper waste management methods.

Key words: *Solid waste, management, Mukono central division*

DEFINITIONS OF KEY CONCEPTS

Wastes

UNEP (2002) defined waste as substances or objects, which are disposed or are anticipated to be disposed of by the provisions of national law. Wastes may include: Municipal waste, solid waste, hazardous waste, electronic waste and a variety of domestic waste.

Solid waste

Solid waste is referred to as rubbish; they are organic and inorganic waste materials that are normally solid and produced by households, commercial, institutional and industrial activities that have lost value in the sight of the initial users.

Waste Management

Is the collection, transportation, and processing, recycling or proper disposal of waste materials. However, solid waste management encompasses waste generation, waste storage, collection, transportation and disposal.

CHAPTER ONE

INTRODUCTION AND BACKGROUND

1.1 Introduction

In our contemporary Ugandan environment, it is not uncommon to find an environment littered with solid waste materials, these waste materials trace their origin right from households, residential settlements, industrial areas and more noticeably in business and commercial places. Due to the fact that solid waste materials are undesirable from their source of origin, somehow they end up into public places where they become nuisance and a threat to human public health.

This study focused on examining the factors that affects effective municipal solid waste management practices in Mukono central division. This introductory chapter to the study focuses on presenting and describing among other key themes; the background to the study, statement of the research problem, purpose and objectives, research questions, scope of the study, justification, significance, and the conceptual framework.

1.2 Background of the study

The concept solid waste has been defined differently by many scholars with no single universally adopted definition. However, for the purpose of this study the researcher will adopt a befitting definition from Ayadinuno et al. (2021) where it was stated that solid waste refers to the range of garbage materials that comes from both animal and human activities discarded as undesirable and unusable. In regards to the above, solid waste is severally categorized based on their nature of material or its source of origin; for instance, categorization in to plastic, paper, glass, metal, and organic waste, further classification may also be based on hazard potential.

OECD (2022) categorically stated that municipal solid waste originates from residential, commercial and institutional settings and they include among other things; food wastes, paper, plastics, textiles, glass, metals, ashes, electrical. Other renown sources include municipal services like street sweepings and tree trimmings and other recreational areas. The above authors further indicated that irrespective of the sources, compositions, or hazard potential, solid waste deserves to be properly managed to ensure the safety of the environmental.

According to World Bank (2018) reports, the world was estimated to be generating at least 2.01 billion tons of municipal waste every year. The above report further sheds light to the fact that the steady increase in the volume of municipal solid waste production is partly attributed to the continuous population growth and the expansion of economies worldwide. As such World Bank estimated that waste generation is likely to increase by nearly 70% from the current 2.01 billion tonnes to at least 3.40 billion by 2050. Despite the projections, in sub-Saharan Africa municipal solid waste production is expected to increase in triplets both in volume and content by the year 2050. Velis and Cook (2021) study report concluded that over 90% of solid waste was still carelessly mismanaged especially in low-income countries.

Given the huge amount of solid waste production at global stage, Govani et al. (2021) reported that about 37% of solid waste is appropriately and legally disposed of in landfills, 33% is in suitably discarded, 19% undergoes materials recovery especially through recycling and composting, and only 11% is suitably treated using contemporary incineration method. In the category of harmful solid waste alone, global estimates stood at13 tons of hazardous solid waste was reportedly produced at a high speed of every second thus translating into at least 400 million tons of hazardous waste (Gautam & Kumar., 2021). This type of solid waste can be found in hospitals, general laboratories, automobile industries, in both large and small scale farming and in several waste water treatment activities.

It is important to appreciate the factors responsible for the continuous and huge amount of municipal solid waste production. Zambrano et al. (2021) demonstrated that solid waste production amplified along with GDP increments, but more importantly upsurge in municipal solid waste were attributed to the overall rise in population, urbanization and the business of tourism all of which had a positive and significant impact on the generation of waste. Likewise, in Kenya it was reported that rapid urban population growth, lack of technical and financial capacity, and low policy priority has resulted in increased solid waste generation by industrial, domestic, and other activities (Chisika &Yeom., 2022).

It is quite apparent from the information above that the presence of municipal solid waste across cities, towns and urban centers is a serious public health problem whose production in truth cannot

be stopped, in this regard the only available option to deal with solid waste is to systematically and scientifically manage the existing solid waste and perhaps control its source of origins.

Generally, solid waste management involves a rigorous processes encompassing collection, processing, treatment and recycling of the waste products. Nanda and Berruti (2021) disclosed that the entire process of waste management involves an array of tasks which among other things include: waste storage, transport, treatment and disposal but more inclined to best waste management practices, the above mentioned processed must be preceded with a broad spectrum of monitoring and regulation of the development, processing, transit, treatment and disposal of the waste products. The above described stages are very important in solid waste management and in any case shouldn't be skipped to effective and sustainable solid waste management

Important to emphasize in this study is the fact that solid waste management practices significantly vary depending on a number of factors. For example, the nature and magnitude of the waste, country jurisdiction and several other factors, for instance solid waste located within a residential and industrial settings, or urban and rural areas, and for developed and developing nations. In respect to the above, Mohan and Joseph (2021) contended that the most common and noticeable municipal solid waste management practices include recycling, composting, incineration and open dumping. Furthermore, one of the key management strategies in waste production is anchored in the overall objective to minimize and subsequently eliminate its adverse impacts on to the environment and human health (Ferronato &Torretta., 2019).

One of the visible issues depicted in this study is the challenges faced by the municipalities in dealing with the mass production of solid and other types of waste materials. And evidence from other studies revealed that municipal solid waste management is an essential service in any society. However, the solid waste management process is faced with a number of difficulties; for example, Fernando (2019) indicated that municipal authorities fail to manage waste due to a wide coverage area and in ability to prioritize a sustainable solid waste management practice. Furthermore, Sarfo-Mensah et al. (2019), noted that economic constraints was reported as the main challenge that affected efficient waste management. In agreement with the above findings, Godfrey et al. (2019) revealed that the reasons for the poor solid waste management in Africa includes but are not limited to weak organizational structures, poor technology, inadequate budgets, weak legislation and its enforcement and low public awareness.

Evidence through literatures reviewed above suggests that poor management of municipal waste especially in developing countries have an adverse environmental impact especially to public health. In most cases uncollected solid waste ends up in drainage systems were they are blocked, this subsequently cause unsanitary conditions that have a direct health impact on residents. Jalosjos et al. (2021) noted that in the worst cases where waste is left uncollected with open access, it exposes the public to health risks and diseases like cholera, dysentery, and diarrhea. Furthermore, another study in which it was revealed that uncollected solid waste blocks drainage pipes and channels which become serious environmental risks and unhealthy living conditions that are hazardous to human lives (Taufiq, 2021)

Yusuf et al. (2019) disclosed that poor management of municipal solid waste has become one of the most pressing and challenging environmental and health problems as it possesses environmental risks such as contamination of useful land areas and ecosystem degradation and groundwater. Given the experiences of various countries dealing with the challenges of managing municipal solid waste, in this study the researcher focused on examining the factors that affects the effective solid waste management practices in Mukono central division.

1.3 Statement of the Problem

In Uganda, the 1995 Constitution under Article 39 provides that every Ugandan has a right to a clean and healthy environment. The above provision of the law has a strong bearing on public health promotion as it infers that generated municipal solid waste must be collected and disposed of in a proper manner that does not pose harm to human life and the environment at large.

However, the Auditor General report 2017, indicated that Mukono municipal council (MMC) was one of the 17 municipalities without satisfactory performance in municipal solid waste (MSW) management as it had no bye law, no enforcement plan on MSW management, and only managed to collect 50% of the total MSW generated in 2017. Yusuf et al. (2019) reported that the population in MMC disposed MSW along road side verges and channels, and the MMC authority releases waste on an open gazetted ground located about 15 hectares of land at Katikolo village, in contrast Nicholas (2022) cited poor supervision and understaffing as some of the key factors affecting effective implementation of policies on MSW management within Kampala metropolitan were Mukono central division is also situated. Media reports, the independent (2021) indicated that

residents in MMC severally demanded the authority to revive the operations of the 600 Million Shillings garbage recycling plant at Katikolo landfill as poor garbage management was compromising public health.

It is quite apparent that in ability to sustainably collect and manage solid waste in Mukono central division risks the health and life of the population, additionally a thorough search of evidence disclosed there is gap in scholarly evidence about the factors affecting solid waste management in Mukono central division. In this regard, this study focused on examining the factors affecting sustainable and effective management of solid waste in Mukono central division.

1.4 Purpose of the study

The purpose of this study was to produce empirical knowledge on the factors affecting the effective and efficient municipal solid waste management practices in Mukono central division situated in Mukono municipality

1.5 Specific Objectives

1. To describe the various solid waste management practices by residence of Mukono central division in Mukono municipality.
2. To examine the associated factors affecting the effective solid waste management practices in Mukono central division.
3. To analyze the various challenges faced by the division's authority in managing solid waste in Mukono central division.
4. To identify existing opportunities that the municipal authority can capitalize on to effectively manage solid waste in Mukono central division.

1.6 Research Questions

In response to the specific research objectives above, the researcher has asked a corresponding research question as indicated below;

1. What are the various solid waste management practices by residence of Mukono central division in Mukono municipality?
2. What are the associated factors affecting the effective solid waste management practices in Mukono central division?

3. What are the various challenges faced by the municipal authority in managing solid waste in Mukono central division?
4. What are the existing opportunities that the municipal authority can capitalize on to manage the solid waste effectively in Mukono central division?

1.7 Scope of the Study

1.7.1 Content Scope

In this study, the researcher confined the content scope of this study focusing on describing the various solid waste management practices by residents of Mukono central division, the researcher examined the associated factors that affected the effective solid waste management practices, carryout an analysis of the various challenges faced by the division authority in managing solid waste and finally explore the available opportunities through which the municipal solid waste in Mukono central division can be effectively managed.

1.7.2 Time Scope

In regards to the time scope, researcher chose and confined the research time scope to a time period of three (3) years starting from 2019 through to 2021, however a lot of reference was made to related data on the same subject matter within and without Mukono central division. The justification behind choosing this timeframe is twofold; firstly, during this time frame there has been a general upsurge into the quantity of municipal solid waste generation globally and nationally in Uganda, and secondly the researcher strongly believed that this time period is the best to provide fresh data that can be analyzed to inform policy and action decisions by Mukono central division authority.

1.7.3 Geographical scope

The study was conducted within the jurisdiction of Mukono central division, located within Mukono municipality, in Mukono district. Mukono Municipality is bordered by Kalagi to the north, Kira Town to the west, Lake Victoria to the south and Lugazi to the east. It lies 27 kilometers (17 miles) east of the central business district of Kampala, Uganda's capital and largest city. The district occupies approximately 31.4 square kilometers (12.1 sq mi) of land area. The coordinates of the town of Mukono are: 00 21 36N, 32 45 00E (Latitude: 0.3600; Longitude: 32.7500).

1.8 Justification of Research

There are several legal and policy directives concerning sustainable management of environment in Uganda. For instance, Under the national objective XXVII of the 1995 Ugandan Constitution, provides that the State shall promote sustainable development and public awareness of the need to manage the environment. Article 39 of the same constitution states that every Ugandan has a right to a clean and healthy environment. Section 96-102 of the National Environment Act, 2019 and section 7, 26, 27, 29, 104 of the National Environment regulations, 2020 all of which provides for a comprehensive mechanism through which waste can be scientifically and sustainably managed; above all there are associated penalties for failure to abide by those legal provisions.

Despite of the legal and police directives above, contemporary evidence like those presented in the problem statement above shows that Mukono central division (MCD) just like other municipalities in Uganda have continuously failed to collect even half of the estimated total amount of solid waste generated on a daily basis within their jurisdictions. Komba (2021) contended that the obvious consequences of uncollected solid waste in our environments is the compromise on public health. This in effect is the violation of legal provision but more importantly the human right to enjoy clean and healthy environment.

1.9 Significance of the Study

In the pursuit of this study, the researcher envisioned that the study findings can be useful in the following ways as enlisted below;

First and foremost, the study finding will produce empirical knowledge about the associated factors that negatively affects the effective management of Mukono municipal solid wastes.

The study findings will be communicated to Mukono municipal authorities such that they can use the knowledge produced to inform their decision-making regarding planning, budgeting and dealing with the heavily produced MSW

The research shall also propose an appropriate evidence based and viable policy alternatives on how best Mukono municipality can sustainably manage the huge amount of solid waste that produced daily within its jurisdiction.

The researcher will endeavor to share the study findings with other key stakeholders involved in the business of managing solid waste within Mukono municipality. Some of the stakeholders like the civil society man use the study findings for advocacy purposes

1.10 Theory underpinning the study

As a point of emphasis, there is hardly any known solid waste management theory that offers a scientific explanation in regards to the entire process of solid waste management. In many cases, there are waste management principles or guidelines that are incidental to the various stages and not a combination of the complete processes involved in waste management practices; starting from waste avoidance, re-use, recycling, recovery and waste removal.

However, in this study the researcher adopted the zero-waste theory. The Zero waste theory was coined in 1970s by chemist Paul Palmer, it is a set of principles that focuses on waste prevention that encourages reuse of resource's life cycles. The purpose of the theory is to avoid wastes ending up into final collection points for disposal. Bogusz, et al. (2021) contended that the zero-waste theory is a philosophical framework designed to promote wastes prevention, reuse, recycling disposal programs. The zero-waste management theoretical model was established on the anticipation that the best way to effectively deal with the overall dynamics of waste management is to ensure that its origin escaped to avoid any subsequent possibilities of its effects in causing harm to the environment and in a specific capacity to human health.

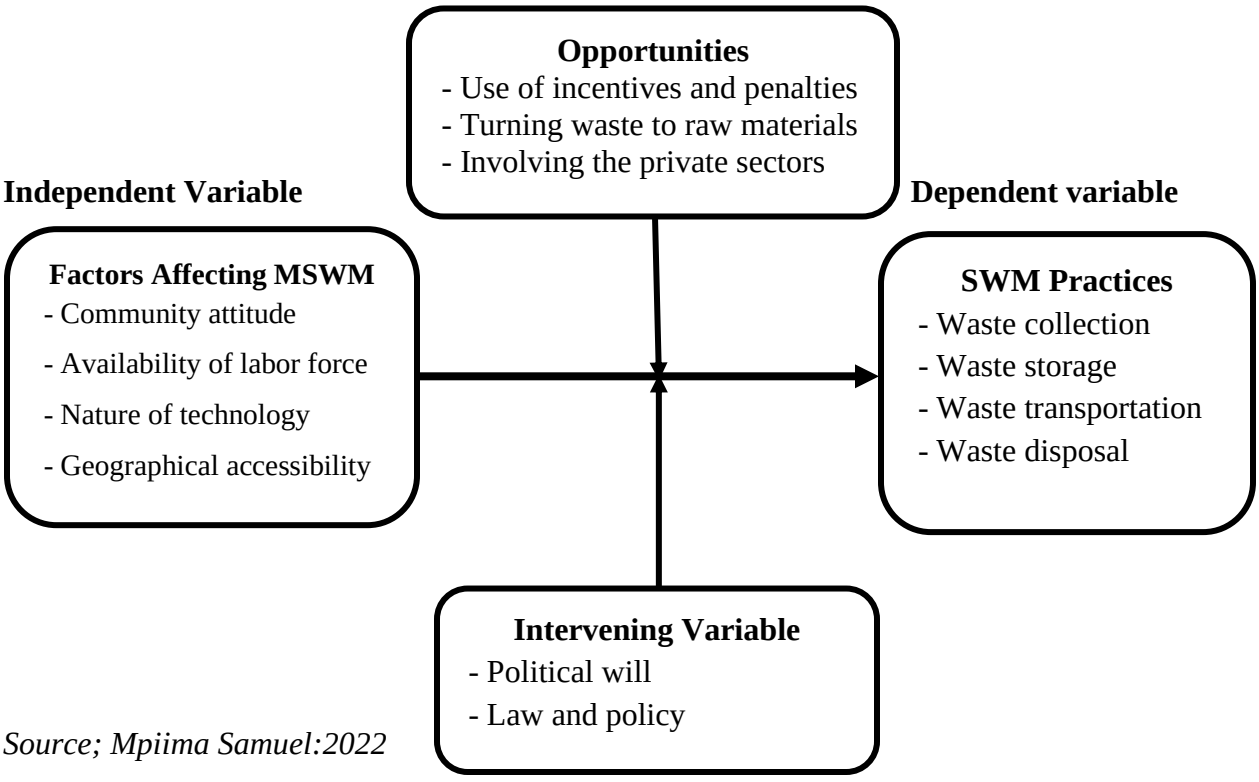
According to Solon et al. (2019), the zero-model strategy is the most preferred and cost-effective method of dealing with waste production and its associated negative consequences on the environment. In agreement to the above, Minelgaitė and Liobikienė (2019) observed that the zero-waste theory presupposes that waste generation must be avoided completely, and that waste management strategies shouldn't aim at minimization or reduction in the quantity to be produced. The theory believes that waste that is not generated cannot create any problems making non generation the cheapest waste handling measure.

At the extreme end of waste generations, the theory presupposes that for those wastes whose generation cannot be completely eradicated, the reuse and other safe related models can be applied with extreme and maximum precautions in order to benefit the environment and human health. Kerdlap et al. (2019) stated that zero waste theory model involves moving from the back end of

waste disposal to the front end of resource management. In response to the dictates of the zero-model theory. Wang and Caldwell (2020) indicated that indeed if a product can't be reused, repaired, rebuilt, refurbished, refinished, resold, recycled or composted, then it should be restricted, redesigned, or removed from production. Above all the theory further recognizes the fact institutional and ideological barriers plays a very vital role inhibiting execution of zero waste theory as such the application of this theory must be done while paying a maximum attention to context and content of the waste management environment.

1.11 Conceptual framework

The diagrammatic expression below is designed to demonstrate the relationship between the independent variable which is the factors affecting effective municipal solid waste management (MSWM) and the dependent variable solid waste management practices (SWM practices).



Source; Mpiima Samuel:2022

The conceptual framework above was constructed by the researcher with huge support from the various scholarly literatures that were accessed and appropriately reviewed, the researcher's conception is that the if the independent variable is well managed it will translate into an effective solid waste management outcome which is the dependent variable. For instance, Lissah et al.

(2021) noted that negative community's attitude towards adopting a modern scientific mechanism of handling solid waste has a strong bearing on the MSWM outcome, similarly Nanda and Berruti (2021) found out that the availability of skilled labor force together with the use of modern technology has a positive bearing on MSWM. The above positions were reiterated by Wang et al. (2018) whose findings disclosed that places located in hard-to-reach areas presented a huge challenge in accessibility and collection of MSW.

However, the researcher also conceived that other than the role of the independent variable, there are other factors that affects the effectiveness in MSW collection, storage, transportation, disposal. One of the key factors is the political will, and Fernando (2019) stated that political will and stakeholder's involvement plays a key role in solid waste management. This manifest informs of planning, budget allocation and the ability to carry out research and do funds mobilization.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

In this chapter the researcher focused on examining some of the key issues related to the factors that affect the effective management of municipal solid waste. The review of literatures in this chapter is guided by the study specific objectives. The literature review based on utilization of secondary sources such as text books, journals, peer reviewed publications and the reports that can be accessed through the internet.

2.2 Municipal solid waste management practices

It is not now surprising that solid waste production is a global problem affecting every person and the economies at large. In 2020, global production of waste products was assessed at 2.24 billion tonnes of solid waste alone. Adipah and Kwame (2019) detailed factors like accelerated population upsurge and urbanization, yearly waste generation is projected to escalate by 73% from 2.24 billion tonnes in 2020 to at least 3.88 billion tons by the year 2050. On top of the large and increasing solid waste production, Victoire et al. (2020) argues that over 90% of the global waste produced is openly dumped or burned especially in developing countries.

In this modern age, the source of municipal solid waste is multifaceted ranging from households, industries, factories, markets, hospitals and on the streets. Given the various source of waste origin, solid waste management should focus more on the whole process of waste generation, collection, storage, transportation and disposition. Mensah (2020) contended that the entire solid waste management procedures must strongly focus on preventive measures like waste recovery.

2.2.1 Solid Waste Source Reduction

One of the global methodological approaches adopted by most countries in dealing with solid waste products and its associated negative consequences is the practice of minimizing the quantity of solid wastes being produced. The above assertion was reechoed by Thomas (2018) who reiterated that among other things solid waste minimization method encompasses solid waste prevention in which solid waste origin is highly controlled. This is followed by performing internal recycling of waste production and finally the option of reuse of waste products for the same

purpose or other related purposes. Other than preventive measures of solid waste management described above, Ibrahim et al. (2019) argued that external methods like recycling, sorting of solid waste, reuse are all part of solid waste management.

In reference to the above, it is only logical to suggest that the ultimate method of handling municipal solid waste is by reducing its production which in turn minimizes its associated dangers that would otherwise pose substantial ecological and well-being risks as a result of the toxic substances they emit through decaying and other processes. Nanda and Berruti (2021) indicated that the source reduction is the lessening in quantity of solid waste before collection and disposition stages are reached. The adoption of this method by far is the most important step in the process of waste management which in other words also encourages reuse of products.

2.2.2 Solid Waste Sorting

Another common method severally adopted as a tool for managing solid waste is the art of sorting the wastes right from their source of generation. It is even better if the sorting is done at the point of disposal from home in which different waste collection facilities are separately designated to collect a particular type of solid waste; in contrast, Antonopoulos et al. (2021) noted that sorting of solid wastes is the practice of separating unwanted solid materials before dumping them in a waste collection facility such that they are not mixed up in one waste collection facility. The above author acknowledges the fact that source separation and sorting enable easy decision making concerning what can further be reused or recycled or kept for final disposition.

Given the fact that most municipal solid waste originates from households or business premises, the best opportunity to practice waste sorting is by doing it right from the waste generation points. In dismay, some scholars have reported that contrary to expected practice, most households in Ghana were reportedly to have failed to adopt to the practice of source separation of solid waste materials. Alhassan, et al. (2020). The reason for the failures however was not disclosed comprehensively. In the same spirit as in above, Rousta & Bolton (2019) noted the fact that sorting of solid waste products especially for recycling purposes takes place at numerous stages of the solid waste management system; the above study further observed that the first level of plastic waste collection and sorting can only be best done at the household's level. Despite of the practice

of waste separation, it is not performed on an industrial level as many households have still not cultivated the habit of recycling, thus affecting the designed waste management system.

2.2.3 Recycling of solid waste

The art of recycling solid waste products is an old practice which came in existence as a mechanism to control the excessive abuse of the environment due to heavy disposals of unwanted waste materials. In essence, Manickam and Duraisamy (2019) stated that solid waste recycling is the process by which resources that are not good for further usage are refashioned into different new products or refurbishing the waste into the same old products such that it can further be used for the purposes of consumption. At the global scale, recycling is renowned as one of the most viable methods used to sustainably manage the excessive production of municipal solid wastes. The practice plays a significant role in keeping large amounts of solid waste out of production and away from reaching into landfills, this according to Thangavel and Sankriti (2019) helps in preserving the global environment from pollution and destructions. The above is possible simply by reusing the discarded substances other than dumping them

In Nigeria for example, reports indicated that in textile industry there is a familiar practice of reusing textile products that are no longer desirable by their original owners; in most cases the old textiles are traded as used clothes especially from developed countries to developing countries, or better still the second-hand clothes are bequeathed to charitable organization. Okafor et al. (2021) indicated that in 2008 alone, about 26,000 tons of foreign used textiles were collected by charity organizations, with the sole purpose of donating them to Africa. Furthermore, Momoh and Oladeye (2010) argued that normally recycling is an excellent method for minimizing the quantity of municipal solid wastes that would otherwise get to Landfill. It is important again to emphasize that the practice of recycling not only minimizes the amount of waste that goes in to the landfills but also serves as an important raw material for manufacturing various products (Artiola, 2019). The only challenges with recycling method of solid waste management is that it is expensive to invest in especially in terms of technology.

2.2.4 Incineration solid waste management method

Another effective and efficient method of managing solid waste production is at the stage in which it is properly collected with a plan of disposal. Incineration is literally a method of burning solid waste products but in a very controlled manner that minimizes air pollution. Lin (2019) observed that incinerators have the capability to condense huge amount of solid waste in to a very small aggregation as compared to all the other methods of solid waste management methods. As part of its advantages, incineration method also eradicates disease carrying organisms and bacteria that sprouts amidst solid waste products while sinking the bulkiness of the solid waste (Khobragade, 2019). As it was in the case of recycling, in the early1990's, Kreith (1994) indicated that extraneous factors like technology plays a huge role in hindering the uptake and consumption of incineration method of managing solid wastes.

2.2.5 Final disposal of solid waste

Solid waste disposal forms the final stage in waste management cycle. Regardless of whether in the management cycles waste were reduced or recycled, the waste must be disposed of at some point. However, the manner in which this waste is disposed of matters a lot, whereas there are legal and policy directives governing waste disposal almost in every municipality globally most households still practices illegal dumping. For instance, Odonkor and Salla (2021) observed that in Ghana it was observed that solid waste is disposed-off rationally, with some going in the legally designated points whereas majority ends up at illegal dump sites without regards to the adverse effects to the environment.

Legitimate municipal solid waste management requires that netizens are sensitized and informed about the pros and cons of illegitimate waste disposals. Kanuku et al. (2020) disclosed that in Kenya it was observed that many households do not take their solid wastes into the newly installed waste collection bins by the authorities. And part of the reasoning of this behavior was attributed to the overflowing, accumulated and stinking uncollected waste in and around the waste collection bins which in turns created negative perception. Sinthumule and Mkumbuzi (2019) in Tanzania revealed that the community-based solid waste management practices that was introduced to help sort the challenge of waste management within the communities was not successful in causing any change of mind set and behavior of citizens towards responsible waste disposal methods.

Nuwematsiko et al. (2021) found in Kampala that citizens lacked clear knowledge on how to appropriately dispose of solid waste despite of the fact that the study findings also indicate that the electronic consumers demonstrated having positive perceptions.

2.3 The constrains faced in effective management of Municipal Solid waste

This section reviews literatures concerning the challenges and associated factors that makes efficient and successful management of solid wastes challenging for municipal authorities.

2.3.1 Financial factors

One of the key issues that heavily contributes towards the failure of municipal solid waste management (MSWM) is the aspect of sustainable financing of the waste management activities. Awasthi, et al (2021) argued that the financial issues start right from budgeting, capital investment, cost reduction, and cost recovery. All these attributes of financial factors are deeply troubled with costs that are involved in the entire waste management cycle.

According to Zurbrugg (2002) and Hufane (2015), it is no longer a secret that financial constraints play a very significant role in determining the inadequacy with which municipal waste is collected and disposed in most developing countries especially in localized areas were local councils lacks of finance. In such a situation, only adequate budgeting is highly necessary in effectively managing solid waste. The reason why lack of funds in financing MWM is disastrous in waste management is that the finance acts like the fuel of the system of waste management as it covers various operating costs like paying the laborers, fueling machines including vehicles, costs associated with the maintenance of the machines. Farah (2019) explained that financial costs in MWM comprises costs of purchasing waste collection vehicles and their maintenance

2.3.2 Technical Factors

It is important to emphasize the fact that critical issues to do with collecting data about waste production, engaging in a comprehensive planning on waste management systems and procedures among other things forms the technical aspect of Solid Waste Management. And this factor is also key in determining the effectiveness and sustainability of waste collection cycle in a given municipality. It becomes obvious as stated by Abrahame (2018) that literally all categories of wastes that are left uncollected emerge as a result of the absence of sound MSW management and

control. Fernando (2019) argued that for waste management to be technically sound, the local authorities together with stakeholders must provide a clear and thorough waste collection systems with qualified personnel.

Furthermore, the issues of technicality as identified above extends to detailed and scientific thoughtfulness on how to deal with recyclable and discarding wastes. Some of these elements as explained by Nanda and Berruti (2021) captured the issues of hazardous wastes which requires to be stabilized and solidified such that they can enter a landfill to go through various treatments with the view to alleviate and be able to be disposed of in an environmentally friendly manner.

2.3.3 Social Factors

It is very issue to forget and ignore the role of social factors in ensuring effective MSW management practices. Social factors cover a number of elements including but not limited to attitudes and perceptions of solid waste generators especially towards best waste management practices. In a matter of speaking, Yousefi et al. (2021) recognized that the social aspects of MSW management involves waste generation and handling community-based waste management and the social conditions of waste workers. In dealing with community's participation in waste management, it is very vital that they are educated and sensitized to invoke positive attitudes which can also influences other people's willingness to cooperate and participate in adequate waste management practice.

Fernando (2019) stated the core of complications in solid waste management originates rightly from the deficiency of public knowledge, poor condition of waste workers, and the reluctant participation of key private sectors. As such social aspects of SWM is very vital and can only be enhanced by constructing strong social awareness and educational program, ensure that waste workers are properly handled with specific attention to their health and remunerations.

2.3.4 Political factors

Another element that influences the effectiveness of solid waste collection and management is the aspect of strong leadership which in this case manifests inform of the political spectrums. In most countries, these involves the central governments that largely plays the role of promulgating laws and policy directives on how to deal with MSW in various local governments, and in turn it's the role of the local governments that plays and labors to implement the legal and regulatory

frameworks. According to Ahluwalia and Patel (2018), local governments often involve solid waste collection services, and often work under a national legal framework rather than a local one and this makes difficult to change framework to suit local conditions such as private sector involvement and community involvement.

It is of great importance to note that if a given authority operates on an outdated legislative and legal framework in managing solid wastes even the actual enforcement of the laws themselves contributes towards the unsuccessfulness of MSWM (Mahpour, 2018). For an efficient and sustainable management of waste, legal, policy and regulations must be updated, current and must be very clear in directives and line of actions. Chopra (2009) noted that it needs to have also oversight body to monitor the enactment and the implementation of those policies. Lack of enforcement of policies of solid waste is the real challenge to sustainable waste management.

2.4 Opportunities for effective municipal solid waste management

In the face of huge challenges in dealing with Municipal solid waste management at nearly every municipality in the world especially developing countries, there exists some promising opportunities that can be exploited in order to enhance the ability and efficiency in managing the huge current state of global solid wastes.

2.4.1 Waste segregation and composting

One of the opportunities to captivate in dealing with the problem associated with MSW is by venturing in waste segregation and composting; in fact, composting is one of the approaches frequently practiced in developed countries. Martin and Gershuny (2012) indicated that composting is a sustainable waste management activity in which any amount of gathered organic solid waste is converted into a useful product for human usage like manures used in farming activities. The beauty with this opportunity is that whenever the organic wastes undergo biodegradation the size of waste is greatly condensed which implies that the amount of waste going into landfills is greatly reduced.

2.4.2 Turning waste into raw materials

On top of the above, a lot of emphasis is placed on exhaustive resource utilization which is by far one of the greatest operational and ecological mechanism of managing solid waste and its

associated abstracts. Elkhalifa et al. (2019) observed that this simply means that rather than dumping every aspect of the solid waste into landfills, a considerate proportion of decomposable organic waste is considered as a valuable source of alternative energy for producing power, raw materials for manufacturing other products.

The examples in which solid wastes have been turned into raw materials for making other products or simply reusing them are endless. To start with, Ghuge et al. (2019) reported that polythene bugs and plastics were used for plastic paver block which were designed to be used in the parking yards, footpath and yards of the residential as well as commercial building, and all these are due to the fact that due to their compressive strength is sufficient for the smooth utility of user. Furthermore, Singh (2019) in an Indian study found out that some of the solid wastes products in plastics forms such as plastic bags and bottles were being productively used for the cultivation of plants and vegetables in households. In a more particular circumstances among the youths, the art and practice of making crafts from used car tires and other wastes has been reportedly common, according to Stachowitsch (2019) who elaborately noted that out of waste products, there are many types and models of shoes and sandals made out of old car tire treads.

2.4.3 Use of incentives to encourage waste management

The use of incentives to enhance performance is an historical approach that has been used in different sectors like employment, medicine and others. The philosophy behind providing incentives is that people are rewarded for demonstrating achieving or attaining some positive threshold in a given task. In the context of waste management, provision of incentives has a track record inculcating positive behavioral attitudes towards solid waste collection, separation, reuse and recycling and proper disposals.

Gibovic &Bikfalvi (2021) noted that a virtual reward token was created to inspire recycling of solid waste among families, the model used incentives and awards and was reported to have had enhanced recycling behaviors of families as over 1053 families registered on the scheme just after six weeks of launching the pilot project in Spain. Further, Li, (2020) noted that overtime the system of rewards has been a very useful tool for several authorities not just to enhance the performance solid waste collection service but also it has severally proliferated the degree of recycling among households.

Another evidence from Hong Kong in which the environmental protection department introduced Green Coins smart card with the sole aim to encourage the public to use the community recycling facilities to earn green coins and subsequently exchange them for gift items (Ozili, 2022). Given the nature and magnitude of evidence through literature, it is evident that incentives play a vital role in managing municipal solid waste in a substantial way especially by enhancing the practice of recycling solid waste materials. This is further illustrated by the evidence of Abila and Kantola (2019) in which empirical evidence disclosed that monetary incentives played significant role in achieving waste management goals in Finland.

2.4.4 Use of penalties to manage solid waste

In the face of huge solid waste production and the unwillingness to participate in its management by several individuals, this leads to several governments and local authorities to introduce penalty mechanisms to help manage the vise. These penalties range from warning, doing community service, paying fines to imprisonment. For instance, Wang et al. (2020) argued that an increase in incentives or in penalties invariably increases the probability that waste collectors and recyclers shall willingly participate in the recycling process.

Heavy taxations and subsequent ban on products like plastics and polythene papers that are so very difficult to control and has adverse impacts onto our environment. This method helps in reducing the amounts of solid wastes that would otherwise been produced. According to the findings of Clayton et al. (2021), this fining method was adopted by the Caribbean governments who diagnosed the adverse effects of marine debris on their social and economic well-being and strongly reacted with policies zeroing on total prohibitions of single-use plastic papers. The use of penalties is very important to control illegal solid waste management practices like roadside dumping, open disposals, open burning of solid wastes which in turn possess a significant risk to the environment and human health

2.5 Conclusion and gap in knowledge in literature

The literature review above ably demonstrates that there is huge global challenge in managing solid wastes and the developing countries are even in more problem in dealing with solid waste issues especially at municipal levels. This is in spite of the fact that various measures have been taken to try and lower waste output to providing penalties and incentives. There remains gap

knowledge concerning data collection about waste management, legality and expertise in human resource regarding solid waste management, as such it remains to be seen how these challenges and management mechanism interplay in a community like Mukono central division.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This methodological chapter generally elucidates on the various processes and procedures that were adopted in the pursuit of carrying out this study, and specifically this chapter describes the rationale for the choice and application of the specific procedures in identifying, selecting, and analyzing data in order to gain a better understanding of the research problem. This chapter therefore, encompasses the study design, study population, sampling, data collection methods, data quality control, ethical consideration, data management and analysis, and the plan for dissemination of findings.

3.2 Study Design

Research design refers to the overall strategy that integrates the different components of the study in a coherent and logical way. This research undertaking adopted a descriptive survey research design that was used to gather relevant information from different participants during the research data collection stages. Imran and Yusoff (2015) observed that a descriptive survey research design is a tactic that amalgamates and facilitate both quantitative and qualitative facts with a view of delivering appropriate and truthful information. Further, Tetnowski (2015) commended this method of inquiry because it explores a contemporary phenomenon within its real-life context, as such this design aided the researcher in to investigating some of the complex nature of factors affecting the effectiveness of managing MSW in Mukono central division.

3.3 Research study site

The research was carried out within Mukono central division, located in Mukono district, central Uganda. The study site is located approximately 27 kilometers east of Kampala, Uganda's capital and largest city. According to UBOS (2017) Mukono municipality occupies approximately 31.4 square kilometers of land with an estimated total population of 162,710. Mukono Central Division which comprises of four (4) different wards; Ntawo ward with a total of 9 villages, Ggulu ward with a total of 11 villages, Namumira ward with a total of 12 villages, and Nsuube Kauga ward which has a total of 9 villages, thus totaling to 41 villages as specified above. Mukono central

division houses a number of prominent institutions like hotels residential estates, educational institutions, markets, factories, hospitals all of which are potential source of waste production

3.4 Data collection methods and their tools

The researcher acknowledges the fact that research data collection instruments forms one of the fundamental pillars of the entire research process, it aids in collecting data that are subsequently analyzed to answer the research questions. In this study, questionnaire and interview guides were used to collect data from potential respondents.

3.4.1 Survey and questionnaire

One of the methods used in this study to guide the processes of collecting reliable and meaningful data collection procedure was a survey. A survey in research is often used to evaluate views and beliefs of potential study respondents with the view to gain detailed material information and understandings about the subjects of interest. In order to achieve the purpose of using survey in data collection, the data was generally attained through the use of standardized instrument known as a questionnaire which played a vital role in ensuring validity and reliability of data collected.

In exercising the survey, the researcher used a questionnaire to mainly collect quantitative data. Singh (2017) contended that a questionnaire is data collection tool that comprises of a sequence of research questions that are carefully identified and chosen with the view to solicit for data that will subsequently provide information to answer the research questions. The researcher chose to use structured questionnaire for several reasons including its ability to cover a wide range of area therefore it made it easier to contact as many potential respondents, and most of all according to Conrad and Schober (2008), structured questionnaires are generally standardized instructions for collecting responses with a significant degree of internal validity due to their uniformity in design.

3.4.2 In-depth interview and in-depth interview guide

Another method employed in data collection in this study was interview. Interview is a method of data collection in which an interviewer or researcher interviews potential study respondents. The entire interview process is guided by a sequence of well formulated questions designed to elicit information from study participants on a particular themes and specific topic in the study.

In executing the in-depth interviews, the researcher used an in-depth interview guide which is a data collection instrument mostly used in collecting qualitative data. Harrell and Bradley (2009) noted that in-depth interview guide is a tool that contains a list of series of carefully identified and selected themes or topics which a researcher uses as a general guide for asking question to solicit for answers to answer research questions. The researcher used an unstructured interview guide to solicit for data from key informants which included top administrators at Mukono municipal counsel, Mukono central division and waste collection site managers within Mukono central division jurisdiction.

3.4.3 Observation method and observation checklist

Observation is one of the methods used in research to collect data that could not otherwise be possibly collected by other methods. As such in order to improve on the quality and accuracy of the overall data collected about municipal solid waste in Mukono central division, the researcher also used a non-participant and a structured observation method using an observation checklist as the tool for collecting the data. Hammersley (2018) noted that observation method is a qualitative research method that has been used by the social sciences for several years with high quality and proven quality results. Mohajan (2018) stated that observation data collection method is one of the qualitative methods in which a single or sequence of events is observed from their naturally occurring setting and data is accordingly recorded.

The researcher visited several waste damping points within Mukono central division and performed several observations about the sites, their sizes, how waste was disposed, materials used for gathering the waste and all other parameters necessary to help inform the study. Overall, this method played a vital role in validating the various data gathered through interviews and the survey.

Additionally, the researcher took photographs of waste damping points, the photography was done to enhance the value of evidence in the report with the view to enhance the validity and reliability of the overall study findings.

3.5 Study Population

One of the key elements of in a research undertaking is the understanding and correct identification and description of the study population. Weeks (2020) contended that in research, the study

population is acknowledged as being generally a large collection of individuals or objects that is the main focus of a scientific query. In other words, a research population is the well-defined collection of individuals who possesses some known characteristics which are key to the interest of the researcher. In brief, it is the group of individuals that a researcher wants to draw conclusions about. In this study, the study population constituted all groups of community population that the researcher perceived are capable of producing solid waste that subsequently could end up in the hands of the MMC management. They included household residents, commercial shop owners, Mukono municipal counsel and Mukono central division waste management administrators, and waste site managers and collectors.

3.6 Sampling Technique

3.6.1 Sampling methods

The study adopted a stratified sampling strategy. According to Manna and Mete (2021), stratified sampling method is a sampling technique where study population is first divided into strata usually centered on common traits of the members, subsequently a random selection of participants among the identified groups is performed to create the final sample. The entire idea of stratification was to ensure that the samples selected comprehensively represent the characteristic in the population of study. In this study, the researcher stratified the study population into the various geographical delineation of the four wards of Mukono central division. Secondly, the study variables were categorized according to the study population of interest.

3.6.2 Sample Size determination

The sample size was derived from UBOS (2017) national census report in which Mukono municipality had a total population size of 162,710. Out of this population there are two divisions in Mukono municipality that shares it, Mukono central division that has 41 villages and Goma division that has 38 villages. In terms of percentage, Mukono central division holds 66711 of the total estimated population of 162,710 above. However, the sample size was calculated and determined using a simplified formula provided by Yamane (1970) to come out with the estimated sample frame. The sample size formula provides as follows;

$$n = \frac{N}{1 + N(e)^2}$$

Where:

n = Sample size in the study

N = Population size (estimates 66,711)

e^2 = the level of precision/sampling error (taking $\alpha = 0.05$)

In computing the sample size, a 95% confidence level and level of precision of 5%:

$n=66,711/1+66711\ (0.05)^2$

n=397

Table 2: Guide for sample size determination

Target Groups	**Sample method**	
	Estimated No.	**Sampling method**
Waste collection workers	87	Survey
House hold residents	200	Survey
Commercial shop attendants	100	Survey
Environmental officers	03	Interview
Waste collection managers	07	Interview
Total Number	**397**	

3.7 Variables of study and their indicators

The independent variable was factors affecting effective municipal solid waste management (MSWM). Apuke (2017) suggested that the best way to comprehensively study a variable is by understanding their indicators or attributes, and this in research play a vital role in helping the researcher to restrain their scope of study focusing on important areas. In this study, the indicators attributed to the independent variable by the researcher included; community attitude, availability

of labor force, nature of technology, geographical accessibility, and the dependent variable was Solid waste management practices (SWM). The indicators attributed to the dependent variable included; waste collection, waste storage, waste transportation, waste disposal.

3.8 Quality Control mechanism

The entire idea behind quality data control was to ensure that the tools used for data collection are appropriate, the data collection process is meted with excellent ethical considerations.

3.8.1 Validity

In the process of constructing the data collection tools, the draft tools were shared with the supervisor for perusal to establish and confirmed that the tools were measuring the right parameters upon which data was intended to be collected in the study. After identifying the vague and ambiguous questions, corrections were appropriately made and final instruments prepared.

3.8.2 Reliability

Another element of quality data control was reliability or internal consistency and stability of the data collection instruments. In order to ensure that potential respondents were understanding the questions, a pretest was performed to ensure that there is consistency of respondents' answers to all questions being asked.

3.9 Ethical consideration

The proposed study protocol was submitted to Uganda Christian University Research Ethics Committee (UCUREC) and an approval was obtained.

In the process of enrolling this study, the researcher sort permission for the approval of the proposal by the university supervisor, got introductory letter from the directorate of post graduate studies.

Before gaining entry into the field, the researcher sought clearance from the municipal authority from the office of the town clerk Mukono municipality, and while in the field all potential respondents went through an informed consent processes before participating in the study.

An informed consent was obtained from owners of the premises from where the pictures were taken.

3.10Anticipated methodological constraints and possible way forward

The researcher experienced difficulties in financing the research process including secretarial work and general facilitation of the data collection process and analysis. The researcher used few (2) research assistance, and managed to finance other critical aspects of the research process.

There was a reasonably low response rate in comparison to the projected sample estimated, however the researcher ensured that the sample collected was sufficient to deduce a logical conclusion.

The researcher was aware of the danger of reliance on self-reported information involving the opinions, experience and attitude of the respondents with regards to solid waste management. The researcher endeavored to cross check with the views of other respondents to verify the consistency of data being collected.

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION AND INTERPRETATION

4.1 Introduction

In any research undertaking, presentation and analysis of data forms an integral part of the study without which the entire research loses meaning. Therefore, after a rigorous data collection process, in this chapter the researcher presents the study findings.

4.2 Summary of demographic variable

In the course of data collection, the researcher collected background information about the age of the study respondents, as such table 1 below presents descriptive analysis about the variable age of the study participants who took part in the study.

Table 1: Age of Study Respondents

	Frequency	Percent	C/ Percent
Under 15	8	3.7	3.7
15-19	37	16.9	20.5
20-24	33	15.1	35.6
25-29	60	27.4	63.0
30+	81	37.0	100.0
Total	219	100.0	

Source: Own Primary data from Survey;2022

According to table 1 above, the information presents background information about the age of the study respondents, the findings revealed that 81 (37%) of the respondents were aged 30 years and above, 60 (27.4%) of the respondent aged between 25-29 years, 37 (16.9%) of the respondent were aged between 15-19 years, 33 (15.1%) of the respondent were aged between 220-24 years, and 8 (3.7%) of the respondent were below 15 years of age. Cumulatively, the findings above demonstrate that at least 79.5% of the study participants were aged 20 years and above.

Overall, this means that majority of the respondents were old enough to understand the study survey questions and answer them constructively in regards to their knowledge and experience of

dealing with the various stages and levels of solid waste management within Mukono central division. Furthermore, this suggests that the quality of information collected from mature study participants is ensured.

Table 2: Sex of Study respondents

	Frequency	Percent	C/Percent
Male	132	60.3	60.3
Female	87	39.7	100.0
Total	219	100.0	

Source: Own Primary data from Survey;2022

Table 2 above presents the background information about the variable sex of the study respondents, the findings revealed that 132 (60.3%) of the respondents were male and 87 (39.7%) of the respondent female. This study confirms that both male and female respondent participated in the study, the higher proportion of male at 60.3% were due to the fact that majority of male respondent were those within the shop attendant category.

However, both views and attitude of the male and female respondent were captured in the study which is very important as in most households it's the women heavily engaged in waste management business, the experiences from men in this context is gold.

Table 3: Educational level of study respondent

	Frequency	Percent	C/ Percent
1	37	16.9	16.9
2	37	16.9	33.8
3	67	30.6	64.4
4	47	21.5	85.8
5	31	14.2	100.0
Total	219	100.0	

Source: Own Primary data from Survey;2022

According to table 3 above, 67 (30.6%) of the respondents were those that had secondary education level, 47 (21.5%) of the respondents were those that had university education, 37 (16.9%) of the

respondents had primary education, another 37 (16.9%) of the respondents had no formal education at all and 31 (14.2%) of the respondents had a tertiary education level. In essence, there was a representation of nearly all category of educational status in the community, better still majority (83.1%) of the respondent had some sort of formal education.

The statistics from table 3 above suggests that the study respondents were in better position to appreciate the survey questions and provide a logical response based on their personal knowledge and experiences in waste management.

Table 4: Estimated Amount of Monthly Income in "000" UgShs

	Frequency	Percent	C/ Percent
Below 300000	74	33.8	33.8
300-400	41	18.7	52.5
400-500	27	12.3	64.8
500-1000	42	19.2	84.0
1000 and above	35	16.0	100.0
Total	219	100.0	

Source: Own Primary data from Survey;2022

In the table 4 above revealed that 74 (33.8%) of the study respondents constituted a category of those who earned an estimated monthly income of 300,000 shillings or less, 42 (19.2%) were those that earned an estimated monthly income between 500,000 to 1000,000 and 41 (18.7%) of the respondents were those that earned an estimated monthly income between 300,000 to 400,000 shillings, 27 (12.3%) were those that earned an estimated monthly income between400,000 to 500,000 and 35 (16%) were those that earned an estimated monthly income more than 1000,000.

In a nut shell, all respondents interviewed earned some amo

unt of money within a month's duration which implies that they possess some sort of purchasing power for goods like food staffs and others, thereby drawing an inference of solid waste production.

Table 5: Status (capacity) of Study Respondent

	Frequency	Percent	C/ Percent
Waste collection worker	64	29.2	29.2
Community resident	61	27.9	57.1
Commercial shop attendant	94	42.9	100.0
Total	219	100.0	100.0

Source: Own Primary data from Survey;2022

In table 5 above presents background information about the capacity in which the study respondents participated, the result shows that 94 (42.9%) of the study respondents were commercial shop attendants, followed by 64 (29.2%) of the study respondents who were solid waste collection workers and 61 (27.9%) of the study respondents were community residents. Overall, there was a proportional representation of the three main categories of population who produces the largest amount of solid waste in an urban setting like Mukono central division.

Table 6: Largest content of solid waste generated from own remises

	Frequency	Percent	C/Percent
food and vegetable	75	34.2	34.2
plastics	81	37.0	71.2
papers and boxes	25	11.4	82.6
glasses and hard plastics	21	9.6	92.2
metallic	17	7.8	100.0
Total	219	100.0	

Source: Own Primary data from Survey;2022

The result in table 6 above revealed that majority 81 (37%) of the respondents indicated that plastics constituted the largest content of solid waste generated from their own premises, followed 75 (34.2%) of the respondents who indicated that food and vegetable constituted the largest content of the solid waste generated from their own premises, 25 (11.4%) of the respondents indicated that papers and boxes constituted the largest content of solid waste generated from their own premises, 21 (9.6%) of the respondents indicated that glasses and hard plastics constituted the largest content

of solid waste generated from their own premises and 17 (7.8%) of the respondents indicated that hard metallic constituted the largest content of solid waste generated from their own premises.

In essence the result confirms the variation in contents of solid waste generated with Mukono central division, and the variation in content could be due to the different status (capacity) of the respondents as observed in table 5 above.

Table 7: Place of solid waste storage within own premises

		Frequency	Percent	C/ Percent
	own premises	96	43.8	43.8
	common public premises	75	34.2	78.1
	municipal designated place	48	21.9	100.0
	Total	219	100.0	

Source: Own Primary data from Survey;2022

Table 7 above present findings that was solicited by asking the study respondents where they store solid waste arising from their premises. In response, 96 (43.8%) of the respondents indicated that they temporarily store solid waste within their premises before taking it to municipal designated waste collection point, 75 (34.2%) of the respondents indicated that they take solid waste generated within their premises to common public premises and 48 (21.9%) of the respondents indicated that they take solid waste generated within their premises straight to municipal designated waste collection places.

Figure 1: Pictures showing some of the common waste collection facilities

Source: Own Pictures taken during data collection process;2022

The pictures in figure 1 above demonstrates the nature of solid waste collection materials with the premises of the respondents which were being used by residents (photo on the left side) and shop owners (photo on the right side)

Table 8: Duration of solid waste storage within own premises

	Frequency	Percent	C/ Percent
within 1 day	35	16.0	16.0
1-2 days	53	24.2	40.2
2-3 days	54	24.7	64.8
3-4 days	37	16.9	81.7
4-5 days	40	18.3	100.0
Total	219	100.0	

Source: Own Primary data from Survey;2022

The results in the table above were solicited from respondents when they were asked to disclose the number of days they store generated solid waste within their own premises, in response 54 (24.7%) of the respondents indicated that they store generated solid waste within their premises for about 2 to 3 days before disposing it away from own premises, 53 (24.2%) of the respondents indicated that they store generated solid waste within their premises for about 1 to 2 days before disposing it away from own premises, 40 (18.3%) of the respondents indicated that they store generated solid waste within their premises for about 4 to 5 days before disposing it away from own premises, 37 (16.9%) of the respondents indicated that they store generated solid waste within their premises for about 3 to 4 days before disposing it away from own premises and 35 (16%) of the respondents indicated that they store generated solid waste within their premises for about 1 day before disposing it away from own premises.

In general, at least 64.9% of the respondents indicated that they can't store solid waste within their premises for a period exceeding 3 days before they can finally dispose it out of their premises. This could be due to lack of space and facilities for practicing proper solid waste management at waste generation points.

4.3 Solid waste management practices in Mukono central division

In regards to the first specific objective which was to describe the various solid waste management practices in Mukono central division, data was collected by way of field observation, survey and interview mostly with residents and shop owners.

Through observation, the researcher noted that most parts of Mukono central division is densely populated in terms of commercial businesses and human settlement. Some of the densely populated areas noted included Mukono industrial area, Wantony, Kiko market, Bugujju, Kauga and their outskirts. These densely populated areas harbor a lot of business; for instance, in Mukono industrial area where there are heavy vehicle repairs, wood works, carpentry and several factories for animal and chicken's feeds and grain's flour. These businesses in turns facilitates heavy production of unwanted products that requires disposals.

In most urban and busy areas of Mukono central division, there were observable practices of open dumping of solid wastes. The researcher observed huge hips of solid wastes dumped on open grounds with no collection facilities within the premises of residents or business owners. In some cases, solid wastes were dumped behind toilets or unused lands located within the industrial areas. the researcher also noticed that the occupiers of business premises in those areas were practicing open burning method as a way of dealing with over accumulated solid wastes.

Figure 2: Pictures showing open damping within the study sites

Source: Own Pictures taken during data collection process;2022

In the figure 2 above is among the few examples of open damping in which residents and business communities damp solid waste behind toilets (first picture from left), other damp solid waste materials within their premises along major road sides (picture in the center) and others damp in un used or abandoned places (last picture from left)

The researcher also visited some institutions to observe how they were collecting and disposing solid waste products. Some of the institutions visited were Namirembe church of Uganda hospital, Mukono health center IV, Uganda Christian University, Collins hotel and some few others, also places like residential rental apartments and hostels were visited. The observational findings disclosed that surprisingly some of the institutions had excellent solid waste management practices. For example, Uganda Christian University had dust bins located nearly every 80 to 100 meters a part on the entire campus environment, there were at least three observed dust bins placed per every solid waste collection point and the dust bins were emptied at least twice a week by solid waste collectors who transported the wastes for disposals.

Figure 3: Showing Waste collection equipment within Institutions

Source: Own Pictures taken during data collection process;2022

The pictures in figure 3 above represents some of the equipment used for collecting solid waste within the ambit of institutions. For instance, at Uganda Christian University, the researcher found most of solid waste collection equipment empty and clean implying that the waste is frequently emptied, but to the surprise of the researcher it was severally observed that in most institutions like schools and hospitals, solid waste collection materials were considerately more in numbers;

at UCU the garbage collection equipment are placed nearly 100 meters apart throughout the campus premises especially along pathways and buildings.

At household level, the researcher observed that most privately owned households, hostels and residential rental premises mostly used plastic bags, broken tins and basins for gathering waste generated within their premises. In some of the homes, shallow landfills that rapidly filled up were observed dug behind the houses usually next to toilets and residents do not practice waste separation and prefer to burn the waste products when they become too much. Due to scarcity in lands were to dump solid waste, most residents opt to through solid waste along road sides and in the gutters, this practice is very common on access roads and foot paths as opposed to major roads.

Figure 4: Showing waste collection points and equipment at household levels

Source: Own Pictures taken during data collection process;2022

The pictures in figure 4 above represents the nature of the commonest waste collection materials within household homesteads. Some of the pictures are as indicated in figure 1 above. It was further observed that a considerate proportion of households and shop owners did not have a place or the facilities for storing solid waste within their premises, others opened small landfills which were visibly excessively field up; in essence majority of the places visited for observation data collection had facilities similar in nature with those reported in the picture in figure 4 above.

4.4 Factors affecting effective solid waste management practices in Mukono central division

The result presented under the thematic area factors that affects solid waste management in Mukono central division, the study respondents were asked to respond statements that depicted factors that affect solid waste collection; specific attention was made towards the modernity of solid waste collection equipment, attractiveness of the business venture, accessibility of waste collection points and whether residence fancy good solid waste management practices.

Table 9: Statistics on factors affecting effective Solid Waste Management

	Modern equipment	Waste collection not attractive	Collection points accessible	Waste collectors are well paid	Good practice attitudes
Mode	2.00	2.00	2.00	4.00	2.00
Minimum	1.00	1.00	1.00	1.00	1.00
Maximum	5.00	5.00	5.00	5.00	4.00

Source: Own Primary data from Survey;2022

Table 9 above presents study findings on factors that affect effective solid waste management practices in Mukono municipality, in summary majority of the respondent agreed (mode: 2.00) to the fact that there are no modern solid waste collection vehicles within Mukono central division, solid waste collection service is not an attractive business (mode: 2.00) for a large section of the community, that solid waste collection points are accessible (mode: 2.00) by solid waste collection vehicles, but disagreed (mode: 4.00) with the fact that solid waste collection workers are well paid and finally majority of the respondents agreed to the fact that household and residence members within Mukono central division have positive attitude (mode: 2.00) towards good practice of solid waste collection practices

Table 10: Availability of Modern Solid waste collection Equipment

		Frequency	Percent	C/ Percent
	Strongly agree	62	28.3	28.3
	Agree	94	42.9	71.2
	Neutral	17	7.8	79.0
	Disagree	44	20.1	99.1

	Strongly disagree	2	.9	100.0
	Total	219	100.0	

Source: Own Primary data from Survey;2022

In reference to table 10 above, the researcher presents the facts as to whether there is no adequate and modern solid waste management equipment within Mukono central division, in response 94 (42.9%) of the study respondents agreed, and 62 (28.3%) strongly agreed to the fact that there are no modern solid waste collection vehicles within Mukono central division, 44 (20.1%) disagreed with 2 (9%) strongly disagreed to the above fact whereas 17 (7.8%) had a neutral response to the above fact posed to them.

Overall, the findings suggest that residence of Mukono central division for some reasons do not know have modern solid waste collection equipment accessing their premises to collect solid wastes.

Table 11: The non-attractiveness in solid Waste collection business

		Frequency	Percent	C/ Percent
	Strongly agree	49	22.4	22.4
	Agree	99	45.2	67.6
	Neutral	13	5.9	73.5
	Disagree	36	16.4	90.0
	Strongly disagree	22	10.0	100.0
	Total	219	100.0	

Source: Own Primary data from Survey;2022

The table 11 above presents findings as to whether solid waste collection business is not an attractive venture for most residency of Mukono central division. According to the table above (45.2%) of the study respondents agreed, and 49 (22.4%) strongly agreed to the fact that solid waste collection business is not an attractive venture for most residency of Mukono central division, 36 (16.4%) and 22 (10%) of the respondents accordingly disagreed and strongly disagreed to the above stated fact. The non-attractiveness of solid waste collection business was attributed to the fact that waste collection is jobs for people who are not mentally sound or those who are considered outcast in the communities.

Table 12: Accessibility of Solid Waste Collection points

		Frequency	Percent	C/ Percent
	Strongly agree	33	15.1	15.1
	Agree	104	47.5	62.6
	Neutral	8	3.7	66.2
	Disagree	45	20.5	86.8
	Strongly disagree	29	13.2	100.0
	Total	219	100.0	100.0

Source: Own Primary data from Survey;2022

In regards to table 12 above, the study respondents were asked to give their opinions by rating whether solid waste collection points are easily accessible by solid waste collectors especially with their vehicles. In response 104 (47.5%) agreed and 33 (15.1%) strongly agreed to the fact that solid waste collection points were accessible by solid waste collection vehicles. Further 45 (20.5%) disagreed and 29 (13.2%) strongly disagreed to the above fact posed to them.

The researcher also observed that it was mostly shop owners and some residents who whom waste collection vehicles easily accessed their premises to pick solid waste. Despite the mixed reaction from the study respondents, it is generally concluded that most waste damping premises were accessible by waste collecting vehicles.

Figure 5: Waste damping points located in places difficult to access by waste collectors

Source: Own Pictures taken during data collection process;2022

The pictures in figure 5 above were taken behind Mukono central taxi park located in the heart of Mukono central division and is one of the busiest areas. The place houses a beehive of activities including car repairs, bars, restaurants, shops and residence; What was surprising to observe is the fact that solid and liquid waste were observed littered on the pathways, compounds, and trenches. Behind toilets and small empty spots were filled with piles of waste products that in reality are just in accessible by waste collection tracks, as a result the residence burns the wastes when it becomes too much. It is not known how they manage to survive in those dirty areas without an outbreak of public health diseases.

Table 13: Household attitudes towards good Solid waste management

	Frequency	Percent	C/ Percent
Strongly agree	76	34.7	34.7
Agree	128	58.4	93.2
Neutral	10	4.6	97.7
Disagree	5	2.3	100.0
Total	219	100.0	

Source: Own Primary data from Survey;2022

In regards to table 13 above, the respondents were asked to give their opinions by rating whether residents, shop owners and households have positive attitude towards good practice of solid waste

management. In response 128 (58.4%) agreed and 76 (34.7%) strongly agreed to the fact that residents have positive attitude towards good practice of solid waste management. Furthermore, only 5 (2.3%) disagreed to the fact above. Positive practices include willingness to prevent, minimize, store, reuse and properly dispose solid waste by collecting the waste in a manner that makes them not litter the environment.

4.5 Challenges faced in managing solid waste in Mukono central division

Table 14: Statistics on challenges in managing solid waste in Mukono central division

	Many people involve	Littering waste anywhere	Poor work condition	Municipal lacks policy	Promotion programs
Mode	4.00	2.00	2.00	2.00	2.00
Minimum	1.00	1.00	1.00	1.00	1.00
Maximum	5.00	5.00	5.00	5.00	5.00

Source: Own Primary data from Survey;2022

Table 14 above presents study findings on challenges faced in managing solid waste management in Mukono central division, in summary majority of the respondent disagreed (4.00) with the fact that there are many people involved in the business of collecting solid waste in Mukono central division, whereas majority (2.00) of the respondents agreed to the fact that there is improper and careless dumping of solid waste, that Mukono central division lacks legislative and policy frame work governing solid waste management and that Mukono central division authority should carry out promotion programs on solid waste management within Mukono central division.

Table 15: Improper and careless dumping of Solid Waste

		Frequency	Percent	C/ Percent
	Strongly agree	38	17.4	17.4
	Agree	90	41.1	58.4
	Neutral	11	5.0	63.5
	Disagree	66	30.1	93.6
	Strongly disagree	14	6.4	100.0

Total	219	100.0	

Source: Own Primary data from Survey;2022

Table 15 above presents study finding from participants concerning whether there was improper and careless dumping of solid waste within Mukono municipality. In response, 90 (41%) agreed and 38 (17.4%) of the respondents strongly agreed to the above stated fact. In contrast, 66 (30.1%) disagreed and 14 (6.4%) strongly disagreed accordingly. The large proportion of the agreement is a clear indication that solid waste is generally littered in the communities around Mukono central division.

Figure 6: Careless damping, littered Solid Waste within Mukono central division

Source: Own Pictures taken during data collection process;2022

The pictures in figure 6 above were taken mainly along major feeder and access roads within Mukono central division, the researcher observed a common phenomenon that solid waste products, mostly plastics; bags, sacks, bottles and children's pumpers among other kitchen refuse were notably observed along the roadsides. However, majority of such kind of open and careless damping were more common in areas located within the outskirts of the central trading area of Mukono central division.

Table 16: Working Condition of Solid Waste Collectors

	Frequency	Percent	C/ Percent
Strongly agree	58	26.5	26.5

	Agree	108	49.3	75.8
	Neutral	6	2.7	78.5
	Disagree	37	16.9	95.4
	Strongly disagree	10	4.6	100.0
	Total	219	100.0	

Source: Own Primary data from Survey;2022

Table 16 above presents findings on whether solid waste collectors within Mukono central division experiences poor working conditions, in response 108 (49.3%) of the respondents agreed and 58 (26.5%) strongly agreed to the fact that solid waste collectors have poor working conditions, however 37 (16.9%) disagreed and 19 (4.6%) strongly disagreed to the above stated fact.

It's important to emphasis the fact that a large proportion of those that constituted the disagreement category were largely the waste collection workers themselves who refuted the fact that there working condition is that bad reasoning that work environments differs according to what one does.

4.6 Available opportunities for effectively managing solid waste in Mukono central division

Table 17: Statistics on availability of Solid Waste management in Mukono Central Division

	Sensitization on benefit	There is urgent need for laws	Education program	Recycling programs	Incentives to Waste collectors	Household waste separation
Mode	2.00	2.00	2.00	2.00	1.00	2.00
Minimum	1.00	1.00	1.00	1.00	1.00	1.00
Maximum	3.00	15.00	5.00	2.00	2.00	4.00

Source: Own Primary data from Survey;2022

Table 17 above contains findings on the available opportunities on how the division authority can capitalize on for managing solid waste. In summary, majority of the respondent agreed (2.00) to the fact that Mukono central division should periodically sensitize the community on the benefit of waste management by running periodic campaign program on solid waste management practices.

In regards to the urgency of the law, majority agreed (2.00) to the fact that the division urgently needs to create a bylaw to aid solid waste management practices by providing for strong penalties for those that do not adhere to the legal directives on municipal waste management practices.

In regards to incentives, majority of the respondents agreed (2.00) to the fact that Mukono central division authority should reward solid waste collectors (including companies) by awarding them some sort of incentives.

On top of the above findings, it was also pointed out that the authority should invest in mass compost technology to help deal with the ever-increasing issue of waste production. In essence legalization and provision of incentives were the most proposed opportunities that the respondents indicated would help in the waste management within the division.

Table 18: The relationship between factors affecting solid waste management and the management practices in Mukono central division

		Influential factors of solid waste	Municipal management practices
Influential factors of solid waste	Pearson Correlation	1.000	.655**
	Sig. (2-tailed)		.000
Municipal management practices	Pearson Correlation	.655**	1.000
	Sig. (2-tailed)	.000	
**. Correlation is significant at the 0.01 level (2-tailed).			

Source: Primary Data, 2022

According to results presented in table 18 above about the relationship between factors affecting solid waste management and the existing management practice of solid waste, the finding revealed that there is positive significant relationship ($r=.655$, $p<0.01$) between the two variables under the Pearson correlation model test. This means that a unit increase in factors affecting solid waste management invariably causes a proportionate increase in the existing solid waste management practice in Mukono central division. In terms of policy action design, this finding suggests that if all the factors that affect sustainable solid waste management in Mukono central division is properly managed, it will habitually translate into general proper solid waste management in Mukono central division jurisdiction.

Table 19: The relationship between challenges of managing Solid Waste and the Management practices in Mukono central division authorities

		Challenges of managing solid waste	Management by municipality
Challenges of managing solid waste	Pearson Correlation	1.000	.634**
	Sig. (2-tailed)		.000
Management by municipality	Pearson Correlation	.634**	1.000
	Sig. (2-tailed)	.000	
**. Correlation is significant at the 0.01 level (2-tailed).			

Source: Primary Data, 2022

According to results presented in table 19 above about the relationship between challenges faced in managing solid waste and the existing management practice of solid waste in Mukono central division, the finding revealed that there is positive significant relationship ($r=.634$, $p<0.01$) between the two variables under the Pearson correlation model test. This means that a unit increase in challenges of managing solid waste invariably causes a proportionate increase in the existing solid waste management practice in Mukono central division.

To interpret this in policy terms, means that this finding suggests that if all the challenges of managing solid waste in Mukono central division is properly managed, it will habitually translate into general proper solid waste management in Mukono central division jurisdiction.

CHAPTER FIVE

SUMMARY OF FINDINGS AND DISCUSSIONS

5.1 Introduction

This chapter of the research presents summary of key findings in relation to the study objectives, the summary of findings is comprehensively discussed using a comparative analysis model with other study findings in various and several jurisdictions but on the same thematic area around municipal solid waste management.

5.2 The various solid waste management practices in Mukono central division

The study data collection tools gathered some background information about the study respondents which are key in informing the study. In this regard, some of the background information revealed the following vital information.

5.2.1 Content of solid waste

In reference to result in table 6 above, it is shown that plastics constituted the largest content of solid waste generated from their own premises, and this was followed by kitchen refuse inform of food remains and vegetables, and finally papers and boxes. This finding is consistent with the revelation of Chen et al. (2021) in which it was disclosed that plastic constitutes the third highest waste source globally. In particular, the study above pointed out that since 2017 Malaysia has been the world's largest importer of plastic waste. Furthermore, Khair et al. (2019) unveiled that of the total weight of wastes produced by households, organic waste constituted the largest segment, followed by plastics and paper among other materials.

In Mukono central division, the commonest materials used for carrying goods from markets and shops is the polythene bags commonly referred to as *Kavera* or *Buvera* made in different sizes, colors and strength, on top of that literally all imported goods like shoes, bags, clothes, bags, electronics and kitchen wares comes wrapped with *Kaveras*. In contrast, Babayemi et al. (2019) analyzed data from 33 African countries and found out that the continent imported about 86.14 Mt of polymers in primary form and 31.5 Mt of plastic products both valued at $285 billion between 1990 and 2017. This provides a convincing explanation as to why *Kavera* and plastic bottles constitute the largest component of wastes.

5.2.2 Solid waste storage

In reference to result in table 7 above, it was demonstrated that residents temporarily store solid waste within their premises before finally taking it to municipal designated waste collection points. In contrast, Nanda and Berruti (2021) found that land filling for solid waste disposal is preferred in many municipalities especially in developing countries. The study further acknowledges that most households dig small pits around their homes to act as landfills for collecting solid waste.

Further findings in Mukono central division revealed that a considerate number of locals opt take their solid waste straight to common public premises. This is largely due to the fact that the locals did not have the space within their premises from which they can keep their generated solid waste for some time before finally disposing the wastes to a designated division waste collection point. In contrast, Alhassan et al. (2020) was suggested that to win the 'garbage war', it is a very vital requirement that local authorities design, implement and promote household source separation for suitable waste management.

5.2.3 Duration of waste storage

The study finding revealed that majority of the respondents indicated that they store generated solid waste within their premises for about 2 to 3 days and followed by those that reported storing waste for about 1 to 2 days before disposing it away from their own premises. It is important to emphasize the fact that there are cases in which residence stores solid wastes for over a week before finally disposing them off their premises. The above finding is consistent with the evidence of Odonkor et al. (2020) in which it was revealed that majority of the households stored wastes longer in their premises before dumping them out because the distance to the nearest municipal waste dumping sites were far away from their residency. Conversely, other studies including Adzawla, et al. (2019) and Tweneboah et al. (2020) demonstrated that most households especially those situated within urban areas and slum locations collected and dumped solid wastes in a very indiscriminate manner.

The reasons explaining the above observed behavioral practice of careless dumping of solid wastes is due to the fact that most of the households also do not have space where they can temporarily store solid wastes emanating from their homes. As such, the population has no option but to engage in illegal dumping due to the fact that waste collection points are located far away and they don't

have spaces at their homes. The above position was further noted by Schenck et al. (2021) were they found that indiscriminate dumping in Fisantekraal was as a result of having a dump site that got field up quickly despite the community efforts to clean up each month.

5.2.4 Open solid waste dumping

It's a very common phenomenon in most municipalities and trading centers to observe a situation in which solid wastes are carelessly and improperly disposed. It is not surprising that this study revealed that residents in Mukono central division commonly practiced open dumping of solid wastes; this was evidenced by the several heaps and piles of solid wastes that the researcher observed lying on open grounds. The above finding is consistent with Sharma and Jain (2020) in which it was found that crude open dumping without any sort of pre-treatment was common in Ethiopia. Further, in some places within Mukono central division the researcher observed that solid wastes were dumped in hidden places like behind toilets or abandoned lands.

These unfortunate scenes in which residents unreasonably dumped and piled kitchen refuse and other waste materials behind there toilets were more prevalent in densely populated areas for instance around Mukono industrial areas and trade centers. Unsurprisingly, this study finding is consistent with Teshome (2021) in which it was described waste management system into 3 I's (Irregular, inadequate, and inefficient); he further expounded that the 3 I's denote sporadic and inconsistent collection, low coverage, technical frailties, and lack of enforcement of laws, respectively. Without contradictions, the above enlisted factors play a huge role in enabling careless dumbing as was found in this study.

The researcher also noticed the common practice of open burning method as a way of dealing with over accumulated solid wastes. It must be emphasized that open burning of solid wastes was also observed in institutions like hospitals and schools; in the institutions, there is an element of controlled waste burning not as among residents and shop owners who uncontrollably burned their waste products. The above finding is consistent with what Ramadan et al. (2022) observed, he expressed concerns over open burning of solid waste by stating that environmental risks and emission factors related to open burning incidents at the landfill or residential level are highly dangerous to humans.

5.3 Factors affecting effective solid waste collection in Mukono central division

This section presents and discusses some of the associated factors that affects the effective solid waste management practices in Mukono central division.

5.3.1 No modern solid waste collection vehicles

The study findings presented in table 9 in chapter four above, disclosed that Mukono central division doesn't have any modern solid waste collection vehicles. The senior environmental officer of Mukono Municipality indicated that Mukono central division (MCD) by itself doesn't have any waste collection vehicles but they use the tractors from the municipal council. Further, it was revealed that the vehicles used by MCD to collect wastes are of a type that is not specifically designed for waste collection. Sadly, it revealed that the waste collection vehicles in use breakdown more frequently and some of them are out of service due to high cost of repairs.

The study finding above is consistent with Mir et al. (2021) in which it was observed that in municipal waste management, administrative constraints such as lack of modern technology and equipment occasions hindrances to the successful implementation. Similarly, the evidence of Aluma and Amani (2021) concluded that poor road networks to waste collection points and final disposal site, coupled with mechanical problems with the waste collection vehicles (lorry) were among some of the pressing problems associated with waste transportation. In a nutshell, the above discussed challenge makes the bad waste management challenge even worse.

5.3.2 Solid Waste Collection not an attractive Job

On the issue concerning the nature of waste collection job, study respondents revealed that solid waste collection service is not an attractive business to majority of the community members of Mukono central division. This partly explains why the number of people involved in waste collection business or services is very few, this inversely creates a huge workload to the few laborers since the area of coverage is wide with huge heaps of several illegal waste littered. In contrast, Lissah et al. (2020) found out that the undesirable community opinions about domestic waste collector's job negatively played a key role in discouraging the communities from joining the work and business of solid waste collection.

5.3.3 Solid Waste collection points not accessible by vehicles

One of the profound issues that hugely affect an effective management of solid waste management in Mukono central division is the accessibility of waste dumping points. The senior environmental officer of Mukono municipality disclosed in an interview that waste collection vehicles from Mukono municipal have weekly scheduled route that they travel along transporting solid waste, it was reported that sometimes the vehicles could take 2-3 weeks without having repeated a route of travel. This implies that waste would stay uncollected for a longer duration.

It was further revealed that since there are very few designated waste collection points within the study area, residents dumped waste in places that are hidden and practically very inaccessible by the waste collection vehicles. In such a situation waste collecting vehicles parks at a distance and households are tasked to carry their waste to the vehicle, it was further cited that sometimes the waste collectors charge residents for carrying their wastes to the vehicle. In contrast, according to Ibáñez-Forés et al. (2019), public waste collectors charged residents some amount of money depending on their locations for carrying their waste to the waste collection vehicles.

5.3.4 Residence Lacks Knowledge on good Solid Waste Collection Practices

One thing that stands out as a pertinent component of human existence is knowledge of and about things, in fact religiously speaking, Nwanze (2020) while reflecting on the biblical phrase in Hosea 4:6 strongly emphasizes the significance of knowledge that without it we humans perish. In the same spirit, lack of knowledge about proper management of garbage or about the danger of improperly disposing solid waste directly informs the human attitude concerning whether or not they should pay attention to properly managing the waste in their midst.

In regards to the above study findings, majority of the respondents demonstrated good knowledge about the danger of improper solid waste disposal as considerate number of them reported experiences unpleasant odor from rotten improperly dumped solid waste and express fear of contracting diseases. Surprisingly, the residents displayed utmost ignorance as far as proper waste management from within their premises is concerned, some of them indicated that they do not have space for storing the wastes and others insinuated that they can’t afford buying the waste management facilities. In contrast, Oducado and Montaño (2021) demonstrated that even health care providers had poor knowledge regarding common and biomedical waste management though they indicated having affirmative assertiveness toward the same.

5.4The challenges faced in managing solid waste in Mukono Central division

Across the world, the problem related to un collected municipal solid wastes has been strongly linked to the challenges that municipal authorities, private companies providing waste management and other stakeholders face. Below is a presentation and discussions of some of the identified challenges that Mukono central division faces in their attempt to deal with the huge production of solid wastes within its jurisdiction.

5.4.1 Few people involved in solid waste collection

One of the identified challenges has to do with the population of human resource working to deal with solid wastes in Mukono central division. The quality of human resource is very vital for planning and execution of waste management strategies, as such planners, researchers, waste collection managers and the real waste collectors. Despite of the fact that the senior environmental officer of Mukono municipal council indicated that there is shortage of trained and skilled human resource in waste management, the surveyed respondents disclosed that generally people are relaxed to take waste management as their jobs reasoning that it's a job meant for dirty, mental unsound and drag addicts. Some of the study respondents indicated that the work environment surrounding solid waste collection is very risky as workers undertook their jobs without any protective gears. The above finding is consistent to Lissah et al. (2020) in which it was concluded that adverse public discernments about domestic waste collectors were reported to negatively influence work related stress, job satisfaction and job attraction of both the public and waste collectors themselves.

5.4.2 Improper and careless dumping of solid waste

The study findings revealed that there is rampant solid waste littered within the Mukono central division. Shop owners dumped solid wastes in front of their shops, and those located along major roads dumped the wastes into the gutters or simply placed them at the road sides. According to Serge and Simatele (2020), municipal residents tend to illegally dump solid waste because there are weak or no legislative framework governing the management of solid waste, the authors further stressed that weak implementation of existing laws plays a major role in frustrating sustainable waste management within a municipality. In agreement with the above study findings, the management at Mukono central division disclosed that they have a bylaw which is in pipeline yet to be promulgated. In contrast, the residents of Mukono central division indicated that part of the

problem of failed waste management has to do with the fact that solid waste collection points are very few and are located far away from most people.

5.4.3 Insufficient funding

In any project undertaking, the availability of funds is the fuel that drives effective waste management or inversely the lack of it leads to disastrous and failed management of solid waste management whether by a private company or public corporation. Interview with top management at Mukono central division authority disclosed that generally there is low funding from municipal and central government for the purposes of dealing with waste management, they explained that the services of private companies became key in as far as waste management is concerned. Generally speaking, finance is needed in all aspects of waste management; for instance, money for paying workers, buying waste collection equipment, buying and maintaining waste collection vehicles among other things. This finding can be contrasted with Fernando (2019) in which it was discovered that remuneration and the motivation of waste collection staffs are very vital as they significantly affected the successful implementation of the SWM program.

5.4.4 Technical capacity

In a key informant interview with senior environmental officer and other top managers within the division, they decried of a huge gap in technical support for the municipal waste management. For instance, they indicated that they face huge challenges in accurately collecting data about the nature and magnitude of solid waste generated within Mukono municipality and central division specifically. The lack of accurate data on waste production alone makes planning a very frustrating tasks to undertake. Mir et al. (2021) concluded that the lack of technical expertise to deal with the various issues of waste collection is the beginning of its frustration. This technical expertise is required in human resource as well as the ability to lobby for grants and partnership in order to attract experts in the business of municipal solid waste management.

5.5 Existing opportunities for managing solid waste in Mukono municipality

The common saying that necessity is the mother of invention sounds refreshingly true and appealing to the business of managing the overburdened sector of municipal solid waste management. As such this section presents and discusses the possibly existing opportunities that

Mukono central division authority can capitalize on with the view to embark on sustainable solid waste management.

One of the opportunities suggested by study respondents includes the urge for the central division to engage in a massive and periodic sensitization of the community on the benefit of waste management. As observed in this study, luck of knowledge about the benefits of proper solid waste management among the locals was cited as part of the challenges hindering the effectiveness of waste collection within Mukono Municipality.

Secondly, through the sensitization programs cited above the study population suggested that Mukono central division authority should venture in to solid waste preventive measures like source reduction, this in a way will play a great role in minimizing the quantity of solid waste materials that would otherwise end up littered in illegal disposition

Thirdly, the study respondents suggested that residents within the division must be taught and educated in solid waste separation practices. This mechanism plays a key role in determining what type of waste can be recycled, reuse, decomposed or carefully disposed of. On top of the above, it was further suggested that the division authority must endeavor to provide or encourage the population to have storage facilities at households in order to make waste collection and storage possible and easier.

One of the challenges cited facing Mukono municipality and central division in solid waste management was the absence of a strong and comprehensive legal and regulatory framework on waste management. As such there is an urgent need to speed up the process of creating the existing proposed by-law; the legal aspects should contain very tough penalties for those engage in poor waste management or those that ignore the regulatory directives in waste management. Inversely, the law should also provide for a very lenient and attractive incentives to encourage the population to engage in the business of scientific solid waste management within the jurisdiction of Mukono central division. The above findings correlate with Azevedo et al. (2021) in which the authors highlighted practical answers based on the three pillars of the German solid WM system, thus; clear laws, regular public campaigns, and fee methodology. On top of the above, the implementation strategy of exercising the above legislative directives must be sound.

5.6 Conclusion

In a nutshell, it is evident from the discussion above that Mukono central division just like other urban settlement areas globally is marred with huge difficulties in dealing with the ever increasing solid waste production rate in the area. It is noted therefore, that the concerned authority must heavily respond both legally and policy wise to come out and deal with solid waste management in Mukono central division comprehensively.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

In this introductory section of the last chapter to this study, the researcher presents some of the key study findings upon which conclusions are made. Importantly, the associated recommendations are drawn from the summary of the study which shall be presented based on the specific study objectives in a chronological order.

6.2 General Conclusions

6.2.1 Description of solid waste management practices

In regards to the first specific objective which was to describe the various solid waste management practices within the jurisdiction of Mukono central division. Summarily, the findings from selected the background information disclosed the following;

That common nature of solid waste produced by residents and shop owners in Mukono central division largely constituted of plastic material like *Kaveras*, bottles and box papers. This reason for this finding is founded in the facts that most goods in shops are imported products that comes fully wrapped in box papers, *Kavera* or both. On top of the above, from the shops goods are mostly parked in small paper bags known as the *kavera* which invariable ends up in homes of residents, thus becomes waste material.

It was also disclosed that residents and shop owners temporarily store solid waste within their premises before finally taking it to municipal designated waste collection points. The general observations that most of the shops and households do not have strong and sizable waste collection facilities within their premises, worse of all the settlement patterns in a very populated urban area like Mukono central division presupposes that there is limited space where solid wastes materials can be stored and thus they end up dumping on the roadsides.

One of the prominent municipal waste management methods in Mukono central division was reportedly the act of open dumping of solid wastes and open burning. In modern and scientific solid waste management practices, both of those two practices are considered as an illegality both

under international and national legislations. However, given the fact that Mukono municipality under whose jurisdiction Mukono central division falls doesn't have a bylaw or any legal framework to facilitate the effective management of municipal solid waste.

6.2.2 Factors that affect solid waste management

In reference to the second specific objective which was to examine the associated factors that negatively affects the effective solid waste management practices in Mukono central division, it was revealed as follows;

Firstly, that Mukono central division as an autonomous body doesn't have any modern solid waste collection vehicles, instead the waste collection vehicles belong to the municipality that assigns the vehicles to work in the various geographical delineation of Mukono district. Further, most of the available vehicles are those that performs multipurpose tasks like the tractors and lorry tippers but not necessarily specifically designed vehicles for waste collection. Given the scarce number of available vehicles for collecting solid waste as reported, it is very possible that they are over worked and breakdown so easily. This in essence makes the service provision of waste collection within the division quite hectic given the fact that the vehicles are very expensive to maintain in terms of repairs and fueling.

Secondly, generally the study disclosed that residents and shop owners consider solid waste collection service as not being not an attractive venture. Ideally the category of those engage in these jobs, especially the casual workers are male youths who apparently are illiterates with no or very little formal education. Other than fewer people getting involved in solid waste collection jobs, other factors like the in accessibility of waste dumping points also affects waste collection services in Mukono central division, this is partly because the division authority did not allocate and distribute sufficient number of waste collection points where people could easily walk to properly dispose of waste products.

Thirdly, part of the sicknesses that makes solid waste management very difficult within Mukono central division is the fact that majority of the population do not have good knowledge about proper waste management methods despite the fact that they presented positive attitudes towards proper solid waste management. This particular element of knowledge is very vital as it creates awareness about the dangers of illegal and careless waste dumping methods.

6.2.3 Challenges faced by the division authority in managing solid waste

In respects to the third specific objective which was to analyze the various challenges faced by the division authority in managing solid waste in Mukono central division, in response findings disclosed the following;

That there are very few people in the job market of working in solid waste management. This is partly because educated populations especially the youths do not want to engage in jobs that they consider as dirty color jobs, and secondly the general perception of the population especially about solid waste collectors is very negative and discouraging. Such a negative attitude by the community towards waste collectors discourages even those that would have easily join the job market but also induces stress to those in the waste collection jobs.

Household residents openly dumped solid waste in hidden corners of their compounds whereas shop owners dumped their solid wastes in front of their shops or along major roads passing through their shops. The practice of open dumping and open burning has a series of environmental and human health consequences, ultimately such attitudes can easily be controlled by enacting laws with strong penalties while ensuring their successful implementations. Align to the above, Mukono central division suffers from insufficiency funds meant for facilitating smooth management of waste management processes including implementations of the bylaws mentioned above. As a possible way forwards, the authority has to aggressively get involved in the business of outsourcing solid waste collection contracts but also engage in collaborative acts of grant writings that can end up in providing a huge financial base for furling effective solid waste collection.

Regarding the challenges associated with the shortages in technical human capital for managing municipal solid waste in Mukono central division, it is important to reemphasize the fact that human capital is extremely very key in any administrative undertaking. As such it's imperative upon the division authority to ensure that they deploy sufficient man power whether outsourced or otherwise to support in the responsibilities like among other specialties; solid waste data collection, management and analysis; these are very key attributes of strategic planning which act as a blue print for effective waste management.

6.2.4 The existing opportunities for effective solid waste management

Regarding the fourth specific objective of this study which was to identify some of the existing opportunities that the division authority can capitalize to effectively manage solid waste, in response study respondents suggested a number of viable opportunities as seen below;

That Mukono central division should interest itself massive and periodic sensitization of the community on the benefits of proper solid waste management practices and the dangers of improper solid waste management practices. The idea behind this strategy is to ensure that waste is maximally managed in such a way that our environments remain safe and secure from disastrous effects of improper solid waste management. Secondly, the above noted strategy has been proved to have had a great role in minimizing the quantity of solid waste materials that would otherwise end up littered in illegal disposition, and finally the opportunity to establish strong legislative framework in which those that will violate the spirit of good solid waste management practices get themselves severely punished, and on the other hand the policies should provide for encouraging incentives that can attract householders and shop owners to engage in proper solid waste management practices.

6.3 Study recommendations

In this subsection, the researcher provides very insightful recommendations that Mukono municipality together with Mukono central division could adopt in order to help in dealing with the serious problems of solid waste management. Important to emphasize is the fact that these recommendations are informed by the study findings only and includes the following;

Mukono central division authority should adopt and promotes a policy directive in which all households and shop attendants must practice source separation of solid waste management method. This will make disposal and management of the waste easier as collectors would know how to dispose the different categories of solid waste in an environmentally friendly manner.

Mukono central division authority should adopt and promote a policy directive in which residents should be encourage to practice solid waste reduction, reuse what is available till they are worthless and finally recycle products or turn them into materials for making other goods

Mukono central division authority should ensure that more waste dumping bins are provided especially for shop owners but also residents to ensure that waste is collected in a known central point, thus easy collection and transportation.

Mukono central division authority should introduce very harsh and severe punishment for improper dumping of solid waste, this will help discourage people from irresponsible dumping

Mukono central division authority should see into it that it employs or outsource expert human resource to help in planning, budgeting, information collections on waste collected. This can be done either by employ such expertise or engaging in outsource arrangements.

Mukono central division authority should endeavor to heavily invest in modern waste management technologies like waste compressors, transport vehicles and waste collection equipment. This can be done through constructive partnerships with relevant stakeholders and partners

Mukono central division authority should engage in the business of mass community education and sensitization, this art of public awareness campaigns programs should focus on proper management of solid waste in order to instill positive paradigm shift towards waste management

Other than Mukono municipal which is under pipeline, Mukono central division authority should also create its own bylaws and policies with strong legislations and implementation strategies about solid waste management.

Mukono central division authority should laisse with central government to engage in strategic and constructive partnership with other stakeholders like government line ministries, private institutions and companies, NGO's and civil society organizations and the residents to ensure a comprehensive and all-round mechanism of dealing solid waste management.

6.4 Recommended areas for future research

In regards to this section, the researcher recommends possible areas that must be further researched on in order to inform the best policies for managing solid waste in Mukono central division. These recommendations arose due to the fact that the researcher was constrained to the scope of the study which did not cover these recommended areas and yet the form a pertinent component of the study. As such the following are recommended areas for further studies;

a. The knowledge and attitude of households and shop attendants in connection with their willingness to participate in constructive solid waste management practices
b. Study the associated risks and safety mechanisms of solid waste collectors, especially their willingness to abide by those measures
c. How are the main solid waste collections centers being managed especially on issues of public health promotions?
d. To study the effects of social-cultural factors towards informing constructive municipal solid waste management practices in Mukono central division.

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APPENDICES

APPENDIX I: QUESTIONNAIRE

My name is MPIIMA Samuel a Masters student at Uganda Christian University, Mukono Main Campus doing a study entitled *factors affecting effective solid waste management practices in Mukono central division*. You have been identified to take part in this study by volunteering some information by answering some few questions. All information collected shall be kept confidential and only used for this study purpose.

Thank you.

SECTION A: Background information of respondent

Age of respondent						
Under 15	15-19	20-24	25-29	30-34	35+	
Sex of respondent		Male		Female		
Education level of respondents						
No formal education	Primary	Secondary	University	Tertiary		
Estimated monthly income in "000"						
less than 300	300-400	400-500	500-1000	1000+		
Capacity of the respondent						
Waste collection worker		Community resident		Commercial shop attendant		
Common or major content of solid waste generated						
Food and vegetable	Plastics	Papers/ Boxes	Glasses/ hard plastics	Metallic		
Place of solid waste storage before disposal from own premises						
Own premise	Common public premise		Municipal designated premises			

How long do you usually store solid waste before disposal from own premises					
Within 1 day	1-2 days	2-3 days	3-4 days	4-5 days	
Who collect waste from your premise to common damping site					
Municipal waste workers	Private company	Myself	Paid volunteer		
Waste disposal method out of own premises					
Open damping	Open burning	Landfills	Incineration		

SECTION B: Factors affecting effective municipal solid waste management practices

In the preceding sections, please rate on a scale of 1 to 5 whether you agree or disagree with the notion provided in the suggested statements. The meaning of the figures is as below;

1. Strongly agree, **2**. Agree, **3**. Not sure, **4**. Disagree, and **5**. Strongly disagree

Factors affecting effective municipal solid waste management practices							
		1	2	3	4	5
1	Solid waste collection process is very costly financially					
2	Division has strong modern vehicles that are ready for use all the time					
3	Solid waste collection service is not attractive business for many					
4	There is no adequate and modern waste management equipment.					
5	Solid waste collection points are accessible by solid waste collection vehicles					
6	Solid waste personnel regularly receive waste management training					
7	Solid waste collection workers are well paid					
8	Geographical terrain favors accessibility in collecting and disposing waste					
9	Household have positive attitude towards good practice of waste collection					

SECTION C

	Challenges faced throughout the process of solid waste management					
		1	2	3	4	5
	There are many people involved in solid waste collect					
	There is well designed road networks to access most waste collection points					
	There is improper and careless dumping of solid waste within the division					
	Municipal implements promotion programs on solid waste management					
	Division authority carries out awareness programs on solid waste management					
	There are many well facilitated solid waste dumping sites within the division					
	Solid waste workers have poor working conditions					
	Mukono Municipality lacks a policy on waste reduction at the source.					

SECTION D:

	Recommended opportunities for effective solid waste management					
		1	2	3	4	5
1	Authority should reward waste collectors with some incentives					
2	House hold solid waste separation should be implement					
3	Rewarding solid waste recycling programs should be encouraged					
4	Authority should invest in mass compost technology to manage solid waste					
5	There urgent need to come up with laws for waste management					
6	Massive campaign program on solid waste management to be enrolled					
7	There should be periodic educational program on waste management practices					
8	Inhabitants needs to be sensitized about the benefit of waste management					
9	Private companies should be awarded incentives for collecting solid waste					

APPENDIX II:

Interview Guide

My name is MPIIMA Samuel a Masters student at Uganda Christian University, Mukono Main Campus doing a study entitled *factors affecting effective solid waste management practices in Mukono central division*. You have been identified to take part in this study by volunteering some information by answering some few questions. All information collected shall be kept confidential and only used for this study purpose.

Thank you.

Background information

Position: ……

Education: ……

Sex: ……

Duration in service: …….

Key guiding question and thematic areas to focus

Describe the nature and magnitude of solid waste produced in Mukono central division

How is solid waste managed by Mukono central division?

Does Mukono Municipality have enough dumping sites for wastes?

Does the Municipality have enough workers to collect wastes more effectively?

Is Mukono City well planned with appropriate infrastructure to collect and transport wastes?

If so, does it have enough vehicles with fuels ready to transport wastes as required?

Do you carry out sensitizations the benefit of effective waste management practices?

Do you have any law or policy on solid waste management?

In your view, do you think the divisions have the capacity to finance its solid waste management?

What challenges do you face in managing solid waste?

What available opportunities to you see to maximize solid waste management?

Thank you very much for your kind response

APPENDIX III:

Observation check list

The researcher prepared this observation list to observe environmental conditions under which solid waste is collected and managed in Mukono central division

Phenomenon to be observed

1. Solid waste collection points within Mukono central division
2. Work environment of solid waste collectors
3. Nature, size and location of solid waste damping sites

APPENDIX IV:

Informed Consent Form

My name is MPIIMA Samuel a Masters student at Uganda Christian University, Mukono Main Campus doing a study entitled *factors affecting effective solid waste management practices in Mukono central division*. You have been identified to take part in this study by volunteering some information by answering some few questions. All information collected shall be kept confidential and only used for this study purpose.

The study procedures

The researcher will be conducting interviews regarding factors affecting effective solid waste management in Mukono central division. All relevant approvals and permissions were adhered to in this pursuit.

Risks involved

This study does not have any anticipated risks, if any; they are minimal and cannot be harmful.

Assurance of confidentiality

Information shared will not be shared with any other third party, names and all personal details of potential respondent with be kept anonym.

Voluntary participation

The study participation will be voluntary. Those who are not interested in the study will not be forced to participate, and participated who consented will have the right to withdraw in the process of the study at any stage if they withdraw consent and there will be no consequences.

Benefits

The benefit of the study will be explained to the participants. The significance of their voluntary participation will also be explained. This study if well utilized, it could help improve waste management in urban areas of Uganda.

Whom to contact in case of ethical related concerns

In case of any Ethical related concerns or inquiries, contact UCUREC chairperson; Prof. Peter Waiswa on 0772 405 357, pwaiswa@musph.ac.ug or UCUREC Secretariat, Mr. Osborn Ahimbisibwe on 0775737627 or oahimbisibwe@ucu.ac.ug. By signing below shows consent to participate in the study.

Respondent/Participant Signature……Date: ……..

PI Signature:…….. Date:……..

APPENDIX V: Introductory Letter from Uganda Christian University

UGANDA CHRISTIAN UNIVERSITY
A Centre of Excellence in the Heart of Africa

4th March, 2022

TO WHOM IT MAY CONCERN

Dear Sir/Madam,

RE: INTRODUCTORY LETTER FOR MPIIMA SAMUEL

Warm greetings from Uganda Christian University!

This serves to introduce the above named; **Mpiima Samuel,** as our student registered number **RS19M12/011** pursuing a Masters degree of Public Administration and Management.

Samuel is conducting a research as a requirement for the award of the above mentioned degree entitled; ***Management of Waste for Mukono Municipality***.

He has fulfilled all clearance requirements such as getting Research Ethics Approval from UCUREC which is accredited and regulated by Uganda National Council for Science and Technology (UNCST).

Any assistance given to him in achieving this goal will be highly welcome.

Thank you so much.

UGANDA CHRISTIAN UNIVERSITY
04 MAR 2022
DIRECTORATE OF POSTGRADUATE STUDIES

Yours faithfully,

.....

Dr. Owor Joseph Jakisa
Directorate of Postgraduate Studies,
Uganda Christian University
jowor@ucu.ac.ug

cc. Executive Secretary, Uganda National Council Science & Technology

A Complete Education for A Complete Person

P.O. Box 4, Mukono, Uganda (East Africa), Plot 67-173, Bishop Tucker Road, Mukono Hill,
Tel: +256 (0) 31 235 0800, Web: www.ucu.ac.ug UgandaChristianUniversity @UCUniversity
Founded by the Province of the Church of Uganda. Chartered by the Government of Uganda

APPENDIX VI

Permission Letter from Mukono municipality council authority

LANDLINE:..... 0414 290203/04
TOWN CLERK:..... 0772 432046/0701
Email: info@mukonomunicipalcouncil@gmail.com/
gbkisekka@gmail.com
FOR ANY CORRESPONDENCE ON THIS SUBJECT, PLEASE QUOTE: FIN/MMC/BA/85

THE REPUBLIC OF UGANDA

MUKONO MUNICIPAL COUNCIL
OFFICE OF THE TOWN CLERK
P. O. BOX 201
MUKONO - UGANDA

Date: 07th March 2022

Mr. Mpiima Samuel
Uganda Christian University
Mukono

PERMISSION TO CARRY OUT RESEARCH WITHIN MUKONO MUNICIPALITY

I am in receipt of your letter dated 4th March 2022 requesting for permission to conduct a research survey as a requirement for the award of a Masters' Degree of Public Administration and Management.

Permission is hereby granted to carry out the research under your selected topic '***Management of Waste for Mukono Municipality'.***

By copy of this letter, the Principal Health Inspector is requested to give you the necessary guidance in respect to your topic.

Yours,

TOWN CLERK * MUKONO MUNICIPAL COUNCIL * 07 MAR 2022

Godfrey B. Kisekka
TOWN CLERK – MUKONO MUNICIPAL COUNCIL

Cc. The Director, Post Graduate Studies – Uganda Christian University
Cc. The Principal Health Inspector – Mukono Municipal Council

UGANDA CHRISTIAN UNIVERSITY

A Centre of Excellence in the Heart of Africa

04/03/2022

To: Samuel Mpiima

Uganda Christian University
0772309999

Type: Initial Review

Re: UCUREC-2022-266: MANAGEMENT OF WASTE FOR MUKONO MUNICIPALITY , 1, 2022-01-24

I am pleased to inform you that the Uganda Christian University REC, through expedited review held on **04/03/2022** approved the above referenced study.
Approval of the research is for the period of **04/03/2022** to **04/03/2023.**

As Principal Investigator of the research, you are responsible for fulfilling the following requirements of approval:

1. All co-investigators must be kept informed of the status of the research.
2. Changes, amendments, and addenda to the protocol or the consent form must be submitted to the REC for re-review and approval **prior** to the activation of the changes.
3. Reports of unanticipated problems involving risks to participants or any new information which could change the risk benefit: ratio must be submitted to the REC.
4. Only approved consent forms are to be used in the enrollment of participants. All consent forms signed by participants and/or witnesses should be retained on file. The REC may conduct audits of all study records, and consent documentation may be part of such audits.
5. Continuing review application must be submitted to the REC **eight weeks** prior to the expiration date of **04/03/2023** in order to continue the study beyond the approved period. Failure to submit a continuing review application in a timely fashion may result in suspension or termination of the study.
6. The REC application number assigned to the research should be cited in any correspondence with the REC of record.
7. You are required to register the research protocol with the Uganda National Council for Science and Technology (UNCST) for final clearance to undertake the study in Uganda.

The following is the list of all documents approved in this application by Uganda Christian University REC:

UGANDA CHRISTIAN UNIVERSITY

A Centre of Excellence in the Heart of Africa

UGANDA CHRISTIAN UNIVERSITY

SCHOOL OF RESEARCH & POSTGRADUATE STUDIES

DISSERTATION CORRECTION COMPLIANCE REPORT BY THE CANDIDATE (POST VIVA FORM)

Date: **20th April, 2024**

Name of Candidate: SAMUEL MPIIMA **Reg. No:** REG. NO: RS19M12/011

Title of Dissertation: FACTORS AFFECTING EFFECTIVE SOLID WASTE MANAGEMENT PRACTICES IN MUKONO CENTRAL DIVISION

SN	COMMENTS BY EXTERNAL EXAMINER	ACTION TAKEN	INDICATOR
1	Please check the grammar, punctuation and spacing.	Editing and proof reading undertaken	Throughout the document
2	Improve section 1.10 by providing the theory before the critique and to let us know whether there are other theories other than the ZERO WASTE THEORY.	Theory stated in section 1.10 No known other theory was found	Page 8
3	The objectives are clear but they are biased and this may affect the quality of the research.	Specific objective 2 was revisited, adjusted as guided	Page 5

4	Please add a section on theories on solid waste management	Captured under section 1.10 about the theory underpinning the study	Page 8
6	Any international set standards on solid waste management?	All international set standards found are generic to environmental issues, and non on solid waste management	Not applicable
7	Please use clear explanations - sentence 2 of /section 3.3.	Section 3.3 revisited and made clear	Page 21
8	Clarify your data collection methods survey/questionnaire, interview (3.2) - there several types of interviews – specify.	Clarity emphasized on using structured questionnaire and in-depth interview methods	Page 21
9	3.7/3.7.1 – double check this section with the UCU research guide	Double checked, action of deletion taken	Page 24
10	3.9 – Did you seek clearance from the UCU research ethics committee?	This is clarified as pointed out	Page 25
11	3.10 What is all this about? Did you compensate the research participants? Please double check your challenges	These sections were revisited and clarified	Page 25
12	4.2 – 15 year olds – you did not talk about the ethics of interviewing children. Table 5 is on/about what capacity status?	2 respondents aged 15 and 17 (both teenage mothers) were treated as liberated adults, thus took informed consent instead of assent	Not applicable
13	Section 4.3 seems to be relating to some previous sections – please remind the reader the specific section that you are referring to.	Reference is clarified to the first specific objective of the study	Page 32
14	It is not clear what the respondents are agreeing to in tables 13/15/16 – please improve the tables by adding the actual question.	Questions added immediately below table 13,15 and 16 to clarify on the question being responded to	Page 39, 40 and 42
15	The first sentence below table 12 is not clear	Revisited and made clear	Page 38
16	There are several statistical tables with valid/missing/mode/minimum/maximum – what are they explaining – it is not immediately clear to the reader. What is there added value?	In the tables valid and missing is deleted, they have no added value to the statistical outcomes Mode, minimum and maximum maintained and their statistical value emphasized	Page 26 to 41

17	You did not talk about using photos in the methods section.	Talked about under 3.4.3 under observation method and observation checklist	Page 22
18	Add recommendations for the community and individual households.	Added	Page 58
19	Please order your references and double check to ensure all citations are included in the list.	Reference checked and ordered	Page 59 - 64

SN	COMMENTS BY INTERNAL EXAMINER	ACTION TAKEN	INDICATOR
1	The problem statement should mainly focus on Mukono and not crowd it with evidence from Kampala.	Problem statement is crowded with evidence in Mukono. The single report that referred to Kampala metropolitan also included Mukono.	Not applicable
2	Literature review should point out the gap in knowledge	Summary of gap in knowledge in the literature is captured under 2.5 Conclusion	Page 19
3	The candidate should decouple factors from challenges or have one common term in the literature review	A generic term "constraint" is adopted as advised and explained to combine both factors and challenges	Page 15
4	Challenges in the literature should appear in the conceptual framework	Since a generic term "constraint" is adopted above, this comment is incapacitated	Not Applicable
5	It is descriptive-normative Survey and amplify more. Elaborate more on ethics, and quality control.	Descriptive-normative Survey aims at studying how things should be, which isn't the case in this study. Ethics and quality control elaborated	Not Applicable Page 25 and 29,
6	The two tests in table 18 and 19 appear irrelevant, to be tied to any objective applicable	The result for tests in table 18 and 19 are not tied to any objective but was done to provide basis for recommendations	Not Applicable

SN	COMMENTS BY VIVA VOCE PANNEL	ACTION TAKEN	INDICATOR
1	Ensure that literature review section covers global, sub-Saharan, and regional perspectives.	Global, sub-Saharan, and regional perspectives covered in the literature review chapter.	Page 11 – 20

2	There was a disconnect between the conceptual framework, study objectives, and the problem statement.	The conceptual framework, study objectives, and the problem statement connected	Page 4, 5 and 9
3	Remove negative factors that may have influenced the study. For instance, while UCU (Uganda Christian University) was highlighted for good solid waste practices	Evidence from UCU just like others are factual and evidence backed, there is no basis for treating it as a negative factor in the report	Not Applicable
4	In the methodology section, define univariate and bivariate analysis. For bivariate analysis, use correlation or chi-square, and attach objectives to the summary	More details provided	Page 26
5	Cross-check the existence of solid waste management bylaws in Mukono and verify against the Mukono Solid Waste Management bylaw of 2020	Situation of the bylaw checked, as of 19th April 2024, It is still in the Attorney general chambers going through legal process; there is no bylaw in Mukono municipality on waste management	Not Applicable
6	Ensure recommendations align with the study area.	Study recommendations were revisited and confirmed	Page 58 and 59
7	Address the ethical considerations regarding the pictures taken in the study.	Cited ethical issue addressed	Page 26

SAMUEL MPIIMA

Candidate's Name Signature

Supervisor's Name: Mary Ssonko Nabacwa

Signature *Mary Ssonko Nabacwa 6/5/24*