ASSESSMENT OF COMMUNITY PARTICIPATION IN MUNICIPAL SOLID WASTE MANAGEMENT IN MONROVIA CITY, LIBERIA

BY

LYDIA T. TOE
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DECLARATION

I Lydia T. TOE hereby declare to the best of my knowledge that the material contained in this thesis is exclusively my own and has never been submitted to any high institution of learning for any academic reward.

Signature: ....

Lydia T. TOE

Date: .....

APPROVAL

This is to confirm that the work presented in this thesis is carried out by the candidate under my supervision.

Submitted for Progress Report

Supervisors:

Dr. Suzan Luyiga

Name of the 1st supervisor — Signature of the supervisor

Supervisor:

Oluwole Olusegun Akiyode

Name of the 2nd supervisor — Signature of the supervisor

DEDICATION

I dedicate this research report to my family for all the love, understanding, encouragement, material, and moral support, without which my studies would not have been a success. To my dear colleagues that I studied with all the way through, l love you all.

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I thank the Almighty God for enabling me to manoeuvre through all the tough, hard times and trying moments I have had in life. My dream of this award would not have become true without His guidance, protection, and assurance that all things are possible if you believe in him.

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ABSTRACT

The study assessed community participation in municipal solid waste management in Monrovia, Liberia. It was guided by three specific objectives; to assess the types/forms of municipal waste management strategies in Monrovia, Liberia, to document the mode of community management participation strategies in waste management and to explore the attitudes and awareness of residents on waste management in Monrovia Liberia. The researcher administered questionnaires to 400 respondents and employed a cross-sectional research design. Descriptive statistics used included frequencies, means and regression analysis. Results indicated that reduction, reuse and recycle are the municipal waste management practices applied in Monrovia. The waste types included any scrap material, effluent or unwanted surplus substance or article that requires disposal because it is broken, worn out, contaminated or otherwise spoiled. The residents expressed positive attitude toward waste handling and transport, varying from region to region within Monrovia. It was therefore, established that waste collection services were mainly provided to the official areas in central Monrovia and Mamba Point while most of the communities received poor or no services. Giving people more opportunities to participate effectively in garbage collection can highly improve on the strategies used in waste management in Monrovia. Lastly, households attitudes towards waste collection can be improved by involving public participation and attaching a fee on waste collection service based on the waste volume or weight. The management of Monrovia City Corporation should, therefore, allow the community members' full participation in waste management programmes as this will improve communal responsibility in waste management. This could be achieved through building capacity among the community members as one of the strategies to improve waste management. This study brought up new frontiers of knowledge and information on how community participation should be done, it also exposed the weaknesses that were found out in current operations of waste management in relation to reduction, reuse and recycle.

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LIST OF ABBREVIATIONS

MCC	Monrovia City Corporation
EPR	Extended Producer Responsibility
NEMA	National Environmental Management Authority
UNFCCC	United Nations Framework Convention on Climate Change
CDM	Development Mechanism
GHS	Green House Gases
WMT	Waste Management Theory
Co.	Company
Ltd	Limited
US	United States
WtE	Waste-to-energy
MSW	Municipal Solid Waste
MBT	Mechanical biological treatment
BMSW	Biodegradable Municipal Solid Waste
COD	Chemical Oxygen Demand
SWM	Solid Waste Management
3Rs	Reduce, Re-use, Recycle/recover

CHAPTER ONE

INTRODUCTION

1.0 Introduction

This chapter covered the background of the study, statement of the problem, purpose of the study, objectives of the study, research questions, scope of the study, and significance of the study.

1.1 Background to the Study

The background of the study comprised of theoretical framework, conceptual framework and contextual framework.

1.1.1 Historical perspective

Solid waste disposal has become an overwhelming task for the municipal authorities who are clearly experiencing severe constraints in tackling the mounting waste situation. Solid waste challenges in Monrovia include higher cost and difficulties in disposing the large volume of waste generated by households and businesses, with a huge quantity of solid waste generated remaining uncollected or haphazardly disposed. For now, the Monrovia City Corporation (MCC) is largely using land filling to solve the solid waste problem. This appears to be a more suitable option for waste disposal since Liberia lacks the capacity to adequately utilize other options such as recycling or energy recovery. This option, however, is down the waste hierarchy which prioritises environmental friendliness with waste prevention at the top, followed by minimisation, reuse, recycling, energy recovery, and disposal (Phillip, 2016).

Rapid urbanisation is a multifaceted phenomenon that provides opportunities and benefits for developing countries, but is also associated with environmental, social, and economic complications. Since the cessation of the devastating civil crisis, the population of urban centres in Montserrado County continues to flourish as more people are migrating from the leeward counties to urban centres, especially Monrovia and Paynesville. This unsustainable urbanisation has resulted in poor environmental conditions in these urban centres.

In a study conducted by the Emergency Monrovia Urban Sanitation project (EMUS, 2017), in collaboration with the municipal corporation in Monrovia, the annual tons of inert waste generated in the provincial capital city of Monrovia was reported as 780 tons/day with an average waste generation of 0.63 kg/capita a day in 2017 (David & Wenchao, 2019).

Site visits at various locations have shown that waste generated are being dumped in open spaces, street corners, burnt, or buried in backyards. Most residents acknowledged there is an issue with solid waste management, and it requires urgent attention. Most Liberians, regardless of their socioeconomic status, are very concerned about the waste management activities in the country and often take to social media to give feedback or vent their frustration about the need to improve the system for managing solid waste.

A significant proportion of the waste generated in Monrovia is organic refuse followed by plastic. The increasing number of plastic waste is as a result of the increased use of plastic products on the market in Monrovia. (E.g. plastic sachet water, polyethylene terephthalate (PET) bottles and plastic bags). Other waste generated consisted mainly of a plastic 14.2%, glass/ceramics 10.5%, metals 3.0%, rubber 10.0% and batteries 9.9%). These results are also in line with other studies which revealed that the highest component of wastes generated in developing nations consists of organic materials (David *et al*., 2016).

1.1.2 Theoretical review

This study adopted the Integrated Sustainable Waste Management theory (ISWT) by Guerrero, Maas, & Hogland (2013). ISWT is a theory that allows studies of complex and multi-dimensional systems in an integral way. The model was developed by WASTE advisers on urban environment and development (WASTE, 2014) and partners or organizations working in developing countries in the mid-1980s and further developed by the Collaborative Working Group (CWG) on solid waste management in the mid-1990's (Anschütz et al., 2014). This theory acknowledges the importance of three dimensions when analyzing, developing or changing a waste management

system. The dimensions are: the stakeholders that have an interest in solid waste management, the elements or stages of the movement or flow of materials from the generation points towards treatment and final disposal and the aspects or ‘‘lenses’’ through which the system is analyzed (Muller, 2012).

The current study is adopting this theory because, it focuses on relating the stakeholder's action/behavior (community participation) with the urban council waste management strategies to enable the entire system to function. To facilitate the analysis, stake holder's action or behavior is being theorized as community participation in terms of empowerment, capacity building and active involvement which is being related with waste management systems as strategies described in terms of 3Rs (Reduce, Reuse, and Recycle) (Anschütz *et al.*, 2014).

In this study, the dependent variable is waste management strategies. Coker *etal* 2016 defined waste as any material or object, which is supposed to be disposed or intended to be disposed by the provisions of the law. According to Achi etal (2016), waste management basically, involves the collection, transportation, processing, disposal, management and monitoring of waste materials. The management of waste treats all materials as a single class, be it solid, liquid, gaseous or radioactive substances. Waste management is the process involved in dealing with the waste of humans and organisms, including minimization, handling, processing, storage, recycling, transport, and final disposal. Waste management encompasses management of all processes and resources for proper handling of waste materials, from maintenance of waste transport trucks and dumping facilities in compliance with health codes and environmental regulations.

In this current study, the concept of waste management strategies referred to as aspects that can be used to minimize on the volumes of waste within the community. In fact, it entailed the 3Rs (Reduce, Reuse, and Recycle) strategies that were proposed with priority on source minimization, intermediate treatment then final disposal and enlighten the waste generators to practice 3Rs as a substantial measure to reduce, reuse and recycle the generated waste (Guerrero *etal*, 2013).

1.1.3 The conceptual framework

The World Bank (2014) defines community participation as the active involvement of a defined community in at least some aspects of a community initiative. Mansuri & Rao (2012) noted that participation can occur at many levels, a key objective is the incorporation of local knowledge into the project's decision-making process as asserted. However, in the context of this study, community participation was operationalized in terms of empowerment, capacity building and community active involvement, whereas waste management strategies were operationalized in relation to reduction, reuse and recycle.

1.1.4 Contextual Perspective

This study was conducted in Monrovia, the capital city of the West African country of Liberia. Founded on April 25, 1822, Monrovia became the second permanent home of freed American slaves after Freetown, Sierra Leone. Located on the Atlantic Coast at Cape Montserrado, Monrovia inhabits 40% of Liberia's 2019 projected 4.9 million population. With a population of 1.9 million and 70% living in slums, a recent study by the World Bank (2019) revealed that about 800 tons/day of solid domestic waste is generated, representing roughly 45% of the total waste produced in Monrovia. The remaining, however (around 55 percent) remains uncollected or is not covered by the solid waste collection system. This, in turn, is due to the high costs and difficulties in collecting large quantities of waste generated by different establishment, i.e. households, business, etc.

1.2 Statement of the problem

Acceptable waste management requires qualified professionals, including engineers, mechanics, sanitation officers, administrators, and finance and accounting staffs. Although there are several factors influencing waste management strategies in Monrovia, this study proposes that community participation as a correlate of waste management strategies is key for waste management. Liberia's waste management sector faces tremendous difficulties, due to various factors, including: unclear and over-lapping legal mandates and responsibilities; inadequate institutional framework; poor

enforcement mechanisms; extremely weak technical and human capacity within the government sector; low level of public awareness on health-waste management linkages; and a complete absence of cost recovery mechanisms. Waste management is grossly inadequate, and a significant amount of domestic solid waste generated remains uncollected (UNEP, 2006). It is worth mentioning that Industries and individuals continue to dump litter in open spaces, street corners and swamps posing threats to public health (David et al., 2016).

According to Environmental protection Agency (2013), solid waste management is faced with challenges characterized by the following: low public awareness regarding waste and the risk to public health if not properly handled, poor environmental education, lack of coordination and participatory approach between stakeholders and policies makers. Challenges also include insufficient resources directed towards waste management services, inadequate legislative provision, and lack of implementation of policies. The shortage of skilled waste management personnel also poses a challenge in waste management. While funding and equipment are essential for operational efficiency, the human resource element is also vital. Therefore, to have a prompt waste collection and proper disposal system, this study is intended to assess the relationship between community participation and waste management strategies.

1.3 General objective

The main objective of the study is to assess the community participation in waste management practices in Monrovia, Liberia.

1.4 Specific Objectives

The study was guided by the following objectives:

(i) To assess the Municipal waste management strategies in Monrovia, Liberia.

(ii) To document the extent of communities' management participation strategies in waste management.

(iii) To explore the attitudes and awareness of residents on waste management in Monrovia Liberia.

1.5 Research questions

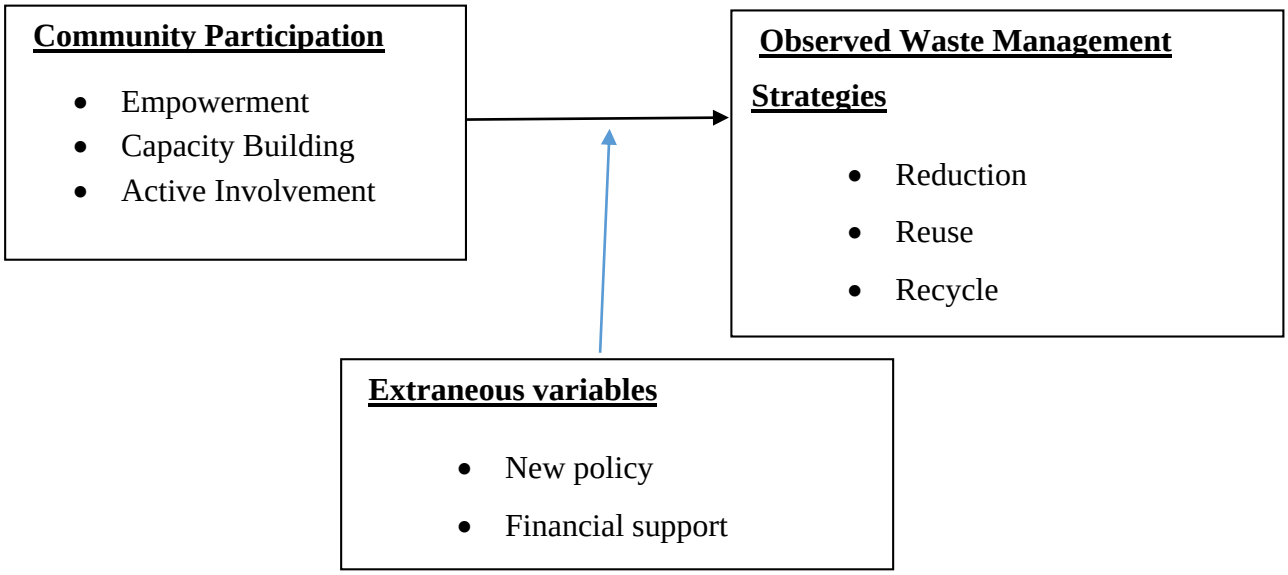
(i) What are the types/forms of Municipal waste management strategies in Monrovia, Liberia?

(ii) What is the extent of community's management participation strategies in waste management?

(iii) What are the attitudes and awareness of residents on waste management in Monrovia Liberia?

1.6 Conceptual Framework

Independent variables **Dependent variables**



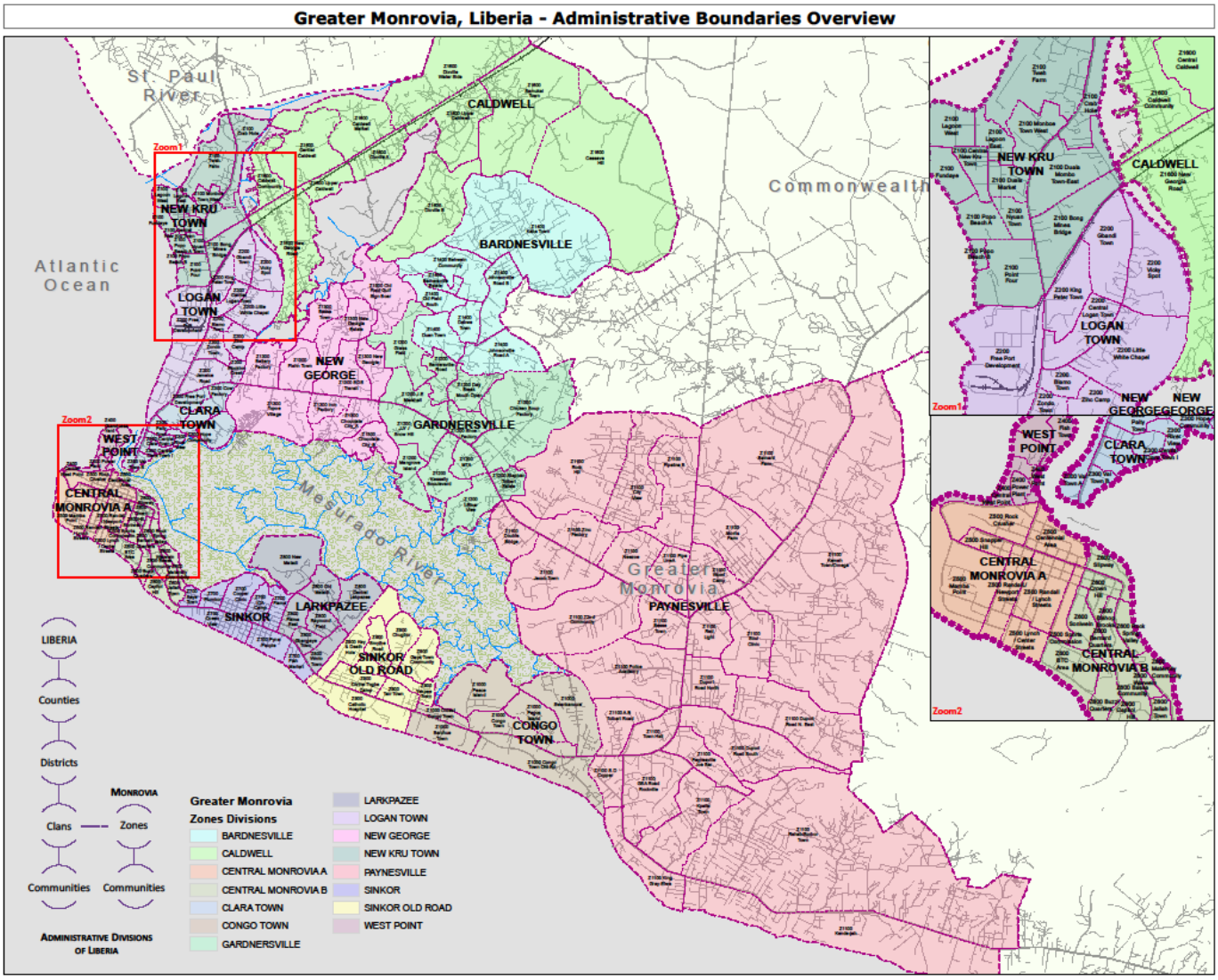
Source: Adapted from ISSOWAMA Consortium (2013)

The conceptual framework illustrates the relationship between community participation and waste management strategies. Community participation which is the independent variable and is conceptualized in terms of empowerment, capacity building and community active involvement. On the other hand, waste management strategies which is the dependent variable will be conceptualized in relation to reduction, reuse and recycle. Waste includes any scrap material, effluent or unwanted surplus substance or article that requires disposal because it is broken, worn out, contaminated or otherwise spoiled.

1.7 Scope of the Study

1.7.1 Geographical scope

This study was carried out in Montserrado County in Monrovia, the capital city of Liberia, West African. According to the 2019 census, the projected population of Montserrado is 1.9 million, 40% of the total population of Liberia.


Greater Monrovia, Liberia - Administrative Boundaries Overview
St. Paul River
Atlantic Ocean
Commonwealth
Mesurado River
Greater Monrovia
CALDWELL
BARDNESVILLE
NEW KRU TOWN
LOGAN TOWN
NEW GEORGE
CLARA TOWN
GARDNERSVILLE
WEST POINT
CENTRAL MONROVIA A
CENTRAL MONROVIA B
PAYNESVILLE
LARKPAZEE
SINKOR
SINKOR OLD ROAD
CONGO TOWN
Zoom1
Zoom2
LIBERIA
Counties
Districts
Clans
Communities
MONROVIA
Zones
Communities
ADMINISTRATIVE DIVISIONS OF LIBERIA
Greater Monrovia
Zones Divisions
BARDNESVILLE
CALDWELL
CENTRAL MONROVIA A
CENTRAL MONROVIA B
CLARA TOWN
CONGO TOWN
GARDNERSVILLE
LARKPAZEE
LOGAN TOWN
NEW GEORGE
NEW KRU TOWN
PAYNESVILLE
SINKOR
SINKOR OLD ROAD
WEST POINT

1.7.2 Content scope

The study assessed whether community participation in terms of empowerment, capacity building and active involvement correlates with the waste management strategies which entailed the 3Rs (Reduce, Reuse, and Recycle) in Monrovia, Liberia.

1.7.3 Time scope

The study considered five year existing data for a period from 2014-2019, this being the period in which poor waste management was reported most in Monrovia. Data was also collected during a period between October 2019 and May 2020. The study period was sufficient to allow for data collection and presentation of findings, and to attain the information for both academics and decision making.

1.8 Significance of the Study

Local governments: the study will help the local government to examine best suitable approaches in handling waste and ensuring funds within the budget framework for proper waste management.

Academicians: it will be a centre for new knowledge about community participation and waste management that calls for further research on reduction of wastes or garbage. Students and researchers; it will be a centre of debate on whether the 3R approaches are effectively used in waste management within the urban centers in Liberia.

The study findings will also contribute to theoretical debates about waste management and service delivery as well as a way forward for the improvement of the policy on waste management. It will also prompt more research relating community participation and waste management strategies having contributed to the literature and the methodology of such studies. Private garbage collecting firms and the public (Financial /Economic dimensions): the study will provide insights on how to cooperate and improve efficiency and effectiveness in waste management, and how to ensure effective community participation.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

In this chapter, attempts are made to review relevant literature on waste management from the international, continental and at the regional level to help in the understanding the causes of poor waste management. The study also used information that had already been published by some accredited scholars and researchers, on community participation and management of wastes, and the literature review was in line with the study objectives.

The theory acknowledges the importance of three dimensions when analyzing, developing or changing a waste management system. The dimensions are: the stakeholders that have an interest in solid waste management, the elements or stages of the movement or flow of materials from the generation points towards treatment and final disposal and the aspects or ‘‘lenses’’ through which the system is analyzed (Müller et al., 2012; Muller and Scheinberg, 2012; Zurbrügg et al., 2012; Zuilen, 2012; ISSOWAMA Consortium, 2013). The theory focused on relating the stakeholder’s action/behavior (community participation) with the urban council waste management strategies to enable the entire system to function. To facilitate the analysis, stake holder’s action or behavior is being theorized as community participation in terms of empowerment, capacity building and active involvement which is being related with waste management systems as strategies described in terms of 3Rs (Reduce, Reuse, and Recycle) (Zuilen, 2012).

Waste Management Theory (WMT) has been introduced to channel environmental sciences into engineering design, WMT is a unified body of knowledge about waste and waste management, it is an effort to organize the diverse variables of the waste management system as it stands today, WMT is considered within the paradigm of Industrial Ecology, and built side-by-side with other relevant theories, most notably Design Theory. Design Theory is a relatively new discipline, still under development. Following its development offers valuable insights about evolving technical theories (Muller, 2012).

According to Love (2012), at the present stage of WMT development, scientific definitions of key concepts have been offered, and evolving of WMT under the paradigm of Industrial Ecology is in progress. The function of science is to build up systems of explanatory techniques; a variety of representative devices, including models, diagrams and theories (Toulmin, 2011). System processes, such as waste generation, collection, and disposal operations, are considered independently, though each is interlinked and influenced by the others (Seadon, 2010). This approach is even applied to waste, as it is not a single entity that can be easily managed. It is typically separated into many primary and many more secondary classifications, and waste streams from different sectors, such as residential and commercial, are often considered separately (Seadon, 2011).

2.1 Review of Related Literature

2.1.1 Types/forms of Municipal waste management strategies

Waste management forms cannot be uniform across regions and sectors because individual waste management methods cannot deal with all potential waste materials in a sustainable manner (Staniskis, 2012). Conditions vary; therefore, procedures must also vary accordingly to ensure that these conditions can be successfully met. Waste management systems must remain flexible considering changing economic, environmental and social conditions (McDougall et al., 2011; Scharfe, 2013).

In most cases, waste management is carried out through a number of processes, many of which are closely interrelated; therefore it is logical to design holistic waste management systems, rather than alternative and competing options (Staniskis, 2012). The three Rs are commonly used terms in waste management; they stand for “reduce, reuse, and recycle”. As waste generation rates have risen, processing costs increased, and available landfill space decreased, the three R`s have become a central tenet in sustainable waste management efforts (El-Haggar, 2013).

Recycle

Not all waste products can be displaced and even reusable products will eventually need to be

replaced. It is inevitable that waste will be created as a by-product of daily human living (Kim, 2013), but in many cases it is possible for this waste to be diverted and recycled into valuable new materials. Glass, plastic and paper products are commonly collected and reformed into new materials and products (Suttibak & Nitivattananon, 2011).

Recycling products offer many of the benefits of waste reduction efforts (displacing new material usage, reducing waste generated and the costs associated with disposal) but recycling requires energy and the input of some new materials, thus placing it lower on the waste hierarchy than reduction and reuse (UC Davis, 2011; USEPA, 2013).

Information and education can shift behavior and help garner public support for waste management initiatives and can also help to build expertise (Tudor et al., 2011). There are a wide range of activities which may take place to further educational efforts.

Waste characterization studies and waste audits are critical to the process of designing and implementing a waste management plan and to gain insight as to where diversion efforts should be focused (Armijo de Vega et al., 2011). The results of waste characterization studies and waste audits can play a central role in educational campaigns that are used to foster support and motivation for waste diversion initiatives. The results of ongoing studies are also useful for evaluating progress towards achieving goals and objectives of a waste management plan, and in helping to review previously established targets (Smyth et al., 2013).

Reduction

The concept of waste reduction, or waste minimization, involves redesigning products or changing societal patterns of consumption, use, and waste generation to prevent the creation of waste and minimize the toxicity of waste that is produced (USEPA, 2013). Common examples of waste reduction include using a reusable coffee mug instead of a disposable one, reducing product packaging, and buying durable products which can be repaired rather than replaced (Seadon, 2014).

Reduction can also be achieved in many cases through reducing consumption of products, goods, and services. The most effective way to reduce waste is by not creating it in the first place, and so reduction is placed at the top of waste hierarchies (USEPA, 2013). In many instances, reduction can be achieved through the reuse of products. Efforts to take action to reduce waste before waste is actually produced can also be termed pre-cycling (HRM, 2013).

Integrated waste management (IWM) has emerged as a holistic approach to managing waste by combining and applying a range of suitable techniques, technologies and management programs to achieve specific objectives and goals (Tchobanoglous & Kreith, 2013). The concept of IWM arose out of recognition that waste management systems are comprised of several interconnected systems and functions, and has come to be known as "a framework of reference for designing and implementing new waste management systems and for analysing and optimising existing systems" (UNEP, 2011). Just as there is no individual waste management method which is suitable for processing all waste in a sustainable manner, there is no perfect IWM system (McDougall et al., 2011).

Due to the varying needs and challenges faced by organization in the ICI sector, a flexible yet comprehensive approach is needed to manage waste properly. Using a wide range of waste management options as part of a comprehensive integrated waste management system allows for improved ability to adjust to changing environmental, social and economic conditions (McDougall et al., 2011).

Reuse

It is sometimes possible to use a product more than once in its same form for the same purpose; this is known as reuse (USEPA, 2013). Examples include using single-sided paper for notes, reusing disposable shopping bags, or using boxes as storage containers (UC Davis, 2011). Reusing products displaces the need to buy other products thus preventing the generation of waste. Minimizing waste through reduction and reuse offers several advantages including: saving the use of natural resources to form new products and the wastes produced in the manufacturing processes;

reducing waste generated from product disposal; and reducing costs associated with waste disposal (USEPA, 2013).

Roberta (2014) realized that collection and processing of waste is not the exclusive domain of the local government calling for a more comprehensive partnership between the community and local governments where each actor has a role to play towards waste minimisation, waste recycling and waste disposal. Apart from Japan and Korea, the only country where several local authorities have instituted source separation and collection programs is Malaysia, the record of successful extension of pilot projects is uneven, but Taiping Municipal Council has 10,000 households participating in separating glass, paper and metals since 1993 and Petaling Jaya has done extensive research and pilot work for an ambitious programme which includes school clubs organised by Parents and Teachers Associations, and separate collection by private contractors appointed by the municipal council (Dalley, 2013).

2.1.2 Community's participation in waste management

Community empowerment

The concept of "Participation" means involvement of beneficiaries in public Decision-making implementation and control process of the project (Maratha, 2014). This concept is used in the theory of community development whereby it means that all members of a community participate in decision-making that affect their lives, not merely in consultation or contribution. It is far more than the contribution of labor or supplies. When developmental projects are developed without regard to beneficiaries' wishes, priorities, and concerns, they always experience difficulties and often fail. On the other hand, findings of evaluative studies have shown that when projects consider beneficiaries' needs, the results are always effective (Beigl, 2012).

Community empowerment includes the process by which the efforts of the people themselves are united with government or aid agencies to improve economic, social, and cultural conditions and enable them to contribute fully to development initiatives (UN, 2012). Community participation is the process of "giving people more opportunities to participate effectively in development

activities, empowering people to mobilize their own capacities, become social actors rather than passive subjects, manage their resources, make decisions, and control the activities that affect their lives" (Bodin, 2011).

Capacity building

Lederer (2015) generated stakeholder's knowledge for solid waste management planning through action research. Results showed that due to lack of financial and technical resources, only half of the wastes generated were formally collected, while the residual was littered, irregularly dumped, or burned. Some of the resulting problems as defined by community members were solved by themselves, while for others, they relied on the commitment of other stakeholders, particularly authorities, this was particularly the case for the drafting of by-laws and the provision of collection vehicles (Baeyens, 2013).

Sujauddin et al. (2012) noted that the generation of waste is influenced by family size, their education level and the monthly income. Households attitudes related to separation of waste are affected by the active support and investment of a real estate company, community residential committees' involvement for public participation and fee for collection service based on the waste volume or weight. Gender, peer influence, land size, location of household and membership of environmental organization explain household waste utilization and separation behavior.

Tadesse et al. (2012) analyzed the factors that influence household waste disposal decision making. Results showed that the supply of waste facilities significantly affects waste disposal choice. Inadequate supply of waste containers and longer distance to these containers increase the probability of waste dumping in open areas and roadsides relative to the use of communal containers. Insufficient financial resources limiting the safe disposal of waste in well-equipped and engineered landfills and absence of legislation are mentioned.

Malika, Abdullah, & Manaf (2015) identified the relationship between community participation in recycling programme and community attitude and their knowledge on solid waste segregation. By

using fully structured questionnaires filled by 382 respondents through random sampling, the results showed that there was a weak and positive correlation between community participation in recycling programme with community attitude on solid waste segregation. Their study recommended that policy review by government was important in influencing more community participation in recycling programmes. This study was carried out in Putrajaya, Malaysia, any yet this current study will be conducted in Monrovia, Liberia and will correlate community participation not only with recycling but with also reduction and re-use.

Active involvement

Zake (2011) noted that waste is a man-made substance in a given time and places which in its actual structure and state is not useful to the owner or is an output without an owner and purpose. In other words, waste is anything that we no longer need. It is also commonly referred to as rubbish, trash, garbage, refuse, effluents and "unwanted or unusable materials.

Most non-biodegradable wastes are produced from manufacturing industries. While, Liquid wastes refer to waste materials that contain full liquids (Cokaygil, 2013). These include waste water from industries, households; sewerage and leachates from land fill or garbage heaps (Banar, 2013). This is equally harmful to the water sources hence endangering both human beings who depend on such water sources and the aquatic life like fish. It also destroys the land and its level of productivity since some of these wastes like grease, paints will deepen into the soils hence affecting the soil alkalinity (Environmental Protection Agency, 2012).

Bauld (2012) noted that waste management is all those activities and action required to manage waste from its inception to its final disposal. This includes amongst other things, collection, transport, treatment and disposal of waste together with monitoring and regulation. It also encompasses the legal and regulatory framework that relates to waste management encompassing guidance on recycling etc. The term usually relates to all kinds of waste, whether generated during the extraction of raw materials, the processing of raw materials into intermediate and final products, the consumption of final products, or other human activities, including municipal

(residential, institutional, commercial), agricultural, and special (health care, household hazardous wastes, sewage sludge).

Beigl et al., (2012) indicated that waste management is intended to reduce adverse effects of waste on health, the environment or aesthetics. Waste management practices are not uniform among countries (developed and developing nations); regions (urban and rural area), and sectors (residential and industrial).

2.2 The attitudes and awareness of residents on waste management

Waste collection is a critical component to waste management, the economic and environmental performance of the entire system can be impacted by the way that materials are collected and sorted. In many instances, the collection point will be an interface where waste generators and waste collectors that must be carefully managed if the system is to be effective. Waste generators require waste collection with minimal inconvenience, while collectors must be able to collect waste in a way that is compatible with the planned treatment and processing methods if the waste management system is to be sustainable (McDougall et al., 2011).

Roberta (2014) noted that waste management includes all issues and processes associated with the generation, processing, and disposal of all categories of wastes produced by human activities or related to human existence; it includes, therefore, the stages of production and minimization, collection, handling and transportation, reuse and recycling, and treatment and disposal of all such wastes.

Zake (2011) argued that waste management handling and transport varies from region to region, country to country, there are waste management concepts that are universally accepted and are being implemented accordingly. These are the waste hierarchy or the 3Rs (reduce, reuse and recycle), the extended producer responsibility (EPR) and the polluter pay principle.

2.3 Research gaps

Several studies have been done on waste management in different parts of Africa (Benetto, Tiruta-Barna and Perrodin, 2011) in South Africa and Nigeria, however little is known about community participation and waste management strategies in Liberia, more so in Monrovia Liberia, hence the study intended to close this gap. The above study did not indicate the knowledge required among stakeholders to engage in waste management, and never correlated the community participation with waste management, which gap, this study had to fill. There is also a missing link between the national waste management strategy and local practices. Therefore, the realization of sustainable solutions to waste management and environmental protection is therefore critically hindered. The national strategy, therefore, has not been transformed into real, effective and sustainable solutions to waste management. An integrated approach to waste management should, therefore, be explored by urban councils and it can be promoted through community participation and education involving the private sector.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

This section presents the methods used in attaining the research objectives. It highlights the research design, study population, target population, sample size, sampling design, research methods, data analysis, validity and reliability, research limitations and ethical considerations.

3.1 Research design

This study employed a cross-sectional research design. Cross-sectional design allows the study of the population at one specific time and the difference between the individual groups within the population compared. The cross-sectional research design helped to understand the phenomena through the meanings that citizens assign to them and it aims at understanding the context of waste management strategies in Monrovia, Liberia. The study based on the quantitative approach, in that, it based on variables measured with numbers, and thereafter was analyzed with statistical means. The study also collected data from a large sample of respondents. This study also used mixed research approaches to gain insight to variables. Qualitative approach included the use of interviews, while quantitative approaches involved use of descriptive statistics that was generated inform of frequency tables, graphs, and Charts. Qualitative and quantitative approaches were adopted to enable the researcher to get and analyze information concerning respondents' opinions about community participation and waste management strategies in Monrovia Liberia.

3.2 Study Design and Data Collection Methods

The study conducted interviews purposively with 12 local leaders to have the understanding of the background of the waste management issues in Monrovia. It also conducted interviews with 18 senior, middle and lower level staff (each from every cadre) of the Monrovia City Corporation (MCC) officers directly related to environment and waste management and Heritage Disposal Inc officers, a private company contracted by Monrovia City Corporation (MCC) to collect garbage in Monrovia, and households registered with Heritage Disposal Incorporation.

Also, a sample of the household heads in Monrovia was administered questionnaires based on Slovin formular using the current population of Monrovia city (the population was used instead of

the number of houses in Monrovia is not documented). Thus, based on the latest Liberia population of 1,010,970 people and using the Slovein formula

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

Equation 3.1: Slovene's Formula

$$n = \frac{1{,}900{,}000}{1+1{,}900{,}000\ (0.05)^2}$$

n = 400

Thus, the sample size was 400 respondents. However, it may be impossible to do an investigation on all the residents in the urban council, therefore with such a large number within a limited time period and inadequate financial budget, a simple random sampling technique was employed to select an appropriate sample to evaluate the objectives of this study. Therefore, 7 parishes were randomly selected out of 21 in Monrovia.

Also, **F**ocuss Group Discussion (FGD) was carried out using an interview guide. This intend to support respond from the questionnaire. An interview was a tool of data collection in which a researcher and research assistant obtained information from the key respondents by face-to-face interaction.

3.3 Data Collection Tools

3.3.1 Questionnaire

The data in the proposed study was collected using a self-administered questionnaire. In addition to a main title and cover letter, the SAQ had three sections. The first section (Section A) was for the background variables namely; gender, age and education level.

The second section (Section B) was on the independent variable (community participation). The third section (Section C) was on the dependent variable (waste management strategies). The researcher used a 4 point Likert scale to rate the responses.

3.4 Validity and Reliability of the Instruments

3.4.1 Validity of the instrument

Validity is the degree to which results obtained from the analysis of the data actually represents the phenomenon under study. This study looked at three kinds of validity: face validity, content validity and construct validity. Face validity was ensured by giving the questionnaires to five experts to check whether the questions was relevant to the contents. Content validity was ensured by subjecting the researcher devised questionnaires on community participation and waste management strategies in Monrovia, Liberia that consisted of all the elements of the concept of community participation and waste management strategies. From there, a Content Validity Ratio (CVR) and Content Validity Index (CVI) was calculated. CVR was calculated by subtracting the total number of items judged to strongly disagree (1), and disagree (2) from the total number of items judged to strongly agree (4) and agree (3), thereby dividing them to a half of people asked to judge the questionnaire. This CVI was accepted because normally it should be greater (≥) than 0.7, which means that the questionnaire could be administered. For the purpose of this study, using this formula;

$$\text{CVI} = \frac{\textit{No. of questions declared valid}}{\textit{Total no. of questions in the questionnaire}}$$

$$\frac{24}{30}$$

$$= 0.8 \text{ which is} \geq 075$$

CVI calculated was 0.8

3.4.2 Reliability of the instrument

Reliability is a measure of the degree to which research instruments yield consistent results or data after repeated trials. The test-retest technique was used to assess the reliability (accuracy) of the instruments. The researcher devised instruments to ten qualified respondents, in Monrovia, Liberia. These respondents were be not included in the actual study. In this test- retest technique, the questionnaires was administered twice to the same subjects after the appropriate group of the subject was selected, then the initial conditions was kept constant, the scores were then correlated

from both testing periods to get the coefficient of reliability or stability. The tests and the trait measured was stable, indicating consistent and essentially the same results in both times. The minimum Cronbatch Alpha coefficient of 0.852 was used to declare an instrument reliable.

Reliability Statistics	
Cronbach's Alpha	No. of Items
0.852	24

3.5 Data Analysis

The frequency and percentage distribution were used to determine the demographic characteristics of the respondents. The mean and standard deviations was applied for the extent of community participation and waste management strategies. An item analysis illustrated the strengths and weaknesses of the respondents based on community participation and waste management strategies in terms of mean and rank. From these strengths and weaknesses, the recommendations were derived. The regression analysis was also used to determine the significant effect between variables.

Regression equation

$Y=\alpha+b_1x_1+b_2x_2+b_3x_3$

Whereby;

Y= the dependent variable (waste management strategies)

α = level of significance (0.05)

b = Beta

x_1 = Empowerment

x_2 = Capacity building

x_3 = Active involvement

Decision rule

The researcher can reject the null hypothesis if the significance value is less than 0.05 and can accept if the significance value is greater than 0.05.

3.6 Ethical considerations

To ensure confidentiality of the information provided by the respondents and to ascertain the practice of ethical in this study, the following activities were implemented by the researcher:

1. Requesting the respondents to sign in the informed consent form.
2. Acknowledging the authors quoted in this study and the author of standardized instrument through citations and referencing.
3. Presenting the findings in a generalized manner.

3.7 Limitations of the study

In view of the following threats to validity, the researcher allows 0.05 level of significance. Measures are also indicated in order to minimize if not to eradicate the threats to the validity of the findings of the study.

1. Extraneous variables which was beyond the researcher's control such as respondent's honesty, personal biases and uncontrolled setting of the study.
2. The use of research assistants can bring about inconsistency in the administration of the questionnaires in terms of time of administration, understanding of the items in the questionnaires and explanations given to the respondents. To minimize the threat, the research assistants were oriented and briefed on the procedures to be done in data collection.
3. Attrition/Mortality: Not all questionnaires may be returned completely answered or even retrieved back due to circumstances on the part of the respondents such as travels, sickness, hospitalization and refusal/withdrawal to participate. In anticipation to this, the researcher reserved more respondents by exceeding the minimum sample size. The respondents were also be reminded not to leave any item in the questionnaires unanswered and was closely followed up as to the date of retrieval.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.0 Introduction

This chapter presents the mode of community participation, the types/forms of Municipal waste management strategies, the mode of communities' management participation strategies in waste management, and lastly the attitudes and awareness of residents on waste management in Monrovia Liberia.

4.1 Profile of respondents

Respondents were asked to provide information regarding their gender, age and education level. Their responses were summarized using frequencies and percentage distributions as indicated in table 4.1;

Table 4.1: Profile of respondents

Profile	**Frequency**	**Percent**
Gender		
Male	212	53
Female	188	47
Total	**400**	**100**
Age		
20-29 years	91	23
30-39 years	106	27
40-49 years	82	20
50-59 years	65	16
60 years and above	56	14
Total	**400**	**100**
Education qualification		
Certificate	105	26
Diploma	122	31
Bachelors' degree	93	23
Masters	80	20
Total	**400**	**100**

Source: Primary Data, 2020

Results in Table 4.1 indicated that male respondents (53%) were more than female respondents (47%). This indicates a gender gap among citizens and management of wastes in Monrovia, Liberia. Regarding age, respondents in this sample were dominated by those between 30-39 years (27%), implying that most of respondents in this sample were in their early adulthood age, 23% were between 20-29 years, 20% were between 40-49 years, 16% were between 50-59 years, and 14% were 60 years and above. With respect to education qualification, majority of the respondents in this sample (31%) were diploma holders, indicating that respondents in this are relatively qualified and they were able to answer the questions in the questionnaire, these were followed by certificate holders (26%), 23% were degree holders and only 20% were masters' degree holders.

4.2 Types/forms of Municipal waste management strategies

The types/forms of Municipal waste management strategies were broken into three aspects and these are; reduction (with four questions), reuse (with five items) and recycle (with four items). Each of these questions was based on a four point Likert scale and respondents were asked to rate waste management strategies by indicating the extent to which they agree or disagree with each question, their responses were analyzed using SPSS and summarized using means as indicated in table 4.2;

Table 4.2: Types/forms of Municipal waste management strategies

Items on types/forms of Municipal waste management strategies	Mean	Interpretation	Rank
Reduction			
People in the communities always pay for waste collection according to the waste they generate	3.37	Very satisfactory	1
Reduction on the amount of waste generated in the community is your priority and responsibility	3.25	Satisfactory	2
All community members and MCA (Monrovia City Authority) always agree to work together for better reduction of waste	2.47	Unsatisfactory	3
All members in the community are availed with bio-degradable containers for easy disposal of wastes	2.33	Unsatisfactory	4
Average mean	**2.87**	**Satisfactory**	
Reuse			
MCA (Monrovia City Authority) has always sorted out some of waste items to be reused for managing waste	2.42	Unsatisfactory	1
Monrovia City Authority has its own dumping site, other than the one being used collectively.	2.38	Unsatisfactory	2
You always reuse waste to produce other products	2.27	Unsatisfactory	3
You have always been sensitized on how to reuse waste materials as a strategy of waste management	1.68	Very unsatisfactory	4
Average mean	**2.19**	**Unsatisfactory**	
Recycle			
Recycling can help to sort out waste before disposing it off	2.66	Satisfactory	1
MCA (Monrovia City Authority) has always embraced recycling as the best strategy for waste management	2.45	Unsatisfactory	2
The government has allocated adequate funds towards proper waste recycling	2.26	Unsatisfactory	3
There is adequate sensitization programs for the masses on waste recycling	1.55	Very unsatisfactory	4
Average mean	**2.23**	**Unsatisfactory**	
Overall mean	**2.43**	**Unsatisfactory**	

Source: Primary Data, 2020

Mean range	Response range	Interpretation
3.26 - 4.00	strongly agree	Very satisfactory
2.51 - 3.25	agree	Satisfactory
1.76 - 2.50	disagree	Unsatisfactory
1.00 - 1.75	strongly disagree	Very unsatisfactory

Results in table 4.2 indicated that waste management strategies in Monrovia, Liberia was rated unsatisfactory and this was indicated by the overall mean of 2.43. The dependent variable represents the perceptions of the respondents regarding these concepts; Reduction, reuse and recycle. All items for the dependent constructs were measured on a 4-point likert scale (1=strongly agree, 2=agree, 3=Disagree and 4=strongly disagree):-

Reduction was the first construct on the dependent variable and was measured using four items/questions and it was rated satisfactory (mean=2.87), implying that reduction as the waste management strategy is practiced satisfactorily in Monrovia, Liberia. People in the communities always pay for waste collection according to the waste they generate (mean=3.37), reduction on the amount of waste generated in the community is your priority and responsibility (mean=3.29), all community members and MCA (Monrovia City Authority) do not always agree to work together for better reduction of waste (mean=2.47), all members in the community are not availed with bio-degradable containers for easy disposal of wastes (mean=2.33).

Reuse; results in table 4.2 indicated that this construct was rated unsatisfactory and this was indicated by the average mean of 2.19, implying that wastes are not reused well as waste management strategy in Monrovia, Liberia. MCA (Monrovia City Authority) has not always sorted out well some of waste items to be reused for managing waste (mean=2.42), Monrovia City Authority has no its own dumping site, other than the one being used collectively (mean=2.38), reusing of waste to produce other products has failed in Monrovia City Authority (mean=2.27), the community members have not always been sensitized on how to reuse waste materials as a strategy of waste management (mean=1.68).

With respect to recycle; this construct was measured using four questions and it was also rated unsatisfactory (mean=2.23), hence implying that recycling wastes is not highly practiced in Monrovia, Liberia and this may be due limited technology. Though recycling can help to sort out waste in Monrovia City Authority before disposing it off (mean=2.66), MCA (Monrovia City) has not always embraced recycling as the best strategy for waste management (mean=2.45), the

government has not effectively allocated adequate funds towards proper waste recycling (mean=2.26), and there are no adequate sensitization programs for the masses on waste recycling (mean=1.55).

4.3 Communities' participation in waste management

This aspect was broken into three constructs and these are; empowerment (with five items/questions), capacity building (with four questions) and community active involvement (with four questions). Each of these questions was based on a four point Likert scale where respondents were asked to rate the level of community participation by indicating the extent to which they agree or disagree with each question, and their responses were analyzed using SPSS and summarized using means and rank as indicated in table 4.3;

Table 4.3: Attitudes and awareness of residents on waste management

Items on the attitudes and awareness of residents on waste management	Mean	Interpretation	Rank
Empowerment			
Government encourages community participation before taking decisions regarding waste management	2.63	Satisfactory	1
Community members are trained to monitor waste management programmes	2.57	Satisfactory	2
Community members have powers to control waste management programmes	2.21	Unsatisfactory	3
Community members are empowered to monitor garbage collection projects	2.11	Unsatisfactory	4
Average mean	**2.38**	**Unsatisfactory**	
Capacity building			
There is a clear method of operating where by each actor understands their role and responsibility during waste management	3.26	Very Satisfactory	1
Waste management policies have been put in place to strengthen the abilities, skills and knowledge among individuals in your community	2.77	Satisfactory	2
MCA (Monrovia City Authority) has developed a vision and strategy to be used during waste management	2.47	Unsatisfactory	3
There has been a well-developed system used in the process of waste management	2.38	Unsatisfactory	4
Average mean	**2.72**	**Satisfactory**	
Active involvement			
Communities are allowed to manage the wastes they generate	3.31	Very satisfactory	1
Communities are mobilized to participate in collection and disposal of wastes	2.81	Satisfactory	2
Communities are consulted on matters concerning wastes in the community	2.36	Unsatisfactory	3
Communities are involved in decision making as regards to waste management	2.28	Unsatisfactory	4
Average mean	**2.69**	**Satisfactory**	
Overall mean	**2.59**	**Satisfactory**	

Source: Primary Data, 2020

Mean range	Response range	Interpretation
3.26 - 4.00	strongly agree	Very satisfactory
2.51 - 3.25	agree	Satisfactory
1.76 - 2.50	disagree	Unsatisfactory
1.00 - 1.75	strongly disagree	Very unsatisfactory

Results in table 4.3 indicated that community participation in Monrovia, Liberia was generally rated satisfactory and this was indicated by the overall mean of 2.59, implying that the community members in Monrovia are also allowed to express their views when setting up waste management programmes.

With respect to empowerment; results indicated that empowerment was rated as unsatisfactory and this was indicated by the average mean (mean=2.38), implying that community members have no full powers to control waste management programmes, this is because some of community members are not empowered to monitor garbage collection projects. The results still indicated that the government encourages community participation before taking decisions regarding waste management (mean=2.63), the community members are trained to monitor waste management programmes (mean=2.57), community members have no powers to control waste management programmes (mean=2.21), and community members are not empowered to monitor garbage collection projects (mean=2.11).

Capacity building; results in table 4.3 indicated that four items were used to measure this construct and it was also rated satisfactory and this was indicated by the average mean of 2.72, implying that there is a clear method of operating where by each actor understands their role and responsibility during waste management in Monrovia, Liberia. There is a clear method of operating where by each actor understands their role and responsibility during waste management (mean=3.26), waste management policies have been put in place to strengthen the abilities, skills and knowledge among individuals in your community (mean=2.77), but however MCA (Monrovia City Authority) has not yet developed a vision and strategy to be used during waste management (mean=2.47), since there has not been any well-developed system used in the process of waste management (mean=2.38).

Active involvement; results in table 4.3 connoted that community active involvement was also measured using four items (questions) and it was rated satisfactory (mean=2.69), hence implying that the community members are also involved in programmes of waste management. Communities are allowed to manage the wastes they generate (mean=3.31), communities are mobilized to participate in collection and disposal of wastes (mean=2.81), communities are not consulted on matters concerning wastes in the community (mean=2.36), and majority of community members are not involved in decision making as regards to waste management (mean=2.28).

4.4 The attitudes and awareness of residents on waste management

Results indicated the following;

The key informants had this to say; *"since Liberia is facing rapid urbanization everyday which leads to overcrowding and the development of slums and informal settlements with poor waste management practices. Urban dwellers generally consume more resources than rural dwellers, and so generate large quantities of solid waste and sewage. Waste management in these areas is hampered by multiple land tenure system with many tenants not having a right to the land and therefore not able to manage waste domestically and also the urban authorities are overwhelmed by the sheer volumes of garbage generated"*.

When the key informants talked about the challenges facing the waste management strategies in Monrovia City Authority; *"the weak sanctions put in place by the solid waste ordinances and the strategy for those who fail to comply with the provisions, limited capacity of the council to effectively enforce the solid waste management ordinance and the strategy, technical and infrastructural challenges of the council to handle solid waste, and lack of recognition, support and integration of the informal waste reduction strategies into council solid waste management plan".* These key informants also continued and noted that; *"the local community initiatives to solid waste have lacked the capacity to transport their solid waste to the final disposal place hence supplemented council efforts by collecting solid waste from areas where council trucks could not reach to areas where they would effectively reach"*.

However when asked about what can be done in order to minimise the challenges faced during waste management strategies in Monrovia City Authority they had this say;

"there is need to repeal and revise the solid waste ordinance to include tough sanctions and working arrangement for enforcement, introduction of a solid waste management levy to be paid by every generator of solid waste, collected by all landlords and remitted to council to enable council raise funds to effectively manage solid waste, to support informal solid waste management practices as part of the council solid waste management strategy through provision of working capital on revolving schemes, capacity building and access to council solid waste collection trucks and the land fill, policy and advocacy training for the local community in rooted advocacy, establishment of advocacy structures and holding of community dialogue meetings with all key stake holders to effectively hold council reliable for solid waste management".

4.5 Regression analysis

Table 4.7: Regression Analysis between the Dependent and Independent Variables

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.479[a]	.230	.893	.43141

a. Predictors: (Constant), Community participation

ANOVA[b]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	20.151	1	20.151	108.275	.000
	Residual	67.558	400	.186		
	Total	87.709	399			

a. Predictors: (Constant), Community participation

b.Dependent Variable: waste management strategies

Coefficients[a]

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.479[a]	.230	.893	.43141

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.687	.096		17.652	.000
	Community participation	.362	.035	.479	10.406	.000

Source: Primary Data, 2020

Regression analysis results in table 4.5 above indicated that community participation accounted for 89.3% of the waste management strategies in Monrovia, Liberia. This was indicated by adjusted r squared of 0.893 leading to a conclusion that community participation significantly affects the waste management strategies in Monrovia. The coefficients table indicated that of all the aspects of community participation, community active involvement accounted for the biggest influence on waste management strategies in Monrovia, Liberia ($\beta = 0.538$, $P = 0.001$).

CHAPTER FIVE

DISCUSSIONS, CONLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This chapter focuses on the findings, conclusions; recommendations and suggested areas that need further research following the study objectives and study hypothesis.

5.1 Discussions

Here the discussions were in line with study objectives;

This study was set to assess the community participation in waste management practices in Monrovia, Liberia, three specific objectives guided this study and these were to; i) to assess the types/forms of Municipal waste management strategies in Monrovia, Liberia; ii) to document the mode of communities management participation strategies in waste management; iii) to explore the attitudes and awareness of residents on waste management in Monrovia Liberia.

5.1.1 Objective one; to assess the types/forms of Municipal waste management strategies in Monrovia, Liberia

The first objective in this study was to assess the types/forms of Municipal waste management strategies in Monrovia, Liberia. Findings indicated that the types/forms of Municipal waste management strategies available in Monrovia include reduction, reuse and recycle. Wastes include any scrap material, effluent or unwanted surplus substance or article that requires disposal because it is broken, worn out, contaminated or otherwise spoiled. This is in line with El-Haggar (2013) who noted that in most cases, waste management is carried out by a number of processes, many of which are closely interrelated; therefore, it is logical to design holistic waste management systems, rather than alternative and competing options (Staniskis, 2012). The three R's are commonly used terms in waste management; they stand for "reduce, reuse, and recycle". As waste generation rates have risen, processing costs increased, and available landfill space decreased, the three R`s have become a central tenet in sustainable waste management efforts.

Kim (2013) noted that it is inevitable that waste will be created as a by-product of daily human living, but in many cases, it is possible for this waste to be diverted and recycled into valuable new materials. Glass, plastic and paper products are commonly collected and reformed into new materials and products. Recycling products offer many of the benefits of waste reduction efforts (displacing new material usage, reducing waste generated and the costs associated with disposal) but recycling requires energy and the input of some new materials, thus placing it lower on the waste hierarchy than reduction and reuse (USEPA, 2013).

Reduction can also be achieved in many cases through reducing consumption of products, goods, and services. The most effective way to reduce waste is by not creating it in the first place, and so reduction is placed at the top of waste hierarchies (USEPA, 2013). In many instances, reduction can be achieved through the reuse of products. Efforts to take action to reduce waste before waste is actually produced can also be termed pre-cycling. Integrated waste management has emerged as a holistic approach to managing waste by combining and applying a range of suitable techniques, technologies and management programs to achieve specific objectives and goals (Tchobanoglous and Kreith, 2013).

Reusing products displaces the need to buy other products thus preventing the generation of waste. Minimizing waste through reduction and reuse offers several advantages including: saving the use of natural resources to form new products and the wastes produced in the manufacturing processes; reducing waste generated from product disposal; and reducing costs associated with waste disposal (USEPA, 2013). The collection and processing of waste is not the exclusive domain of the local government calling for a more comprehensive partnership between the community and local governments where each actor has a role to play towards waste minimisation, waste recycling and waste disposal (Roberta, 2014).

The waste hierarchy is represented as a pyramid because the basic premise is for policy to take action first and prevent the generation of waste. The next step or preferred action is to reduce the generation of waste i.e. by re-use. The next is recycling which would include composting. Following this step is material recovery and waste-to-energy. The finding is in line with Tadesse et al. (2012) who analyzed the factors influencing household waste disposal decision making. His

study results showed that the supply of waste facilities significantly affects waste disposal choice, whereby inadequate supply of waste containers and longer distance to these containers increase the probability of waste dumping in open areas and roadsides relative to the use of communal containers. Insufficient financial resources limiting the safe disposal of waste in well-equipped and engineered landfills and absence of legislation are mentioned.

5.1.2 Objective two; to document the mode of communities' management participation strategies in waste management

The findings revealed that the people themselves are united with those government authorities to improve the economic social and culture conditions of the nation and this has enabled them to contribute fully to national progress. This finding is also in line with Sujauddin et al. (2012) who noted that the generation of waste is influenced by family size, their education level and the monthly income. Tadesse et al. (2012) analyzed the factors that influence household waste disposal decision making. Results showed that the supply of waste facilities significantly affects waste disposal choice. Inadequate supply of waste containers and longer distance to these containers increase the probability of waste dumping in open areas and roadsides relative to the use of communal containers. Insufficient financial resources limiting the safe disposal of waste in well-equipped and engineered landfills and absence of legislation are mentioned.

5.1.3 Objective three; to explore the attitudes and awareness of residents on waste management in Monrovia Liberia

The findings of this study indicated that the residents in Monrovia express positive attitude during waste management handling and transport, and this varies from region to region within Monrovia. This finding is also in line with McDougall et al (2011) who noted that in many instances, the collection point will be an interface where waste generators and waste collectors that must be carefully managed if the system is to be effective. Waste generators require waste collection with minimal inconvenience, while collectors must be able to collect waste in a way that is compatible with the planned treatment and processing methods if the waste management system is to be sustainable. Beigl et al., (2012) added that waste management is intended to reduce adverse effects of waste on health, the environment or aesthetics. Waste management practices are not uniform

among countries (developed and developing nations); regions (urban and rural area), and sectors (residential and industrial).

Malika et al., (2015) identified the relationship between community participation in recycling programme and community attitude and their knowledge on solid waste segregation. Their study recommended that policy review by government was important in influencing more community participation in recycling programmes.

Lederer et al., (2015) generated stakeholder's knowledge for solid waste management planning through action research. Results showed that due to lack of financial and technical resources, only half of the wastes generated were formally collected, while the residual was littered, irregularly dumped, or burned. Some of the resulting problems as defined by community members were solved by themselves, while for others, they relied on the commitment of other stakeholders, particularly authorities, this was particularly the case for the drafting of by-laws and the provision of collection vehicles (Salem & Baeyens, 2013).

5.2 Conclusions

Objective one

The types/forms of Municipal waste management strategies available in Monrovia, Liberia include reduction, reuse and recycle. As a result, waste collection services are provided mainly to the official areas in central Monrovia and Mamba Point while services in the majority of the communities are non-existent or very minimal. Lack of logistics, poorly maintained disposal sites, and lack of waste treatment facilities make it extremely difficult for accumulated wastes to be effectively collected and disposed. The shortage of skilled waste management personnel also poses a challenge in waste management. While funding and equipment are essential for the day to day administration of waste management activities, the human resource element is also vital. However the practice of waste collection requires qualified professionals, including engineers, mechanics, sanitation officers, administrators, and finance and accounting staffs.

Objective two

The study concluded that giving people more opportunities to participate effectively in garbage collection can highly improve on the strategies used in waste management in Monrovia, Liberia. This is because the households attitudes related to separation of waste are affected by the active support community residential committees' involvement for public participation and fee for collection service based on the waste volume or weight. Gender, peer influence, land size, location of household and membership of environmental organization determine the household waste utilization and separation behavior.

Objective three

The household's attitudes towards waste collection can be determined by the involvement of public participation and fee for waste collection service based on the waste volume or weight. Gender, peer influence, land size and location of household; all such factors always influence the attitudes and awareness of residents on waste management in Monrovia Liberia.

5.3 Recommendations

Objective one

The researcher recommends to the management of Monrovia city to allow the community members have powers to control waste management programmes, this will improve on the empowerement which can improve community participation during waste management.

Objective two

The researcher recommends to Monrovia city to develop a vision and strategy to be used during waste management, this can be done improving community capacity building, hence improving on waste management strategies.

Objective three

The Communities should also get involved in decision making as regards to waste management, this can be done through allowing the entire community to give their views during waste management meetings, and this can increase active involvement of the community during waste management.

5.4. Contribution to knowledge

The study was able to bridge the gaps that were not covered by the previous studies on community participation during waste management practices in Monrovia, Liberia. The study brought up new frontiers of knowledge and information on how community participation should be done, the study also exposed the weaknesses that were found out in current operations of waste management in relation to reduction, reuse and recycle.

5.5 Areas for further research

Prospective researchers and even students are encouraged to research on the following areas;

1) Community capacity building and recycling of wastes in Monrovia, Liberia.
2) Community active involvement and reduction of wastes in Monrovia, Liberia.

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APPENDICES

Appendix 1: Research instrument

SECTION A: Demographic characteristics of the respondents

Gender (Please Tick)

_____ (1) Male _____ (2) Female

Age (Please Tick)

Below 20 years	
20 – 29 years	
30 – 39 years	
40 – 49 years	
50 years and above	

Qualifications Under Education Discipline (Please Tick):

Certificate	
Diploma	
Bachelors	
Masters	
Ph. D	
Others (Specify)	

Section B Independent Variable: Community Participation. Please circle the number to indicate the degree to which you feel the statement is characteristic or true for you. The rating scale is as follows: 1 = **Strongly Disagree** 2 = **Disagree** 3 = **Not sure** 4= **Agree 5** = **Strongly Agree**

		1	2	3	4
	Empowerment				
1	Government encourages community participation before taking decisions regarding waste management	1	2	3	4
2	Community members are empowered to monitor garbage collection projects	1	2	3	4
3	Community members have powers to control waste management programmes	1	2	3	4
4	Community members are trained to monitor waste management programmes	1	2	3	4
	Capacity building	1	2	3	4
1	Waste management policies have been put in place to strengthen the abilities, skills and knowledge among individuals in your community	1	2	3	4
2	There is a clear method of operating where by each actor understands their role and responsibility during waste management	1	2	3	4
3	There has been a well developed system used in the process of waste management	1	2	3	4
4	MCC has developed a vision and strategy to be used during waste management	1	2	3	4
	Active involvement				
1	Communities are involved in decision making as regards to waste management	1	2	3	4
2	Communities are consulted on matters concerning wastes in the community	1	2	3	4
3	Communities are allowed to manage the wastes they generate	1	2	3	4
4	Communities are mobilized to participate in collection and disposal of wastes	1	2	3	4

Section C Waste Management Strategies: Please circle the number to indicate the degree to which you feel the statement is characteristic or true for you. Please circle the number to indicate the degree to which you feel the statement is characteristic or true for you. The rating scale is as follows: 1 = **Strongly DISAGREE,** 2 =**Disagree,** 3= **Agree 4= Strongly agree**

	Reduction	1	2	3	4
1	Reduction on the amount of waste generated in the community is your priority and responsibility	1	2	3	4

2	People in the communities always pay for waste collection according to the waste they generate	1	2	3	4
3	Members of the community always work together for better reduction of waste	1	2	3	4
4	All members in the community are availed with bio-degradable containers for easy disposal of wastes	1	2	3	4
	Reuse				
1	MCC has always sorted out some of waste items to be reused for managing waste	1	2	3	4
2	Monrovia has its own dumping site, other than the one being used collectively	1	2	3	4
3	You always reuse waste to produce other products	1	2	3	4
4	You have always been sensitized on how to reuse waste materials as a strategy of waste management	1	2	3	4
	Recycle				
1	Recycling helps to sort out waste before disposing it off	1	2	3	4
2	There is adequate sensitization programs for the masses on waste recycling	1	2	3	4
3	MCC has always embraced recycling as the best strategy for waste management	1	2	3	4
4	The government has allocated adequate funds towards proper waste recycling	1	2	3	4

Thanks a lot for your valuable time

Appendix 2: Interview Guide

Interview guide

1. Are there designated waste collection points in Monrovia, Liberia?
2. What is the nature of waste collected by the waste collectors in Monrovia, Liberia?
3. Where is waste taken, and how is it disposed in Monrovia, Liberia?
4. How do you encourage the 3R (reduce, recycling and reuse) in the solid waste management processes Monrovia, Liberia?
5. What are the activities embark on to reduce, reuse or recycle solid wastes Monrovia, Liberia?
6. Do we have any recycling companies in Monrovia, Liberia?
7. Do we undergo composting of organic wastes Monrovia, Liberia?
8. Are there policies put in place that encourage reduce, reuse or recycle solid wastes Monrovia, Liberia?
9. Are there programs put in place to give information on waste management strategies Monrovia, Liberia?
10. If there is, how is it communicated (radio, television, workshops, etc)?
11. What do you feel could be done to enhance reduce, reuse or recycle solid wastes Monrovia, Liberia?
12. In your own opinion, what can be done in order to minimise the challenges facing the waste management strategies in Monrovia Liberia Monrovia, Liberia?