CONTRIBUTION OF HOTELS PARTICIPATION IN SOLID WASTE SORTING AND STORAGE IN KAKAMEGA TOWN, KENYA

BY

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DECLARATION

I declare that this thesis is my original work and has not been presented to another University or any other institution of higher learning for any award. All the work in this thesis has been carried out by myself and quoted sources of information are well acknowledged by way of referencing.

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DEDICATION

This thesis is dedicated to all stakeholders in solid waste management in Kakamega County and my staff, research assistants, wife and children for their efforts towards its success.

ABSTRACT

Globally, hotels recognize the importance of sorting and storing solid waste to achieve sustainable waste management. However, hotels in developing countries like Kenya face challenges in collaboration, empowerment and access to information, leading to low levels of waste sorting and storage practices. In Kakamega Town, approximately 30% of hotels solid waste end up in municipal waste streams, complicating environmental planning efforts for the municipality. Therefore, the main objective was to examine the contribution of hotels participation in solid waste sorting and storage in Kakamega Town. Specific objectives were to: determine the contribution of hotels information sharing in solid waste sorting and storage; establish the contribution of hotels empowerment in solid waste sorting and storage; and assess the contribution of hotels collaboration in solid waste sorting and storage. A cross-sectional descriptive research design was used. Saturated sampling was adopted to sample 39 hotels. Twenty-two key informants were interviewed. The study utilized stratified sampling to categorize hotels based on bed capacity into low (6 – 20 beds) and high (21–100 beds). Primary data were collected using semi-structured questionnaires, interviews schedule and observational checklist. Quantitative data were analysed using descriptive statistics such as bar charts, pie charts, percentages, and frequencies. The hypotheses were tested using Chi-square tests of independence and homogeneity. The effect sizes were measured using Cramer's V coefficient to determine the significance and strength of relationships among variables. The results show a statistically insignificant ($\chi^2 = 34.192$, V= 0.781, p = 0.001), collaboration contributed very highly to solid waste sorting and storage; a strong statistically insignificant ($\chi^2 = 8.442$, V = 0.403, p = 0.392), empowerment contributed strongly to solid waste sorting and storage; and a moderate statistically insignificant ($\chi^2 = 25.763$, V = 0.471, p = 0.586), a moderate contribution on methods of accessing information on solid waste sorting and storage among hotels. The study concludes that, hotels collaboration, empowerment and access to information strongly contributes to solid waste sorting and storage. The study recommended the increased collaboration and empowerment of hotels towards sustainable solid waste sorting and storage.

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LIST OF ABBREVIATIONS AND ACRONYMS

4Rs	Reduction, Reuse, Recycling and Recovery
CENIA	Czech Environmental Information Agency
HSWM	Hotels Solid Waste Management
EAC	East Africa Community
EC	European Commission
EMCA	Environmental Management and Coordination Act
EMS	Environmental Management System
IBM	International Business Machine
ISO	International Organization for Standardization
ISWM	Integrated Solid Waste Management
KMC	Kakamega Municipal Council
KNBS	Kenya National Bureau of Statistics
LCA	Life Cycle Assessment
MRF	Material Recovery Facility
NEMA	National Environment Management Authority
NGO	Non-Governmental Organization
NIMBY	Not in My Backyard
SPSS	Statistical Package for Social Sciences
SWM	Solid Waste Management
UNEP	United Nations Environment Programme
UN-HABITAT	United National Human Settlement Programme
US EPA	United States Environmental Protection Agency
US-AEP	United States - Asia Environmental Partnership
WB	World Bank

WORKING DEFINITION OF TERMS

Contribution: It is a dialogue-based communication of hotels and stakeholders working together and making decisions collaboratively through forums, stakeholders' involvement, idea collection, education events, and financial support. In this study, it will be measured by the organisation of education events, and types of stakeholders who collaborated with hotels in solid waste sorting and storage. The levels of contribution for this study include; Level 1 Information sharing, Level 2 Collaboration and Level 3 Empowerment

Empowerment: It is a dialogue-based communication where hotel management organizes events in collaboration with relevant environmental agencies to train hotel workers on solid waste sorting and storage, during the training solid waste storage bins are provided. In this study, empowerment will be measured by the frequency of training conducted, and the types of solid waste storage bins provided.

High-Capacity hotels: Refers to hotels with more accommodation rooms. This study, refers to those hotels with a bed capacity of 21-100 within Kakamega town that sort, and store solid waste.

Hotel: A hotel refers to a business entity providing meals, accommodation, conference, and meeting services. For this study, it refers to hotel operators (manager, storekeeper, waste handlers, secretary or receptionist) operating under a single business license permit by the County Government of Kakamega who sort, and store solid waste within Kakamega Town with a bed capacity of 6 to 100.

Hotel participation: The action of taking part in an activity. For this study, it refers to three levels of participation by hotels in solid waste sorting, and storage activities within their facilities. The levels of participation include Level 1 Information sharing, Level 2 Collaboration and Level 3 Empowerment.

Information Sharing: It is a one-way communication of passing information about the hotel and service offered through newsletters, websites, and brochures. In this study, information sharing will be measured by the frequency of sharing information and access to information on solid waste generation and types through Self-initiative, social media, company advisory, seminar/workshop, suggestion boxes, and websites.

Low-Capacity hotels: Refers to those with minimal accommodation space. This study refers to hotels with a bed capacity of 6-20, that sort, and store solid wastes in Kakamega town.

Solid waste sorting: Refers to manually segregating (separating) solid waste components into specific fractions, that is glass, food waste, paper, and plastic generated by hotels.

Solid waste Storage: The interim containment of solid waste, in an approved manner, after generating and before collection and disposal**.** The solid wastes are stored in waste bins such as dustbins, garbage cans, and trash cans, among others at the hotel.

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CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

The quantity of food waste generation per annum averages about 1.3 billion tonnes of global solid waste (FAO, 2011; Gustavsson *et al*., 2011; Pfaltzgraff *et al.*, 2013; the World Bank, 2018). The magnitude and complexity of the hotels solid waste sorting and storage have been a growing challenge since the late 20th century (Liu *et al.*, 2016; Pirani & Arafat, 2016). Despite the importance of empowerment, solid waste sorting and storage are challenges faced by hotels (Omidiani & Hashemi, 2016; Wan *et al*., 2017). Thus, it was important for this study to investigate the challenges of hotels contribution in solid waste sorting and storage through empowerment (training and provision of waste bins).

Globally, between the mid-1970s and early 2000s, the period experienced increased hotels solid waste from 250,000 tonnes to 300,000 tons/year and each person yield an average of 0.74kg/day; due to increased number of hotels in towns with little information on the type of solid waste sorted by hotels (Radwan, Jones & Minoli, 2010; Pirana & Arafat, 2014; Yim, Fujiwara & Sour, 2014). The burgeoning of hotels with higher carrying bed capacity (guest rooms, event halls and gardens) to cater for the needs of the increasing number of customers has exacerbated waste sorting and storage space by hotels (Tostivint *et al*., 2016; Wang *et al*., 2017; Pham Phu *et al.*, 2018). Studies by FAO (2011), Gustavsson *et al*., (2011); Pfaltzgraff *et al.*, 2013; the World Bank, 2018, have shown that the global annual food waste generated is significant towards hotel industries to determine their sorting and storage capacity but they still face similar challenges. These studies were limited to food waste generated by hotels and not the other types of waste such as plastic,

metal, paper and glass which this study focused on. This was important as it would help the hotels in determining their type of waste generated, storage and sorting space.

Global Municipal waste is predicted to grow from 2.3 billion tonnes in 2023 to 3.8 billion tonnes by 2050. Also, the global direct cost of waste management was estimated to be USD252 billion and expected to raise to USD640.3billion by 2050 if urgent action towards waste management is not taken (UNEP, 2024). Food waste from hotel operations approximately contributes 20 per cent of global greenhouse gas emissions when poorly stored and disposed of in landfills (Kallbekken and Sælen, 2013; Papargyropoulou *et al*., 2014, de Lange & Nahman, 2015, Scholz *et al.*, 2015). Moreover, the approaches used by management in serving customers - time of service, type of food served and the number of customers - contribute to increased food waste generation (Papargyropoulou *et al.*, 2016; Pirana & Arafat, 2016; Kasavan, Mohamed & Halim, 2019). This study acknowledges that the reviewed literature affirms that hotels hardly sort solid waste at their premises at a global level. The researcher sought to investigate whether lack of empowerment influenced the scarcity of sorting and storage of solid waste by the hotels.

According to FAO and Stewarding Association International, (2017), about 30% of food waste generated by hotels ends up in the Municipal waste stream. Some of the determinants of increased hotel solid waste arise from avoidable edible waste where on average, each customer generates about 0.9 kg of solid waste per day (Aamir *et al.*, 2018; Abdulredha *et al.*, 2018). This avoidable edible waste arises from excessive plate service that end up as waste. Studies which have been done over the years have noted that hotels size and income were important determinants of waste generation but few studies have investigated the sorting and storage practices. Hotels with more facilities such as conference halls, accommodation rooms, recreation facilities, garden service

areas have higher potential to generate more waste due to high influx of customers. Researchers have shown that there were significant quantities of solid waste generated by hotels and at least a third ended up in the municipal waste stream in mixed form, thus scanty information on solid waste sorting and storage by the hotels.

The problem in developing countries is that hotels generate mixed solid waste in large volumes but do not have the capacity in terms of willingness to pay, attitude to sort and store the waste. They believe in profit maximization rather than investing in human resource and technology, thus harming the environment (Mtungwe *et al.*, 2014; Kinobe *et al*., 2015). Moreover, hotels have inadequate storage bins and rarely sort solid waste thus an attribute of a lack of empowerment and collaboration with other stakeholders (Kubanza & Simatele, 2016; Kirama & Mayo, 2016). Hotels, contribution in solid waste sorting and provision of storage bins empowers personnel and enhances collaboration with other stakeholders thus mitigating challenges posed by solid waste management; however, this has been given little attention in fostering a green environment in hotels in Africa (Mbasera, Du Plessis, Saayman & Kruger, 2016). Previous studies have shown that hotels generate large amounts of mixed solid waste – organic waste, glass, paper and metal - during peak hours and high seasons (food waste 60%,) and are rarely sorted before storage (Chaabane *et al*., 2018; Kashyap & Borthakur, 2018). From an African perspective, it has been shown that the empowerment of hotels in solid waste sorting and storage has been given little attention. With an increasing campaign on solid waste management, this study endeavoured to investigate hotels contribution in solid waste sorting and storage.

Previous studies indicated that solid waste generation in hotels has increased with the increasing number of clients and an average of 0.043 kg per person per service of food waste was generated

(Filimonau & Delysia, 2019; Camilleri-Fenech *et al*., 2020). Filimonau & Tochukwu, (2020) reported that customers play a critical role in solid waste generation. Unfortunately, customers have exacerbated hotel waste generation without there participation in sorting and storage as a result of their lack of information on solid waste sorting and storage (Camilleri-Fenech *et al*., 2020). Payment of services by hotels for solid waste sorting and storage bins has financial setbacks limiting participation in training of staff on sorting and provision of storage bins (Abou-Kamar, 2017; Boateng *et al*., 2019; Mulat *et al.,* 2019; Serge-Kubanza & Simatele, 2020). These studies, (Camilleri-Fenech *et al*., 2020) have indicated that hotels generate mixed waste, which is mainly contributed by the customers; however, there is lack of information, collaboration on solid waste sorting and storage by hotels.

In the late 1980s to early 2000s, hotel solid waste sorting and storage became an environmentally unsound challenge, on average about 1.9 kg/person/day - food wastes (79.1%), paper (3.5%), glass (4.5%), plastic 3.3%, metal (1.7%) (Munga *et al*., 1993; Muthini, Tole & Otieno, 2003). Previous studies have also shown that the consumption of goods, the hotel size, income per day and type of customers were important determinants of the quantity of solid waste produced (Kimeu, 2015). However, the studies did not elaborate on the importance of information sharing among hotels on solid waste types and sorting which is a key factor in reducing global greenhouse gas emissions.

Previous studies have pointed out that despite the importance of the availability of sorting bins and accessibility, they were rarely available and accessible by hotels, thus, encouraging the mixing of solid waste in one storage bin (Sibanda *et al.,* 2017; Okumu, 2020). Training personnel, provision of storage bins, payment of services and access to information regarding solid waste sorting and storage are essential and encourage solid waste characterization (Odera, 2016; Atieno, 2017;

Mugambi, 2017; Sibanda *et al.*, 2017); however, this is a challenge faced by hotels. It was revealed from the reviewed literature that hotels hardly provided sorting bins thus encouraging the mixing of solid waste at the source. Besides, the studies scarcely elaborated on the importance of information sharing among hotels on solid waste sorting and storage practices; which this study sought to investigate.

Customers and personnel play an important role in exacerbating solid waste generation in hotels as they are the major consumers of hotels goods and services (Okumu, 2020). Mbaki (2019) and Cheruiyot (2020) have explained that there was a shortage of sorting bins which was the main challenge to the hotels and was attributed to the scarcity of knowledge on waste sorting and installation of different storage bins. In addition, it was revealed that the scarcity of knowledge among hotels on sorting solid waste had contributed to the elevation of solid waste storage challenges (Osiako & Kummitha, 2020; Omune *et al*., 2021). These studies, (Osiako & Kummitha, 2020; Omune *et al*., 2021), in Kenya have underscored the importance of solid waste generation in relation to the hotels size, income and type of customers that informs the composition and quantity (amount) of solid waste. However, these studies have rarely informed on the importance of solid waste sorting and storage considering the solid waste types.

Studies in Kakamega County investigated the determinants of effective solid waste management (Nyayiemi, 2012; Malenya, 2015). These studies found that solid waste management practices were being hampered by the lack of awareness, insufficiency of finances for the promotion of waste reduction and recycling and the lack of professional personnel. The County government of Kakamega focus more on promoting town cleaning services where mixed waste ends up at the dumpsite with less attention and budget given to expedite source sorting and storage initiatives

(Nyayiemi, 2012; Malenya, 2015). The County government, has focused on waste to energy plant, waste to fertilizer plant and installation of refuse chambers for material recovery, however little attention is given to promoting hotels solid waste sorting and storage that could promote the same practices (KCIDP, 2023-2027). The findings of Nyayiem, 2012; Malenya, 2015, were general and could not inform the contribution of hotels in solid waste sorting and storage. However, the studies make us understand the role of hotels through willingness to pay a fee of two hundred Kenyan shillings per month towards municipal solid waste management which is inadequate. These has resulted into challenges by the municipal council to plan for waste sorting and storage in liaise with other stakeholders like NEMA, private companies, community-based organizations to collaborate and share information with hotels regarding waste sorting and storage.

The National Environment Management Authority (NEMA) reported grave challenges faced by Kakamega Town whose management capacity by 2014 was 22%. This was below average as compared to Nairobi City (80%), Mombasa City (65%), Thika Town (60%), Eldoret Town (55%), and Nakuru Town (45%) now City (NEMA, 2014). The National Solid Waste Management Strategy (NEMA, 2014), provides that solid waste generators have the responsibility of participating in solid waste sorting and storage. However, most towns in Kenya like Kakamega, waste generators like hotels believe such role lies with the municipal council thus escalating the volume of mixed waste within towns (Ozoike-Dennis *et al.* (2019) and Mochache *et al.* (2020).

Another study by Kanda and Cherono (2020) ‘Evaluation of Solid Waste Management Practices in Kakamega Municipality, Kakamega County’ was skewed towards commercial enterprises in general in Kakamega Municipality. Their major finding was that the management of commercial enterprises were aware of the importance of recycling solid waste generated. Furthermore, it was

revealed by Kanda and Cherono that solid waste generation per day on average was 8.2 kg by the commercial enterprises in Kakamega Municipality. This study did not clearly articulate whether the knowledge of the management informed the sorting and storage of solid wastes and also, did not classify the type of the solid waste and the commercial enterprises. Therefore, there was the need to specifically assess hotels operating in Kakamega Town to ascertain their involvement in solid waste sorting and storage which could promote solid waste management practices.

Studies by Muthini, Tole and Otieno (2003), on solid waste pollution loads in beach hotels on the Kenyan South Coast shows that, the mean per-capita waste generation rate by hotels was found to be 1.90 kg person/day and the relative proportions by weight of the respective waste categories were: paper 35%, plastics 3.3%, tins 1.7%, glass 45%, food waste 79.1%, cartons 2.0%, and residual waste 6.0%. However, in Kakamega Town, there are no previous studies that assessed quantity of solid waste sorted and stored among hotels hence its selection as the study area. Studies by Chaabane *et al*., 2018; Kashyap & Borthakur, 2018, revealed that of the total urban solid waste generated, organic waste accounts for 60%-70% of which hotels contribute more as compared to other commercial enterprises. In Kakamega Town, the hotels were chosen to help understand their involvement in solid waste sorting and storage to help the municipal council plan for their waste. Also, hotels were selected based on bed capacity as used in KCIDP-2018, to enforce on County revenue collection and polluter pay principal. A previous study in Kakamega municipality indicated that about 55% of commercial enterprises rarely sort their waste at the point of generation (Kanda & Cherono, 2020). This led to this study to further assess the specific sorting of solid waste (food waste, plastic, glass, and metal) by the hotels and their storage practices.

The research identifies a significant gap in the role of information sharing on solid waste sorting and storage among hotels, particularly in developing countries like Kenya. Previous studies have

shown that hotels contribute heavily to solid waste generation but often lack access to information on proper sorting and storage practices, which hinders effective waste management. Furthermore, empowerment through training and provision of bins remains insufficient, exacerbating waste-related challenges. The study aims to investigate these gaps, particularly in Kakamega Town, where hotel participation in solid waste management is lacking.

This research aims at filling this gap by assessing the current solid waste sorting and storage by hotels in Kakamega Town which have no adequate training and no enough bins provided. This situation can be attributed to the global environmental and health concerns in relation to waste management and due to this the need for change is warranted especially among hotel establishments that are significant contributors of solid waste. The research is designed to identify the ways of enhancement of the waste management systems in Kakamega Town utilizing the concept of hotel empowerment and stakeholders' engagement.

1.2 Statement of the problem

Globally, hotels generate solid waste which adds to the solid waste burden and poses challenges in solid waste sorting and storage. Thus, the huge increase in the volume of mixed solid waste witness unprecedented scale of environmental risks such as diseases, ecosystem degradation, contamination of soil and water, global warming and climate extremes and increased budget. This is due to inaccessibility to information empowerment and collaboration among hotels in solid waste sorting and storage. Therefore, the global municipal solid waste generated is estimated to be 2.3 billion tonnes and expected to rise to 3.8billion by 2050, with a budget estimate of USD252 billion and to rise to USD 640.3 billion by 2050 per annum. Of the total waste generated, hotels contribute about 300,000 tonnes per year and expected to rise to 600,500 by 2050.

In developing countries, due to insufficient information sharing, empowerment and collaboration among hotels on solid waste sorting and storage has led to continuous uncontrolled dumping of unsorted waste into open channels and drains (Hussein and Mona, 2018). Hotels assume that it's the responsibility of the municipal council to collect, sort and dispose of the waste as its expensive for them. This is due to lack of information sharing and collaboration with other stakeholders in solid waste sorting and storage. In Kenya, hotels in larger towns like Mombasa practice solid waste sorting and storage thus encouraging reuse, and composting of their waste such as Mombasa Beach Hotel, Severin Sea lodge and Diani Sea lodge. Tins are re-used for planting tree seedlings and flowers; Glass waste and cartons are collected by dealers for recycling and Food waste was used to feed pigs. This implies that, there is good collaboration, access to information on importance of solid waste sorting and storage practices by the hotels.

However, in Kakamega Town, studies gave the general quantity of solid waste generated by commercial enterprises which was estimated at 1,633 tonnes per day. Therefore, in Kakamega Town there is lack of information solid waste sorting and storage. Kakamega Town has the lowest waste management capacity at 22% which is below average as compared to Nairobi City (80%), Mombasa City (65%), Thika Town (60%), Eldoret Town (55%), and Nakuru Town (45%) now City (NEMA, 2014). This implies that, there is low access to information, empowerment and collaboration on solid waste sorting and storage by the hotels which could promote environmental sustainability thus its selection.

The County government of Kakamega through the municipal council, only collects revenue from the hotels based on their classification based on bed capacity. This has created a misleading attitude of hotels that the role of the municipal council is to manage all the waste within the town. Hotels rarely install sufficient sorting and storage bins which has escalated the mixing of solid waste as a

common practice that could have been brought about by the scarcity of training in solid waste sorting and storage. Stakeholder collaboration in solid waste sorting and storage was key in promoting hotel information sharing in solid waste sorting and storage practices. However, hotels experience a challenge in financial allocation for training, installation of sorting and storage bins, collaborating with other key stakeholders as they are in profit maximization business. Thus, the mixed of the hotels solid waste ends up in the municipal waste stream blocking drainage's, ground water pollution, air pollution, spread of diseases and extreme climate change.

Therefore, the purpose of this study was to examine the contributions of hotels towards solid waste sorting and storage in Kakamega Town. These will help in understanding the contribution of hotels in terms of collaboration, empowerment and information sharing on solid waste sorting and storage thus promoting Sustainable Development Goals 11 and 12 (UNDP, 2015), that aim to promote sustainable cities and to ensure sustainable consumption and production patterns. Also, the study will help the municipal council to efficiently plan for the hotels solid waste sorting and storage, thus help them in further waste management practices like collection, transportation and final disposal.

1.3 Objective of the study

The main objective of this study was to examine the contributions of hotels participation in solid waste sorting and storage in Kakamega Town, Kenya.

1.3.1 Specific Objectives

This study was guided by the following specific objectives.

1. To determine the contribution of hotel information sharing (self-initiative, social media, company advisory, seminars and websites) in solid waste sorting and storage in Kakamega Town
2. To establish the contribution of hotels empowerment (training and provision of bins) in solid waste sorting and storage in Kakamega Town;
3. To assess the contribution of hotels collaboration (stakeholder, financial, technical support) in solid waste sorting and storage in Kakamega Town;

1.4 Research Hypotheses

The research hypotheses for this study were:

1. H_0: Hotels information sharing (self-initiative, social media, company advisory, seminars and websites) has no significant difference in solid waste sorting and storage in Kakamega Town.
2. H_0: Hotels empowerment (training and provision of bins) has no significance difference in solid waste sorting and storage in Kakamega Town;
3. H_0: Hotels collaboration (stakeholder, financial, technical support) has no significant difference in solid waste sorting and storage in Kakamega Town;

1.5 Justification of the Study

Hotels are the main consumer base that essentially generates more organic solid waste in towns. In Kakamega Town, there are no previous studies that assessed solid waste sorting and storage among hotels hence its selection as the study area. Also, previous studies in Kakamega Town focused on general commercial solid waste generation, sorting and recycling without being specific on the type of commercial enterprises. Thus, hotels being among the commercial

enterprises were specifically selected based on the bed capacity of 6-100. This will help the County Government of Kakamega to plan for their waste sorting and storage practices through collaboration and information sharing. The previous studies also failed to show the methodology used in measuring the waste generated thus this study adopted the direct waste analysis method to quantify the waste type and weight in kilograms. Studies have also revealed that of the total urban solid waste generated, organic waste accounts for 60%-70% of which hotels contribute more as compared to other commercial enterprises. Thus, hotels were chosen for this study, to help understand their involvement in solid waste sorting and storage.

Hotels of bed capacity 6-100 were selected because it will easily inform the County Government of Kakamega to adopt the findings of this study and come up with appropriate policies on hotels solid waste sorting and storage. The criteria of bed capacity were used to categorize the hotels as it informs the size, type, services offered, number of customers, and type of solid waste sorted and stored by the hotel and the implementation of polluter payee principle towards environmental conservation. Also, the County Government of Kakamega in their KCIDP (2018), categorized hotels based on their bed capacity as first-firth stars, thus adopted by this study. Furthermore, previous studies in Mombasa beach hotels shows that the mean per-capita waste generation rate by hotels was found to be 1.90 kg person/day and the relative proportions by weight of the respective waste categories were: paper 35%, plastics 3.3%, tins 1.7%, glass 45%, food waste 79.1%, cartons 2.0%, and residual waste 6.0%. However, in Kakamega Town, there is no information on the type and amount of waste sorted and stored by the hotels. Thus, there was a need to undertake this study since the available literature was inadequate to reveal the contribution of hotels in solid waste sorting and storage in Kakamega Town.

Solid waste sorting and storage were the dependent variables for this study and assessed the types of solid waste, on-site sorting and storage practices by the hotels as they are the major practices, they are directly involved in waste management stream. The independent variables were guided by the hotels empowerment in training and provision of sorting and storage bins; collaboration with stakeholders in solid waste sorting and storage and accessing to information on solid waste sorting and storage. It was important to consider solid waste type, information sharing on solid waste and the frequency of training on solid waste because they inform solid waste sorting and storage that could promote source reduction.

The findings from this study may help hotels to put in place the appropriate storage and sorting bins. Also, waste sorting will inform hotels to invest in solid waste resource recovery programs and bring more stakeholders on board. Information on solid waste sorting and storage will inform the principal of polluter payee, thus minimize on environmental pollution. Policymakers in the hospitality industry may use the findings of this study to inform decision-makers on solid waste management practices in hotels. Academics will be interested in the study because it will aim to build on and encourage areas for further research. It is recommended that hotels effectively sort waste at source to ensure high quality waste components for further processing. This will help to reduce the costs of waste disposal, minimize health risks and improve the quality of the environment.

1.6 Scope and Limitations of the Study

This study examined the contributions of hotels participation in solid waste sorting and storage; with a focus on hotels in Kakamega Town. Hotels with a minimum of 6 beds and a maximum of 100 beds within Kakamega Town were covered. The selection of the 6-100 bed capacity hotels

was informed by the KCIDP, (2018) that classified the hotels as first – fourth star within Kakamega Town. The hotels data sheet obtained from the Ministry of Trade Kakamega County had only hotels with bed capacity ranging from 6-100, classified as first or four stars. Thus, the others are eateries which failed to meet the study selection criteria. Data was collected on solid waste sorting and storage by hotels. Based on solid waste management hierarchy, sorting and storage are the primary practices that the hotels are directly involved with thus easy to collect reliable information. The solid waste types were categorized as organic waste and inorganic waste. The organic waste included food waste and inorganic waste included paper, plastic, glass, metal and textile. The study collected data on empowerment, collaboration and access to information on solid waste sorting and storage by the hotels. Data was collected in March 2023 for three weeks.

The study limitations were: the availability of respondents and the time to respond to the questions. This was overcome by the flexibility of the researcher to adjust to the respondent's appointed time to respond to questions. Also, some of the respondents had difficulties in providing answers due to the fear of the unknown. This was overcome by the researcher assuring the respondents that the study would ensure their privacy and anonymity is upheld; and that the research was purely for academic use.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviews previous scholarly works covering solid waste sorting and storage by hotels. Objective one examined the contribution of hotels information sharing (self-initiative, social media, company advisory, seminars and websites) on solid waste sorting and storage. Objective two, establish the contribution of hotels empowerment (training and provision of bins) in solid waste sorting and storage. The third objective assess the contribution of hotels collaboration (stakeholder, financial, technical support) in solid waste sorting and storage. Furthermore, the Theory of Planned Behaviour was reviewed and modified to apply in this study with a focus on hotel management and stakeholders who participate in solid waste generation. The conceptual framework was then developed in accordance with the study objectives and tenets of the Theory of Planned Behaviour.

2.2 Information sharing on hotel solid waste sorting and storage

Globally, hotels have been generating significant quantities (1.3 billion tonnes) of solid waste that was rarely sorted and appropriately stored for resource recovery since the 1970s (Ball & Taleb, 2011; FAO, 2011; Liu *et al.*, 2016; Pirani & Arafat, 2016; Abduredha *et al.*, 2017). Moreover, there has been a scarcity of research on solid waste management that affected the hotels plan for resource recovery and minimise solid waste generation (Radwan, Jones & Minoli, 2010; Pirana & Arafat, 2014; Yim, Fujiwara & Sour, 2014). Solid waste sorting is a global challenge: as the population rises, progressively increases hotels solid waste generation (UN-HABITAT, 2011;

Kashid *et al.*, 2015). Moreover, operations at hotels have been established to continuously increase waste generation from the point of goods reception, kitchen services, dining services, room services and event services that are not sorted (Papargyropoulou *et al.*, 2016; Pirana & Arafat, 2016; Kasavan, Mohamed & Halim, 2019). The previous studies showed that there was a steady increase in hotels solid waste generation that was hardly sorted and stored. However, the studies gave little attention to the hotels access to information regarding solid waste sorting and storage.

Information sharing on the value of solid waste generation helps hotels to prioritize sorting and storage (Ajuntament de Barcelona, 2017). Currently, there has been a growth of hotels with higher carrying capacity (guest rooms, event halls and gardens) that has increased solid waste generation with minimum sorting (Tostivint *et al*., 2016; Wang *et al*., 2017; Pham Phu *et al.*, 2018). There is a scarcity of information on the types of solid waste sorted by hotels which could be attributed to poor or lack of participation in solid waste management (Rathore, Sarmah, & Singh, 2020). Previous studies showed that information sharing on solid waste sorting among hotels is important towards resource recovery. Also, they have shown that an increase in global population has led to increased hotels thus increasing solid waste generation with insufficient information on the sorting and storage practices.

In Africa, Naibbi and Umar (2017) posit that despite policies on solid waste generation in Kano Metropolis, solid waste management practices challenges were noticeable especially sorting and storage. Moreover, Douti, Abanyie and Ampofo (2017), stipulated that the urban areas of Ghana faced a challenge in information sharing among the hotels thus more solid waste ended up mixed in the municipal stream. Furthermore, Bundhoo (2018), agrees that with such inadequacies in information sharing, there has been a mushrooming of unregulated illegal disposal sites with mixed

wastes in urban centres. In Ethiopia, only 57.5% of collected waste is disposed of in dumpsites with the remaining left to litter and scatter in the urban environments (Erasu *et al.*, 2018). These previous studies indicated that information sharing on solid waste sorting and storage at source was a major challenge that contributed to irregular dumping of mixed waste. However, these studies hardly investigate the influence of information sharing on solid waste sorting and storage among the hotels.

It is known that accessibility to information promotes proper solid waste management practices (Yaoundé *et al.*, 2019). Therefore, it was established by Lema *et al.* (2019) and Kamugisha *et al.* (2019) that the inaccessibility to information sharing by most hotels has been contributing to increased littering as an alternative disposal method. The scarcity of information on solid waste characterisation has exacerbated solid waste generation without sorting and storage among hotels (Kinobe *et al*., 2015). Moreover, less than half of the solid waste generated by hotels is stored in convenienty positioned storage bins (Addaney & Oppong, 2015; LeBlanc, 2017). These previous studies have helped us understand that information sharing among hotels plays a key role in proper solid waste sorting and storage that can reduce environmental pollution. Littering and illegal dumping of solid waste arise from scarcity or lack of information on the importance of solid waste sorting and proper storage. This study sought to investigate information sharing and access to information related to solid waste sorting, storage and type.

In Kenya, in the late 1980s to early 2000s, hotels solid waste generation and storage became an environmentally unsound challenge (Munga *et al*., 1993; Muthini, Tole & Otieno, 2003). Kimeu (2015) indicated that the consumption of goods by hotels in relation to the hotel carrying capacity, income per day and its type determined solid waste characterization. Increasing solid waste

generation faces shortages of storage bins by hotels that eventually end up littered with the environment (NEMA, 2015). Moreover, poor coverage of storage bins by hotels in towns has negatively affected solid waste management (collection, resource recovery and final disposal) (NEMA, 2015). Scarcity of Information sharing on the responsibility of waste generators such as the principal of polluter pay, the Millennium Development Goal 11 and 12 and the Extended Producer Responsibility to reduce the environmental impact arising from the products and the waste generated thereafter (NEMA, 2022) has increased volumes of mixed waste by hotels. These previous studies make us understand the importance of information sharing on solid waste generation and how it leads to waste minimization among hotels. They also revealed that information on the size of the hotel, and income per day determined the type of solid waste generated and characterization. However, these studies have scarce information on how hotels can access information on solid waste sorting, storage and type.

Commercial enterprise within towns reluctantly contributes to waste minimization through seminars, company advisory, websites, social media, thus encouraging unsorted waste storage (Odera, 2016; Atieno, 2017). Moreover, Mugambi (2017) noted that the reluctance of commercial enterprises to participation in the minimization of solid waste generation contributed to low solid waste sorting and provision of storage bins. However, commercial enterprise contribution in solid characterization helps in waste resource recovery and sanitary disposal (Ephantus *et al.*, 2021). These previous studies make us understand the importance of information sharing on solid waste generation (volume of waste, type of waste, impact of waste on environment, cost of waste management and life cycle of the waste) and how it leads to waste minimization among hotels. These studies only gave a general view of all commercial enterprises within towns. Therefore,

there was a need to assess the importance of information sharing on solid waste sorting, type and storage among hotels being part of the commercial enterprises.

In Kakamega Town, information on solid waste sorting and characterization by commercial enterprises remains a challenge (Malenya, 2015). The estimated quantity of mixed solid waste generated per day in Kakamega Municipality by 2018 was 1,633 tonnes (Kakamega County, Integrated Development Plan (KCIDP), 2018). Since then, there has been an upsurge in population and hotels, thus, quantity could be higher as Kanda and Cherono (2020) observed that commercial enterprises were participating in recycling solid waste. From the previous studies, there is no specific information on the characterization of hotels solid waste in terms of type, sorting and storage in Kakamega Town, thus the focus of this study.

2.3 Empowerment of hotels on solid waste sorting and storage

Current global climate change campaigns bank on the reduction of greenhouse gas emissions; however, food waste from hotels was contributing 20 per cent to global greenhouse gas emissions (Kallbekken and Sælen, 2013; Papargyropoulou *et al*., 2014, de Lange & Nahman, 2015, Scholz *et al.,* 2015). Attempts have been made to empower hotels to enhance solid waste sorting and proper storage; however, it is still a challenge faced by many hotels (Omidiani & Hashemi, 2016). Training and provision of storage bins for solid waste generated by hotels contributed to solid waste sorting and storage, however, these determinants are a global challenge faced by hotels (Ziraba, *et al.* 2016; Wan *et al*., 2017). These previous studies have shown the impact of food waste on the environment. The studies have also appreciated the provision of storage bins to hotels as a way of encouraging proper solid waste sorting and storage, which lingered as a challenge for hotels.

Hotels have little training regarding the sorting and storage of wastes generated unlike developed countries (CENIA, 2016). The scarcity of provision of waste bins and training on solid waste sorting and storage has negatively influenced waste resource recovery which could have contributed to good solid waste management practices among hotels (Laor *et al*., 2018). Moreover, the World Bank report indicated a low level of empowerment (training and provision of storage bins), especially in developing countries (the World Bank, 2018). Therefore, hotels in such developing countries face challenges in solid waste sorting and appropriate storage (Rai *et al.*, 2019). Studies have shown that training and provision of storage bins improve solid waste sorting and storage. However, it was established as an inherent challenge from previous studies. This study underscored the importance of hotels and personnel having access to training to enhance the sorting of waste to embrace resource recovery, hence the investigation.

Park (2020) stated that many benefits come with solid waste sorting and proper storage contributing to sustainable development – the production of sustainable products such as building materials. Globally, frequency of training is scarce by commercial enterprise personnel regarding solid waste sorting and storage (CENIA, 2016; Ziraba *et al*., 2016; Laor *et al*., 2018; the World Bank, 2018), which have not been particular to hotel waste management (generation, sorting and storage). These previous studies have shown the impact of food waste on the environment. The studies have also appreciated the provision of storage bins to hotels as a way of encouraging proper solid waste sorting and storage. Moreover, it was revealed that hotel personnel are key in promoting sorting and proper storage. Thus, this sought to determine the empowerment of personnel regarding solid waste sorting and proper storage.

In Africa, commercial enterprise participation in solid waste sorting and storage was a challenge that had promoted reluctance of the management to provide assorted storage bins for sorting and storage of waste (Mtungwe *et al*., 2014; Desta *et al*., 2014; Olukanni *et al.*, 2016). Moreover, hotel personnel were rarely empowered to actively participate in solid waste sorting and appropriate storage for resource recovery (Mtungwe *et al.*, 2014; Kinobe *et al*., 2015). Therefore, solid waste sorting and appropriate storage challenges indicated little attention preferred for solid waste sorting and storage by hotels (Kirama & Mayo, 2016; Kubanza & Simatele, 2016; Mbasera *et al.*, 2016). Previous studies have argued that hotels management has been adamant in their responsibility to provide trainings and equipment for solid waste sorting and storage (Yukalang, *et al.*, 2017; Fredrick, Oonyu & Sentongo, 2018; Serge-Kubanza & Simatele, 2020). Studies have indicated that frequency of training was a key determinant of the empowerment of hotels in solid waste sorting and storage. However, the frequency of training and provision of waste bins was scares to inform as to whether hotels and personnel lacked the same training that this study endeavored to find out.

Hotels have faced challenges investing in training personnel on the importance of solid waste sorting and the provision of appropriate storage bins (Boateng *et al*., 2019; Mulat *et al.*, 2019; Serge-Kubanza & Simatele, 2020). Hotels with a scares trainings on solid waste sorting and storage enhanced poor waste management practices (Nyampundu, *et al.*, 2020). Otumawu-Apreku (2020) and Debrah, *et al*. (2021), revealed that the hotels that were not empowered found it challenging to practice sorting and proper storage of solid waste due to a lack of practical skills. These reviewed studies have indicated that hotels face solid waste sorting and storage challenges. Therefore, this study sought to investigate whether hotels in Kakamega Town also faced similar challenges in solid waste sorting and storage.

In Kenya, most hotels are not much conversant with solid waste sorting and storage thus, their reluctance to conduct sorting of solid waste and provision of appropriate storage bins (Njoroge, Kimani & Ndunge, 2014; Ondieki, 2014; Shivonga, 2016). Training the personnel and provision of assorted storage bins by hotels has proven to be a lingering challenge (Odera, 2016; Atieno, 2017; Mugambi, 2017; Sibanda *et al.,* 2017). Despite the importance of sorting bins in hotels, they are rarely accessible to customers and personnel (Sibanda *et al.,* 2017; Okumu, 2020). In addition, previous studies by Ozoike-Dennis *et al.* (2019) and Mochache *et al.* (2020) opined that the hotels management was adamant about exercising the directives from the authorities regarding solid waste sorting and proper storage. These studies have shown that there is inadequate training in hotel management and personnel on solid waste sorting and storage. Therefore, this study sought to assess the participation of hotel management in solid waste sorting and storage in Kakamega Town.

In Kakamega municipality, hotels rarely contribute in solid waste sorting and storage at their premises (Nyayiemi 2012). Their lack of participation was attributed to inadequate public awareness creation of solid waste management practices that exacerbated littering in Kakamega town (Malenya, 2015). Hotels are reluctant to participate in solid waste management practices subjecting the responsibility to the municipal council of Kakamega (Kanda & Cherono, 2020). The previous scholarly works have helped this study understand the inadequate information on solid waste management that has negatively influenced their management practices in Kakamega town; however, they failed to comprehensively investigate the importance of hotel empowerment in solid waste sorting and storage at their premises.

2.4 Consistency of hotel Collaboration on solid waste sorting and storage

Waste storage bins that are well-designed and maintained by hotels are effective for sanitary solid waste storage, however, it remains a challenge in hotels (Wilson & Ing, 2013; Kashid *et al.*, 2015). Inconsistency of hotels organizing education events on solid waste sorting and storage with other stakeholders (department of environment, municipal council, national environmental agencies and the community-based organizations) has seen about 30% of the solid waste generated end up in municipal waste streams, yet most of the waste could be recovered (FAO, 2017; Stewarding Association International, 2017). Proper educational events and financial support by hotels has not been given priority to support for payment of services to the municipal, None-Governmental Organization, community-based organization, or private waste management companies on sorting and storage, considering a customer generates about 0.9 kg of solid waste per day (Aamir *et al.*, 2018; Abdulredha *et al.*, 2018). These previous studies revealed that collaboration among the hotels and other waste management stakeholders like recycling plants, is key in waste recovery but it has been given less attention as the role of solid waste management has been seen as the role of the municipal council. Also, the studies have revealed the amount of waste generated per person in a hotel per day at 0.9kg. However, the studies noted that there was no clear consistency in the collaboration of hotels and other stakeholders in solid waste sorting and proper storage, which this study sought to investigate.

Sorting and appropriate storage of solid waste generated by hotels are at the epicentre of a sustainable environment (Abdel-Shafy & Mansour, 2018). However, sorting and appropriate storage has been given less attention by hotels (Yukalang *et al.*, 2017). Hotels frequently receive visitors for various purposes such as for dining, meetings and accommodation who eventually generate solid wastes (Srangsriwong *et al.*, 2019). These previous studies revealed that a

sustainable environment was important by limiting solid waste littered and dumped in the environment. However, solid waste sorting and proper storage had limited focus on hotels which could indicate less collaboration among the hotels and other key stakeholders in waste resource recovery and organization of education events and forums around solid waste sorting and storage, which sought to investigate.

In Africa, solid waste sorting is a collaborative endeavour but is ignored by hotels due to a lack of financial investment to facilitate proper sorting and storage (Kirama & Mayo, 2016). Without collaborative efforts by hotels and other solid waste stakeholders, challenges in sorting and storage become inevitable (Naibbi & Umar, 2017; Bundhoo, 2018). Storage of mixed waste by hotels is an attribute of inadequate collaboration between hotels and other key stakeholders advocating for resource recovery (Chaabane *et al*., 2018; Kashyap & Borthakur, 2018). Stakeholder collaboration mitigates the deleterious effect of unsorted solid waste on the environment and encourages waste resource recovery (Erasu *et al.*, 2018; Yaoundé *et al.*, 2019; Lema *et al.*, 2019; Kamugisha *et al.*, 2019). Filimonau & Tochukwu, (2020) and Camilleri-Fenech *et al*., (2020) reported that customers play a critical role in solid waste generation; however, there is little information regarding their participation in placing waste in assorted storage bins. Previous studies revealed that a lack of collaboration among stakeholders leads to inadequate resource recovery among hotels. Also, the studies revealed that customers play a key role in solid waste generation in hotels with little collaboration thus poor solid waste sorting and storage. This study sought to investigate whether collaborative engagement by hotels in Kakamega Town promoted solid waste sorting and storage.

In Kenya, sorting at source is the appropriate approach that would encourage the participation of the stakeholders and promote appropriate storage and resource recovery, which is currently a

challenge (Njoroge *et al.*, 2014; NEMA, 2015). Payment for services such as sorting and appropriate storage of sorted wastes requires trained personnel and collaboration with other stakeholders such as the County government and other national agencies (NEMA, 2015). Shivonga (2016) stipulated those hotels have inadequate storage bins and rarely sort their solid waste generated. Moreover, payment for services through a collaborative approach is a venture that lags behind hotels thus contributing to the storage of mixed waste making resource recovery problematic (Mugambi, 2017; Sibanda *et al.*, 2017). Previous studies in Kenya have underscored the importance of stakeholder participation in solid waste sorting and storage. The studies also revealed that there was a scarcity of storage bins at the hotels. Therefore, this study sought to investigate the relationship of collaboration regarding the promotion of solid waste sorting and storage by hotels.

Previous studies by Kaluli *et al*. (2017), Sibanda *et al.* (2017) and Ndunda (2018) noted the importance of commercial enterprise management providing storage bins and skilled personnel, which currently remains a challenge faced by many hotels. Previous studies stated that hotels had shortages of assorted storage bins that emanated from the management's reluctance to offer training to personnel on sorting and appropriate storage bins (Mbaki, 2019; Cheruiyot, 2020; Osiako & Kummitha, 2020; Omune *et al*., 2021). Customers and the staff at the hotels play an important role in solid waste generation (Okumu, 2020); however, it is not clear their collaboration in solid waste sorting and storage. Previous studies in Kenya have underscored the importance of stakeholder collaboration especially customers at the hotels with regards to solid waste sorting and storage. However, these studies have a scarcity of information on the importance of sorting solid waste before proper storage considering the solid waste types.

In Kakamega County, there is low budget allocation as compared to Nairobi County, USD 896,527.5 and USD. 10,714,285.7 million respectively towards solid waste management practices (Nairobi CIDP, 2013-2017 and Kakamega CIDP, 2013-2017). The low investment in the promotion of solid waste reduction and resource recovery has affected the collaboration efforts by hotels and other stakeholders (Nyayiemi, 2012; Malenya, 2015). The installation of storage bins by hotels was essential in proper solid waste management (Malenya, 2015); however, the scarcity of sorting and storage bins is a challenge that lingers despite some of the hotels practising recycling in Kakamega Town (Kanda & Cherono, 2020). These previous studies helped the researcher understand that inadequate and poor distribution of solid waste collection bins in Kakamega municipality has negatively influenced solid waste management practices. Therefore, there was a need to establish how the availability of collection bins influences the hotel's solid waste management practices in Kakamega Town. Their findings were general and could not inform the contribution of hotels in solid waste generation, sorting and storage.

2.5 Theoretical Framework

Under the concept of pro-environmental behaviours, the Theory of Planned Behaviour (TPB), has been applied to predict the likelihood or intention that individuals will engage in various pro-environmental behaviours. The Theory of Planned Behaviour (TPB) was an extension of the Theory of Reasoned Action (TRA) by Fishbein and Ajzen 1975 - 1980. In 1985 - 1991 Icek Ajzen developed the Theory of Planned Behaviour as a general model to predict and explain an individual's intention to engage in a behaviour at a specific time and place. For waste management, many studies rely on TPB theory to prove that psychological factors including attitude, subjective norms, and perceived behavioral control (PBC) are main predictors to waste sorting and storage intentions, and are based on their positive intention. It is possible to forecast the actual behaviour

on hotels waste sorting and storage. This theory was vital in establishing the behaviour of the hotels regarding solid waste sorting and storage at a specific time and place. The theory intended to explain all behaviours over which people could exert self-control and propagate best practices in solid waste sorting and storage. The key component of this model was behavioural intent; behavioural intentions are influenced by the attitude about the likelihood that the behaviour would have the expected outcome and the subjective evaluation of the risks and benefits of that outcome. The tenets of the theory were subjected to the actions persons take are guided by behavioural beliefs, normative beliefs and control beliefs. This study took cognizant that a behavioural belief led to participants in the hotel industry understanding the outcomes of a behaviour – solid waste sorting and storage as practised. Secondly, the normative beliefs help the hotels to embrace a certain guiding perception regarding solid waste sorting and storage.

Sharifah *et al*. (2015), utilized the TPB to establish the consumption and management of plastic waste in Putra Malaysia among students. Strydom (2018) used the Theory of Planned Behaviour to explain how it influenced the recycling of solid wastes in South Africa. It was found that the TPB was useful in showing that the South Africans lacked sufficient knowledge, positive attitudes, social pressure, and perceived control that would encourage recycling behaviour. Besides awareness was found to positively influence recycling behaviour among South Africa's city dwellers. In Indonesia, Santoso and Farizal (2019), used TPB on community participation in household waste management. Therefore, the TPB has been used successfully to predict and explain a wide range of parameters with solid waste management being part of it among others. The TPB states that behavioural achievement depends on both motivation (intention) and ability (behavioural control). It distinguishes between three types of beliefs - behavioural, normative, and

control. A person's attitude may lead to a favourable or unfavourable evaluation of solid waste management.

The theory, therefore, applies to this study by determining the behavioural characteristics of the hotels (bed capacity of 6-100, type of services offered, type of waste sorted, quantity of waste and type of waste bins) and the association between information sharing (self-initiative, social media, company advisory, seminars and website) and solid waste sorting and storage the frequency of empowerment (training and provision of storage bins) and solid waste sorting and storage; the consistency of collaboration (stakeholders, financial, and technical support,) and solid waste sorting and storage. The stronger the intention to perform the behaviour the more likely the behaviour would be performed. The hotels behaviours to practise good solid waste management practices (sorting and storage) are affected by their intention to access information, collaborate with other stakeholders, provision of solid waste sorting bins, pay for sorting services and provision of enough storage space.

2.6 Conceptual Framework

Solid waste sorting and storage is an important complex task, cohesion is a paramount endeavour for both solid waste generators and solid waste managers. Based on the reviewed literature and the theories, the researcher formulated the conceptual framework. These study hypotheses that information sharing and access (self-initiative, social media, company advisory, seminars and website), empowerment (frequency of training in solid waste sorting and storage and provision of storage bins); collaboration (number of stakeholders and the frequency of financial & technical support); were determinants of solid waste sorting and storage in hotels and the independent variables which had a direct influence on the solid waste sorting and storage (depended variables) as shown in Figure 2.1. The arrows show the interrelationships among the variables of the study.

According to this study, the level of empowerment (training in solid waste sorting and storage and provision of storage bins); collaboration (number of stakeholders and the frequency of financial & technical support); and information (information sharing and access to information) indicate the positive influence in hotels solid waste sorting and storage thus play a vital role in reducing the environmental impacts of solid waste. Waste storage bin distribution within hotels is an indicator of proper plans for solid waste sorting and storage. The dependent variables in this study were the frequency of solid waste sorting and storage. This was intervened by the government policies on solid waste management.

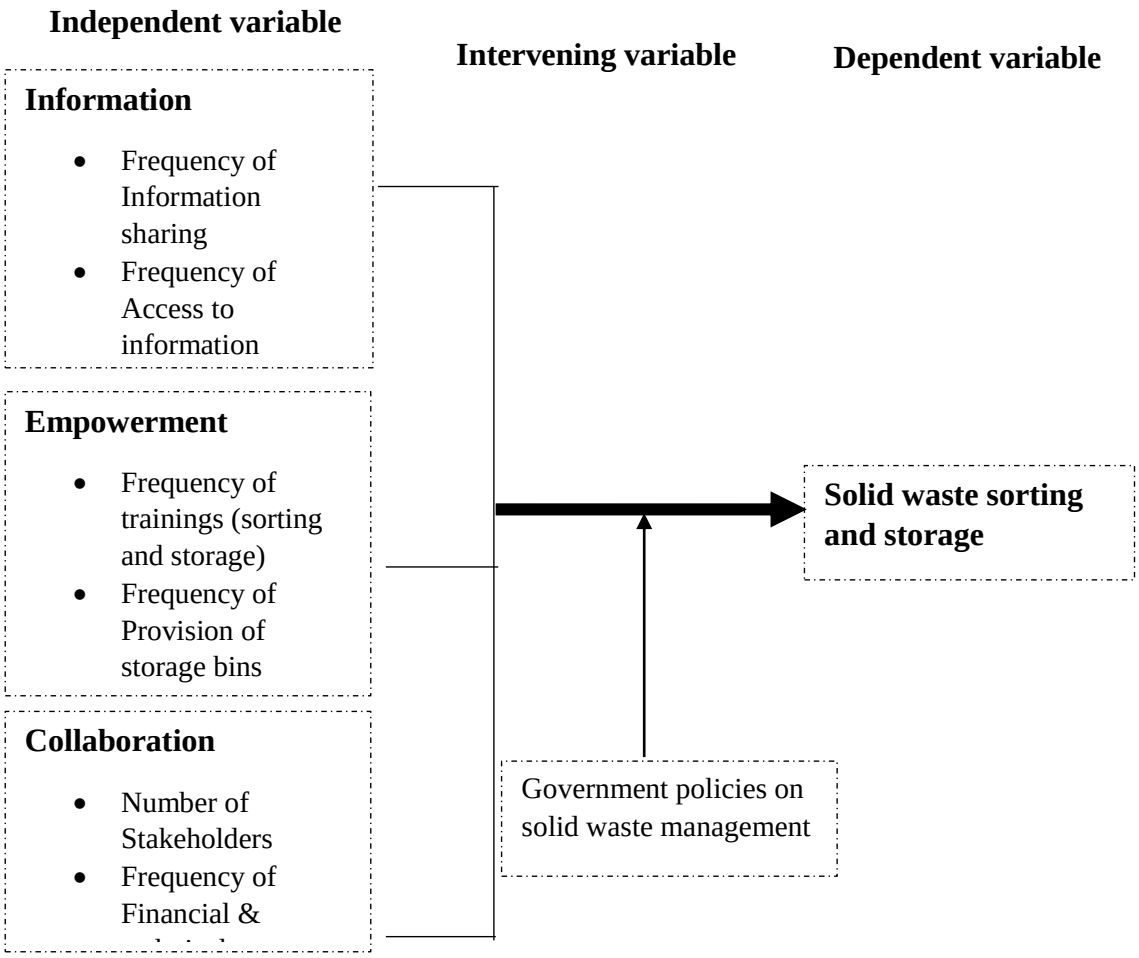

Figure 2.1: Conceptual Framework
Source: Author (2023)

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents a research methodology. The chapter covered the description of the study area (Kakamega Town) in terms of the location, administration and estimated number of hotels. The research design looked at the desirability considering the target population and data collection approaches. The study population and the target population are described as well as the sampling techniques. Data collection tools have been described – questionnaire, interview guide, and observation checklist. A pilot test has been described that led to testing the reliability and validity of the tools. The data analysis has been described. Finally, ethical considerations have been described.

3.2 Study Area

Kakamega Town was selected as the study area. Kakamega county has an estimated population of 1,867,579 of which 107,227 is the urban population (KNBS, 2019). Kakamega Town is located between Latitude 0.270^{o} N and 0.300^{o} N and Longitude 34.740^{o} E and 34.770^{o} E. The town intercepts three wards – Shirere Ward, Mahiakalo Ward, and Sheywe Ward. Moreover, it is the headquarters of the County Government of Kakamega as well as the regional headquarters of the national government. The town boarders the Kakamega Tropical rain forest to the North West thus receives high rains throughout the year that is 1280.1millimiters to 2214.1mm. The town is also known to have a sacred spiritual and cultural crying stone site, which act as a tourist attraction point. Kakamega Town has an estimated 1,372 commercial enterprises out of which 39 are hotels

with bed capacity of 6-100, among them are Golf Hotel, Kakamega Sports Club, and Shieywe Guest house as per attached list in the appendix VI. On average an estimated 28,761 people are served by these hotels per day. Over the past ten years, Kakamega Town has experienced a 58.05% growth rate (KCIDP, 2018).

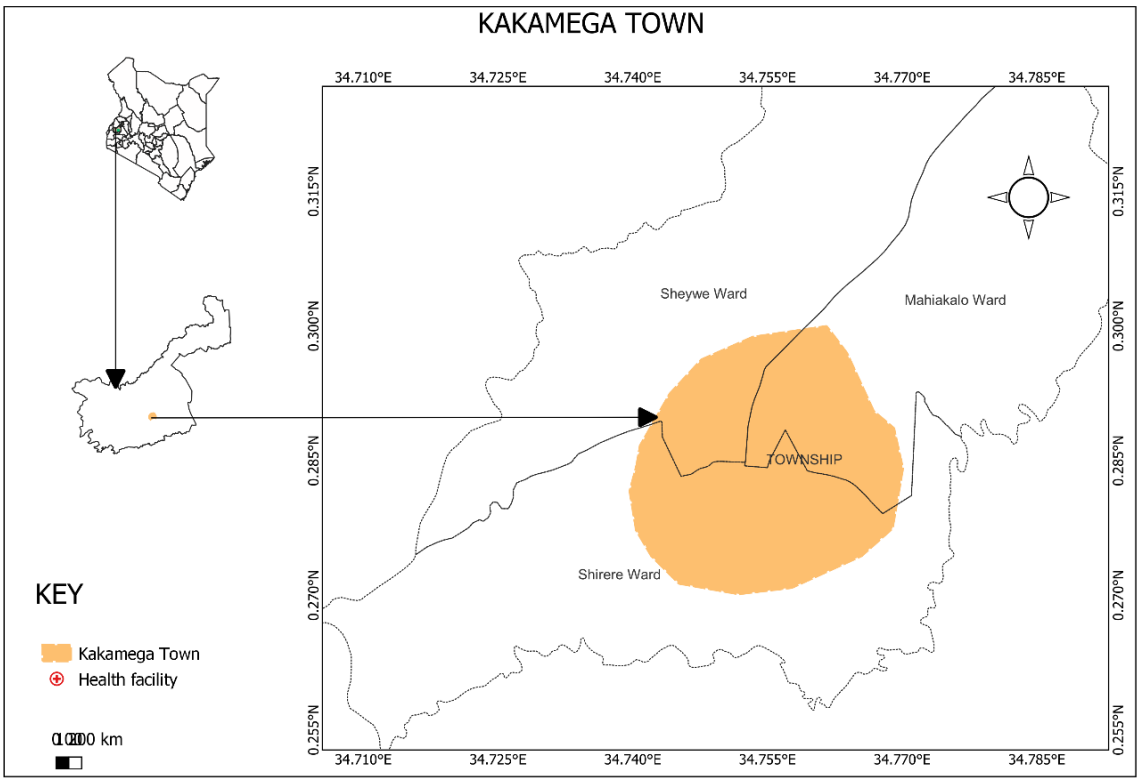

Figure 3.1: Map of Kakamega Town

Source: Author (2023)

The burgeoning population and hotels have escalated the rate of solid waste generation in Kakamega Town. By 2018, Kakamega Municipality was generating an estimated 1,632 tonnes of solid waste per day (KCIDP, 2018). It's also known that each commercial enterprise generates 8.2kg of solid waste per day of the total 1,632 tonnes. The Town is served by one main dumping site situated at Roster Man, on the outskirts of the town which is currently filled. This has put pressure on solid waste sorting and appropriate storage by the hotels. In retrospect, the National

Environment Management Authority (NEMA) reported grave challenges faced by Kakamega Municipality whose management capacity by 2014 was 22%. This was below average as compared to Nairobi City (80%), Mombasa City (65%), Thika Town (60%), Eldoret Town (55%), and Nakuru Town (45%) now City (NEMA, 2014).

3.3 Research Design

A descriptive cross-sectional research design was used as it permits the researcher to collect different information on a subject at the same time as information on the current situation (Patten & Newhart, 2017). The unit of analysis were purposively selected as they had vast knowledge regarding solid waste sorting and storage by the hotel, thus were either the hotel (manager, storekeeper, or receptionist). The 39 hotels were purposely selected as they met the study selection criteria with bed capacity of 6-20 which were 25 and 21-100 were 14. This was adopted from the KCIDP, (2018) that categorized hotels in Kakamega Town based on bed capacity as first to firth star. Also, categorization based on bed capacity allows to determine the size, and type, measure the quality of services offered, and the number of customers and easy to compare their operations.

3.4 Study Population and Sampling Technique

Kakamega Town has an estimated 1,372 commercial enterprises. The target population was made up of 39 hotels, of which 25 had a bed capacity of 6-20, and 14 had a bed capacity of 21-100 who met the selection criteria of this study. The unit of analysis was either the hotel (manager, storekeeper, or receptionist) who purposively met the criteria of the study. The hotels with a bed capacity of 6-100 were selected because it's easy for the County Government of Kakamega to adopt the findings from this study to enforce policies on solid waste sorting and storage by the hotels. The key informants of this study were purposively selected and were the Kakamega

municipal manager, the Kakamega County Director of Environment, the Director for NEMA in Kakamega County and 19 hotel managers (7 from high bed capacity and 12 from low bed capacity) as they are conversant in the field of solid waste management practices within the town.

The sampling techniques used were stratified, proportionate and purposive sampling. The stratified sampling was used to select the types of hotels and grouped them into two strata i.e., low bed capacity (6 – 20 beds) and high bed capacity (21 – 100 beds). Thereafter, saturated sampling was used to sample all the hotels from each stratum (14 high bed capacity and 25 low bed capacity) as the sample size was adequate to present the phenomenon under study. Francis *et al.*, (2010), stated that saturated sampling is an important indicator that a sample is adequate for the phenomenon studied and data collected have captured the diversity, depth and shades of the issue studied and thereby demonstrates content validity. This allowed all the participants who met the study selection criteria to participate equally.

A purposive sampling technique was used to select key informants (NEMA director of Kakamega County, Kakamega Municipal Manager, hotels managers, and Director for Environment – County Government of Kakamega). It was believed that the key informants had up-to-date information regarding solid waste sorting and storage practices in Kakamega town. Akhter (2022) stated that the key informants were essential in providing important or specific information on the subject under research.

3.4.2 Sampling frame

The sampling for the selection of respondents was done based on the hotel bed capacity as shown in Table 3.1:

Table 3.1: Hotel's categorization based on bed capacity

Characteristics of hotels)	Frequency (n)	Proportions
Hotels with bed capacity of 6 to 20	25	0.658
Hotels with bed capacity of 21 to 100	14	
Director of environment Kakamega County	1	0.342
Director of environment NEMA	1	
Kakamega Municipal Manager	1	
Hotel Mangers	19	
Total	**60**	**1.000**

3.4.3 Sampling procedure

The target population for the study was made up of 39 hotels with a bed capacity of 6-100 as shown in Table 3.1. A stratified proportionate sampling technique was used to divide the 39 hotels into two strata (low bed capacity 6-20 were 25 and high bed capacity, 21-100 were 14). Saturated sampling was used to select all the hotels from the two strata as they were adequate in number (39) that met the selection criteria of the study.

A purposive sampling technique was also used to select the key informants - the Kakamega Municipal Manager, the County Director of Environment from the Directorate of Environment Kakamega County, and the County Director of Environment – NEMA and 19 managers from the hotels as they have vast knowledge of solid waste management practices (sorting and storage).

3.5 Data Collection Methods

The researcher used a semi-structured questionnaire, interview schedule, and observation checklist to collect qualitative data. The semi-structured questionnaire was used to collect data from the hotels manager, storekeeper, and receptionist, while the interview schedule was used to collect data from the key informants and focused group discussion.

3.5.1 Semi-structured questionnaire

A semi-structured questionnaire was used to collect data from hotels (managers, receptionists and storekeepers) in Kakamega Town. The semi-structured questionnaires were designed to obtain data on the contribution between hotel empowerment (frequency of training and provision of storage bins) on solid waste sorting and storage; the contribution of collaboration (frequency of education events, types of forums, and stakeholders involvement) in hotel solid waste sorting and storage; and the contribution between hotels participation (information, consultation, collaboration, and empowerment) and solid waste sorting and storage.

3.5.1.1 Likert scale data

The study adopted a 5-point Likert scale (strongly disagree, disagree, undecided, agree, and strongly agree) to test how the respondents agree or disagree with the statements on solid waste generation, sorting and storage in their facility. The statements were drawn from the Environmental Management and Coordination (Waste Management) Regulations, 2006. The regulation gives guidance on the roles of the waste generators in solid waste generation, sorting and storage. The data from the Likert scale were analyzed by use of the chi-square test of independence and Cramer V Test to test the levels of either agreement, disagreement and neither of the respondents with the statements on solid waste sorting and storage as per the Environmental Management and Coordination (Waste Management) Regulations, 2006.

3.5.2 Interviews Schedule

The interview schedule was used to collect data from twenty-two key informants – Kakamega Municipal manager, the Kakamega County Director of Environment, the County Director of Environment – NEMA and 19 hotel managers (12 from low bed capacity and 7 high bed capacity).

This tool obtained data on their opinion on the empowerment of hotels regarding sorting and storage, the potential collaboration between hotel management, personnel, and other key stakeholders (NEMA, County Government, None Governmental organization and Community based organization) and the participation of hotels in solid waste sorting and storage.

3.5.3 Observation checklist

An observation checklist was used to collect qualitative data on hotel solid waste management practices (sorting and storage). The researcher looked at waste storage area and sorting sections by the hotels.

3.5.4 Direct waste analysis

Quantifying solid waste in hotels typically involved direct measurement techniques. Solid waste was collected and weighed using a scale. This involves separating different types of waste (e.g., mixed waste, plastic, paper, food waste) and weighing each category separately. Thereafter, the total weight was added up of each type of waste to obtain the overall amount of solid waste generated by the hotel within one week.

Total solid waste sorted in a week = Total Mixed waste + Total Plastic waste + Total Metal waste + Total Glass waste + Total Paper waste + Total Food waste + Total Uneatable waste

3.6 Pilot survey

The researcher conducted a pilot survey to test the research tools i.e., questionnaires, interview schedule, and the observation checklist. This was conducted to the ten per cent of the sample size in selected hotels on the outskirts of Kakamega Town that were not included in the final data collection exercise. The results from the pilot testing were used to determine the reliability and

validity of the data collection tools. Some of the questionnaires that were not clear to the participants were adjusted accordingly.

3.7 Reliability and Validity

3.7.1 Reliability of the research instrument

Cronbach's Alpha was used to measure internal consistency by establishing if certain items within a scale measure the same construct. Table 3.2 below shows information sharing had reliability (0.758); empowerment had a reliability of (0.757), and collaboration had (0.757). The results show that the data collection instrument was reliable as it was within the prescribed threshold of 0.7. Wright (2015) observed that an alpha value of more than 0.7 indicates the reliability of the instrument and the resultant data. This therefore depicts that the research instrument was reliable and there was no need for amendments.

Table 3.2: Reliability Statistics

Response	Cronbach's Alpha	N of Items	Conclusion
Information sharing	0.758	8	Accepted
Empowerment	0.757	6	Accepted
Collaboration	0.763	9	Accepted

3.7.2 Validity of the research instrument

Validity is the degree to which results obtained from the analysis of the data represent the phenomenon under study (Weiner & Braun, 2013; Heale & Twycross, 2015). For this study, content validity was used to ensure all components relevant to the study were included in the instruments of data collection and thus no component was neglected. This was achieved by sharing the tools with the two supervisors from the School of Agriculture, Food Security and Environment

Sciences with relevant skills in the field of study who assessed the content of the tools and gave feedback which was incorporated in the final instrument before the actual study.

3.7 Data analysis methods and results presentation

Both quantitative and qualitative data were collected. Quantitative data was coded and entered into the computer with the aid of IBM version 25.0 Statistical Package for the Social Scientists (SPSS). SPSS was also used for data analysis, after which some of the results were exported into Excel for the generation of charts. The data were analyzed at a 0.05 significance level. Descriptive statistics generated included frequency and percentage tables and charts. The hypotheses were tested using Chi-square tests of independence and homogeneity. The effect sizes were measured using Cramer's V coefficient to determine the significance and strength of relationships among variables. Table 3.3 shows a summary of statistical techniques used to collect data on each objective, with the variables and the data analysis method used in the questionnaire.

Table 3.3: Summary of statistical techniques and data analysis method

Specific Objectives	Variables	Data collection technique	Data analysis method
Objective One:	Training Provision of storage bins	Questionnaire Interviews guide Checklist	Descriptive – frequencies and percentages Inferential – Chi-Square test of independence and Cramer's V test
Objective Two:	Stakeholders Forms of collaboration	Questionnaire Interviews guide Checklist	Descriptive – frequencies and percentages Inferential – Chi-Square of homogeneity and Cramer's V test
Objective Three:	Information Access to information	Questionnaire Interviews guide Checklist	Descriptive – frequencies and percentages Inferential – Chi-Square test of independent and Cramer's V test

3.8 Ethical Consideration

Data collection was conducted by the researcher obtaining permission from the School of Graduate Studies of Maseno University through the School of Agriculture, Food Security, and Environmental Sciences. Thereafter, the researcher applied for a research permit from the National Commission for Science, Technology, and Innovation (NACOSTI) to conduct data collection from hotels in Kakamega Town. A letter was drafted by the researcher to seek consent from the hotels management to allow the researcher to conduct data collection. The researcher treated all the information given with utmost confidentiality with a view to safeguarding the organizations and informants' reputation and privacy. Similarly, the researcher sought permission from the County Government of Kakamega administration in order to carry the research within the Kakamega Town. The research assistants were trained on the use of the tool and given approved introductory letter to protect themselves. Also, the respondents were assured of the confidentiality of their views as the research was only academic. Further, there were introduction messages on the data collection tool seeking to invite the participant to participate in the study willingly without coercion or ill will. The confidentiality and privacy of the participants were assured in writing and practice as they were informed before data collection.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.1.Introduction

This chapter presents the findings and the discussions of the study. The results presented and discussed were the demographic characteristics, the relationship between empowerment and solid waste sorting and storage, the consistency of hotel collaboration and solid waste sorting and storage, and the association between hotel participation and solid waste generation. The hypotheses of the specific objectives were tested by use of the chi-square of independent.

4.2. Demographic characteristics of the respondents

The demographic characteristics of the 39 respondents either the (receptionist, storekeeper, room manager or overall manager) from each hotel are summarized in Table 4.1.

Table 4.1: Demographic characteristics of hotels respondents

Demographic		Frequency	Per cent
Age category	18 – 23	1	2.6
	24 – 29	13	33.3
	30 – 35	9	23.0
	36 – 41	3	7.7
	42 – 47	5	12.8
	48 – 53	4	10.3
	54 – 59	4	10.3
Gender	Male	26	66.7
	Female	13	33.3
Education level	Bachelor's Degree	15	38.8
	Diploma	22	55.6
	Certificate in Administration	2	5.6

The age categorization of the respondents was between 18 years to 59 years (Table 4.1). According to Afidep (2018), this category (18 – 34) of participants belongs to the youth group and those 35 years and above are non-youths and thus eligible to participate in the study. Male respondents were 26 (66.7% of the total respondents) and female respondents were 13 (33.3% of the total respondents) (Table 4.1). All the respondents in Table 4.1 had post-secondary education: 2 had a certificate in administration, 22 had a diploma and 15 had bachelors according to 5.6%, 55.6% and 38.8% respectively.

The respondents indicated a representative population that was engaged in establishing the hotels participation in solid waste sorting, and storage in Kakamega Town. The respondents were educated and able to help in the research by providing their professional opinions supporting the research questions. Kothari (2017) stated the importance of examining the respondents to ensure their competencies before data collection in order to assure the study's reliability and validity of the outcome of the research.

4.3 Contribution of hotel information sharing and solid waste sorting and storage

Objective one of this study assessed information sharing on solid waste sorting and storage in hotels. Thus, it focused on how hotels access information on solid waste sorting and storage by hotels. Moreover, it assessed the satisfaction level of information-sharing on solid waste sorting and storage methods among the hotels.

4.3.1 Categorization of hotels

Table 4.2: Categorization of hotels in terms of bed capacity

Hotel categorization	Frequency	Per cent
Low Capacity	25	58.6
High Capacity	14	41.4
Total	39	100.0

The study categorized hotels in Kakamega Town based on their bed capacity, revealing that the majority were low-capacity establishments. Specifically, 23 hotels, or 58.6% of the sample, were classified as low capacity, while 16 hotels, representing 41.4%, were categorized as high capacity (Table 4.2). This finding aligned with previous research, such as Filimonau and Tochukwu (2020), who explored managerial approaches to mitigating solid waste in hotels in Lagos, Nigeria, and found a similar trend in smaller establishments. Agyeiwaah (2020) also highlighted the significant role of small accommodation enterprises in sustainable solid waste management, which corroborates the predominance of low-capacity hotels in Kakamega. Furthermore, Agesa, Beatrice and Alex (2022) observed that waste management practices directly influence operating costs in classified hotels in Nakuru County, Kenya, suggesting that smaller hotels might favour cost-effective waste management strategies. This underscores the need for tailored waste management solutions that address the unique challenges faced by low-capacity hotels in Kakamega.

4.3.2 Accessing information on solid waste sorting and storage and frequency of solid waste sorting and storage

Objective one of this study assessed information sharing on solid waste sorting and storage in hotels. Thus, it focused on how access to information on solid waste sorting and storage and the frequency of solid waste sorting in hotels. Moreover, it assessed the satisfaction level with the solid waste management on sorting and storage. The study assessed the methods of accessing information on solid waste sorting and storage and the frequency of solid waste sorting as illustrated in Table 4.3.

Table 4.3: Showing a cross-tabulation of Access information on solid waste sorting and storage and the frequency of solid waste sorting

		Frequency of solid waste sorting			
		Daily	Twice a week	Weekly	Total
Accessing information on solid waste sorting and storage	Self-initiative	0	0	2	2
	Suggestion Boxes	2	0	0	2
	Social media	8	0	0	8
	Training	2	0	0	2
	Company Advisory	3	0	0	3
	Website	3	0	0	3
	Seminar	3	0	0	3
	None	11	3	2	16
Total		32	3	4	39

Table 4.3 presents a crosstabulation of the access methods for information on solid waste sorting and storage against the frequency of solid waste sorting among the 39 hotels in Kakamega Town. None of the hotels accessed information through self-initiative sorted waste on a daily or twice-a-week basis. However, 5.1% representing 2 out of the total 39 hotels sorted waste weekly. The hotels accessing information via suggestion boxes sorted waste daily, accounting for 2 out of 39 hotels (5.1%). All hotels utilizing social media for information access sorted waste daily, constituting 8 out of 39 hotels (20.5%). Similarly, all hotels accessing information through training sorted waste daily, representing 2 out of 39 hotels (5.1%). Likewise, all hotels relying on company advisory for information sorted waste daily, making up 3 out of 39 hotels (7.7%). Hotels accessing information via websites also exhibited 100% daily waste sorting, with 3 out of 39 hotels (7.7%). All hotels leveraging seminars for information access sorted waste daily, accounting for 3 out of 39 hotels (7.7%). Among hotels without a designated information source, 11 out of 16 (28.2%) sorted waste daily, 3 out of 16 (7.7%) sorted twice a week, and 2 out of 16 (5.1%) sorted weekly.

Table 4.3 provides valuable insights into the relationship between access methods for information on solid waste sorting and storage and the frequency of solid waste sorting among 39 hotels in Kakamega Town. The findings reveal distinct patterns based on the information access channels utilized by the hotels. Interestingly, hotels that relied on self-initiative for information access did not engage in daily or twice-a-week waste sorting, indicating a potential gap in proactive waste management practices. However, a small proportion (5.1%) of these hotels sorted waste weekly, suggesting some level of commitment to waste management despite the lack of daily sorting. This aligns with previous research indicating that hotels often face challenges in implementing effective waste management strategies without adequate access to relevant information (Filimonau & Tochukwu, 2020).

In contrast, hotels accessing information through suggestion boxes demonstrated a higher propensity for daily waste sorting, with 100% of them engaging in this practice. This finding underscores the potential effectiveness of suggestion boxes as a communication channel for promoting regular waste sorting among hotel staff. Similarly, hotels leveraging social media, training, company advisory, websites, and seminars for information access exhibited a consistent trend of daily waste sorting. These results suggest that hotels utilizing diverse information channels tend to prioritize daily waste sorting, reflecting a proactive approach to waste management (Agyeiwaah, 2020; Agesa, Kamau, & Kivuva, 2022).

Conversely, hotels without a designated information source demonstrated varied waste sorting frequencies, with a significant proportion (28.2%) engaging in daily sorting. This finding highlights the importance of further investigation into the waste management practices of hotels lacking formal information channels. Overall, the findings emphasize the influence of information

access methods on the waste sorting behaviour of hotels in Kakamega Town, indicating the need for targeted interventions to enhance waste management practices across the hospitality sector (Abduredha *et al*., 2017; Kamugisha *et al*., 2019). Table 4.4 tested the significance and the level of strength and direction of accessing information on solid waste sorting and storage and the frequency of sorting.

Table 4.4: Assessing the level of significance, strength and direction of accessing information on solid waste sorting and storage and frequency of solid waste sorting

Chi-Square Tests

	Value	Df	Asymptotic Significance (2-sided)
Pearson Chi-Square	16.331[a]	14	0.294
Likelihood Ratio	11.160	14	0.673
Linear-by-Linear Association	0.003	1	0.957
N of Valid Cases	39		

a. 22 cells (91.7%) have an expected count of less than 5. The minimum expected count is .08.

Symmetric Measures

		Value	Approximate Significance
Nominal by Nominal	Phi	.793	.294
	Cramer's V	.560	.294
N of Valid Cases		39	

Table 4.4 presents the results of chi-square tests, providing insight into the contribution of accessing information on solid waste sorting and storage and the frequency of solid waste sorting among hotels in Kakamega Town. The Chi-square resulted in an asymptotic significance of 0.294 ($p > 0.05$). This indicated insignificant contribution of the method of accessing information and the frequency of waste sorting among the hotels (Ajzen, 1991; Filimonau & Tochukwu, 2020). The non-significant p-0.294 suggests that any observed relationship may have occurred by chance rather than reflecting a week association.

Cramer's V yielded a value of 0.560, indicating a strong association between accessing information and waste sorting frequency. However, the approximate significance of 0.294 suggested that this association may not be significant (Sharifah *et al*., 2015). While these results may imply some connection between the variables, they highlight the complexity of waste management practices in the hospitality sector. Other factors beyond the method of accessing information, such as organizational culture, resource allocation and regulatory frameworks, likely played significant roles in shaping waste-sorting behaviours among hotels (Nhamo *et al*., 2021; Kamugisha *et al*., 2019).

While accessing information on solid waste sorting and storage is undoubtedly important, its direct impact on the frequency of waste sorting appears to be limited in this context. Future research should explore deeper into the interplay between various organizational factors and waste management behaviours to develop more effective strategies for promoting sustainable waste practices in the hospitality industry (Strydom, 2018; Abdel-Shafy & Mansour, 2018). Additionally, longitudinal studies could provide valuable insights into the dynamics of waste management practices over time and help identify key determinants of behavioural change within hotel establishments.

This study underscored the methods of information sharing that were helping hotels to enhance their solid waste sorting and storage campaigns. A key informant and focused group statement stated that:

> "… hotels put notices in rooms and hotel lobbies on solid waste management (assorted storage in storage bins)." Also, hotels lack finances to purchase different waste bins thus encouraging mixed waste".

Therefore, such information helps the customers, and hotel workers, to sustainably manage solid waste sorting and storage. However, there were hotel managers who were reluctant to participate in the minimization of solid waste sorting and storage, which contributed to poor solid waste sorting and provision of appropriate storage bins. According to the key informant, an environmental expert stated that:

> "… As a department, we have been visiting hotels to share how they conduct sorting and storage of solid waste generated at the hotel."

4.3.3 Accessing information on solid waste sorting and storage and the type of solid waste sorted and stored

The study assessed the methods of accessing information on solid waste sorting and storage and the frequency of solid waste sorting as illustrated in Table 4.5.

Table 4.5: Methods of accessing information and type of solid waste sorted and stored by hotels in Kakamega Town

		Type of solid waste sorted and stored					
		Food waste	Plastic	Glass	Metal	Textile	Total
Access information on solid waste sorting and storage	Self-initiative	1	0	0	0	0	1
	Suggestion Boxes	1	0	0	0	0	1
	Social media	8	0	0	0	0	8
	Training	1	0	1	0	0	3
	Company Advisory	0	3	0	0	0	3
	Website	1	0	0	1	0	3
	Seminar	1	1	0	0	0	3
	None	8	4	3	1	1	17
Total		21	8	4	2	1	39

Table 4.5 provides a comprehensive overview of the methods utilized by hotels in Kakamega Town to access information on solid waste sorting and storage, alongside the types of solid waste sorted and stored, based on a sample size of 39 hotels. Self-initiative and suggestion boxes, each representing 2.6% of the total sample (1 out of 39), made minimal contributions to solid waste sorting and storage. In contrast, social media emerged as the predominant method, influencing the sorting of various waste types, with 20.5% of hotels (8 out of 39) utilizing it. Training sessions also played a role, contributing to 7.7% of hotels sorting food waste and one hotel (2.6%) sorting glass. Company advisory services predominantly influenced plastic waste sorting, representing 7.7% of the total (3 out of 39). Websites similarly impacted waste sorting, accounting for 7.7% of hotels sorting food waste and metal waste. Seminars showed a balanced influence across food and textile waste sorting, with one entry each, representing 7.7% of the total 39.

Interestingly, a notable proportion of hotels, 43.6% of the total sample (17 out of 39), do not rely on any specific method for accessing information. Yet, they contribute notably to solid waste sorting and storage, particularly in food, plastic, and glass waste categories. Overall, food waste appears to be the most frequently sorted and stored waste type, constituting 53.8% of the total sample (21 out of 39). Plastic and glass waste follow, representing 20.5% (8 out of 39) and 10.3% (4 out of 39) of the sample, respectively. Metal and textile waste, while present, are relatively less frequent, each accounting for 5.1% (2 out of 39) and 2.6% (1 out of 39) of the sample, respectively. These findings shed light on the varied approaches hotels employ in managing solid waste, with certain methods demonstrating more influence than others (Ajzen, 1991; Sharifah *et al*., 2015).

Table 4.5 presents the types of waste generated by hotels categorized into food waste, plastic, glass, and metal, in relation to the methods of accessing information on solid waste generation.

Notably, the majority of respondents (8, 20.5%) who accessed information through social media reported generating food waste exclusively. Seminars and company advisory services also resulted in a significant proportion of food waste generation. Plastic waste generation was relatively high among respondents who accessed information through company advisory services (3, 7.7%) and those who did not respond to the survey (7, 17.9%). Glass and metal waste generation were less prevalent compared to food waste and plastic waste, with only 3.4% of the respondents respectively reported across seminars, website, and training. The highest number of respondents (17, 43.6%) did not provide any response regarding the method for accessing information. Overall, the findings provide insights into the composition of solid waste generated by respondents across different methods of accessing information on waste generation (Filimonau & Tochukwu, 2020; Kamugisha *et al*., 2019).

The analysis of waste sorting and storage practices among hotels in Kakamega Town, as depicted in Table 4.5, underscores the pivotal role of information dissemination methods in shaping solid waste management behaviours. Social media emerges as a strong tool, influencing the sorting of various waste types, with 20.5% of hotels utilizing it. However, a significant proportion of hotels (43.6%) do not rely on any specific method for accessing information, suggesting a potential communication gap. These findings align with previous studies emphasizing the importance of targeted communication strategies and organizational support in promoting sustainable waste management practices (Ajzen, 1991; Sharifah *et al*., 2015; Filimonau & Tochukwu, 2020; Kamugisha *et al*., 2019). Effective waste management strategies should prioritize comprehensive information dissemination and tailored interventions to address the diverse needs and challenges faced by hotels in Kakamega Town.

The null hypothesis that the methods of accessing information and type of solid waste sorted and stored in hotels were independent was tested using the Chi-square test of independence (Table 4.6).

Table 4.6: The association between methods of accessing information and the type of solid waste sorted and stored in hotels in Kakamega Town

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	25.763[a]	28	0.586
Likelihood Ratio	23.967	28	.683
Linear-by-Linear Association	3.600	1	.058
N of Valid Cases	39		

a. 39 cells (97.5%) have an expected count of less than 5. The minimum expected count is .03.

Symmetric Measures

		Value	Approximate Significance
Nominal by Nominal	Phi	0.943	.586
	Cramer's V	0.471	.586
N of Valid Cases		39	

The findings from Table 4.6 revealed a lack of statistically significant association between methods of accessing information and the type of solid waste sorted and stored in hotels in Kakamega Town ($\chi^2(28) = 25.763$, $p = .586$). However, Cramer's V value of 0.471 further indicated a very strong effect of information on solid waste sorting and storage (V = .0471). These results suggested that while certain methods of accessing information may have influenced waste sorting behaviours to some extent. Thus, accessing to information has a great effect on solid waste sorting and storage among hotels. This aligned with previous research by Sharifah *et al*. (2015) and Nhamo *et al*. (2021), which emphasized the multifaceted nature of factors influencing waste management practices in the hospitality industry. Therefore, while hotels may have utilized various information

dissemination methods, additional contextual factors need to be considered in developing effective waste management strategies.

Despite the findings, it's noteworthy that about 55% of hotels were not using any method to access information on solid waste generation. This could imply a lack of awareness or training regarding the importance of solid waste generation, sorting, and storage, or reliance on external stakeholders like private companies and community-based organizations (CBOs) to handle waste. This finding resonates with the observations of a key informant who noted that some hotels were outsourcing waste management to private companies. However, it's essential to recognize the global significance of hotel waste management, given its contribution of approximately 20% to global greenhouse gas emissions, as highlighted by Kallbekken and Sælen (2013), Papargyropoulou *et al*. (2014), de Lange and Nahman (2015), and Scholz *et al*. (2015). Thus, there's a critical need for easy access to solid waste databases generated by hotels to inform effective waste management strategies, as emphasized by Abdulredha *et al*. (2018), the World Bank (2018), and Kasavan, Mohamed and Halim (2019).

4.3.4 Accessing information on solid waste sorting and storage and education of the respondents

Accessing information on solid waste sorting and storage and the education level of the respondents were crucial components that influenced waste management practices in hospitality settings. Understanding how these factors intersected provided valuable insights into sustainable waste management strategies Table 4.7 summarizes the findings.

Table 4.7: Accessing information on solid waste generation, sorting and storage and education level

		Education level				
		KCSE	Post-secondary certificate	Diploma	Bachelor's Degree	Total
Access information on solid waste sorting and storage	Self-initiative	0	0	1	0	1
	Suggestion Boxes	0	1	0	0	1
	Social media	0	1	3	4	8
	Training	0	0	1	1	2
	Company Advisory	3	0	0	0	3
	Website	2	2	0	0	4
	Seminar	0	0	3	0	3
	None	3	0	5	9	17
Total		8	4	13	14	39

Table 4.7 presents the relationship between accessing information on solid waste sorting, and storage and the education level of respondents in the hospitality sector, with a total sample size of 39. Notably, the majority of respondents with a Bachelor's degree (14 out of 39, 35.9%) accessed information through social media, followed by those with a Diploma (13 out of 39, 33.3%) and a post-secondary certificate (4 out of 39, 10.3%). Conversely, respondents with a KCSE level education showed minimal engagement across all access methods, with a total of 8 out of 39 (20.5%). Interestingly, a significant proportion of respondents with no specified education level (17 out of 39, 43.6%) did not utilize any specific method for accessing information.

The findings from Table 4.7 indicate a notable association between the education level of respondents and the methods they utilized to access information on solid waste management. Specifically, among respondents with Bachelor's degrees, a significant portion (35.9%) relied on social media for information, aligning with previous research emphasizing the influence of digital platforms on waste management awareness (Filimonau & Tochukwu, 2020). Conversely,

respondents with a Diploma (33.3%) and a post-secondary certificate (10.3%) were also inclined towards social media, suggesting its effectiveness across various educational backgrounds (Kamugisha *et al*., 2019). Moreover, the minimal engagement of respondents with a KCSE education level (20.5%) across all access methods highlights the need for targeted educational interventions to improve waste management practices in this demographic (Ajzen, 1991).

Interestingly, respondents with no specified education level exhibited a higher propensity (43.6%) to not utilize any specific method for accessing information, indicating potential gaps in waste management knowledge among this group (Nhamo *et al*., 2021). This finding underscores the importance of tailored educational programs targeting individuals with diverse educational backgrounds to enhance their participation in sustainable solid waste management efforts (Sharifah *et al*., 2015). Furthermore, the engagement of respondents with Bachelor's degrees (35.9%) and Diplomas (33.3%) with social media suggests the potential of digital platforms in disseminating waste management information among educated populations (Abdulredha *et al*., 2018).

These results highlight the different relationship between education levels and information access methods in waste management practices. While social media emerges as a preferred medium across various educational backgrounds, targeted interventions are needed to address the specific information needs of less-educated respondents. A multifaceted approach is important in waste management education to ensure inclusivity and effectiveness across diverse demographic groups (Kasavan, Mohamed & Halim, 2019).

The null hypothesis for this study was that there is no relationship between accessing information on solid waste sorting and storage and the education level of the respondents. Table 4.8 illustrates the findings.

Table 4.8: Relationship between accessing information on solid waste sorting and storage and education level

Chi-Square Tests

	Value	Df	Asymptotic Significance (2-sided)
Pearson Chi-Square	34.258[a]	21	.034
Likelihood Ratio	30.547	21	.082
Linear-by-Linear Association	.167	1	.683
N of Valid Cases	39		

a. 32 cells (100.0%) have an expected count of less than 5. The minimum expected count is .10.

Symmetric Measures

		Value	Approximate Significance
Nominal by Nominal	Phi	1.087	.034
	Cramer's V	.628	.034
N of Valid Cases		39	

The results from Table 4.8 revealed a statistically significant association between accessing information on solid waste sorting and storage, and the education level of respondents ($\chi^2(21) = 34.258$, V= .628, p = .034). Based on the results presented in Table 4.8, the null hypothesis was rejected, as indicated by the statistically significant p-value of .034. This suggests that access to information, significantly contributes to waste sorting and storage, and the education level of respondents. The rejection of the null hypothesis implies that education level influences individuals' approaches to seeking information on waste management practices.

These findings were consistent with previous research by Abdulredha *et al*. (2018) and Kasavan, Mohamed & Halim (2019), which suggested that education level influenced individuals' knowledge and awareness of waste management practices. The significant association underscored the importance of educational initiatives in shaping waste management behaviours among different educational strata. Specifically, individuals with higher education levels were more inclined to seek information through diverse channels such as seminars and websites, while those with lower

education levels relied more on company advisories or social media for information dissemination. Therefore, tailored educational programs targeting specific educational groups could enhance the effectiveness of waste management efforts in diverse communities.

4.3.5 Satisfaction with the access to solid waste information at the hotel

The opinions of respondents were sought on whether they were satisfied with their access to information in terms of solid waste generation, sorting, and storage at the hotel. The five-point Likert scale presents the findings (Table 4.9). The results showed that the majority of the hotel respondents (30% to 57% of total respondents) agreed or strongly agreed with their accessibility to information regarding solid waste generation, sorting, and storage (Table 4.9).

Table 4.9: Percentages of total respondents on satisfaction with access to information on solid waste management in the hotel

Statement	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
Solid waste management information is accessible to staff and customers	0.0%	8.7%	0.0%	56.5%	34.8%
The solid waste information is properly cited at the hotel	0.0%	4.3%	0.0%	56.5%	39.1%
Hotel management daily briefs the staff on solid waste generation, sorting, and storage	4.3%	13.0%	13.0%	34.8%	34.8%
Solid waste management information is well advertised on social media, websites, and posters at the hotel	4.3%	4.3%	17.4%	43.5%	30.4%

Table 4.9 shows that 56.5% of respondents agreed that the solid waste management information was accessible to both staff and customers, while 34.8% strongly agreed. Only 8.7% disagreed, and no respondents were undecided or strongly disagreed. Research indicates that accessible and widely disseminated solid waste management policies are crucial for their efficacy, as they enhance knowledge and compliance, and encourage waste reduction initiatives (Ajuntament de Barcelona, 2017). The hotels efforts in communication have been positively reflected by the high percentage of respondents who strongly agreed with the accessibility of the solid waste management information. The hotel has effectively communicated its waste management policies to staff and customers, fostering a responsible waste management culture (Tostivint *et al*., 2016; Wang *et al*., 2017). The low percentage of respondents who disagreed with their accessibility to information on solid waste generation and storage suggests minimal perceived barriers or challenges in accessing waste management guidelines. Limited accessibility to information can hinder individuals from adhering to waste management protocols, leading to inefficiencies and increased waste generation. (Radwan, Jones & Minoli, 2010).

The findings in Table 4.9 indicated that 56.5% of respondents agreed and 39.1% strongly agreed, that their accessibility to information on solid waste management is a great achievement towards sustainability. Ball and Taleb (2011), FAO (2011) and Liu *et al*. (2016) highlighted the importance of clear information and guidelines for waste management in various contexts, including hotels. Proper citation and dissemination of waste management policies within hotel establishments are crucial for ensuring staff and customers are aware of waste management protocols. This aligns with the notion that effective communication and accessibility to waste management policies contribute to improved waste sorting and storage practices (Ajuntament de Barcelona, 2017). The smaller proportion (4.3%) who disagreed with the proper accessibility to information may reflect

potential gaps in communication or implementation of waste management policies within hotels. Studies such as those by Desta *et al*. (2014) and Bundhoo (2018) have highlighted challenges in information sharing and adherence to waste management policies in various urban areas. The study indicates a consensus on accessing information on solid waste generation, sorting and storage but small disagreements may suggest areas for improvement in hotel waste management, emphasizing the need for continuous monitoring and evaluation.

Table 4.9 shows the percentage of respondents who agreed (34.8%) or strongly agreed (34.8%) with the statement may suggest that some hotels are actively engaging in daily briefings to educate staff on waste management practices. According to previous studies, effective communication initiatives are crucial for promoting proper waste sorting and storage (Omidiani & Hashemi, 2016). Conversely, the percentage of respondents who disagreed (13.0%) or were undecided (13.0%) underscores the existence of challenges or inconsistencies in daily briefings by hotel management. This could be attributed to factors such as inadequate investment in personnel or insufficient collaboration among stakeholders in waste management efforts (Mbaki, 2019). The smaller percentage of respondents who strongly disagreed (4.3%) highlights the significance of addressing barriers to effective waste management practices within hotels.

The findings in Table 4.9 indicated that 43.5% of respondents agreed and 30.4% strongly agreed with the statement that hotels advertised their solid waste management information on various platforms, such as social media, websites, and posters. This is congruent with the importance of information sharing as highlighted in existing literature (Ajuntament de Barcelona, 2017). Effective dissemination of information regarding solid waste management policies through these channels reflects a proactive approach by hotels towards waste management practices (Kinobe *et*

al., 2015). Furthermore, the substantial percentage of respondents who strongly agreed with this statement suggests a significant level of satisfaction or approval with the efforts made by hotels in communicating their waste management policies (Yaoundé *et al*., 2019). However, the presence of 17.4% of respondents who were undecided about whether hotels advertised their waste management information indicated a lack of clarity or awareness among some individuals, which could be attributed to inadequate information-sharing practices (Kinobe *et al*., 2015).

Similarly, the smaller percentages of respondents who disagreed or strongly disagreed with the statement may reflect a perception among some individuals that hotels do not effectively communicate their waste management policies. Such a notion could potentially lead to misunderstandings or mismanagement of waste (Kinobe *et al*., 2015). This discrepancy underscores the importance of consistent and comprehensive communication strategies by hotels to ensure that their waste management policies are effectively understood and embraced by all stakeholders (Yaoundé *et al*., 2019). Key informant interview stated that:

> "… It is a requirement by all hotels to have solid waste management procedures as a guide to proper waste handling and management by both hotels and visitors."

4.3.7 Amount of solid waste and their respective type

The study sought to quantify solid waste generated by the hotels based on the type of waste. Table 4.10 summarizes the findings.

Table 4.10: Amount of solid waste sorted according to the type

Type of waste	quantity (kg) per week
Mixed waste	3.199
Plastic	1.267
Metal	0.279
Glass	0.693
Paper	0.371
Food waste	1.505
Uneatable waste	1.323

The findings presented in Table 4.10 revealed that mixed waste constituted the largest portion at 3.199 kg per week, indicating a lack of effective sorting practices within hotels. This consistency with earlier findings suggests that hotels often fail to sort waste adequately, hampering recycling efforts and resource recovery (Radwan, Jones, & Minoli, 2010; Pirani & Arafat, 2014). This lack of sorting not only impacted environmental sustainability but also reflected a broader challenge in waste management practices in the hotels.

Plastic waste emerged as the second most significant category, with hotels sorted waste, 1.267 kg per week. The high level of plastic waste underscored the widespread use of plastic materials in hotel operations, particularly in packaging (Liu *et al*., 2016; Pirani & Arafat, 2016). Metal waste, though relatively low at 0.279 kg per week, and glass waste at 0.693 kg per week, suggested some level of material separation, indicating the potential for improved recycling processes (Kasavan, Mohamed, & Halim, 2019; Tostivint *et al*., 2016). Properly addressing these waste streams could lead to better recycling rates and resource recovery.

Food waste also constituted a significant portion of the waste sorted by hotels, amounting to 1.505 kg per week. This highlighted the need for effective waste management strategies in hotel kitchens and dining areas (Papargyropoulou *et al*., 2016). Uneatable waste, at 1.323 kg per week, further

underscored the importance of innovative waste disposal solutions such as composting or waste-to-energy conversion to minimize environmental impacts (Bundhoo, 2018). These figures reflected the operational realities of hotels and the diverse sources of waste, emphasizing the need for tailored waste management approaches.

The importance of information sharing in effective waste management cannot be overstated. Previous research indicated that a lack of access to information on waste types and quantities could lead to inadequate sorting and increased environmental pollution (Douti, Abanyie, & Ampofo, 2017; Lema *et al*., 2019). In regions such as Ghana and Ethiopia, poor information dissemination has resulted in improper waste management practices and higher rates of illegal dumping (Erasu *et al*., 2018; Naibbi & Umar, 2017). Thus, enhancing information-sharing mechanisms was crucial for improving waste management practices in hotels. Implementing comprehensive staff training, investing in proper waste sorting infrastructure, and fostering collaborations with waste management firms were essential steps towards achieving this goal.

4.3.8 Paired T-test between hotel categorization in terms of hotel bed-capacity and type of solid waste found at the hotels

Paired T Test between hotel categorization in terms of hotel bed-capacity and type of solid waste found at the hotels. Table 4.11 summarizes the findings.

Table 4.11: Paired between hotel bed capacity and type of solid waste

Paired T-test		Mean	N	Std. Deviation	Std. Error Mean
1	Category of the hotel	1.2222	9	.44096	.14699
	Mixed waste	.45689	9	.604194	.201398
2	Category of the hotel	1.4348	23	.50687	.10569
	Plastic	.18096	23	.231710	.048315
3	Category of the hotel	1.3333	3	.57735	.33333
	Metal	.27933	3	.381629	.220333
4	Category of the hotel	1.4737	19	.51299	.11769
	Glass	.09863	19	.154662	.035482
5	Category of the hotel	1.4706	17	.51450	.12478
	Paper	.05276	17	.099345	.024095
6	Category of the hotel	1.5238	21	.51177	.11168
	Food waste	.21467	21	.215745	.047079
7	Category of the hotel	1.5000	16	.51640	.12910
	Uneatable waste	.18900	16	.175202	.043800

[scale used to analyses the findings – 1 to 1.5 stands for mean leaning towards Low-bed capacity hotels and 1.51 to 2 leaning towards High-bed capacity hotels]

The paired t-test analysis examined the relationship between hotel categories (low or high bed capacity) and the types of waste they generate. Using a scale where a mean between 1 and 1.5 indicates a tendency towards low-bed capacity hotels and a mean between 1.51 and 2 indicates a tendency towards high-bed capacity hotels, the results highlighted several trends.

For mixed waste, the mean of 1.2222 suggests that it was predominantly generated by low-bed capacity hotels, with a standard deviation of 0.44096 and a standard error mean of 0.14699. This indicates a significant tendency towards low-bed capacity hotels generating more mixed waste (Filimonau & Tochukwu, 2020).

Plastic waste had a mean of 1.4348, also leaning towards low-bed capacity hotels, though less strongly than mixed waste. The standard deviation for plastic waste was 0.50687 with a standard error mean of 0.10569, showing moderate variability in this trend. Similarly, metal waste, with a

mean of 1.3333, was more common in low-bed capacity hotels, supported by a standard deviation of 0.57735 and a standard error mean of 0.33333 (Agyeiwaah, 2020).

Glass waste, with a mean of 1.4737, showed a strong inclination towards low-bed capacity hotels, though close to the threshold for high-bed capacity hotels. The standard deviation was 0.51299 and the standard error mean was 0.11769, indicating moderate consistency. Paper waste followed a similar pattern with a mean of 1.4706, a standard deviation of 0.51450, and a standard error mean of 0.12478, suggesting it was also predominantly generated by low-bed capacity hotels (Agesa *et al*., 2022).

Food waste, with a mean of 1.5238, indicated a slight tendency towards high-bed capacity hotels. The standard deviation was 0.51177 and the standard error mean was 0.11168, highlighting a more variable distribution. Lastly, uneatable waste had a mean of 1.5000, showing an even distribution between low and high-bed capacity hotels, with a standard deviation of 0.51640 and a standard error mean of 0.12910.

These findings underscore that low-bed capacity hotels generally unsorted waste into plastic, metal, glass, and paper waste, while food waste is slightly more common in high-bed capacity hotels. The variability in standard deviations and standard error means indicates differing levels of consistency in these waste generation patterns across hotel categories. These results are consistent with previous research, such as Filimonau and Tochukwu (2020), who noted similar waste generation patterns in Nigerian hotels, and Agyeiwaah (2020), who observed that small accommodation enterprises in Ghana contributed significantly to solid waste management challenges. Agesa *et al*. (2022) also highlighted the impact of waste management practices on

operating costs in Kenyan hotels, emphasizing the need for tailored waste management strategies based on hotel capacity.

4.4 Contribution of hotel empowerment (training and provision of bins) and solid waste sorting and storage

The second objective sought to determine the contribution of empowerment of the hotels regarding solid waste sorting and storage. The results presented are frequency of training on sorting and storage of solid waste; agencies offering training, frequency of sorting, categorization of sorted waste and type of storage bins and the provider of the storage bins to hotels. The hypotheses tested include Chi-square tests on the relationship between frequency of training and frequency of sorting; and Chi-square tests on the relationship between the provision of bins and frequency of the type of storage bins used.

4.4.1 Frequency of hotel training on solid waste sorting and storage

The respondents from hotels were asked the number of times they conduct solid waste training on sorting and storage in a year. Figure 4.1 presents the findings.

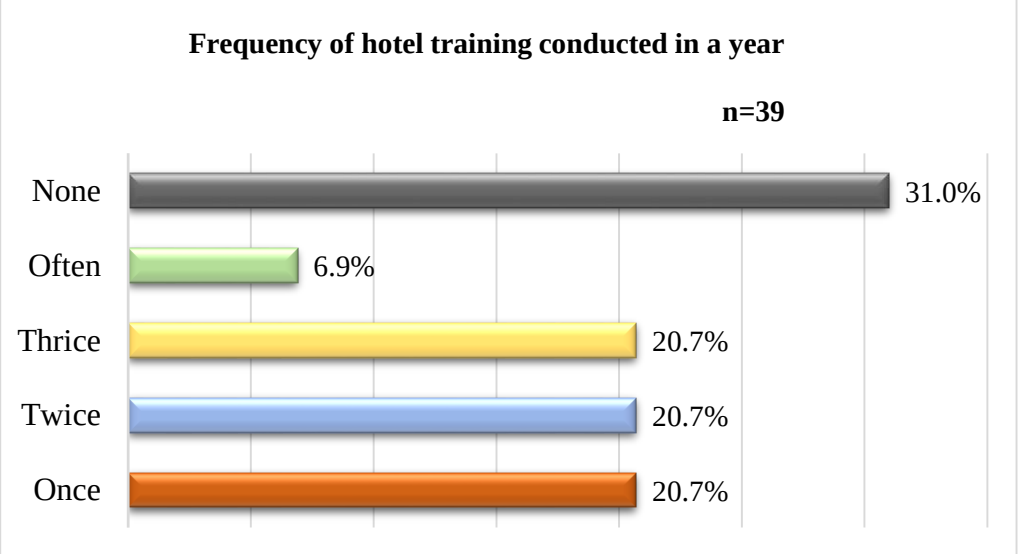

Figure 4.1: The frequency of training attained on solid waste sorting and storage in a year by the hotels.

The findings show that training on solid waste sorting was at least conducted once (20.7%), twice (20.7%), thrice (20.7%), and often (6.9%) by hotels (Figure 4.1). However, 31% of the hotels have not conducted any training (Figure 4.1). Training in solid waste is important in informing the hotels on the importance of solid waste management - sorting, and proper storage prior to collection and resource recovery or final disposal. From the foregoing, slightly about two-thirds of the hotels were training their staff on the importance of sorting and proper storage of solid waste generated. Previous studies emphasized the importance of training personnel (Odera, 2016; Atieno, 2017; Mugambi, 2017; Sibanda *et al.,* 2017).

There has been a notable improvement among the hotels in solid waste training in compliance with national and county policies on solid waste management. Resource recovery currently is at the epicentre of progress and the minimization of the global greenhouse effect on climate change and variability (de Lange & Nahman, 2015; Scholz *et al.,* 2015; Laor *et al*., 2018). This study notes that hotels have to invest in training their staff on sorting and proper storage of the generated solid waste to promote a healthy, clean, and appealing environment as provided in Environmental Management and Coordination (Waste Management) Regulations, 2006.

This study underscored the fact that about a third of the hotels had not provided training to staff in solid waste sorting and proper storage (Figure 4.1). In this regard, previous studies suggested that the lack of training was occasioned by financial constraints by hotels (Boateng *et al*., 2019; Mulat *et al.,* 2019; Serge-Kubanza & Simatele, 2020). This study acknowledges the grave concern over the lack of training among hotels on solid waste sorting and storage to promote inclusivity and thus reduce the impact of solid waste on the environment. The lack or scarcity of training of the workers on solid waste sorting and storage was occasioned by the lack of support from the hotel

management (Ozoike-Dennis *et al.,* 2019; Mochache *et al.,* 2020). It was also established that some of the hotels depended on a third party to sort solid waste that was mixed at the facility. This was informed by the key informant observed that:

> "… Some hotels use private companies to manage their waste, thus, the company handles sorting if they so wish and provides some plastic sacks for the temporary storage of waste at the hotels." Also, we feel it's the role of the municipal waste collector to handle the waste.

Therefore, from the foregoing, some hotels were not convinced of the need to train their workers in solid waste sorting and proper storage.

Keeping a clean environment is the goal of all waste generators enforced by NEMA through environmental auditing (NEMA, 2015). Currently, NEMA conducts an annual environmental audit that is meant to advise the hotels on environmental matters under EMCA, 1999 and Environmental (Impact Assessment and Audit) Regulations, 2003). NEMA and the Department of the Environment of the County Government of Kakamega must enforce training to the 31% (12) of the hotels that had not received any training on solid waste sorting and storage (Figure 4.1). Previous studies revealed that scarcity of training in sorting and storage of waste encouraged mixed waste storage by hotels and hampered resource recovery (CENIA, 2016; Laor *et al*., 2018).

This study notes that hotels should periodically engage personnel in solid waste training in order to promote solid waste sorting and proper storage. This study noted that there have been challenges for the hotels to fund the training and non-commitment from the owners to use their funds for personnel development as supported by Ziraba, *et al.* (2016) and Moh, (2017). Previous studies

have reported similar situations where hotels faced challenges in investing in training on solid waste management personnel (Boateng *et al*., 2019; Mulat *et al.*, 2019; Serge-Kubanza & Simatele, 2020). Training should involve all stakeholders through a public-private partnership to promote the sorting and proper storage of solid waste. This will promote energy recovery from solid waste, and encourage hog feeding and composting for manure as supported by Pirana & Arafat, (2014); and Yim, Fujiwara & Sour, (2014).

Solid waste is potentially a resource instead of a menace considering the reuse of food waste for feeding, the reuse of glass waste to make art etc. (Abdel-Shafy & Mansour, 2018). Ziraba, *et al.* (2016) and Moh (2017) indicated that training workers in solid waste generated by hotels contribute to proper solid waste sorting and storage. This study reveals that hotels had trained at least two-thirds of their workers in solid waste sorting and storage (often time 6.9%, once, twice, or thrice annually at 20.7% respectively – Figure 4.1). From the key informant interview, it was reported that the last time training was conducted on solid waste management (sorting and storage) was over five years ago. Meaning the workers were not currently receiving training thus potentially increasing the possibilities of mixed waste storage by the hotels.

4.4.2 Environmental agencies involved in training hotels on solid waste sorting and storage

The types of environmental agencies which train hotels on solid waste sorting and storage were examined. National Environment Management Authority (NEMA) participation in training hotels and workers on solid waste sorting and storage was only 17.9%, the Department of the Environment of CGK was 12.8%, the NGO involved in solid waste management trained 7.7% and the Diageo Agency of East African Breweries Limited trained only 2.6%. The majority of the hotels (46.2%) did not receive solid waste training from any environmental agencies while 12.8%

were not sure meaning they have not been trained as well. The findings are presented in Table 4.12.

Table 4.12: Environmental Agencies that train hotels on solid waste sorting and storage in Kakamega Town

Agencies involved in training	Frequency	Per cent
CGK	5	12.8
Diageo	1	2.6
NGO	3	7.7
NEMA	7	17. 9
Not sure	5	12.8
None	18	46.2
Total	**39**	**100**

NEMA is the leading authority bequeathed with environmental management responsibilities in Kenya. Solid waste management is one of the functions of NEMA which is governed by solid waste policies (NEMA Solid Waste Management, 2014). This study revealed that NEMA was the leading agency involved in training hotels on solid waste sorting and proper storage at 17.9% (Table 4.12). The researcher acknowledges the importance of agencies and authorities involved in training hotels on solid waste sorting and proper storage is critical in addressing wastage and environmental degradation. From the foregoing, quite a small percentage of the hotels received training from NEMA and the Department of Environment from CGK that are bequeathed with the responsibilities in environment management (NEMA, 2015).

About 46.2% of the hotels were not trained on solid waste sorting and storage by the environmental agencies or authorities (Table 4.12). Training hotels on solid waste sorting and storage is the responsibility of the National and County Governments (Mtungwe *et al.*, 2014; (Kinobe *et al.*, 2015). Plausibly, having about half of the surveyed hotels missing out on the training on solid

waste sorting and proper storage could mean that the function of solid waste sorting and proper storage was not given prominence by the hotels and the stakeholders. Hence, there was a need for the hotels and environmental stakeholders to invest in solid waste training and give it the urgency it deserves in order to rid Kakamega Town of any potential solid waste menace arising from hotel activities.

Solid waste has been established as an important resource, especially in the construction industry where building materials are made out of them (Ephantus *et al.*, 2021). Therefore, the agencies liaising with the hotels to train on sorting and proper storage helps in promoting resource recovery and effectively mitigating littering at the facility. Training opens vast opportunities and solves unemployment in Kenya. From the key informant interview, it was stated that:

> "… Most hotels received their training on solid waste management about five years ago. Over the past five years, there have likely been significant developments and new techniques introduced in waste management that these hotels may not be aware of or implementing. Furthermore, given the evolving nature of environmental regulations and sustainability practices, periodic training is essential to maintain compliance and improve operational efficiency."

This study acknowledges that about five years ago since the last training, the needs of the hotels could have changed, thus, foregoing training of the workers on solid waste sorting and storage. NEMA conducts routine environmental audits in accordance with EMCA (1999) amended 2015 and environmental impact and audit regulation of 2003 amended 2019. These annual environmental audits are meant to provide indicators of what should be managed by the hotels (NEMA, 2015).

The percentage of 17.9% (Table 4.12) reflects a low training activity by NEMA to the hotels. This could also be caused by the environmental agencies hardly focusing on training the hotels on the impact of solid waste generation and storage rather than focusing on solid waste collection, sorting, transportation and disposal. This was supported by Rai *et al.* (2019), which stated that solid waste management in towns is solely guided by the local authority rules and regulations that determine the frequency of collection, sorting, transportation and disposal only.

4.4.3 Frequency of solid waste sorting by hotels

The respondents were asked the question on how often they sort their solid waste in a week and the findings were presented in Table 4.13.

Table 4.13*:* The frequency of solid waste sorting by the hotels in Kakamega Town.

Solid waste sorting	Frequency	Per cent
Daily	28	72.2
Twice a week	3	8.3
Once a Week	3	8.3
Not sure	4	11.2
Total	**39**	**100**

Most of the hotels (72.2%) were sorting their generated solid wastes daily (Table 4.13). Food waste is the main waste generated by hotels, thus sorting waste daily is key for conversion into other products such as feeds and manure (FAO, 2011; the World Bank, 2018). Table 4.13, also revealed that 11.2% of the hotels were not sure of the frequency of solid waste sorting in their establishments. A study by CENIA (2016) indicated that some hotels were hardly sorting waste because they lacked training on the importance of sorting waste, especially at the source. Resource recovery from waste is the current trend whose global campaign was meant to solve the problems emanating from solid waste polluting land and marine environments as well as harbouring disease

agents (de Lange & Nahman, 2015, Scholz *et al.*, 2015). Omidiani and Hashemi (2016), stipulated that there were attempts taken owing to the deleterious effect of solid waste on the environment haphazardly to promote sorting and proper storage by hotels.

This study established that about 88.8% of the hotels were sorting waste indicating the importance they have placed in resource recovery (Table 4.13). Besides, the key informant revealed that:

> "… there were individuals who had an agreement with the hotels to daily collect food remains to feed their animals such as pigs and dogs."

These findings concur with Park's (2020) study which suggested that there were many benefits of solid waste sorting which led to a sustainable environment. Moreover, from the opinion of a key informant, it was stated that:

> "… sorting makes it easy for the solid waste collection party(s) to avoid mixing of the solid waste during transportation for further management."

The 11.2 per cent of the hotels (Table 4.13) that were not sure of whether they were sorting solid waste could suggest that the hotels and workers had not received training on sorting solid waste and hence were not sure of the importance of sorting. Mugambi (2017) acknowledged that the lack of training on solid waste sorting by hotels negatively impacted the sorting of solid waste at source.

4.4.4 Categorization of sorted solid waste types by hotels in Kakamega Town

The categorization of the sorted solid waste was examined. The respondents were asked how they categorize their sorted solid wastes and the findings were presented in Figure 4.2.

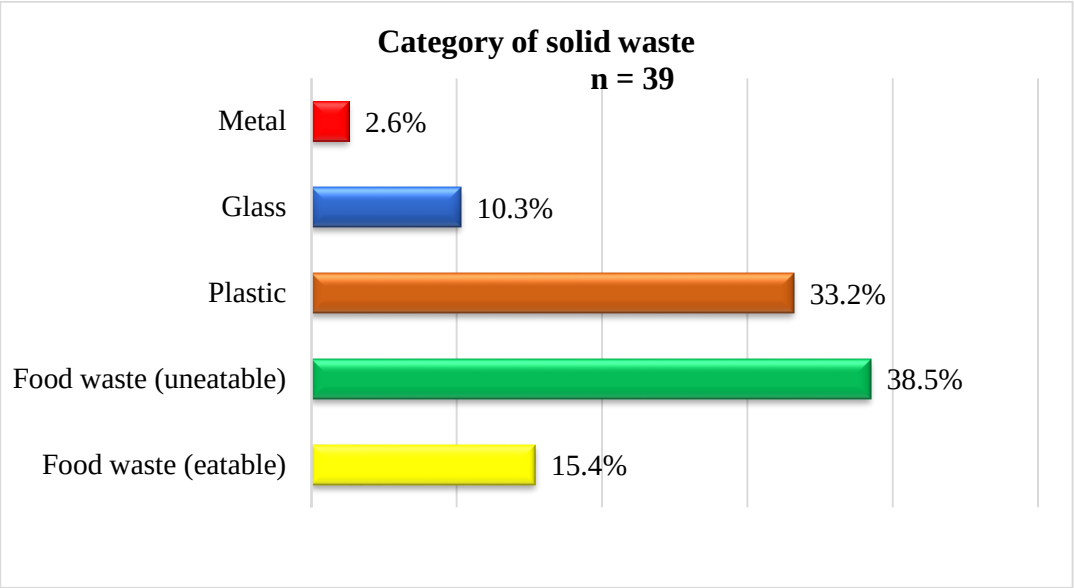

Figure 4.2: Categorization of sorted solid waste types in percentages by hotels in Kakamega Town.

According to Figure 4.2, hotels sorted waste into food waste 53.9% (15.4% eatable and 38.5% uneatable), plastic waste (33.2%), glass waste (10.3%), and metal waste (2.6%). The result (Figure 4.2) shows that more than half of the sorted waste by the hotels came from food waste and a third was plastic waste. Moreover, inedible food was the majority of the sorted waste. Hotels provide catering, accommodation, and events services among others. The generation of food waste and other non-food waste is inevitable by the hotels. In Kakamega Town, hotels mainly provide catering, meeting, and accommodation services. Studies have established that in the early 1990s, food waste from hotels accounted for 79.1% and plastic accounted for 3.3%, glass accounted for 4.5%, metal accounted for 1.7% (Munga *et al*., 1993; Muthini, Tole & Otieno, 2003). From this study, the types of solid waste generated were: food waste 53.9%, plastic 33.2%, glass 10.3%, and

metal 2.6%. Food and plastic waste were contributing to the bulk of solid waste generated by the hotels. Food waste could be reduced to avoid plate wastage and at-service wastage, reused to feed animals, and composted to make organic manure. Plastic waste could be reused and recycled into other forms. Therefore, resource recovery is possible for hotels if the solid wastes are sorted.

Food waste by the surveyed hotels in Kakamega Town was at 53.9% which exceeds the global average of 30% from about 8 years ago as reported by FAO (2017) and Stewarding Association International (2017). According to Chaabane *et al*. (2018) and Kashyap and Borthakur (2018), hotels have been generating 60% of food waste during peak hours and high seasons and are hardly sorted. Lack of unsorted solid waste contributes to poor waste management and affects resource recovery.

Solid waste contributes to greenhouse gas emissions thus affecting climate change. To mitigate the effect of food waste it was important for hotels to invest in sorting, proper storage and appropriate management. Edible waste formed about 15.4% of the total food waste which was fair (Figure 4.2). Previous studies noted that at least a person in a hotel would generate about 1.9 kg of food waste per day in the late 1990s and 2000s (Munga *et al*., 1993; Muthini *et al.*, 2003). In 2018, at least a person would generate at least 0.9 kg of food waste per day. This indicates a significant reduction in wastage especially could be brought about by the introduction of buffet services (Aamir *et al.*, 2018; Abdulredha *et al.*, 2018). Hotels should improve on sorting food waste as they encourage customers and kitchen staff to minimize food waste generation. Investing in sorting will promote hog feeding and composting for manure thus reducing mixed solid waste at the dumpsite.

Previous studies indicate that food waste from the hospitality industry has contributed to 20 per cent of global greenhouse gas emissions (Kallbekken and Sælen, 2013; Papargyropoulou *et al*., 2014, de Lange & Nahman, 2015, Scholz *et al.*, 2015). Therefore, hotels need to mitigate the presence of food waste and plastic waste in the environment by practising effective sorting and final storage of the waste generated.

4.4.5 Types of solid waste storage bins at the hotels in Kakamega Town

The types of solid waste storage bin the hotels used were investigated. The findings are presented in Figure 4.3.

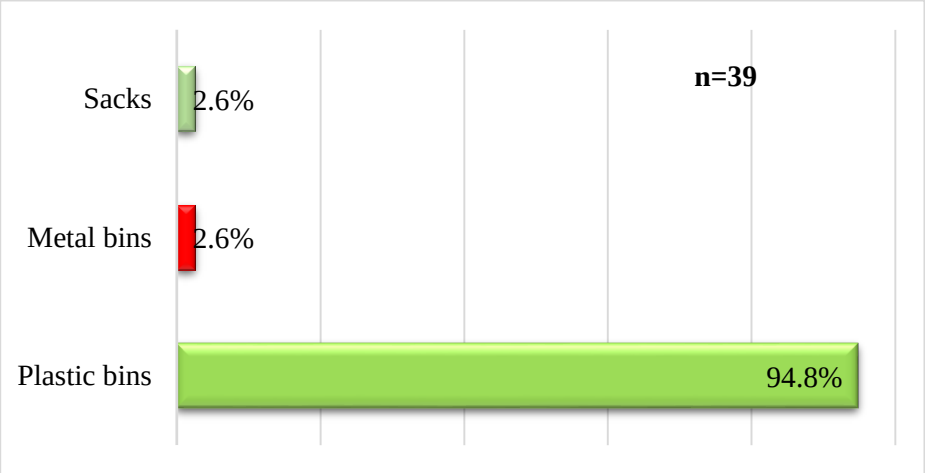

Figure 4.3: Types of solid waste storage bins in percentages used by the hotels in Kakamega Town.

According to the findings (Figure 4.3), 94.8% of total respondents in the surveyed hotels in Kakamega Town preferred plastic bins, while metal bins and sacks were used by 2.6% of total respondents respectively. Plastic bins are preferable because they are not as erodible as metal bins and thus last for a longer time than metal bins. Besides, plastic bins are better than sacks as they are sanitary and can be handled with ease. All the hotels had storage bins because it is a requirement

by the NEMA and public health department to enhance a sanitary environment at the hotels. The Kakamega County Environmental Management Act (2019), provides that solid waste generators have the responsibility of participating in solid waste storage. Thus, the provision of storage bins lies with the hotels. The findings demonstrate that the hotels have complied with the NEMA requirements; contrary to the findings from previous studies (Mtungwe *et al*., (2014; Desta *et al*., 2014; Olukanni *et al.*, 2016). Moreover, hotels endeavoured to invest in storage bins that are accessible to the general population at the hotels, because they appreciated the importance of storage bins at the hotels (Ziraba *et al.* 2016; Moh (2017). Unlike other commercial enterprises which had shortages of storage bins, hotels had solid waste storage bins which could be accessed by hotel personnel and clients (Mbaki (2019) and Cheruiyot (2020).

4.4.6 Service providers for solid waste storage bins in hotels in Kakamega town

The hotel respondents were asked whether solid waste storage bins were outsourced or provided by the hotels themselves. The external service providers were the County Government of Kakamega and private companies as shown in Figure 4.4.

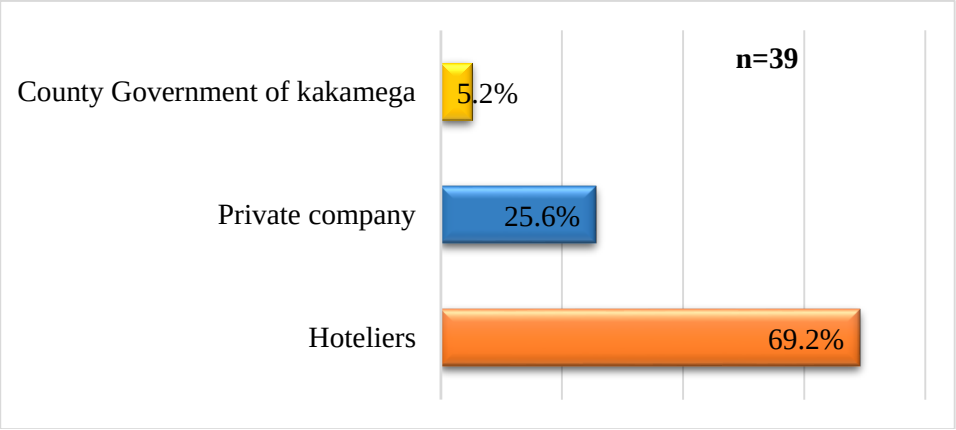

Figure 4.4: The providers of solid waste storage bins used by hotels in Kakamega Town

The majority of the hotel respondents (69.2%) indicated that solid waste bins were internally provided by hotels. (Figure 4.4). About 25.6% of total respondents chose Private companies as the external provider for the solid waste storage bins. Only 5.2% of the total respondents selected the County Government of Kakamega as the external provider for the solid waste storage bins.

Over two-thirds of the storage bin providers (Figure 4.3) surveyed were hotels that carry the main responsibility of the hotel's operations. Naturally, it is assumed that the hotels provide storage bins for solid waste considering the inevitability of solid waste generation. However, from this study, it was established that only 69.2% of the hotels were responsible for the provision of solid waste bins. From Mbaki (2019) and Cheruiyot's (2020) studies, it could be confirmed that knowledge about the provision of storage bins was limited to the management, thus, in this study about 25.6% relied on private companies to make available storage bins, and 5.2% was provided by CGK (Figure 4.4). From the foregoing, it is quite low for only 69.2% of the hotels to provide storage bins at their facilities instead of 100%. In this study, it could also mean that 69.2% (Table 4.3) was applicable by hotels that could have received training on solid waste sorting and storage. The remaining 30.8% might have not received solid waste training or did not see the need for solid waste storage and opted for private companies and CGK for solid waste sorting and storage services.

Moreover, the previous studies indicated that the hotel management was not flexible in providing storage bins (Yukalang, *et al.*, 2017; Fredrick, Oonyu & Sentongo, 2018; Serge-Kubanza & Simatele, 2020). To some extent, it could mean that the hotels were not aware of their responsibility in solid waste storage before collection from their facilities. This concurs with previous studies in Kenya such that hotels were not much conversant with solid waste storage,

thus, their reluctance to provide storage bins (Nyayiemi 2012; Njoroge, Kimani & Ndunge, 2014; Ondieki, 2014; Malenya, 2015; Shivonga, 2016). This study acknowledges that hotels could have missed the training on solid waste storage at their facilities and thus do not understand their role in promoting proper storage through the provision of storage bins.

Private companies are becoming common in solid waste management especially collection, transportation, and final disposal. About 25.6% of hotel respondents indicated that hotels relied on private companies to provide them with storage bins at their respective facilities (Figure 4.4). Moreover, the key informant interview stated that:

> "…Private companies are providing storage bins to hotels especially those which have interest in resource recovery – reuse and recycling of solid waste."

Another key informant stated:

> "… private companies provide waste liners at our hotels for various storage bins to make it easy for them to collect the waste for further management."

Previous studies in Kakamega Municipality indicated that commercial enterprises including hotels hardly participate in solid waste management practices such as sorting and proper storage (Nyayiemi 2012; Malenya, 2015). Moreover, Shivonga (2016) added that hotels had inadequate storage bins and rarely sorted or properly stored the waste which could have provided the opportunity for private companies to extend the services to hotels. Besides, the key informant indicated that:

"… most hotels hardly employ skilled personnel in solid waste sorting and proper storage. To some hotels, it is affordable and convenient to give a contract to a private company to manage the solid waste they generate."

This could be in line with the findings of previous studies by Kaluli *et al*. (2017), Sibanda *et al.* (2017), and Ndunda (2018) that the skilled workforce and availability of storage bins were important in solid waste storage by the hotels.

4.4.7 Frequency of training conducted in a year and frequency of sorting solid waste by hotels in Kakamega Town.

The hotels were interviewed on the frequency of their annual training on solid waste sorting and the frequency of solid waste sorting. The responses were presented in cross-tabulation (Table 4.14).

Table 4.14: The frequency of training conducted in a year and the frequency of solid waste sorting by hotels in Kakamega Town

		Frequency of solid waste sorting			Total
		Daily	Twice a week	Weekly	
Frequency of training conducted in a year	Once	8	0	0	8
	Twice	9	0	0	9
	Thrice	8	0	1	9
	Often	3	0	0	3
	None	6	3	1	10
Total		34	3	2	39

8,9,9 and 3 (20.5%,23.1%,23.1% and 7.7 %) respectively of the total respondents said that the frequency of conducting training in a year was once, twice, thrice, or often and corresponding solid

waste sorting was daily (Table 4.14). 10 (25.6%) of the total respondents said that they had not received any training on solid waste sorting. The null hypothesis that the frequency of training and frequency of solid waste sorting was not independent was tested using the Chi-square test of independence and Cramer's V test (Table 4.15).

Table 4.15: The frequency of training conducted in a year and the frequency of solid waste sorting by hotels in Kakamega Town

Chi-Square Tests

	Value	Df	Asymptotic Significance (2-sided)
Pearson Chi-Square	8.442[a]	8	0.392
Likelihood Ratio	9.083	8	0.335
Linear-by-Linear Association	1.018	1	0.313
N of Valid Cases	39		

a. 12 cells (80.0%) have an expected count of less than 5. The minimum expected count is .15.

Symmetric Measures

		Value	Approximate Significance
Nominal by Nominal	Phi	0.570	0.392
	Cramer's V	0.403	0.392
N of Valid Cases		39	

The Chi-Square test results IN Table 4.15, (χ^2(8.442, V=.403, p= 0.392), suggest that there is no statistically significant association between frequency of training and solid waste sorting and storage. The Cramer's V value of 0.403 further indicates a strong contribution on hotel training and frequency of solid waste sorting and storage. Thus, training has an effect to frequency of solid waste sorting and storage as it provides information on sustainable environment. Triangulating these findings with existing literature, studies such as those by Rai *et al*. (2019) and Boateng *et al*. (2019) have highlighted the complexities and challenges in identifying significant associations in studies related to solid waste management practices in hotel settings. These studies emphasize the

need for caution in interpreting statistical results and suggest considering broader contextual factors that may influence the relationship between variables.

4.3.8 Provision of storage bins and types of storage bins used by hotels

The hotel respondents were interviewed on the source of storage bins and the types of storage bins they used. The responses which were frequencies were presented in cross-tabulation (Table 4.16).

Table 4.16: The source of storage bins and types of storage bins used by hotels in Kakamega Town

Statement		Types of storage bins			Total
		Plastic	Metallic	Plastic and Sacks	
Sources of storage bins	Self-provider	23	1	2	26
	Private company	10	0	0	10
	Hotels and Community-Based Organizations	1	0	0	1
	Hotels and private company	1	0	0	1
	County Government Kakamega	1	0	0	1
Total		36	1	2	39

About 23 respondents (59% of total respondents) said that the source of the storage bins was self and the corresponding storage bins were plastic (Table 4.16). Besides, about 10 respondents (24% of total respondents) said that the source of the storage bin was by private company and the corresponding type was plastic. The null hypothesis that the source of storage bins and types used in the hotels were independent was tested using the Chi-square test of independence (Table 4.17).

Table 4.17: The relationship between source of storage bins and types of storage bins used by hotels in Kakamega Town

Chi-Square Tests

	Value	Df	Asymptotic Significance (2-sided)
Pearson Chi-Square	1.131[a]	8	.997
Likelihood Ratio	1.769	8	.987
Linear-by-Linear Association	.567	1	.451
N of Valid Cases	39		

a. 13 cells (86.7%) have an expected count of less than 5. The minimum expected count is .03.

Symmetric Measures

		Value	Approximate Significance
Nominal by Nominal	Phi	.197	.997
	Cramer's V	.140	.997
N of Valid Cases		39	

The Chi-Square $\chi^2(1.131, p=0.997)$, indicate a lack of statistically significant association between the source of storage bin and type of storage bins used by hotels (Table 4.17). This aligns with previous research findings, such as those by Rai *et al*. (2019), which highlighted challenges faced by hotels in solid waste sorting and storage, possibly indicating that factors influencing satisfaction with solid waste management policies are multifaceted and not necessarily correlated. Moreover, the low Cramer's V value of .140 further reinforces this interpretation, suggesting a very weak association between the variables. This finding resonates with the observations made by Mtungwe *et al*. (2014) and Kirama & Mayo (2016), who indicated a reluctance among hotels to participate in solid waste sorting and storage initiatives.

These findings imply that the variables under study, including satisfaction with solid waste management policies, may operate independently or are influenced by factors not explored in this research, such as organizational culture or external regulations. Additionally, the lack of a significant association could also be attributed to the relatively small sample size, as noted in

previous studies (Kubanza & Simatele, 2016), which might limit the ability to detect meaningful relationships between variables.

4.4.9 Hotel categorization as a test of frequency of training, Education level

In the analysis, hotel categorization served as a test of the frequency of training and education level.

4.4.9.1 Frequency of training conducted in a year and hotel category

The analysis explores the relationship between the frequency of training conducted in a year and the hotel category. Table 4.18 presents the findings.

Table 4.18: Frequency of training conducted in a year and hotel category

		Category of the hotel		
		Low Capacity	High Capacity	Total
Frequency of training conducted in a year	Once	5	5	10
	Twice	5	5	10
	Thrice	7	4	11
	Occasionally	4	0	4
	Often	4	0	4
Total		25	14	39

Table 4.18 shows the frequency of training sessions conducted in a year categorized by hotel capacity, with a total of 39 hotels. In hotels categorized as low capacity, there were 25 instances out of 39 (64.1%) where training sessions were conducted, while in high-capacity hotels, there were 14 instances out of 39 (35.9%). Among low-capacity hotels, training sessions were evenly distributed, with 10 sessions each conducted once or twice a year, accounting for 25.6% each. Additionally, 11 sessions (28.2%) were conducted thrice a year and 4 sessions (10.3%) were conducted occasionally. Conversely, in high-capacity hotels, training sessions were evenly distributed between once and twice a year, each comprising 25.6% of the total. However, higher

frequency training sessions were less common, with 11.5% conducted thrice a year in 4 instances, while occasional and frequent sessions were absent. In general, the study revealed variations in training session frequencies across different hotel capacities, with low-capacity hotels demonstrating a slightly higher engagement in training activities.

The table illustrates that 64.1% of low-capacity hotels conducted training sessions, whereas only 35.9% of high-capacity hotels did so. This indicates a disparity in training engagement between the two categories. The distribution of training frequency varied among low-capacity hotels, with 25.6% conducting sessions once or twice a year, and 28.2% conducting them thrice annually. In contrast, high-capacity hotels primarily conducted training once or twice a year (25.6%), with fewer instances of thrice-yearly sessions (11.5%). These findings echo previous studies (Radwan, Jones, & Minoli, 2010; Pirani & Arafat, 2014), suggesting that differences in hotel capacity may influence training engagement and frequency. However, further research could delve deeper into the reasons behind these disparities and their implications for waste management practices in the hospitality industry. The observed differences in training frequency between low and high-capacity hotels align with previous research by Liu *et al*. (2016) and Tostivint *et al*. (2016), which emphasized disparities in resource allocation and staff development practices based on hotel size and capacity. Moreover, the findings resonate with the conclusions drawn by Kasavan, Mohamed, and Halim (2019), who highlighted the importance of tailored training programs to address the specific needs and operational challenges faced by hotels of different capacities. These studies collectively emphasize the significance of targeted training interventions in enhancing waste management practices across diverse hotel categories.

4.4.9.2 Relationship between frequency of training conducted in a year and hotel category

The study sought to examine the relationship between the frequency of training conducted in a year and hotel category and shed light on how training practices vary across different types of hotels based on their capacity and operational requirements. Table 4.19 presents the findings.

Table 4.19: Cross-tabulation between frequency of training conducted in a year and hotel category

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	3.274[a]	4	.513
Likelihood Ratio	4.567	4	.335
Linear-by-Linear Association	2.650	1	.104
N of Valid Cases	39		

a. 10 cells (100.0%) have an expected count of less than 5. The minimum expected count is .73.

Symmetric Measures

		Value	Approximate Significance
Nominal by Nominal	Phi	.386	0.513
	Cramer's V	.386	0.513
N of Valid Cases		39	

The findings from Table 4.19 indicate a lack of statistically significant relationship between the frequency of training conducted in a year and hotel category, as evidenced by the Pearson Chi-Square test ($\chi^2(4) = 3.274$, $p = .513$). This led to failure to reject the null hypothesis stating that there is no contribution on the frequency of training and hotel categories in Kakamega County. Similarly, the Cramer's V value of 0.386, with an approximate significance of 0.513, further supports the absence of a strong effect between frequency of training and hotel category. These results suggest that the frequency of training sessions conducted in hotels is not significantly influenced by their categorization based on capacity.

The non-significant relationship between the frequency of training sessions and hotel categories in Kakamega County supports the conclusion that hotel capacity does not dictate the frequency of training sessions conducted. There was a lack of a strong relationship between the two factors tested. These findings are consistent with prior research by Radwan, Jones, and Minoli (2010) and Pirani & Arafat (2014), which highlighted the complex nature of training practices in the hospitality industry. Despite the absence of a significant relationship, this does not discount the importance of training in waste management practices. Instead, it emphasizes the need for tailored training programs that consider the unique operational requirements and challenges faced by hotels of different capacities (Liu *et al*., 2016; Tostivint *et al*., 2016).

4.4.9.3 Association between frequency of solid waste sorting and hotel category

This study explored the relationship between the frequency of solid waste sorting and the hotel category. Table 4.20 presents the findings.

Table 4.20: Cross-tabulation between frequency of solid waste sorting and hotel category

		Category of the hotel		
		Low Capacity	High Capacity	Total
Frequency of solid waste sorting	Daily	19	14	33
	twice a week	0	3	3
	Weekly	3	0	3
Total		23	17	39

Table 4.20 illustrates the cross-tabulation between the frequency of solid waste sorting and hotel category, based on a total sample size of 39 hotels. Among low-capacity hotels, 19 out of 23 (48.7%) engage in daily solid waste sorting, while none sort waste twice a week. Three hotels (13.0%) sort waste every week. In contrast, among high-capacity hotels, 14 out of 17 (35.9%) sort waste daily, three hotels (7.7%) do so twice a week, and none sort waste weekly. Overall, the

majority of hotels in both categories sort waste daily, indicating a consistent effort in waste management across hotel types.

Table 4.20 illustrates the relationship between the frequency of solid waste sorting and hotel category, drawing insights from a total of 39 hotels sampled. Among low-capacity hotels, nearly half (48.7%) engaged in daily solid waste sorting, with none opting for twice-weekly sorting. A small proportion (13.0%) sorted waste every week. Conversely, in high-capacity hotels, 35.9% sorted waste daily, with 7.7% doing so twice a week, and none opting for weekly sorting. These findings suggest a consistent trend of daily waste sorting across both hotel categories, highlighting a concerted effort in waste management practices. This aligns with existing literature emphasizing the importance of regular waste sorting to mitigate environmental impacts and promote sustainability (Radwan, Jones, & Minoli, 2010; Pirani & Arafat, 2014).

The absence of weekly waste sorting practices in high-capacity hotels could reflect operational priorities or logistical constraints, warranting further investigation into the underlying factors driving waste management decisions in hospitality establishments. Findings underscored the significance of regular waste sorting practices in enhancing waste management efficacy across hotels of varying capacities. Further supporting the importance of regular waste sorting, Radwan, Jones and Minoli (2010) highlighted the benefits of daily waste sorting routines in improving resource recovery and reducing waste disposal volumes. Similarly, Pirani and Arafat (2014) underscored the role of regular waste sorting in promoting sustainability and environmental stewardship in the hospitality sector. These studies collectively reinforce the importance of daily waste sorting practices in hotels of varying capacities to achieve effective waste management outcomes and promote sustainable hotel operations. To further understand this, the null hypothesis

was tested stating that there is no relationship between the frequency of solid waste sorting and the hotel category. Table 4.21 presents the findings.

Table 4.21: The association between frequency of solid waste sorting and hotel category

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	4.212[a]	2	.122
Likelihood Ratio	5.659	2	.059
Linear-by-Linear Association	.133	1	.716
N of Valid Cases	39		

a. 4 cells (66.7%) have an expected count of less than 5. The minimum expected count is .85.

Symmetric Measures

		Value	Approximate Significance
Nominal by Nominal	Phi	.402	.122
	Cramer's V	.402	.122
N of Valid Cases		39	

The findings from Table 4.21 suggested that there was no statistically significant relationship between the frequency of solid waste sorting and hotel category ($\chi^2(2) = 4.212$, $p = .122$). This indicated that the observed differences in waste sorting frequency between low-capacity and high-capacity hotels could have occurred randomly, rather than being influenced by hotel category. Similarly, the Cramer's V value of 0.402, with an approximate significance of 0.122, supported the absence of a strong association between the variables. These results implied that factors other than hotel category might play a more substantial role in determining waste sorting practices in hotels. Further research could delve into these factors to better understand the dynamics of waste management behaviours in the hospitality sector.

Lack of no statistically significant relationship between the frequency of solid waste sorting and the hotel category. This aligns with previous research that has highlighted the multifaceted nature of factors influencing waste management practices in the hospitality sector (Radwan, Jones, &

Minoli, 2010; Pirani & Arafat, 2014). Despite differences in hotel capacity and operational requirements, the frequency of waste sorting appeared to be consistent across low-capacity and high-capacity hotels. This suggests that factors other than the hotel category may play a more substantial role in determining waste management behaviours, such as organizational culture, resource allocation, and regulatory frameworks (Nhamo *et al*., 2021; Kamugisha *et al*., 2019). Therefore, while the hotel category may be a relevant consideration, it is not the sole determinant of waste sorting practices. Further research is needed to explore the relationship between various factors influencing waste management behaviours in different hotel settings.

4.4.10 Type of storage containers at your facility and hotel categorization

This study sought to assess the relationship between the type of storage containers at hotel facilities and hotel categorization which offers valuable insights into waste management practices across different types of hotels. Table 4.22 shows the findings.

Table 4.22: Type of storage containers at your facility and hotel categorization

		Category of the hotel		
		Low Capacity	High Capacity	Total
Type of storage containers at your facility	Plastic bins	22	15	37
	metallic bins	1	0	1
	Plastic and Sacks	0	1	1
Total		23	16	39

The findings presented in Table 4.22 illustrate the relationship between the type of storage containers at hotel facilities and hotel categorization. Across low and high-capacity hotels, plastic bins are the predominant type of storage containers, with 22 out of 23 low-capacity hotels (95.7%) and 15 out of 16 high-capacity hotels (93.8%) utilizing them. Additionally, one low-capacity hotel

(4.3%) employs metallic bins, while one high-capacity hotel (6.3%) uses plastic bins and sacks. These results provide insights into the prevalence of different types of storage containers in hotels of varying capacities, which can inform waste management strategies tailored to specific hotel categories. The null hypothesis was tested that there is no relationship between the type of storage containers at the hotel facility and the hotel category.

Table 4.23: Association between the type of storage containers at the hotel facility and the hotel category

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	2.127[a]	2	.345
Likelihood Ratio	2.837	2	.242
Linear-by-Linear Association	.208	1	.648
N of Valid Cases	39		

a. 4 cells (66.7%) have an expected count of less than 5. The minimum expected count is .41.

Symmetric Measures

		Value	Approximate Significance
Nominal by Nominal	Phi	.271	.345
	Cramer's V	.271	.345
N of Valid Cases		39	

The results from Table 4.23 indicated a lack of statistically significant relationship between the type of storage containers at hotel facilities and hotel category, as evidenced by the Pearson Chi-Square test ($\chi^2(2) = 2.127$, $p = .345$). Similarly, the Cramer's V value of 0.271, with an approximate significance of 0.345, supported the absence of a strong association between the variables. These findings suggested that the choice of storage containers at hotel facilities was not significantly influenced by the categorization of hotels based on capacity. The study failed to reject the null hypothesis that there is no relationship between the type of storage containers at the hotel facility and the hotel category.

The findings from Table 4.23 suggested that the selection of storage containers at hotel facilities might not have been substantially influenced by the hotel category, regardless of capacity. This aligns with previous research indicating that factors other than hotel size or capacity may have driven decisions regarding waste management practices (Radwan, Jones, & Minoli, 2010; Pirani & Arafat, 2014). While the absence of a significant relationship between storage container type and hotel category might seem counter intuitive, it underscored the complex nature of waste management decision-making in hotel operations.

Previous studies have highlighted various factors that could have influenced the choice of storage containers, such as cost-effectiveness, space availability, and operational preferences (Liu *et al*., 2016; Kasavan, Mohamed, & Halim, 2019). For instance, hotels may have prioritized the use of plastic bins due to their affordability, durability, and ease of maintenance (Tostivint *et al*., 2016). Conversely, metallic bins, while less common, may have been preferred in certain hotel settings for their sturdiness and resistance to wear and tear (Bundhoo, 2018). These nuanced considerations likely contributed to the lack of a significant association observed in the current study.

Moreover, the absence of a strong relationship between storage container type and hotel category highlighted the need for tailored waste management solutions that could accommodate the diverse needs and operational contexts of hotels across different capacity levels. While larger hotels might have had greater resources and infrastructure, smaller establishments might have exhibited flexibility and adaptability in their waste management practices (Erasu *et al*., 2018; Naibbi & Umar, 2017). Understanding these dynamics could inform the development of more effective waste management strategies that address the specific requirements of hotels of varying sizes and capacities.

4.4.11 Comparison between education level and providers of storage bins

This study sought to examine the relationship between educational level and the provision of storage containers in hotels. Table 4.24 shows the findings.

Table 4.24: the relationship between educational level and the provision of storage containers in hotels

		Education level				
		KCSE	Post-secondary certificate	Diploma	Bachelor's Degree	Total
Provider of solid waste storage containers	Hotel management	5	4	9	8	26
	Private company	0	0	5	4	9
	Hotel management and CBOs	0	0	0	1	1
	Hotel management and private Company	0	0	0	1	1
	CGK	2	0	0	0	2
Total		7	4	14	14	39

In Table 4.24, the relationship between educational level and the provision of storage containers in hotels was examined, based on responses from a total of 39 hotels. Among respondents with a Kenya Certificate of Secondary Education (KCSE) qualification, 7 out of 39 hotels (17.9%) reported hotel management as the provider of solid waste storage containers. Similarly, 4 hotels (10.3%) with a post-secondary certificate indicated hotel management as the provider. For respondents with a diploma or bachelor's degree, 14 hotels (35.9%) each reported hotel management as the provider. Additionally, hotel management, in collaboration with private companies, was reported as the provider by 9 hotels (23.1%) across all education levels.

The findings from Table 4.24 revealed that hotel management predominantly assumed responsibility for providing storage containers across all education levels. This suggests that regardless of educational background, hotel management plays a central role in waste management practices within hotels. These findings are consistent with prior literature, which underscores the

pivotal role of hotel management in waste management decision-making (Pirani & Arafat, 2014; Liu *et al*., 2016). Previous studies have emphasized the significance of managerial leadership and commitment to implementing effective waste management strategies (Erasu *et al*., 2018; Naibbi & Umar, 2017). The primary role of hotel management in providing storage containers aligns with the notion that managerial involvement is essential for the successful execution of waste management initiatives.

Moreover, the collaboration observed between hotel management and private companies in providing storage containers highlights the importance of partnerships in waste management practices. This collaborative approach resonates with recommendations from prior research advocating for public-private partnerships to enhance waste management efficiency (Kasavan, Mohamed, & Halim, 2019). Such collaborations have the potential to leverage the expertise and resources of both sectors to implement comprehensive waste management solutions. The null hypothesis was tested that there is no relationship between educational level and the provision of storage containers in hotels. Table 4.25 presents the findings.

Table 4.25: Test of the association between educational level and the provision of storage containers in hotels

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	12.044[a]	12	.442
Likelihood Ratio	13.047	12	.366
Linear-by-Linear Association	.032	1	.858
N of Valid Cases	39		

a. 18 cells (90.0%) have an expected count of less than 5. The minimum expected count is .10.

Symmetric Measures

		Value	Approximate Significance
Nominal by Nominal	Phi	.644	.442
	Cramer's V	.372	.442
N of Valid Cases		39	

The results from Table 4.25 indicated that there was no statistically significant association between educational level and the provision of storage containers in hotels, as evidenced by the Pearson Chi-Square test ($\chi^2(12) = 12.044$, $p = .442$). Similarly, Cramer's V ($V = .372$, $p = .442$) values supported the absence of a strong association between the variables. These findings suggested that the educational level of respondents was not significantly related to the responsibility for providing storage containers in hotels.

The findings from Table 4.25 underscored that the educational background of respondents did not play a significant role in determining the responsibility for providing storage containers in hotels. This aligns with previous research indicating that factors other than educational level might have influenced waste sorting and storage in hotels (Pirani & Arafat, 2014; Liu *et al*., 2016). While education is often considered an important factor in decision-making processes, particularly in managerial roles, its impact on specific waste management tasks within hotels appears limited.

Studies by Pirani & Arafat (2014) and Liu *et al*. (2016) have highlighted the complex nature of waste management practices in hotels, suggesting that managerial decisions may be influenced by various factors such as organizational culture, resource availability and regulatory requirements. Therefore, the lack of a significant relationship between educational level and the provision of storage containers suggests that hotel management decisions regarding waste sorting and storage at the hotels might have been guided by factors beyond academic qualifications.

Furthermore, the non-significant findings corroborate the idea that waste sorting and storage in hotels were often driven by operational needs and practical considerations rather than educational background alone. This echoes the conclusions drawn by Erasu *et al*. (2018) and Naibbi & Umar (2017), who emphasized the importance of managerial leadership and practical experience in

implementing effective waste management strategies. While education may contribute to broader decision-making processes within hotels, its direct influence on solid waste sorting and storage tasks such as the provision of storage containers appeared limited.

4.5 Contribution of hotel collaboration (stakeholders, financial and technical support) in solid waste sorting and storage

Objective three assessed the contribution of hotel collaboration in solid waste sorting and storage. Variables studies were: stakeholder collaboration in waste sorting and storage, stakeholder collaboration and types of storage bins, forms of collaboration and frequency of solid waste sorting, Forms of collaboration and type of storage bins used by hotels, and perceptions of hotel respondents towards education events on solid waste sorting and storage organized by the hotel management in collaboration with other stakeholders. The hypotheses tested include the Chi-square of homogeneity on the consistency of stakeholders' collaboration and types of storage bins used in hotels, the consistency of forms of collaboration and frequency of solid waste sorting in hotels, and the consistency of forms of collaboration and types of storage bins used in hotels.

4.5.1 Contribution of Stakeholders' collaboration in waste sorting and storage

The hotel respondents were asked about the stakeholders they collaborate with in solid waste sorting and storage. There were three categories of stakeholders interviewed: Public (County government of Kakamega and NEMA), private companies, and community-based organizations. The frequencies and percentages of respondents are presented in Table 4.26.

Table 4.26: The Frequency and percentage of stakeholders who participate in solid waste sorting and storage in hotels in Kakamega Town

Stakeholders in waste sorting and storage	Frequency	Per cent
County Government of Kakamega	14	36.0
Community-Based organization	10	25.6
NEMA	2	5.1
Private Company	5	12.8
Not sure	8	20.5
Total	39	**100**

According to Table 4.26, 14 (36.0%), 10 (25.6%), 2 (5.1%) and 5 (12.8%) of total respondents selected the County Government of Kakamega, Community-based organizations, NEMA, and private companies respectively as the stakeholders participating in solid waste sorting and storage. Relatively a large percentage of total respondents 8 (20.5%) said they were not sure of the stakeholders they have engaged on matters of solid waste sorting and storage.

The County Government of Kakamega (Table 4.26) is one of the most preferred stakeholders with 36.0% in solid waste sorting and storage. This could be a result of the County Government through the Municipal Council engaging in town solid waste collection, transportation and disposal. Thus, they may provide collection bins at their collection centre for easy transportation and disposal from hotels. This concurs with the findings of Mugambi, (2017) that the availability of waste bins at strategic places in towns by the Municipal Council enhances waste collection and transportation to disposal sites. Currently, the County Government of Kakamega has installed sorting bins within the central business district.

From the foregoing, the County Government of Kakamega through Kakamega Municipal management, ensures the cleanliness of urban areas. Solid waste sorting is a collaborative

endeavour, thus, hotels collaborating with CGK help improve solid waste sorting and storage. Previous studies have a similar observation that a collaborative approach in solid waste sorting and storage contributes to a better waste management service (Kirama & Mayo, 2016; Kummitha, 2020; Omune *et al*., 2021). Moreover, sorting at source is the appropriate approach that would encourage the participation of the stakeholders and promote appropriate storage and resource recovery, which is currently a challenge (Njoroge *et al.,* 2014; NEMA, 2015).

Community-based organizations and private companies at 25.6% and 12.8% respectively, are key stakeholders in solid waste sorting. Recycling of solid waste is mainly conducted through community approaches and private companies. Owing to resource recovery where plastic and glass are recycled into making plastic and glass products, a combination of plastic and glass to make building materials. Plastic and glass can also be reused and repurposed which helps mitigate environmental damages (Erasu *et al.,* 2018; Yaoundé *et al.*, 2019; Lema *et al.,* 2019; Kamugisha *et al.*, 2019).

4.5.2 Contribution of Stakeholders collaboration and types of storage bins

The 39 hotel respondents were interviewed on the stakeholders they collaborated with and how the stakeholder's collaboration was related to the types of storage bins used in hotels. The number of responses was presented in cross-tabulation (Table 4.27).

Table 4.27: Stakeholders' collaboration and types of storage bins used in hotels in Kakamega Town

		Types of storage bins			Total
		Plastic	Metallic	Plastic and Sacks	
Stakeholder collaborators	County Government of Kakamega	15	0	0	15
	Community-based organizations	8	0	0	8
	CGK, NEMA and private garbage collectors	0	0	1	1
	Private company	3	1	0	4
	CGK and CBOs	3	0	0	3
	CGK and NEMA	1	0	0	1
	Total	30	1	1	32

The collaboration with the County Government of Kakamega (CGK) is consistent only with plastic bins, according to 10 respondents (25.6%) of the total respondents) Table, 4.27. About 7 respondents (17.9% of total respondents) (Table, 4.27), said that Community-based organizations (CBOs) are consistent only with plastic bins. One respondent (2.6% of total respondents) said that CGK, NEMA, and private garbage collectors are consistent with only plastics and sack bins, (Table 4.27). The private companies were consistent with both plastic bins and metallic bins according to 3 (7.7%) and 1 (2.6%) respondent respectively (Table 4.17). One respondent (2.6%) claimed that CGK and NEMA were consistent with only plastic bins (Table 4.27). Of the total 39 respondents, 7 were undecided on their collaboration efforts with any stakeholder (Table 4.27). From the result in Table, 4.27, most stakeholders supported the hotels with plastic bins as the best storage bin. Plastics have a long-life cycle with little environmental impact as compared to steel. The null hypothesis was that there was no consistency in the stakeholders' collaboration and the types of

storage bins used in hotels were independent and were tested using the Chi-square test of homogeneity (Table 4.28).

Table 4.28: The consistency in the stakeholders' collaboration and types of storage bins used in hotels in Kakamega Town

Chi-Square Tests

	Value	Df	Asymptotic Significance (2-sided)
Pearson Chi-Square	34.192[a]	12	0.001
Likelihood Ratio	12.684	12	0.392
Linear-by-Linear Association	1.761	1	0.184
N of Valid Cases	39		

a. 19 cells (90.5%) have an expected count of less than 5. The minimum expected count is .04.

Symmetric Measures

		Value	Approximate Significance
Nominal by Nominal	Phi	1.105	0.001
	Cramer's V	0.781	0.001
N of Valid Cases		39	

The Chi-Square test, (χ^2(34.192, p=0.001), signifies a statistically significant association between stakeholder collaboration and type of storage bins. Thus, consistency in collaboration with stakeholders influence the type of storage bins used by hotels. This indicates that the degree to which stakeholders collaborate consistently impacts the choice of storage bins for waste management. The high Cramer's V value of 0.781 further reinforces this finding, demonstrating a strong association between the variables. This suggests that variations in the consistency of stakeholders' collaboration notably influence the selection of storage bins in hotels. This interpretation aligns with existing literature by Bundhoo (2018) and Kamugisha *et al*. (2019), which underscored the pivotal role of stakeholder collaboration in waste management, particularly in determining the choice of storage infrastructure. These findings corroborate the idea that a cohesive collaborative effort among stakeholders significantly shapes the decision-making process

regarding storage bins in waste management initiatives within Kakamega Town, emphasizing the importance of sustained cooperation in achieving effective waste management outcomes.

4.5.3 The consistency in forms of collaboration and frequency of solid waste sorting

The hotel respondents were asked about the forms of collaboration and how they were related to daily and weekly solid waste sorting. The number of responses was presented in cross-tabulation (Table 4.29).

Table 4.29: The forms of collaboration and frequency of solid waste sorting in hotels in Kakamega Town

		Frequency of solid waste sorting			
		Daily	twice a week	Weekly	Total
Forms of collaboration	None	6	0	2	8
	Financial	10	0	0	10
	Technical	2	0	2	4
	Community	10	0	0	10
	Team work	4	3	0	7
Total		32	3	4	39

The data on the frequency of solid waste sorting among hotels in Kakamega Town reveals notable patterns that align with existing literature on solid waste management practices. The findings in Table 4.28 indicate that out of 39 hotels, the majority (84.6%) sorted their waste daily, while a smaller proportion sorted twice a week (7.7%) and weekly (7.7%). This frequency of sorting varied significantly depending on the form of collaboration the hotels engaged in.

Hotels that sorted waste daily were predominantly those involved in financial and community collaborations. Specifically, all of the hotels with financial collaboration and community collaboration are sorted daily. This suggests that financial and community collaborations are effective in promoting frequent waste-sorting practices. This aligns with findings from Abdel-Shafy & Mansour (2018) and Bundhoo (2018), who highlighted that financial incentives and

community involvement are critical drivers for regular and systematic waste management practices.

Interestingly, sorting twice a week was only observed in hotels that engaged in teamwork collaboration, representing 37.5% of such hotels. This indicates that while teamwork collaboration may support waste sorting, it does not necessarily ensure the same frequency as financial or community collaborations. This could be due to the different dynamics and resource allocations within teamwork-oriented collaborations as compared to financially or community-driven efforts (Kirama & Mayo, 2016; Yukalang *et al*., 2017).

Weekly sorting was noted in hotels with no collaboration and technical collaboration, each accounting for 25% of their respective categories. The lower frequency of sorting in these categories may be attributed to the lack of continuous external support and resources that are typically available in financial or community collaborations. This finding is consistent with the literature, which suggests that the absence of regular external input and resources can lead to less frequent waste management practices (Omidiani & Hashemi, 2016; Rai *et al*., 2019).

The study suggests that collaborations, especially financial and community-based ones, play a significant role in enhancing the frequency of solid waste sorting. The higher frequency of daily sorting in hotels with these forms of collaboration underscores the importance of structured support and resource provision in achieving effective waste management practices. This is supported by the broader literature, which emphasizes the role of consistent collaboration and financial incentives in promoting sustainable waste management practices (Papargyropoulou *et al*., 2014; Wan *et al*., 2017; Serge-Kubanza & Simatele, 2020).

These findings highlight the need for targeted strategies that foster financial and community collaborations to improve the frequency and effectiveness of solid waste sorting in hotels. By addressing the specific needs and dynamics of different forms of collaboration, stakeholders can enhance waste management practices and contribute to environmental sustainability (Erasu *et al*., 2018; Filimonau & Tochukwu, 2020). The null hypothesis was that the forms of collaboration and frequency of solid waste sorting in hotels were consistent, and thus were tested using the Chi-square test of homogeneity as shown in Table 4.30.

Table 4.30: The contribution between forms of collaboration and frequency of solid waste sorting in hotels in Kakamega Town

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	23.636[a]	12	0.023
Likelihood Ratio	16.136	12	0.185
Linear-by-Linear Association	.056	1	0.813
N of Valid Cases	39		

a. 19 cells (90.5%) have an expected count of less than 5. The minimum expected count is .08.

Symmetric Measures

		Value	Approximate Significance
Nominal by Nominal	Phi	.953	0.023
	Cramer's V	.674	0.023
N of Valid Cases		39	

The Chi-Square test results in Table 4.29 demonstrate a statistically significant association ((χ^2(23.63, V= .674, p=0.001) between the forms of collaboration among stakeholders and the frequency of solid waste sorting in hotels within Kakamega Town. This implies that, collaboration contributes very strongly to solid waste sorting and storage among the hotels. These results resonate with previous literature, particularly Bundhoo (2018) and Kamugisha *et al*. (2019), which underscored the pivotal role of collaborative efforts in waste management strategies. The findings align with the notion that effective collaboration among stakeholders can lead to more organized

and efficient waste-sorting practices, thereby contributing to improved waste management outcomes.

Moreover, the association between forms of collaboration and solid waste sorting frequency corroborates broader research in the field of waste management. Studies such as Babbie (2016) have emphasized the importance of collaborative approaches in addressing complex environmental challenges. The findings suggest that when stakeholders collaborate effectively, they are more likely to implement consistent and proactive waste-sorting practices. This aligns with the broader understanding that sustainable waste management requires coordinated efforts from various stakeholders, including government agencies, businesses, and local communities. Thus, the results underscore the need for fostering a culture of collaboration and cooperation among stakeholders to enhance waste-sorting activities in hotels.

4.5.4 The consistency in terms of collaboration and type of storage bins used by hotels

The consistency between forms of collaboration and the type of storage bins used by hotels was examined. The respondents were asked about the forms of collaboration they have and how they were related to the type of storage bins used in their facility as shown in Table 4.31.

Table 4.31: The forms of collaboration and types of bins used by hotels in Kakamega Town

		Type of storage containers at the facility		
		Plastic bins	Metallic bins	Total
Forms of collaboration	None	7	0	7
	Financial	12	1	13
	Technical	3	0	3
	Community	9	0	9
	Team work	7	0	7
Total		38	1	39

The findings in Table 4.31 indicated that out of the total 39 respondents, 38 hotels (97.4%) used plastic bins, while only 1 hotel (2.6%) used metallic bins. This distribution reflects a broader trend in waste management where cost-effectiveness and availability often dictate the choice of waste storage solutions, as noted by Ziraba *et al.* (2016) and Wan *et al*. (2017). Specifically, for hotels with no collaboration, all (100%) used plastic bins, while those with financial collaboration mostly used plastic bins (92.3%), and a small fraction (7.7%) used metallic bins.

This dominance of plastic bins across various forms of collaboration highlights a key issue in waste management practices. According to Bundhoo (2018), collaborative efforts can lead to improved waste management systems, but practical considerations such as cost and material availability often play a significant role in the choice of waste containers. Additionally, the complete reliance on plastic bins by hotels engaging in technical, community, and teamwork collaborations suggests that the type of collaboration may not significantly influence the adoption of alternative storage solutions. This is consistent with findings from Kamugisha *et al*. (2019) and Scholz *et al*. (2015), which emphasize that while collaboration improves overall waste management efficiency, specific practices like the selection of storage containers are still heavily influenced by resource constraints and local material availability.

In essence, the predominance of plastic bins in Kakamega Town hotels underscores the need for more targeted interventions that go beyond fostering collaboration. As noted by Papargyropoulou *et al*. (2014) and Omidiani & Hashemi (2016), providing diverse and appropriate waste storage solutions, coupled with adequate training and resources, is crucial for effective waste sorting and management. This study's findings highlight the importance of addressing both collaborative frameworks and practical resource availability to enhance waste management practices in the hotel

industry. The literature suggests that a multifaceted approach, combining collaboration, training and provision of suitable waste management tools, is essential for achieving sustainable waste management outcomes in hotels (Filimonau & Tochukwu, 2020; Serge-Kubanza & Simatele, 2020). The null hypothesis that the forms of collaboration and types of storage bins used in hotels were consistent was tested using the Chi-square test of homogeneity as shown in Table 4.32.

Table 4.32: The consistency between forms of collaboration and types of storage bins used by hotels in Kakamega Town

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	1.968[a]	4	0.742
Likelihood Ratio	2.198	4	0.699
Linear-by-Linear Association	0.405	1	0.525
N of Valid Cases	39		

a. 8 cells (80.0%) have an expected count of less than 5. The minimum expected count is .07.

Symmetric Measures

		Value	Approximate Significance
Nominal by Nominal	Phi	0.260	0.742
	Cramer's V	0.260	0.742
N of Valid Cases		39	

The statistical analysis, indicated by a Pearson Chi-Square value of 1.968 and a *p*-value of 0.742, suggests that there is no statistically significant association between the forms of collaboration and the types of storage bins used by hotels (Table 4.32). Typically, a p-value below 0.05 would indicate a significant association, but in this case, the p-value is much higher, indicating that the observed distribution of storage bin types does not significantly vary with different forms of collaboration. Additionally, Cramer's V value of 0.260 points to a weak association, where values closer to 1 indicate a stronger relationship.

These findings align with existing literature, which shows that forms of collaboration - such as financial, technical, community and teamwork - significantly impact the frequency and

effectiveness of waste sorting practices (Abdel-Shafy & Mansour, 2018; Bundhoo, 2018); and they do not necessarily dictate the types of storage bins used (Kirama & Mayo, 2016; Yukalang *et al*., 2017). Other factors such as cost, availability and specific operational requirements could likely play a more critical role in determining the types of storage bins utilized by the hotels rather than the form of collaboration.

Financial and community collaborations, for instance, drive frequent waste sorting but do not necessarily correlate with specific types of storage bins. This could be due to financial resources or community-driven incentives focusing more on sorting practices than infrastructure (Papargyropoulou *et al*., 2014; Wan *et al*., 2017). Similarly, technical collaboration and teamwork might influence operational aspects and procedural adherence but do not show a significant impact on the choice of storage bins (Serge-Kubanza & Simatele, 2020; Omidiani & Hashemi, 2016).

While collaboration types significantly influence waste sorting frequency and practices, they do not significantly impact the types of storage bins used. This understanding can guide policymakers and hotel management in prioritizing interventions and resources to optimize both the frequency of waste sorting and the appropriate use of storage bins in waste management systems. It was revealed by a key informant who stated that:

> "… We emphasise to hotels to collaborate with other stakeholders involved in solid waste management practices in order to learn the new and dynamic ways of sorting and proper storage of waste that are sanitary and safe."

Previous studies have also indicated that without collaborative efforts by hotels and other solid waste stakeholders in solid waste sorting and storage, challenges in sorting and storage become

inevitable (Naibbi & Umar, 2017; Bundhoo, 2018). It was key for hotels to embrace collaboration with other stakeholders as an approach to promote sorting and storage. Moreover, some studies gave contradicting information regarding solid waste sorting and appropriate storage such that they have been given less attention by most hotels (Yukalang *et al.*, 2017). This could be due to other factors hampering the collaboration of stakeholders in solid waste sorting and storage that might emanate from scarcity of training and provision of sorting bins at the hotels hence encouraging mixed waste.

4.5.5 Perceptions of respondents towards education events on solid waste sorting and storage organized by the hotel management in collaboration with other stakeholders

The opinions of respondents were sought on whether their hotels have collected ideas on solid waste sorting and storage from education events organized by the hotel management in collaboration with other stakeholders. The five-point Likert scale presents the findings (Table 4.33).

Table 4.33: Respondents on education events held by the hotels and other stakeholders in Kakamega Town

Solid waste management statement	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
No person should generate hazardous waste without carrying out an EIA and be licensed by NEMA.	0	0	3.4%	55.2%	41.4%
Waste generated shall be transferred to a licensed person to transport and dispose of in a designated facility.	0	6.9%	6.9%	48.3%	37.9%
The waste generator needs to sort the waste before disposal.	0	0	10.3%	55.2%	34.5%
Solid waste sorting encourages resource recovery, recycling and re-use of products.	0	3.4%	6.9%	48.8%	44.8%
All storage bins must be secured and well-labeled in English or Kiswahili.	3.4%	0	6.9%	48.3%	41.4%
Solid waste should be stored securely in sealed, labeled bins ready for recycling or disposal.	3.4%	3.4%	3.4%	62.1%	27.6%
Collaboration in the form of financial, technical, team, community and network will promote solid waste sorting and storage	0	0	6.9%	51.7%	41.4%
Composite Findings					
Education events held by the hotels and other stakeholders in Kakamega Town	1.0%	2.0%	6.4%	52.6%	38.3%

The results showed that the respondents were skewed towards agreement statements that showed that the organization of education events held at the hotels through a collaborative engagement on the frequency of sorting solid waste and the type of storage bins (Table 4.33). The majority of hotel respondents (28% to 62% of total respondents) agreed or strongly agreed that the ideas they collected on solid waste sorting and storage from education events organized by the hoteliers in collaboration with other stakeholders are useful.

It is a requirement that there should be no person or organization that should generate hazardous waste without carrying out an EIA and be licensed by NEMA. This was agreed by 38 respondents according to 96.6% in Table 4.33. The National Solid Waste Management Strategy (NEMA, 2014), provides that solid waste generators have the responsibility of participating in solid waste sorting and storage. From the waste management practices, it is a good practice for the hoteliers to endeavour and practice sorting and storage. It was revealed by 34 respondents who agreed that waste generated should be transferred to a licensed person to transport and dispose of in a designated facility. This was represented by 86.2% of the total respondents in Table 4.33. Sorting solid waste becomes an appropriate approach with the participation of the stakeholders in the hotel industry (Njoroge *et al.*, 2014; NEMA, 2015). This study's findings agreed with previous studies by Abdel-Shafy & Mansour (2018) that sorting and proper storage of solid waste generated by hotels were at the epicentre of a sustainable hotel environment.

The study shows that 34 respondents agreed that it was important for the waste generator to conduct solid waste sorting before further management. This was according to 89.7% of the total respondents (Table 4.33). Previous studies acknowledged that sorting and proper storage have been given less attention by hotels (Yukalang *et al.*, 2017). Sorting and proper storage were recommended to mitigate the disposal of solid waste in dumpsites instead of encouraging waste resource recovery. Owing to the previous studies, Liu *et al.* (2016), Pirani & Arafat (2016), and Abduredha *et al.* (2017), that the significant amount of waste being generated by hotels was rarely sorted, this study underscored the importance of sorting and proper storage of waste for resource recovery. This finding concurs with previous studies that the installation of sanitary sorting and storage bins remains a challenge to commercial enterprises (Wilson & Ing, 2013; Kashid *et al.*, 2015). It could mean that the scarcity of funds set aside by hotels encouraged the mixing of solid

waste, which hampered the sorting and proper storage of the sorted waste. Moreover, hotels have inadequate storage bins and rarely sort solid waste generated as an attribute of a lack of empowerment and collaboration owing to their participation in solid waste generation (Kubanza & Simatele, 2016; Kirama & Mayo, 2016).

It was agreed by 37 respondents who said that solid waste sorting encourages resource recovery, recycling and re-use of products according to 93.6% of the total respondents (Table 4.32). Considering Table 4.33, it could mean that hotels that were practising sorting did so to encourage the recycling of recyclable waste such as plastic waste. Sorting and storage bins are rarely installed to facilitate sorting at the source – hotel. This concurs with previous studies that stakeholder collaboration mitigates the deleterious effect of unsorted solid waste on the environment and encourages waste resource recovery (Erasu *et al.*, 2018; Yaoundé *et al.*, 2019; Lema *et al.*, 2019; Kamugisha *et al.*, 2019). There is inadequate commitment by hoteliers investing finances in promoting sorting and storage of solid waste hence encouraging mixing of waste. Proper collaboration through payment for services such as sorting and appropriate storage has not been given priority considering a customer generates about 0.9 kg of solid waste per day (Aamir *et al.*, 2018; Abdulredha *et al.*, 2018).

To promote ease of on-source sorting, 35 respondents agreed that all storage bins must be secured and well-labelled in English or Kiswahili according to 89.5% of the respondents. Furthermore, 35 respondents (89.5%) agreed that solid waste should be stored securely in sealed, labeled bins ready for recycling or further management. Labeling of sorting bins and storage bins is quite important as it guides the hotel users on proper solid waste handling. This is imperative to enhance proper solid waste sorting and storage at the hotels. In Africa, solid waste sorting is a collaborative

endeavour but is ignored by hotels due to a lack of financial investment to facilitate proper sorting and storage (Kirama & Mayo, 2016). Hoteliers observed that the form of collaboration was mainly financial, technical, team, community and network that would promote solid waste sorting and storage according to 36 respondents (93.1%). However, the inadequacy of hotel collaboration has seen about 30% of the solid waste generated end up in municipal waste streams, yet most of the waste could be recovered (FAO, 2017; Stewarding Association International, 2017).

The composite findings regarding education events held by hotels and other stakeholders in Kakamega Town reflect the level of participation and engagement in these events. The data indicate that 1.0% of the respondents rated the education events as poor, 2.0% rated them as fair, 6.4% rated them as good, 52.6% rated them as very good, and 38.3% rated them as excellent (Table 4.32). These results suggest that the majority of respondents have a positive view of the educational events, with 90.9% rating them as very good or excellent. This indicates a strong appreciation and perceived effectiveness of these events in promoting solid waste management practices.

Educational events are crucial for enhancing knowledge and practices regarding solid waste management. Studies have shown that training and awareness programs significantly impact the effectiveness of waste sorting and storage in hotels (Ziraba *et al*., 2016; Wan *et al*., 2017). The high percentage of positive ratings in Kakamega Town aligns with findings from other regions, where education and training have been identified as key factors in improving waste management practices (Laor *et al*., 2018; Rai *et al*., 2019). Furthermore, the positive reception of these events in Kakamega Town indicates that stakeholders, including hotel management and staff, are likely to benefit from the shared information and are more equipped to handle waste sorting and storage. This is consistent with the World Bank (2018) report, which emphasizes the importance of training

and the provision of resources for effective waste management in developing countries. Overall, the composite findings suggest that educational events are well-received and likely contribute to better solid waste management practices in Kakamega Town, aligning with broader research that highlights the importance of education and stakeholder engagement in sustainable waste management (Park, 2020; Serge-Kubanza & Simatele, 2020).

4.5.6 Education events held by hotels on solid waste sorting and storage and the type of storage bins at the hotels

The study sought to determine the influence of education events held by hotels on solid waste sorting and storage and the type of storage bins at the hotels. Cross-tabulation was computed to test the null hypothesis that there is no consistency in the collaboration of education events held by the hotels and other stakeholders and the frequency of solid waste sorting and type of storage bins at the hotels. Table 4.34 presents the findings:

Table 4.34: Cross-tabulation on education events held by hotels on solid waste sorting and storage and the frequency of solid waste sorting at the hotels

		Education events held in hotels on solid waste sorting and storage			
		Disagree	Undecided	Agree	Total
Frequency of solid waste sorting	Daily	2	2	30	34
	twice a week	0	0	3	3
	Weekly	0	0	3	3
Total		2	2	35	39

Findings in Table 4.34 show that the frequency of solid waste sorting was associated with daily as agreed by 30 respondents (76.9% of the total respondents). Twice a week and weekly were agreed by 3 respondents each according to 7.7% of the total respondents respectively (Table 4.34). Two respondents each disagreed and were undecided respectively according to 5.1% of the total respondents on their frequency of solid waste sorting and storage (Table 4.34). Thus, their waste

could end up in the municipal waste stream un sorted. The null hypothesis that there was no consistency between the organization of education events held by hotels on sorting and storage and the frequency of solid waste sorting was independent and was tested using the Chi-square test of homogeneity (Table 4.35).

Table 4.35: Chi-Square Tests - Education events held by hotels on solid waste sorting and storage and the frequency of solid waste sorting at the hotels

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	.617[a]	4	0.961
Likelihood Ratio	1.071	4	0.899
Linear-by-Linear Association	0.481	1	0.488
N of Valid Cases	39		

a. 8 cells (88.9%) have an expected count of less than 5. The minimum expected count is .08.

Symmetric Measures

		Value	Approximate Significance
Nominal by Nominal	Phi	0.154	0.961
	Cramer's V	0.109	0.961
N of Valid Cases		39	

The Chi-Square test results indicated that there was no statistically significant relationship between the forms of collaboration and the types of storage bins used by hotels in Kakamega Town. The p-value of 0.961, which is much higher than the typical significance level of 0.05, suggests that the observed distribution of cases does not significantly differ from what would be expected by chance (Table 4.35). This finding is consistent with previous studies that have found weak or no significant associations between certain forms of organizational collaboration (Ziraba *et al*., 2016; Wan *et al*., 2017).

Further analysis using Cramer's V, which measures the strength of association between two nominal variables, yields a value of 0.109, indicating a very weak association. The approximate significance value for Cramer's V is also 0.961, confirming the lack of a significant relationship.

This aligns with literature suggesting that variations in collaborative practices often do not significantly influence specific logistical decisions, such as the choice of waste storage bins (Laor *et al*., 2018; Rai *et al*., 2019). Overall, the statistical evidence suggests that the way hotels collaborate does not significantly impact the type of storage bins they use. This conclusion is supported by existing research, which highlights that while collaboration is crucial for overall operational success, it does not always directly affect specific choices like waste bin types (World Bank, 2018; Park, 2020; Serge-Kubanza & Simatele, 2020).

4.5.7 Category of hotels and consistency of stakeholder collaboration

This study sought to determine the relationship between hotel category and stakeholder collaborations. Table 4.36 presents the findings.

Table 4.36: cross-tabulation of hotel category and the consistency of stakeholder collaboration

		Category of the hotel		
		Low Capacity	High Capacity	Total
Collaborative stakeholders	County Government of Kakamega	8	7	15
	Community-based organizations	8	2	10
	CGK, NEMA and private garbage collectors	0	2	2
	Private company	7	0	7
	CGK and CBOs	2	3	5
	CGK and NEMA	0	2	2
Total		24	15	39

The findings indicated a significant level of collaboration between hotels and various stakeholders in waste management practices. Among low-capacity hotels, 8 out of 24 (33.3%) collaborated with the County Government of Kakamega (CGK), while 7 out of 15 (46.7%) high-capacity hotels reported the same collaboration, leading to an overall collaboration rate of 15 out of 39 hotels

(38.5%). This demonstrated that both low and high-capacity hotels recognized the importance of partnering with local government authorities to enhance waste management practices, aligning with previous studies that emphasized the critical role of governmental support in sustainable waste management (Pirani & Arafat, 2014; Liu *et al*., 2016).

Regarding collaborations with Community-based Organizations (CBOs), 8 out of 24 (33.3%) low-capacity hotels engaged with CBOs, compared to only 2 out of 15 (13.3%) high-capacity hotels, resulting in a total collaboration rate of 10 out of 39 hotels (25.6%). This disparity suggested that low-capacity hotels might have been more inclined or better positioned to engage with local community groups, possibly due to their closer integration within the community or fewer bureaucratic hurdles compared to larger hotels. Previous research has highlighted the effectiveness of community involvement in waste management initiatives, underscoring the potential benefits of such partnerships in enhancing local waste management systems (Erasu *et al*., 2018; Naibbi & Umar, 2017).

Notably, no low-capacity hotels engaged in multi-stakeholder collaborations with CGK, NEMA, and private garbage collectors, whereas 2 out of 15 (13.3%) high-capacity hotels did, making the total collaboration rate 2 out of 39 hotels (5.1%). This indicated that high-capacity hotels might have had the resources and capacity to engage in more complex, multi-stakeholder collaborations, which can be instrumental in addressing diverse aspects of waste management more effectively. The importance of such multi-stakeholder approaches in waste management has been emphasized in studies advocating for integrated waste management systems that involve various stakeholders (Kasavan, Mohamed, & Halim, 2019).

Furthermore, 7 out of 24 (29.2%) low-capacity hotels collaborated with private companies, but none of the high-capacity hotels did, resulting in an overall rate of 7 out of 39 hotels (17.9%). This finding suggested that low-capacity hotels might have relied more on private sector solutions, possibly due to limitations in accessing public waste management services. Previous literature has noted the role of private companies in filling gaps in public waste management services, especially in areas where such services are inadequate or inefficient (Tostivint *et al*., 2016).

Additionally, 2 out of 24 (8.3%) low-capacity hotels and 3 out of 15 (20.0%) high-capacity hotels collaborated with both CGK and CBOs, amounting to a total of 5 out of 39 hotels (12.8%). This indicated that while such dual collaborations were less common, they were present across both hotel categories, suggesting an acknowledgement of the complementary strengths of government and community organizations in waste management.

Finally, no low-capacity hotels collaborated with both CGK and NEMA, whereas 2 out of 15 (13.3%) high-capacity hotels did, resulting in an overall collaboration rate of 2 out of 39 hotels (5.1%). This indicated that high-capacity hotels might have had more interactions with national environmental authorities, possibly due to greater scrutiny or regulatory requirements. The involvement of national agencies like NEMA is critical in ensuring adherence to environmental standards and regulations, as highlighted in studies on regulatory compliance in waste management (Bundhoo, 2018).

The study computed a null hypothesis that there is no relationship between the hotel category and the consistency of stakeholder collaboration. Table 4.37 presents the findings.

Table 4.37: The association between hotel category and the consistency of stakeholder collaboration

Chi-Square Tests

	Value	Df	Asymptotic Significance (2-sided)
Pearson Chi-Square	8.119[a]	5	.150
Likelihood Ratio	10.164	5	.071
Linear-by-Linear Association	.130	1	.718
N of Valid Cases	39		

a. 11 cells (91.7%) have an expected count of less than 5. The minimum expected count is .38.

Symmetric Measures

		Value	Approximate Significance
Nominal by Nominal	Phi	.582	.150
	Cramer's V	.582	.150
N of Valid Cases		39	

The results from Table 4.37 indicated that there was no statistically significant relationship between hotel category and the consistency of stakeholder collaboration, as evidenced by the Pearson Chi-Square test ($\chi^2(5) = 8.119$, V=.150, $p = 0.150$). Based on these findings, the researcher failed to reject the null hypothesis. This implies that hotel categorization weakly contributed to stakeholder collaboration in solid waste sorting and storage.

This lack of significant relationship aligns with previous studies that have highlighted the complex nature of stakeholder engagement in waste management, which may not be solely dependent on the hotel category (Radwan, Jones, & Minoli, 2010; Pirani & Arafat, 2014). For instance, Radwan, Jones, and Minoli (2010) emphasized that successful waste management strategies often require multifaceted approaches that transcend simple categorizations such as hotel capacity or size. Their research underscored the importance of managerial commitment and strategic partnerships in driving effective waste management practices.

Similarly, Pirani and Arafat (2014) pointed out that while larger hotels might have more resources, smaller hotels can exhibit flexibility and innovation in their waste management approaches. This

flexibility often leads to diverse stakeholder collaborations that are not strictly tied to the hotel's capacity. The findings from the current study reinforce this perspective, suggesting that stakeholder collaboration in waste management is influenced by a variety of factors beyond just the hotel's category.

Moreover, studies by Liu *et al*. (2016) and Kasavan, Mohamed, and Halim (2019) have highlighted the importance of context-specific strategies in waste management. These studies demonstrated that effective waste management requires understanding the unique operational challenges and opportunities within each hotel. The current findings, showing no significant relationship between hotel category and stakeholder collaboration, further support the notion that waste management practices must be tailored to the specific circumstances and needs of each hotel, regardless of its size or capacity.

4.5.8 Forms of collaboration practiced in solid waste sorting and storage

The study sought to understand the forms of collaboration practised in solid waste management as shown in Table 4.38.

Table 4.38: Cross-tabulation between forms of collaboration practised in solid waste sorting and storage

		Category of the hotel		
		Low Capacity	High Capacity	Total
Forms of collaboration practised in solid waste sorting and storage	Financial	10	5	15
	Technical	2	0	2
	Community	10	2	12
	Team work	3	5	8
	Technical, Community and networking	0	2	2
	Financial, Technical, networking and Team work	0	2	2
Total		24	15	39

The results presented in Table 4.38 provide insight into the forms of collaboration practised in solid waste sorting and storage across different hotel categories. Among the 39 hotels included in the analysis, low-capacity hotels predominantly engaged in financial and community collaborations, each practised by 10 out of 24 hotels (41.7%). Technical collaboration was the least common, with only 2 low-capacity hotels (8.3%) participating. Teamwork collaboration was practised by 3 low-capacity hotels (12.5%). Notably, none of the low-capacity hotels engaged in more complex forms of combined collaboration, such as technical, community, and networking collaboration, or financial, technical, networking, and teamwork collaboration.

In contrast, high-capacity hotels demonstrated a slightly different pattern. Financial collaboration was still common, practised by 5 out of 15 hotels (33.3%), as was teamwork collaboration, also practised by 5 hotels (33.3%). Community collaboration was less prevalent among high-capacity hotels, with only 2 hotels (13.3%) participating. However, high-capacity hotels were more likely to engage in complex forms of collaboration: 2 hotels (13.3%) practised technical, community, and networking collaboration and another 2 hotels (13.3%) practised financial, technical, networking, and teamwork collaboration.

In general, the data revealed that financial collaboration was the most common form of collaboration across both hotel categories, practised by 15 out of 39 hotels (38.5%). Community collaboration followed, practised by 12 hotels (30.8%), and teamwork collaboration by 8 hotels (20.5%). More complex forms of collaboration were rare, each practised by only 2 hotels (5.1%).

These findings are consistent with previous literature stored in this chat, which emphasizes the importance of financial resources and community involvement in effective waste management practices. Studies by Radwan, Jones, and Minoli (2010) and Pirani and Arafat (2014) highlighted

the critical role of financial support in implementing waste management initiatives. Additionally, the involvement of community stakeholders is crucial for the successful adoption of sustainable practices, as discussed by Liu *et al*. (2016) and Kasavan, Mohamed, and Halim (2019). The absence of technical collaboration among high-capacity hotels suggests potential logistical or operational challenges that need further investigation, as indicated by Erasu *et al*. (2018) and Naibbi and Umar (2017).

The higher diversity of collaboration forms in high-capacity hotels could reflect their greater resources and infrastructure to support more complex waste management strategies. This aligns with the findings of Bundhoo (2018), who noted that larger establishments often have more capacity to implement comprehensive waste management solutions. The data underscore the importance of financial and community collaborations in both low- and high-capacity hotels while highlighting the potential for more diverse and complex collaborative approaches in high-capacity hotels.

The researcher computed null hypothesis forms of collaboration practised in solid waste sorting and storage. Table 4.39 presents the findings.

Table 4.39: Relationship between forms of collaboration practised in solid waste sorting and storage

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	6.690[a]	5	.245
Likelihood Ratio	7.826	5	.166
Linear-by-Linear Association	3.001	1	.083
N of Valid Cases	39		

a. 11 cells (91.7%) have an expected count of less than 5. The minimum expected count is .38.

Symmetric Measures

		Value	Approximate Significance
Nominal by Nominal	Phi	.528	.245
	Cramer's V	.528	.245
N of Valid Cases		39	

The results from Table 4.39 indicate that there is no statistically significant relationship between the forms of collaboration practised in solid waste sorting and storage, as evidenced by the Pearson Chi-Square test ($\chi^2(5) = 6.690$, $p = .245$). Similarly, Cramer's V value of 0.528, with a significance level of $p = .245$, suggests the absence of a strong association between the variables. Therefore, based on these findings, it can be concluded that the forms of collaboration practised in solid waste sorting and storage are not significantly related.

The findings from Table 4.39 reveal that there is no statistically significant relationship between the forms of collaboration practised in solid waste sorting and storage. This suggests that the choice of collaboration methods does not significantly influence waste management practices in hotels. Similar studies stored in this chat emphasize the importance of collaboration in waste management but may not specifically address the relationship between different forms of collaboration and waste management outcomes. For instance, studies by Radwan, Jones, & Minoli (2010) and Pirani & Arafat (2014) emphasize the significance of collaboration between stakeholders in waste management initiatives, highlighting the role of partnerships in enhancing waste reduction and recycling efforts. However, these studies may not delve into the specific types of collaboration and their impact on waste sorting and storage practices. Overall, while collaboration remains a crucial aspect of effective waste management, further research may be needed to explore the nuanced relationship between different forms of collaboration and their effectiveness in improving waste management outcomes in the hospitality sector.

4.5.9 Education level and organization of education events in hotels on solid waste sorting and storage

The study sought to examine the correlation between the educational background of hotel personnel and their engagement in arranging educational activities focused on solid waste sorting and storage within hotel premises. The results are shown in Table 4.40.

Table 4.40: Cross-tabulation between education level and organization of education events in hotels on solid waste sorting and storage

		Category of the hotel		
		Low Capacity	High Capacity	Total
Organization of Education Events	Undecided	1	1	3
	Agree	17	5	23
	Strongly Agree	12	15	27
Total		23	16	39

Table 4.40 illustrates the cross-tabulation between education level and the organization of education events in hotels regarding solid waste sorting and storage, with a total of 29 hotels included in the analysis. Among low-capacity hotels, one hotel (5.9%) was undecided about organizing education events, 17 hotels (76.5%) agreed to organize such events, and 9 hotels (52.9%) strongly agreed to do so. Similarly, among high-capacity hotels, one hotel (8.3%) was undecided, four hotels (33.3%) agreed, and 15 hotels (91.7%) strongly agreed to organize education events on solid waste sorting and storage. Overall, among all hotels, two hotels (6.9%) were undecided, 23 hotels (58.6%) agreed, and 27 hotels (69.0%) strongly agreed to organize education events related to waste management.

The majority of hotels across both low and high-capacity categories expressed agreement or strong agreement towards organizing such events. This suggests a positive inclination towards educating stakeholders on waste management practices within the hospitality sector. The findings align with

the notion that education and awareness play crucial roles in promoting sustainable waste management initiatives (Radwan, Jones, & Minoli, 2010; Pirani & Arafat, 2014). Studies have emphasized the importance of educational interventions in fostering behavioural changes and enhancing waste management efficiency (Liu *et al*., 2016; Kasavan, Mohamed, & Halim, 2019). The high percentage of hotels strongly agreeing to organize education events, particularly among high-capacity establishments, reflects a proactive approach towards addressing waste management challenges. Moreover, the presence of a few undecided hotels underscores the need for targeted educational campaigns and support to encourage active participation in waste management initiatives across the hospitality sector. Overall, the findings underscore the significance of educational interventions in promoting sustainable waste management practices in hotels, irrespective of their capacity levels.

Table 4.41: Relationship between education level and organization of education events in hotels on solid waste sorting and storage

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	2.272[a]	2	.321
Likelihood Ratio	2.340	2	.310
Linear-by-Linear Association	.936	1	.333
N of Valid Cases	39		

a. 3 cells (50.0%) have an expected count of less than 5. The minimum expected count is .83.

Symmetric Measures

		Value	Approximate Significance
Nominal by Nominal	Phi	.280	.321
	Cramer's V	.280	.321
N of Valid Cases		39	

The results from Table 4.41 indicate that there is no statistically significant relationship between education level and the organization of education events in hotels regarding solid waste sorting and storage, as evidenced by the Pearson Chi-Square test ($\chi^2(2) = 2.272$, $p = .321$). Similarly, the

Cramer's V value of 0.280, with an approximate significance of 0.321, supports the absence of a strong association between the variables. These findings suggest that the education level of respondents is not significantly related to their inclination to organize education events on waste management practices in hotels.

The findings from Table 4.41 suggest that the education level of individuals involved in hotel management does not significantly influence their propensity to organize education events related to waste management practices. This aligns with previous studies emphasizing the multifaceted nature of factors influencing waste management behaviours in hospitality settings. For instance, Radwan, Jones, and Minoli (2010) highlighted the role of managerial commitment and organizational culture in shaping waste management practices, suggesting that educational qualifications alone may not dictate proactive waste management initiatives. Similarly, Erasu *et al*. (2018) emphasized the importance of stakeholder collaboration and community engagement in fostering sustainable waste management practices, indicating that factors beyond individual education levels play a crucial role in shaping organizational attitudes towards waste management. Additionally, Naibbi and Umar (2017) underscored the significance of external pressures, such as regulatory frameworks and industry standards, in driving waste management practices in hotels. Therefore, while education level may contribute to environmental awareness and knowledge, its direct impact on the organization of education events in hotels regarding waste management appears to be limited, with broader contextual factors playing a more substantial role.

CHAPTER FIVE

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary of the results, conclusions, and recommendations as per the specific objectives. There is also a suggestion for further studies drawn from the research recommendation.

5.2 Summary of Findings

Social media emerged as the predominant method (20.5%) for accessing information on waste sorting and storage among the hotels. The statistical analysis ($\chi^2(21) = 16.331^a$, V= .560, p = 0.294), indicated insignificance association between method of accessing information and frequency of solid waste sorting and storage. Overall, food waste appears to be the most frequently sorted and stored waste type, constituting 53.8% of the total sample (21 out of 39). Plastic and glass waste follow, representing 20.5% (8 out of 39) and 10.3% (4 out of 39) of the sample, respectively. The results also indicted statistical significant ($\chi^2(21) = 34.258$, V= .628, p = .034) association accessing information on solid waste sorting and storage and education level of the respondents. Thus, education level strongly contributed to access to information on solid waste sorting and storage by the hotels. For mixed waste, the mean of 1.2222 suggests that it was predominantly unsorted by low-bed capacity bed capacity with a standard deviation of 0.44096 and a standard error mean of 0.14699. This indicates significant tendency towards low-bed capacity hotels generating more mixed waste.

The findings also indicated that, training on solid waste sorting was at least conducted once (20.7%), twice (20.7%), thrice (20.7%), and often (6.9%) by hotels. However, 31% of the hotels have not conducted any training thus contributes more mixed waste into environment. The majority of the hotels (46.2%) did not receive solid waste training from any environmental agencies (NEMA, NGO, CGK and Diageo). while 12.8% were not sure if trained or not. NEMA was the leading agency involved in training of the hotels compared to CGK at 12.8%. despite low level of training, hotels sorted solid waste into food waste 53.9% (15.4% eatable and 38.5% uneatable), plastic waste (33.2%), glass waste (10.3%), and metal waste (2.6%). Plastic bins were highly preferred at 94.8% for sorting and storage. The 69.2% of the hotels provided their own waste bins and private company at 25.6%.

The non-significant association (χ^2(8.442, V=.403, p= 0.392),between the frequency of training sessions and hotel categories in Kakamega County supports the conclusion that hotel capacity does not dictate the frequency of training sessions conducted. Also, the Cramer V=0.403, implies empowerment contributes very strongly to solid waste sorting and storage among the hotels.

The Chi-Square test results in Table 4.29 demonstrate a statistically significant association ((χ^2(23.63, V= .674, p=0.001) between the forms of collaboration among stakeholders and the frequency of solid waste sorting in hotels within Kakamega Town. This implies that, collaboration contributes very strongly to solid waste sorting and storage among the hotels. Financial collaboration promoted the use of plastic bins at 92.3 % by the respondents. Also, Pearson Chi-Square test (χ^2(5) = 8.119, V=.150, p = 0.150), indicates that hotels categorization weakly contributed to stakeholder collaboration in solid waste sorting and storage. Thus, stakeholder collaboration was not determined by the type of the hotel but other factors may be involved such as financial status of the hotel, education level and attitude.

5.3 Conclusions

The study explored the contribution of access to information on solid waste sorting and storage by the hotels. The study found a significant contribution between hotel access to information on waste sorting and its frequency, with social media being the most common method. Effective communication is crucial for waste management, but satisfaction levels did not significantly impact on the frequency of waste sorting. Low bed capacity had more mixed waste as compared to high bed capacity, an indicator of low access to information on solid waste sorting and storage. Thus, more sensitization on solid waste sorting and storage should be done on low bed capacity hotels for sustainable operations.

The study explores the link between hotel empowerment (training and provision of waste bins) and solid waste sorting and storage effectiveness in Kakamega Town. The results showed that empowerment (training and provision of waste bins) contributed significantly to hotels solid waste sorting and storage. This implies that more training on solid waste sorting and storage will significantly promote hotels participation in solid waste sorting and storage. Also, the provision of solid waste bins will significantly promote solid waste sorting and storage thus reducing the volume of mixed waste in the municipal waste stream. The findings were that, most hotels sort their waste daily, about a third do not offer training due to financial constraints. The agency that was mostly engaged in solid waste sorting and storage training was NEMA by 12.8%.

The study analyzed hotel collaboration in solid waste sorting and storage, revealing a significant contribution in stakeholder collaboration and type of waste storage bins. It found that financial and community-based collaborations led to higher waste sorting frequency. However, cost and availability were more crucial in bin selection. The study emphasizes the need for targeted interventions to optimize collaboration and infrastructure in waste management.

5.4 Recommendations

Given the significant association between information access methods and the frequency of solid waste sorting, it's important to prioritize effective communication channels among the hotels. Establishing robust communication strategies beyond social media, such as workshops, newsletters, or direct engagement sessions, can help hotels stay informed and adopt better waste management practices (sorting and storage). Consistent and accessible information dissemination can lead to more informed decisions and ultimately reduce waste generation.

Recognizing the positive impact of training on waste management practices, efforts should be made to expand training opportunities, particularly for hotels facing financial constraints. Collaborative initiatives between environmental agencies like NEMA and hospitality associations could help scale up training programs to reach more hotels. Additionally, considering the responsibility of bin provision primarily falls on hotels, support mechanisms or incentives may be necessary to facilitate access to appropriate waste storage infrastructure.

To optimize waste sorting and storage initiatives, fostering strong collaborative partnerships among stakeholders is essential. Emphasizing collaborative frameworks that encourage financial and community-based engagement can enhance waste sorting frequency and overall management effectiveness. However, alongside collaboration, attention should also be given to addressing factors like cost and availability to ensure the adoption of suitable storage bins. Targeted interventions should aim to align collaborative efforts with infrastructure improvements for comprehensive waste management solutions.

5.5 Areas for Further Research

1. Challenges of hotels empowerment on solid waste generation, sorting and storage in Kakamega town.
2. Factors that influence stakeholder's collaboration in hotels' solid waste generation, sorting and storage in Kakamega Town.

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APPENDICES

APPENDIX I: LETTER OF TRANSMITTAL

Dear respondent:

I am a postgraduate student undertaking a Master of Science in Environmental Science at the School of Environmental Sciences at Maseno University. I am carrying out a study on the '**Contributions of Hotels Participation in Solid Waste Sorting and Storage in Kakamega Town, Kenya**. I am using the attached questionnaire to collect information for the study. It is my kind request that you fill out the questionnaire, providing the relevant information to facilitate the study. Please use the space provided to fill in the information required as objectively and honestly as possible. The information provided will be treated with strict confidentiality for this study only. Thank you.

Yours faithfully,

Robert Kuya Mbatsi

APPENDIX II: CONSENT TO PARTICIPATE IN A RESEARCH

RESEARCH TITLE:

'Contributions of Hotels Participation in Solid Waste Sorting and Storage in Kakamega Town, Kenya.

You have been asked to participate in a research study,

You have been informed about the study by ……of phone number……. You may contact Mr Kuya Robert Mbatsi (Principal investigator) on cell phone number 0727603754 any time if you have a question about the research.

This research is purely for academic purposes and efforts will be made to keep personal information confidential. The answers given will help the researcher to answer the study research questions.

Your decision whether or not to participate in this study is voluntary. If you choose to participate in this study, you can withdraw your consent and discontinue participation at any time without prejudice.

The research study, including the above information, has been verbally described to me. I understand what my involvement in the study means and I voluntarily agree to participate.

Signature ……Research participant ……..Date……..…
Signature……Interviewer……Date ……

APPENDIX III: QUESTIONNAIRE

My name is Robert Kuya, a Master's degree student at Maseno University. This questionnaire is prepared for collecting relevant data for academic research on establishing the contribution of hotels participation in Solid Waste Sorting and Storage in Kakamega town, Kenya. Kindly, note that the information you provide will only be used for academic purposes and treated as confidential. Thank you for your willingness to share your knowledge and experiences on the subject.

Research Project on:

My name is Robert Kuya, a Master's degree student at Maseno University. This questionnaire is prepared for collecting relevant data for academic research on establishing the contribution of hotels participation in Solid Waste Sorting and Storage in Kakamega town, Kenya. (Kindly, note that the information you provide will only be used for academic purposes and treated as confidential). Thank you for your willingness to share your knowledge and experiences on the subject.

Research Project on:

CONTRIBUTIONS OF HOTELS PARTICIPATION IN SOLID WASTE SORTING AND STORAGE IN KAKAMEGA TOWN, KENYA.

PART A: DEMOGRAPHIC CHARACTERISTICS OF THE RESPONDENTS

1. Name of Hotel:……..Bed capacity:……
2. Gender of respondent: Male [ ] Female [ ]
3. Education level of respondent: …….
4. Designation: …….
5. Age:

   18 – 23 [ ] 24 – 29 [ ] 30 – 35 [ ] 36 – 41 [ ] 42 – 47 [ ] 48 – 53 [ ] 55 – 59 [ ] 60 and above [ ]

PART B: CONTRIBUTION OF HOTELS INFORMATION SHARING AND SOLID WASTE GENERATION

Information: It is a one-way communication of passing information about the hotel and service offered through newsletters, websites, and brochures. In this study, information will be measured by the frequency of producing newsletters and brochures and the presence of websites with information on waste management.

6. What is the frequency of solid waste sorting?

   1. Daily [ ] 2. Twice a week [ ] 3. Weekly [ ]

7. What are the types of solid waste sorted?

   Food Waste [ ] Plastic [ ] Glass [ ] Metal [ ] Textile [ ]

   Others, Specify [ ]

8. Estimated quantity of solid waste sorted weekly in Kilograms

   Food waste ……. Plastic …… Glass……

   Metal…….Textile…….others …..

9. Method of access information on solid waste sorting and storage? Self-initiative [ ] Social media [ ] company advisory [ ] seminar/workshop [ ] suggestion boxes [ ] websites

10. What is your satisfaction level with your access to information on solid waste sorting and storage? Tick appropriately

    Strongly Disagree [1] Agree [2] Undecided [3] Agree [4] Strongly Agree [5]

Statement	**Strongly Disagree**	**Disagree**	**Undecided**	**Agree**	**Strongly Agree**
Solid waste management information is accessible to staff and customers					
Solid waste information is properly sited at the hotel					
Hotel management daily briefs the staff on solid waste generation, sorting, and storage					
Solid waste management information is well advertised on social media, websites and posters at the hotel					

PART C: CONTRIBUTION OF HOTELS EMPOWERMENT ON SOLID WASTE SORTING AND STORAGE

11. How many times do you conduct solid waste training per year.....?
12. Environmental agencies engaged in solid waste training .....

SOLID WASTE SORTING

13. What is the frequency of solid waste sorting?

    1. Daily [ ] 2. Twice a week [ ] 3. Weekly [ ]

14. How do you categorize solid wastes? ……..

SOLID WASTE STORAGE

15. What type of storage bins do you have at your facility?

    1. Plastic Bins [ ] 2. Sacks [ ] 3. Boxes [ ] 4. Metallic bins 5. Others [ ]

16. Who provides storage bins?

    1. Hotel Management [ ] 2. Private Company [ ] 3. CBO [ ]

    4. Other Specify ……

PART D: CONTRIBUTION OF HOTEL COLLABORATION IN SOLID WASTE SORTING AND STORAGE

17. Who are some of the stakeholders you collaborate with?

    County Government of Kakamega [ ] Hotels [ ] CBOs [ ] NEMA [ ]

    Others specify……

18. What are the forms of collaboration? Teamwork [ ] Financial [ ] Technical [ ] Network [ ] community [ ]
19. Based on your knowledge of solid waste sorting and storage practices, which one do you agree with?? Tick appropriately.

Strongly Disagree [1] Disagree [2] Undecided [3] Agree [4] Strongly Agree [5]

Statement	**Strongly Disagree**	**disagree**	**Undecided**	**Agree**	**Strongly Agree**
No person should generate hazardous waste without carrying out an EIA and be licensed by NEMA.					
Waste generated shall be transferred to a licenced person to transport and dispose off in a designated facility.					
Its important for the waste generator to sort the waste before disposal					
Solid waste sorting encourages resource recovery, recycling and re-use of products					
All storage bins must be secured and well-labeled in English or Kiswahili					
Solid waste should be stored securely in sealed, labeled bins ready for recycling or disposal					
Collaboration in the form of financial, technical, team, community and network will promote solid waste sorting and storage.					

APPENDIX IV: INTERVIEW GUIDE

KEY INFORMANT QUESTIONNAIRE

My name is Robert Kuya, a Master's degree student at Maseno University. This questionnaire is prepared to collect relevant data for academic research on Contribution of hotels participation in solid waste Sorting and Storage in Kakamega town, Kenya. (Kindly, note that the information you provide will only be used for academic purposes and treated as confidential). Thank you for your willingness to share your knowledge and experiences on the subject.

Research Project on **Contributions of Hotel Participation in Solid Waste Sorting and Storage in Kakamega Town, Kenya.**

A: solid waste empowerment and solid waste sorting and storage

1. What are your views on hotel involvement in solid waste sorting and storage at their premise?

2. What is your comment on the importance of accessing to information on solid waste sorting and storage and what measures do you put in place to ensure information is easily accessed?

3. What is your opinion on information sharing among the hotels in relationship to solid waste sorting and storage?

4. What are the best methods of information sharing on solid waste sorting, and storage among hotels for a sustainable environment?

5. What are your views on the performance of hotels in solid waste sorting and storage?

APPENDIX V: OBSERVATION CHECKLIST

My name is Robert Kuya, a Master's degree student at Maseno University. This checklist is prepared to collect relevant data for academic research on Contribution of hotels participation in solid Waste Sorting and Storage in Kakamega Town, Kenya.

Research Project on **Contributions of Hotels Participation on Solid Waste Sorting and Storage in Kakamega Town, Kenya.**

No.	**General waste management**	**TICK** *when present*
1.0	**Information on solid waste sorting**	
1.1.	Is the solid waste sorted at the place of generation?	
1.2	Is the solid waste sorted at the place of storage?	
1.3.	Is the sorted waste classified?	
1.4.	Is the sorted waste stored in a ventilated area/room?	
1.5.	Are workers sorting waste having personal protective equipment (PPEs)?	
2.	**Information on Solid waste storage**	
2.1	Are there waste storage bins at the facility?	
2.2.	Are storage bins in good condition?	
2.3	Is waste stored according to its type and characteristics?	
2.4.	Are storage bins labelled clearly?	
2.5.	Are storage bins emptied regularly?	
2.6.	Is the number of storage bins adequate?	

APPENDIX VI: STATISTICAL ANALYSIS OF THE KAKAMEGA COUNTY TOURISM AND HOSPITALITY FACILITIES

CENTRAL REGION

NAME OF FACILITY	LOCATION/ ADDRESS	NO. ROOMS
Sheywe Guest House Limited	Kakamega Town	90
Golf Hotel	Kakamega Town	100
Kakamega Sports Club	Kakamega Town	8
Nayu Guest House	Kakamega Town	45
Diamond Rock Guest House	Kakamega - Webuye Road	50
Ampel Hotel Limited	Kakamega - Ingotse Road	20
Jamindas Paradise Motel Limited		66
Bishop Nicholas Stam Pastrol and	Kakamega - Webuye Road	100
Logmma Guest House	Kakamega Town	20
Kakamega Milimani Resort	Kakamega Town	18
Friends Hotel Kakamega Limited	Kakamega	42
Forest Green Inn	Kakamega Town	20
Golden Inn Guest House	Kakamega Town	20
Jionee Guest House	Kakamega	16
Kakamega Guest House	Kakamega - Webuye Road	60
Eagle's Haven Hotel Limited	Kakamega	20
Vike Guest House	Kakamega town	20
Kamadep Guest House Limited	Kakamega - Milimani	31
Milimani Greens Investments	Milimani Area	6
Franka	Mumias Road	50
Amazon	Mumias Road	20
Western Star	Kakamega Primary	60
Kei Kei	Handidi	8
Sky Nine	Ejinja	20
Pen Njoki	Ejinja	50
Illusion Lounge		20
Elleven		15
Signature		15

Lurambi hotel		40
Ampel Milimani		10
Place Caravan	Ikonyero	20
Savona Isle Resort		20
Green Park		15
Lumo Blues guest house	Maraba road	19
Maraba 1	Maraba road	20
Maraba 2	Maraba road	20
Voi	Jua kali road	60
County Guest house	Kenya power street	15
Mombasa Guest House	Kenya power street	18
	Hotel bed capacity 6-20 =25	
	Hotel bed capacity > 21 =14	

APPENDIX VII: RESEARCH PERMIT (NACOSTI)

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **850198**

Date of Issue: **23/March/2020**

RESEARCH LICENSE

This is to Certify that Mr. KUYA MBATSI ROBERT of Maseno University, has been licensed to conduct research in Kakamega TOWN on the topic: ASSESSMENT OF DETERMINANTS OF SOLID WASTE MANAGEMENT PRACTICES BY THE COMMERCIAL ENTERPRISES IN KAKAMEGA TOWN, KENYA for the period ending : 23/March/2021.

License No: **NACOSTI/P/20/3877**

850198

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Verification QR Code

NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.

APPENDIX VIII: SGS APPROVAL

MASENO UNIVERSITY ETHICS REVIEW COMMITTEE

Tel: +254 057 351 622 Ext: 3050
Fax: +254 057 351 221

Private Bag – 40105, Maseno, Kenya
Email: muerc-secretariate@maseno.ac.ke

FROM: Secretary - MUERC

DATE: 3rd February, 2020

TO: Kuya Robert Mbatsi
PG/MSc/NS/00064/2015
Department of Environmental Science
School of Environment and Earth Sciences
Maseno University
P. O. Box, Private Bag, Maseno, Kenya

REF: MSU/DRPI/MUERC/00763/19

RE: Influence of Community Participation on Solid Waste Management in Commercial Enterprises in Kakamega Municipality, Kenya. Proposal Reference Number MSU/DRPI/MUERC/00763/19

This is to inform you that the Maseno University Ethics Review Committee (MUERC) determined that the ethics issues raised at the initial review were adequately addressed in the revised proposal. Consequently, the study is granted approval for implementation effective this 3rd day of February, 2020 for a period of one (1) year. This is subject to getting approvals from NACOSTI and other relevant authorities.

Please note that authorization to conduct this study will automatically expire on 2nd February, 2021. If you plan to continue with the study beyond this date, please submit an application for continuation approval to the MUERC Secretariat by 15th January, 2021.

Approval for continuation of the study will be subject to successful submission of an annual progress report that is to reach the MUERC Secretariat by 15th January, 2021.

Please note that any unanticipated problems resulting from the conduct of this study must be reported to MUERC. You are required to submit any proposed changes to this study to MUERC for review and approval prior to initiation. Please advice MUERC when the study is completed or discontinued.

Thank you.

MASENO UNIVERSITY SECRETARY 03 FEB 2020 ETHICS REVIEW COMMITTEE

Dr. Bonuke Anyona,
Secretary,
Maseno University Ethics Review Committee.

Cc: Chairman,
Maseno University Ethics Review Committee.