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INFLUENCE OF PLASTIC WASTE MANAGEMENT ON THE LIVELIHOODS OF INFORMAL SETTLEMENT RESIDENTS IN KAJIADO NORTH CONSTITUENCY, KAJIADO COUNTY (KENYA)

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Abstract

Purpose: The study aimed at examining the influence of plastic waste management on the livelihoods of residents in the informal settlements in Kajiado North Constituency.

Methods: This study used mixed method research design. The target population in this study was households which comprised of informal settlement residents, business outlets or owners and waste segregators. The sample population was 96 informants living within the informal settlements in Kajiado North Constituency. Purposive sampling was used during this study. The study collected both quantitative and qualitative data through key informant, interviews and questionnaires. This study also utilized both primary and secondary sources of data. The research instruments were tested to determine their reliability and validity. The data gathered were quantitatively and qualitatively analyzed to determine if certain conjectures were substantiated.

Results: The problems facing developing countries in handling of plastic waste are not impossible to solve but they need concerted effort from all sectors of society. Management of plastic waste is the responsibility of every resident. Meaning that an all-inclusive approach should be adopted in order to achieve any meaningful and lasting solution and eliminate the exploitation of the informal plastic waste collectors.

Unique contribution to theory, practice and policy: There should be a participatory approach in the management of Plastic Waste by involving all stakeholders who include the civil society, NGOS, CBOs and the informal sector so as to facilitate the planning process, mobilization of resources and the maintenance of economic, social and environmental infrastructure.

Key words: *Plastic waste management, livelihoods, residents, informal settlements, Kajiado North Constituency*

1.0 INTRODUCTION

1.1 Background to the Study

Regardless of where we live, work, or play, we generate trash. Since the dawn of mankind, human beings have generated waste. However, waste disposal was not a problem when we had a nomadic existence; we simply moved away and left our waste behind. The term waste management normally relates to all kinds of waste, whether generated during the extraction of raw materials, the processing of raw materials into intermediate and final products, the consumption of final products, or other human activities, including municipal residential, institutional, commercial, agricultural, and social health care, household hazardous waste, and sewage sludge (Gary, 2011).

Around 10,000 BC, humans started to abandon their nomadic existence and live in communities. With the advent of non-transient communities came trash that was dropped on the ground where people lived. Alternative waste disposal methods were not developed until waste began jeopardizing the city (National Solid Wastes Management Association, 2008). A study carried in the UK confirms that in the UK alone, more than 5 million tons of plastic are consumed each year, of which an estimated mere 24% makes it into recycling systems. That leaves a remaining 3.8 million tons of waste, destined for landfills (Mathieu, Justine; Wallace, Sarah; Solla, Shane; Langlois, Valerie, 2014). Plastic reduction campaigns have been carried in different areas all over the world to reduce their consumption and pollution and ultimately promote the practice of plastic recycling. In Africa and Kenya in particular some groups of people have converted the pollution to a business venture of sorts (Hester, Ronald; Harrison, 2011).

Plastic waste management problem is in existence eve regionally in Africa. In Uganda, the rapid population growth in the urban areas has greatly outpaced the ability of the urban authorities to provide adequate housing, roads, water supplies, sewers and collection of solid waste. Although the environmental problems associated with garbage do not disappear with collection, uncollected garbage exacerbates many of the environmental hazards associated with urban centers. Such hazards include fire, pests and disease vectors which create human health problems. Uncontrolled disposal by burning and dumping adds to atmospheric and hydrologic pollution loads, clogs waterways and increases the danger of flooding, which has been experienced in some parts of the country. Solid waste management in Kampala city is done by the Kampala Capital City Authority (KCCA) assisted by some private garbage collectors and in other towns; it's the responsibility of the town council. Generally, some of the materials are recycled for use. Current challenges encountered by KCCA are issues of open dumping, lack of adequate transport receptacles and vehicles, lack of spare parts, corrosion of the waste containers.

In studying plastic waste problems in East Africa and in particular in Kenya, most authors have focused on post-consumer aspects of plastic waste collection and disposal, putting municipal authorities central as the core institution that can provide viable sustainable waste management systems (Bahri, 2005; Karanja, 2005; Kassim & Ali, 2005; Mugambi, 2001; Oyoo, 2011; Rotich et al., 2006). But collecting and adding value to plastic waste has been practiced in Kenya by

private actors since the 1980s, when individual waste pickers, yard shop owners and small-scale traders started to sell unprocessed plastic waste directly to plastic producers who used these materials to manufacture new plastic products. Since the 1990s and partly driven by a general lack of employment and high poverty levels (Republic of Kenya, 2010), community based organizations (CBOs) involved in waste collection and disposal started to venture into recovery of plastic waste. They often worked together with Savings and Credit Cooperative Societies (SACCOs), organizations where individuals and CBOs place their savings and receive advantageous rates for loans, as well as other social benefits. Several authors, from different perspectives, have stressed the important contribution of these (in) formal CBOs, CBO-SACCOs, yard shop owners and small-scale traders in effective waste management (Allison, Harris, Hofny-Collins, & Stevens, 1998; Katusimeh et al., 2013; Liyala, 2011; Scheinberg & Mol, 2010; Tukahirwa, Mol, & Oosterveer, 2011; Tukahirwa et al., 2013; UNDP, 2006; WASTE, 2004).

Parallel to plastic waste management activities of (in)formal private actors, plastic producers and other chain actors have explored the use of plastic waste as a raw material in Kenyan plastic production (KNCPC, 2006; Mugambi, 2001; Njeru, 2006). An extensive body of literature underscores the benefits of promoting plastic waste recovery and recycling as a viable strategy to sustainable plastic waste management (Furedy, 1997; Karanja, Ikiara, & Davies, 2004; Scheinberg et al., 2011). Plastic production started to take off in Kenya from the early 1990s, although Kenya still imports all the polymers (polyethylene PE and polypropylene PP especially, and smaller quantities of polystyrene PS, polyethylene-terephthalate PET, polyurethane PU and polyvinyl-chloride PVC) as it has no petro chemical polymer production units. Around 2010 the use of post-consumer waste as raw material for plastic production has increased to 11% of total raw material (Oyake-Ombis, 2012). Easy access to plastic production technology and liberalization of trade at regional and global levels enabled the use of plastic waste as a raw material in production processes. In Kenya, private industrial actors largely rely on informal actors to provide them with plastic waste as raw material.

1.2 Statement of the Problem

Kajiado North constituency constitutes peri-urban towns of Nairobi County, managing providing basic services like residence to the swarming population due to pull factor rural population migrating to urban centers in search of employment as well as education and other income generating activities. Rapid urbanization is making local urban areas undergo explosive transformation, yet their urban economies are not sufficiently dynamic to diversify (Kazungu, 2011).

The County Governments in Kenya are charged with the responsibility of management of county resources including waste management. Similarly among various utility services, plastic waste management services have been a major concern and a recurring issue for Kajiado North constituency residents as well as the counties nearby. Most cities / towns and in particular, the informal settlements within the towns or cities do not have designated or licensed dumpsites hence, it is common to find animals such as cows, goats, chicken, and pigs feeding at these

dumpsites. All these are exacerbated by the rapid population increase as people migrate from the rural areas to towns to look for employment and also seek better social amenities (Otieno, 2012). As such, its mandate is hard to meet and deliver essential services particularly in the management of plastic waste.

Since the plastic waste collection system is not well managed in Kajiado North constituency, people dispose the plastics wherever possible mostly in the drainages or the river banks on along the roads. This has led to huge environmental pollution deteriorating the health of mankind and the other living beings. Due to the lack of knowledge of disposing the plastics in a way they want, we can see plastics all around the informal settlements in Kajiado North constituency including along the roads, play grounds, and even in hospitals. People throw the plastics without realizing that it is affecting their own health and will deteriorate the future generation's living standard. Data on status on the collection, separation and recycling of plastic waste in Kajiado North constituency is scanty or totally absent. The study intended then to find out the influence of plastic wastes encountered in the constituency's informal settlements in the collection, separation and recycling of the plastic wastes so as to enhance their capacities, and also incorporate reuse and recycling into the constituency's plastic waste management.

1.3 Research Objectives

1. To establish the influence of plastic waste management practices on livelihoods of informal settlement residents in Kajiado North Constituency
2. To examine the influence of income generation from plastic waste management on livelihoods of informal settlement residents in Kajiado North Constituency.
3. To explore the influence of positive changes resulting from plastic waste management on livelihoods of informal settlement residents in Kajiado North Constituency.
4. To examine the policies that influences the management of plastic wastes on the livelihoods of the residents of informal settlements of Kajiado North constituency

1.4 Conceptual Framework

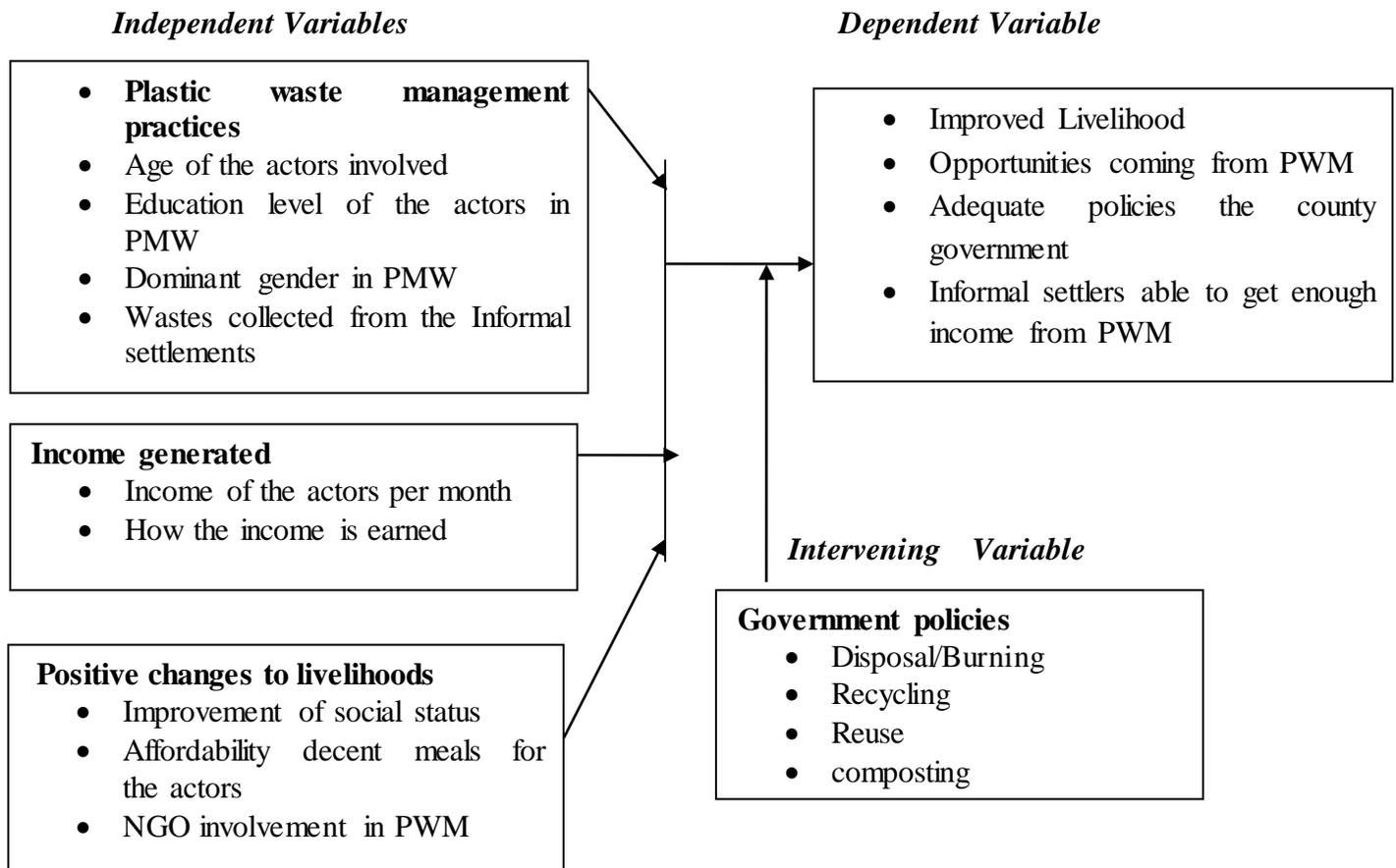


Figure 1: Conceptual Framework

Source: Researcher, (2017).

Studies show that a variable is a concept which can take on different quantitative values at one point in time. The study had both independent and dependent variables. The dependent variable was the livelihood of informal settlement residents while the independent variable constitutes the plastic waste management. Mainly, the study sought to establish the relationship between the independent variable and dependent variable. The Framework supposed that the presence or absence of the indicated independent variables influenced by the intervening variable would influence the livelihoods of informal settlement residents of Kajiado North Constituency. There were three independent variables which were: to establish the plastic waste management practices among the informal settlements residents in Kajiado North Constituency, to assess the possible income generated by actors from plastic waste management in Kajiado North constituency, to explore the positive changes to livelihoods experienced by informal settlement actors in the management of plastic waste. Mainly, the study sought to establish the relationship between the independent variable and dependent variable.

2.0 LITERATURE REVIEW

2.1 Livelihoods Approach Theory

A livelihood is defined by Carney (1998) as comprising the capabilities, assets, including both material and social resources and activities required for a means of living. As already noted in , the notion of sustainable livelihood as we know it today can be said to have arisen out of the 1992 Earth Summit held in Rio (Perrings, 1994) and its promotion of Agenda 21 (Agenda for the 21st Century). A stated aim in Agenda 21 is that everyone must have the “opportunity to earn a sustainable livelihood”. The Livelihoods Approaches are best suited as they stress on utilizing and building on the best existing tools for the circumstances at hand which may include recycling, composting, reuse and even incineration and also an analysis of how they will affect the environment by incorporating the sustainability context.

A livelihood comprises the capabilities, assets and activities required for a means of living; a livelihood is sustainable when it can cope with and recover from stress and shocks, maintain or enhance its capabilities and assets, and provide sustainable livelihood opportunities for the next generation; and which contributes net benefits to other livelihoods at the local and global levels and in the short and long-term (Chambers and Conway, 1992). Considering the two variables that are the plastic waste management and the livelihood. The livelihood approach theory then helped the researcher in assessing the influence of plastic wastes on the informal settlement residents. The sustainability of livelihoods became a function of how men and women utilize assets portfolios on both short and long term basis to be able to cope with and recover from shocks and stresses through adaptive coping strategies they should be economically sound, ensuring that livelihoods activities do not irreversibly degrade natural resources within a given ecosystem.

Plastic waste management and informal settlements residents can best be understood from the point of view of the Livelihoods Approaches. Due to urbanization and globalization, the urban poor have lacked access to basic necessities of life. Plastic waste management as a source of income has provided livelihoods for the informal settlements residents. The Livelihoods Approaches are best suited as they stress on utilizing and building on the best existing tools for the circumstances at hand which may include recycling, composting, reuse and even income generation through selling of the collected plastic wastes and also an analysis of how they will affect the environment by incorporating the sustainability context. These approaches stress the need for livelihoods approaches to be underpinned by a pro-poor bias and to be informed by prior social analysis to ensure that vulnerable groups are not neglected (Conway, 1992).

In critique, it must be noted that any Sustainable Livelihood Approach is by definition unique to the specific context within which it is applied. Nonetheless the case-study foundation of much of the SLA literature can be problematic precisely because it is so easily dismissed as being, site specific. While its analysis in a real sense studies can also be labeled with that most deadly of terms – being descriptive. In terms of the central import of SLA as a means of bringing about change this frankly does not matter, but there is a case to be made for enhancing the potential for comparative research with SLA so as to identify patterns (Nefjes, 2000). It should also be noted

that SLA is a broad banner that covers many disparate practices even if the underlying philosophy is constant, and this may not help comparisons. Secondly, there is a lower common denominator issue. Some SLAs are in greater depth than others, thus the additional knowledge from some SLAs may be wasted as comparisons are not possible with other places where that knowledge was not gleaned. Therefore the danger is one of only being able to identify somewhat large-scale patterns that are almost meaningless (Nefjef, 2000).

It has to be reiterated that despite the criticisms mentioned about SLA does represent a significant step forward in development thinking. It is not so much that the methods are new but the philosophy that an intervention has to be founded on holistic thinking and be based on evidence and a sound understanding of constraints may sound obvious but SLA may not help to crystallize all the social problems under one heading. The desire for evidence-based intervention and policy is still something needed even if it has received much attention in recent years (Nefjes, et al., 2000). SLA is a manifestation of that desire but still has to operate within the maelstrom of other influences that typically can come to bear on the nature of interventions and policies.

2.2. Review of Empirical Studies

2.2.1. Waste Management Practices

There are several factors that have facilitated increase in the volume of solid waste and in particular plastic waste generated. One of the factors that have led to increased plastic waste generation is rapid urbanization (United Nations Environmental Policy, 2007). Urbanization comes with expansion of towns which manifests through the growth of social and economic infrastructure/services and industrialization. The growth in such services warrants the increase in population in such areas. An increased population automatically means increased demand for not only social services but also consumables which potentially present a larger base for waste generation-in most cases plastic waste (United Nations Environmental Policy, 2007).

The increase in the volumes of plastic waste generated has also been proved to be synonymous with the “new lifestyles associated with greater affluence” which convert into higher consumption levels, thus generating more waste amidst changes in waste composition (United Nations Environmental Policy, 2007). Affluence influences people to adopt superfluous demand and purchase patterns making people acquire more of what is not very necessary for their wellbeing. When people possess more than what they actually need, failure to fully and responsibly utilize all that they affluently have, eventually leads them to get rid of the useless excess which turns into solid waste. In most cases more purchases also mean more packaging material- which readily translates into plastic waste especially for the manufactured products.

2.2.2. Possible Income by Actors

In some of the reference cities resource management is still a completely separate set of activities, institutions, actors and economic relations, and has virtually no relationship to the municipal solid waste system. Kunming, China, is an illustrative example: the existing – thriving material recycling is a separate system that functions, as any commodity trade does, dependent

upon and influential in the global market. In a populous country like China, resources management has always been considered as one of the most important economic activities. Therefore, recycling is under the Ministry of Commerce whereas municipal solid waste management is under the Ministry of Housing and Urban-Rural Development. This situation is quite comparable to that in many European and American cities in the early 20th century (Rodic, 2002).

Studies show that municipal organic waste is a heavily underutilized resource. While the organic fraction constitutes 60-80% by weight of municipal waste in most reference cities (Wilson *et al.*, 2010), there have been only modest initiatives to recover its value. This can be due to the lack of a market for compost, which takes focused effort and time to develop, by building urban-rural linkages and by educating potential users and buyers about compost's beneficial properties. The initiative by local professionals in Waste Concern, Dhaka, is a noteworthy exception: they managed to attract Dutch investors and obtain support from CDM, organize collection of organic waste from households and vegetable markets, and establish a community-based composting plant. In order to ensure sustainability of the system, they assist communities in marketing the product.

Active systems of informal sector and micro-enterprise recycling reuse and repair, existing in developing and transitional country cities often achieve high recovery rates in the order of 30%, comparable to those in industrialized countries (Wilson *et al.*, 2010). In addition to their contribution to resource conservation, informal recycling also contributes by removing large quantities of waste that would otherwise need to be collected and disposed of by the formal service provider, thereby avoiding costs for the city. In fact, such informal recycling activities have been shown to save the city perhaps 20% or even more of its waste management budget. The authorities in Belo Horizonte, New Delhi, Quezon City, and Canete are recognizing the potential of collaboration with the existing informal recycling systems to further increase current recycling rates, to reduce costs to the city of managing the residual wastes, and protect and develop people's livelihoods. As one of the first steps, they are legitimizing and actively involving informal primary collectors of recyclables (Wilson *et al.*, 2010).

In Bamako, Mali, as in much of West Africa, raw organic waste is sold to grain farmers (*cerealiculteurs*) while partly decomposed organic waste (called *fumure*, or *terreau*) is sold to *maraîchers*, the vegetable farmers in the floodplain of the Niger River. In itself, this traditional system of nutrient recovery would constitute a global good practice for others to learn from, were it not for the fact that the waste nowadays contains plastic waste, posing acute health risks to the cows that eat it (Scheinberg, 2003). Thompson (1995) reviews waste management in Ghana. The Republic of Ghana is home to 22 million residents. Accra, the nation's capital serves as the economic, administrative, and cultural centre of the country. Its geographical position has allowed it to function as a natural port to the Atlantic Ocean, which has in turn made it an important destination point for number of Ghanaian trading industries. It covers an area of approximately 65 square miles. It houses a full 18% of the total Ghanaian population and 30% of the country's urban population. Unlike the towns and villages spread throughout the majority of

the countryside, Accra is a veritable urban Mecca for labor-seeking residents from all over Ghana.

2.2.3 Positive changes to livelihoods

Globally, Bangladesh is the eighth largest population in the world and the twelfth most densely populated country. Inadequately planned, haphazard urbanization, along with industrial and commercial activities contribute to the substantial quantity of waste produced in Bangladesh. Dhaka, the capital city of Bangladesh had strong economic growth from 2001 to 2011. Although waste can be considered as “unrecovered wealth”, it still remains a major concern in Bangladesh. This would imply that millions of people are involved in some kind of waste picking in Dhaka (JICA, 2010). Waste segregators act as the primary processor in recycling process of Dhaka city, who are found mostly in informal settlements and squatter settlements (72% respondent are living in informal settlements and 24% are living at footpaths). Majority (70%) of the waste pickers’ income is US \$40-75 per month (JICA, 2011).

In Latin America, waste pickers who subsist on informal recycling account for approximately 2% of the urban population, with over 500,000 catadores in Brazil representing approximately 1.3% of the informal urban workers (Medina, 2000). While over 56% of Brazilian catadores earn below minimum wage and live in poverty (Ibid), this industry has been cited by multiple scholars as crucial for the social, economic and environmental viability of sustainable recycling and MSWM (Scheinberg, 2006). Its contributions to urban development also extend to broader economic benefits. Waste picking supplies raw materials to industries and creates various associated jobs in the recycling supply chain for middlemen who sort, purchase, process, and resell recyclables collected by waste pickers (Medina, 2007). In addition, informal recycling reduces the quantity of virgin materials required for production, thereby also reducing water and energy consumption, waste production, landfill. The use of the term “informal sector” was established and popularized in the 1970s by the International Labour Organization (ILO), who developed the main dualist school theories on the subject. The dualist school argues that the “informal sector of the economy is comprised of marginal activities – distinct and not related to the formal sector – that provide income for the poor and a safety net in times of crisis” (Chen, 2012). The structuralism school sees the informal sector “as subordinated economic units / enterprises and workers that serve to reduce input and labour costs, and thereby increase the competitiveness of large capitalist firms” (Chen, et al., 2012).

A recent survey of eighty NGOs within the Latin American Metropolis shows that support NGOs provide a wide range of services. Their emphasis is on education (they provide nine per cent of all primary education and twenty-seven per cent of all secondary education in the city) followed by health and welfare. Some NGOs also provide housing, while a few provided recreation, water waste disposal, and environmental conservation services (Lee-Smith & Stren, 1991). These NGOs are mostly operational among the urban poor in most parts of the country. This increased involvement of grassroots NGOs and CBOs has been in the rural phenomenon in most countries in Africa. As the number of CBOs active in urban areas increases along with the number of urban poor, there is a need for local government and community institutions to collaborate to

improve urban management (Stren, 1991). The organizations are mostly targeting women who are mostly housewives and rather live at home only to engage in small menial commercial jobs with meager earnings. Syagga(1992) notes that the involvement of women is also crucial to the success of community-based solid waste management and particularly plastic waste. He further notes that women are the generators of most of the household waste in Nairobi, and therefore their commitment to improve their earnings and work, would be a major entry to community-based solid waste management (Syagga, 1992).

Regionally, Africa urgently needs infrastructural, institutional, legal reforms and change in attitude. It also needs to adopt Environmentally Sound Management of wastes including Waste Minimization, focusing on the promotion of the “3Rs” – Reduce, Reuse and Recycle; Waste to Wealth Initiatives towards poverty reduction and alleviation (NEMA, 2014). The achievements of these are constrained by access to finance and technical knowhow, and current by-laws put in place by various Counties. The common approaches to municipal solid waste management used by development agencies and international donor agencies for example often fail in developing countries inclusive of Nigeria.

The conventional approaches usually involve solutions that are centralized and undiversified do not distinguish the different needs and heterogeneity of city. They are bureaucratic that only consider the formal sector, ignoring informal sector. They are capital intensive approaches involving advanced technology and equipment. Most developing countries, Nigeria inclusive have solid waste management problems different from those found in developed countries in areas of composition, density, political and economic framework, and in waste amount, access to waste for collection, awareness and attitudes, so a different approach is needed. The socioeconomic conditions in the third world are so different from those of the developed world, that a different approach is needed (Nairobi County By-Law, 2008).

2.2.4 Policies influencing the management of plastic wastes

Other experiences in SWM using various policy instruments can be obtained from ISWA and UNEP (2002). The researcher will discuss lessons internationally, regionally and locally. Human and solid waste management in Urban Africa: Economic instruments for solid waste management in Latin America, some economic instruments are widely and significantly used, while for others only some isolated experiences are known. User charge was later researched on by UNEP (2004) and found to be frequently used instrument as user charges for the collection, transferal and disposal of solid wastes. At least in countries like Bolivia, Brazil, Chile, Colombia, Ecuador, Jamaica, Mexico and Venezuela there is experience with this instrument (UNEP, 2002). For residential wastes, however, it is usual for these charges to be fixed and payable periodically, unrelated to the volume, weight or type of waste being disposed of. In this case, the economic instrument is being directed exclusively to the achievement of cost recovery and not towards the reduction of generated wastes (World Bank, 1999). For example, in the urban municipalities of Greater Santiago, where this instrument has been used for many years and is considered a success, recovery is about 55 per cent of service cost. The use of charges through territorial taxes has the inconvenience that collection costs are high, as they usually involve the

use of legal mechanisms and, therefore, have a high non-payment rate (Fehily, and Company, 1999).

In Colombia, this unified utility bill is the usual practice in many cities, and it has recently also been used in Guayaquil, Ecuador, and La Paz, Bolivia, where it is applied as a surcharge on the electricity bill. This policy allows a higher level of recovery, and some degree of progressiveness (higher income families consume more electricity and therefore pay more for solid waste services), even though it generates a distortion in the electricity market, without increasing efficiency in the solid waste market (JICA, 1998). Another instrument extensively used in the region is the deposit and refund system for recyclable wastes. In countries such as Barbados, Brazil, Bolivia, Chile, Colombia, Ecuador, Jamaica, Mexico and Venezuela these systems exist for products like paper and cardboard, glass bottles, aluminum cans and tyres. Under this system a consumer, when buying an affected good, pays an amount that is reimbursed when the consumer returns the recyclable waste. An interesting characteristic of this activity is that in most countries it is voluntary, based on the interest that many producers have in reusing the recyclable materials. Mexico is the only known exception to this rule, as used car batteries must be returned to acquire new ones. Recycling process and markets for plastic soft drink bottles (made of recyclable material) is thriving in Brazil where over 30 per cent of these bottles are recycled. Some municipalities have taken interesting initiatives to organize this process. In many cases in Brazil and Chile, they have organized and “formalized” waste collectors, so that they contribute in a better way to the collection and separation of recyclables, mitigating the social problem associated with these collectors. Involvement of the private sector in the service of collection, transferable and disposal of wastes is widespread in Latin America (United Nations Environment Policy, 2004). The rationale for this involvement has been the low level of observed coverage, the high inefficiency of municipal operators, the lack of financial resources and the extensive occurrence of illegal dumping. To date, private operators under direct contract service 40 per cent to 50 per cent of cities in Latin America.

Studies indicate that there have been important cost reductions (50 per cent in 5 cities studied) due to larger labour and vehicle productivity. Contract duration is about 5 to 8 years, with periodic re-bidding so that there is competition for the market. Lessons learned from this privatization process include: there is need to develop an overall framework for private sector participation; there have been some justified increases in costs; cost recovery continues to be a problem; municipal labour issues need to be resolved before privatization; municipal institutions for contract regulation need to be strengthened; and improvement of contract characteristics is needed (well defined standards, payment against results and regular monitoring). It seems that there are no experiences in Latin America of residential user charges based on volume, weight or type of waste. Even though the necessary technologies exist, the general understanding is that the controls needed for an effective application of this type of charge, and to avoid fraud or abuse, substantially exceed the institutional capacity of local governments.

3.0 METHODOLOGY

The researcher used mixed method research design. The site of the study was Kajiado North constituency located in Kajiado County which is a county in the former Rift Valley Province of Kenya. It has a population of 687,312 and an area of 21,292.7 km². The target population in this study was households which comprised of residents of informal settlements of Kajiado North constituency. Some of the residents and business owners /employees were selected from the entire population and interviewed to give information on plastic waste management in Kajiado North constituency and how this practice influences their livelihoods.

Simple random sampling was used for each cluster selected for study interviews because it ensures that every member of the population had an equal chance of being included in the sample. Due to time factor, the study conducted interviews and 96 informants randomly selected. Nineteen (19) plastic waste segregators, 48 local residents and 29 business outlets, totaling to 96 participants randomly selected. This is apt since the area is sparsely populated with most residents working in the nearby Nairobi County. The study collected both quantitative and qualitative data through key informant interviews, questionnaires and observations as methods of data collection of primary data.

Piloting of the research instruments was carried out in the two informal settlements. Once the questionnaires were collected from the respondents, they were numbered and sorted out for any incompleteness, keyed in a data template and then coded. The responses were analyzed using simple frequency tallying using the SPSS 20.0 version. The same was also interpreted and presented through figures and tables as well as narratives. In determination of the reliability, the Pearson's product formula was employed to compute the correlation coefficient in order to establish the extent to which the questions are consistent. To ensure the validity of the research instruments, the questionnaire was given to two experts who are lecturers at the Catholic University of Eastern Africa to evaluate each element in relation to the objectives of and to assess if the instrument answers the research questions. They also explored whether all the aspects on the conceptual framework reflect the objectives of the study. The items in the questionnaire were also assessed to check whether they were written in simple English that could easily be understood. Their advice was used by the researcher to make necessary corrections to ensure that the instruments measured what they intend to measure (Mugenda nad Mugengda, 1999).

4.0 DATA PRESENTATION AND INTERPRETATION OF FINDINGS

4.1 Plastic Waste Management Practices

a) Age

Age is a very important socio-economic factor in terms of how it influences the demographic characteristics of the respondent. It also influences the level of participation and decision making towards the attainment of sustainable livelihoods.

Table 1 shows the cumulative percent of 93.7% of the respondents being aged below 45 years which portrays a population that was still fairly young, brisk and productive. These are the years when one is considered to be very active in life and when one is considered to be most industrious.

Table 1: Distribution of the Respondents by their Age Categories

Age Categories	Frequencies	Percent
Below 25	19	19.8
26-35	49	51.0
36-45	22	22.9
Above 46	6	6.3
TOTAL	96	100

Source: Researcher, (2017).

b) Gender

Gender also influences participation and involvement in solid waste management and therefore plays an important role in determining who benefits from plastic waste management. The figure 2 below indicates that 21.9% of the respondents were female while 78.1% were male. The gender disparity can be explained in terms of the role expectations the society has assigned to the different genders. This can also be attributed to the role of women as mothers and men as the de jure providers for their families. Lastly searching and collecting of plastic waste involves walking for long distances in search of waste materials and therefore men are more mobile than women.

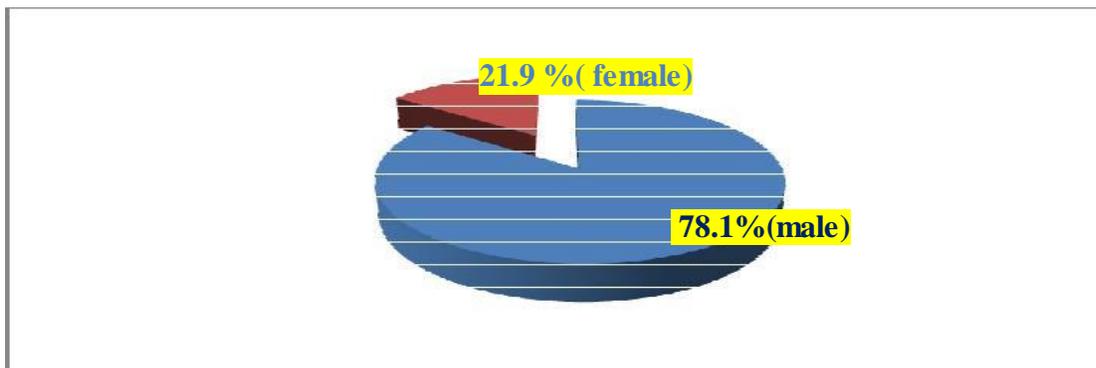


Figure 2 Gender of the respondents

Source: Researcher, (2017).

(c) Education

Education improves the ability of a person to critically reason and understand issues .In solid waste management. It is an important asset since the goods collected are sometimes harmful, unsafe and risky and the way to handle them requires an understanding of how hazardous they are as shown in table 2 below only 33.3% had acquired post primary education.

Table 2: Distribution of respondents by education level

Education level	Frequencies	Percentages %
Did not Attend School	5	4.7
Primary School	60	62.0
Secondary School	29	30.7
Tertiary Institutions	2	2.6
TOTAL	96	100

Source: Researcher, (2017)

The livelihood of the urban individual actors and the income derived from waste management is partly determined by the type of waste that the individual actors are engaged in. This is because the type of waste that is collected by the waste workers has an attached economic and social value and therefore will determine the profitability of the end product. There were mainly four categories of the types of wastes collected by individual actors in this study as shown in figure 3 below which included plastics 37.5%, scrap metals 28.6%, decomposing garbage 17.7% and papers 16.2%. Plastics were greatly preferred by the individual actors partly because they are readily available and secondly because they have immediate use which makes them easy to sell.

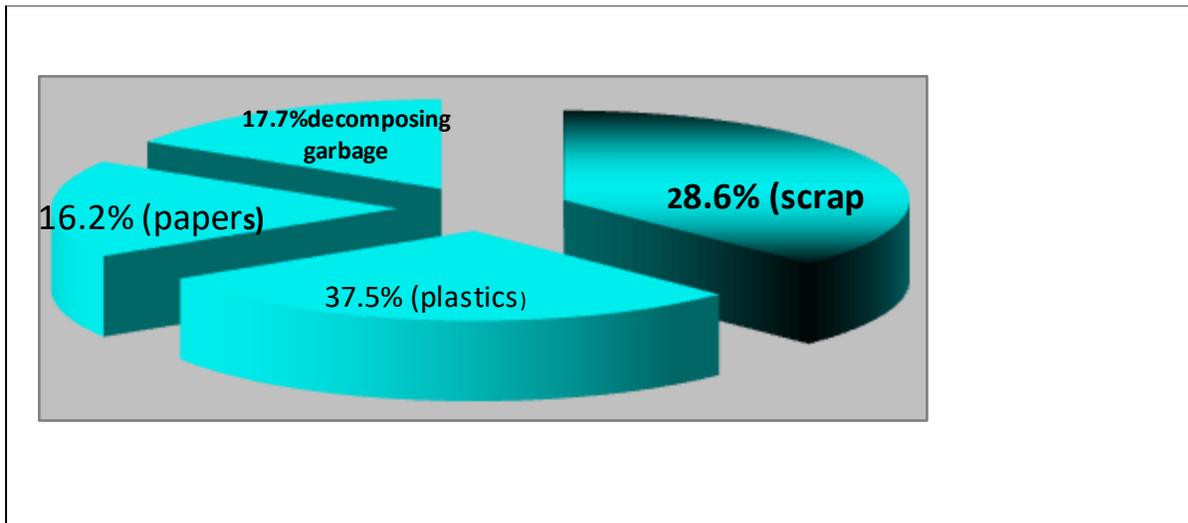


Fig. 3: Distribution of respondents by education level.

Source: Researcher, (2017).

Scrap metals was also preferred by over a quarter of the respondents because they are also readily available especially at the industrial area and the garages. Scrap metals also fetch a higher price compared to the rest based on the quality and quantity of the scrap. Only a few respondents were involved in collecting decomposing garbage, this is because of its limited usage which does not translate to earning income, however a few of the respondents used it for composting while the majority of the respondents earned income by transporting the waste to dumpsites. Though

the availability of waste papers in Kajiado County is high only a few of the respondents in this study were involved in waste paper collection. This is partly because of the bulkiness of the papers and lack of immediate pre-processing use.

Table 3: Types of wastes collected in Kajiado North Constituency Informal settlements.

Income	Waste Types				Total
	Scrap metals	Plastics	Garbage	Papers	
Below 5000	15(15.6%)	29(30.2%)	8(8.3%)	11(11.5%)	63(65.6%)
5000-10000	3(3.6%)	1(1.0%)	7(7.8%)	0(0%)	11(12.5%)
Above 10000	9(9.4%)	6(6.3%)	2(1.6%)	5(4.7%)	22(21.9%)
Total	27(28.6%)	36(37.5%)	17(17.7%)	16(16.2%)	96(100%)

Source: Researcher, (2017).

Data from Asia confirms that the more developed countries like Japan, Laos and Thailand, have more municipal waste generated per capita as earlier been highlighted in the literature review by the researcher. Interestingly also, there have not been signs of abating the increasing amounts of waste generated. The rapid increase in waste generation has therefore made effective waste management in many countries challenging. Consequently, it has put human life and the environment at stake (UNEP, 2007). Very few households segregate waste at the household level in Kenya according to National Environment Management Authority (2005). There is minimal waste segregation at source within the CBD areas, industries, and institutions in most towns/cities. In Kenya, waste in the CBDs is largely collected by the County Governments while private operators dominate collection in residential areas at a fee.

Conventionally, plastic waste is usually collected as a bundle of trash by local authorities or by private firms to be taken to a transfer station and then to a landfill (sometimes collected and taken straight to the landfill). However, considering the fact that there are not always enough resources and infrastructure for waste management, especially in developing countries, this scenario ultimately implies that some waste will not be collected, or will be improperly disposed (UNEP, 2002). As a result, landfills, burning waste, rodents and odors which are very common in developing countries have made residential areas susceptible to health hazards (UNEP, 2007). As indicated from the data presented above by the researcher, Plastic waste has the higher percentage of 37.5%, Scrap metals at 28.6%, Garbage at 16.2%, and finally Papers at 17.7%. This data shows that plastic waste management practices is higher as compare the rest of the waste in the Kajiado North Constituency informal settlements.

4.2 Income Generation from Plastic Waste Management

The study sought to examine the influence of income generation from plastic waste management on livelihoods of informal settlement residents in Kajiado North Constituency. The findings are summarized in the table 4 below.

Table 4: income generation from plastic waste management

Respondents Month (Ksh)	Income Per	Frequencies	Percentages %
Below 5000		63	65.1
5000-10000		12	13.0
Above 10000		21	21.9
TOTAL		96	100

Source: Researcher, (2017).

The data obtained shows that the majority of the informal waste collectors earn less than 5000 Kenyan shilling per month, this can be explained by the fact that as a source of livelihood and due to lack of alternative employment, a lot of the urban poor have ventured into the sector and therefore scavenging for saleable items is competitive. The findings of this study compares to a study conducted in Delhi where an adult waste pickers earn a meager Rupees 45 to 80 per day (Sarkar, 2003) which translates to about Ksh.4000/= per month. The study established that there is a relationship between income and type of waste collected.

In this study majority of the respondents who earn less than Ksh. 5000 were below the age of 35 years this implies that age factor is important in income generation in that the actors are in the process of developing networks of reciprocity which would guide them in their business endeavors and which will connect them to one another and benefit from this associations and hence as age increases so does the income. This can also be understood from the point of limited capital base as these informal actors are in their formative stages in their entrepreneurial skills and have therefore not been able to lay strategies of reciprocal income earning.

This is emphasized by the fact that most of the young people have chosen Kajiado due to its low living standard or its uprising as a cosmopolitan region in Kenya. In this study only 38% of the respondents had gone beyond primary education; it is important to note that even after several years of waste picking they do not acquire any special skills and are hence unable to move into any other occupation.

Income influences the socio-economic status of individual actors in the society and also determines the sustainability of livelihoods in the community. The study established that the urban individual actors were earning some income from plastic waste management in Kajiado County. Table 5 shows that majority of the respondents (65.1%) were earning an income of less than Ksh.5000per month, 13.0% were earning an income of between Ksh. 5001-10000 while 21.9% were earning an income of above Ksh. 10000. In order to establish whether there was a relationship between the type of waste collected and the income generated across tabulation was carried out.

4.3 Positive Changes on livelihoods resulting from Plastic Waste Management

The study sought to explore the influence of positive changes resulting from plastic waste management on livelihoods of informal settlement residents in Kajiado North Constituency. The findings are summarized in the table 5 below.

Table 5: Respondents' opinions on plastic waste management

Respondents Opinion	Frequencies	Percentages %
Strongly Agreed	44	46
Agreed	9	9
Disagreed	9	9
Strongly Disagreed	17	18
Indifferent	17	18
Total	96	100

Source: Researcher, (2017).

The questionnaire sought to explore the positive changes of plastic waste management by asking the residents whether they thought the practice saves money. The data obtained are as follows: 46%'strongly agreed', 9%'agreed', 9% 'disagreed' while 18%'strongly disagreed'. 18% were found to be indifferent (Table 6). Thus majority which had a representation of 44% strongly agreed that recycling plastics has a positive influence on the livelihood of the people of the informal settlements.

As discussed in the literature review, it was found out that Brazil representing approximately 1.3% of the informal urban workers (Medina, 2000). In Brazil waste picking was found to be suppliers of raw materials to industries and creates various associated jobs in the recycling supply chain for middlemen who sort, purchase, process, and resell recyclables collected by waste pickers (Medina, 2007). Regionally, out was found out by NEMA that Africa urgently needs infrastructural, institutional, legal reforms and change in attitude. It also needs to adopt Environmentally Sound Management of wastes including Waste Minimization, focusing on the promotion of the "3Rs" – Reduce, Reuse and Recycle; Waste to Wealth Initiatives towards poverty reduction and alleviation (NEMA, 2014). The researcher's findings then in line with the study which had been done by NEMA in which the researcher's finding was that 46%'strongly agreed that recycling plastics has a positive influence on the livelihood of the people of the informal settlements.

In Kajiado North Constituency, the researcher found out in the literature review that individual dealers have a strong presence in the constituency's informal settlements and strength of the dealers is their recognition that solutions to urban problems are not isolated, but interconnected and thus benefits can be reaped from a mismanagement blunder. This recognition is reflected in the integrated approach they are taking to environmental management and community development (Kajiado County Development Plan, 2014).

4.4 Policies that influence the management of plastic waste

The study sought to examine the policies that influence the management of plastic wastes on the livelihoods of the residents of informal settlements of Kajiado North constituency. The findings are summarized in the table 6 below.

Table 6: Kajiado County Informal Settlements Plastic Waste Management Policies

Policies of Plastic Waste Management	Recycling Frequency	Reuse Frequency	composting Frequency	Disposal/Burning Frequency
YES	79(81.8%)	28(29.2%)	5(5.7%)	12(12%)
NO	17(18.2%)	68(70.8%)	91(94.3%)	84(88%)

Source: Researcher, (2017).

The data obtained as shown in table 6 shows the three policies commonly used in Kajiado County residents by the individual actor in plastic waste management. The data showed that recycling was the most preferred policy of plastic waste management in Kajiado North Constituency by the individual actors at 81.8% followed by reuse and composting at 29.2% and 5.7% respectively. Refuse disposal (12%) and or burning as a policy that was used by individuals who collected plastic waste from households and disposed the waste to designated dumpsites within their neighborhoods. A lot of ascription to recycling can be attributed to the fact that there are a number of individuals who have established themselves within Kajiado County Informal settlements and are able to collate the waste materials and transport them to Nairobi for recycling. Therefore the individual actors are assured of ready market for their products.

The policies used by the individual workers in plastic waste management have an outcome on their livelihoods and that the policy used is dependent on the availability of the waste materials and the value attached to the waste end-product. Reuse of waste has great recovery potential and reduces substantially the amount of waste to be disposed. Recycling as a strategy provides employment opportunities and cheap products while composting has some environmental benefits. Generally all the three strategies reduce substantial amounts of waste to be disposed from the municipality.

However it is important to note that the respondents collected the recyclables and reusable materials and sold them to other individuals who had use for them. Those engaged in composting sold their compost product or were paid to do the composting. Some individuals were involved in more than one strategy in an effort to maximize on their income.

5.0 SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1. Summary

In summary of findings, the study found out the following five key points;

Objective 1: To establish the influence of plastic waste management practices on livelihoods of informal settlement residents in Kajiado North Constituency. The study found out that plastic waste management is highly practiced by the actors. Looking at the data gotten from the field and analyzed, plastics has a percentage of 37.5%, scrap metals 28.6%, decomposing garbage 17.7% and papers 16.2%. Meaning that plastics were greatly preferred by the individual actors partly

because they are readily available and secondly because they have immediate use which makes them easy to sell. Scrap metals was also preferred by over a quarter of the respondents because they are also readily available especially at the industrial area and the garages. Scrap metals also fetch a higher price compared to the rest based on the quality and quantity of the scrap. Only a few respondents were involved in collecting decomposing garbage, this is because of its limited usage which does not translate to earning income, however a few of the respondents used it for composting while the majority of the respondents earned income by transporting the waste to dumpsites. Though the availability of waste papers in Kajiado County is high only a few of the respondents in this study were involved in waste paper collection.

Objective 2: To examine the influence of income generation from plastic waste management on livelihoods of informal settlement residents in Kajiado North Constituency. The study revealed that the Kajiado informal settlers who are actors in plastic waste management earn their livelihoods from PMW though the income varies depending on age, education and the type of waste collected. The data obtained showed that the majority of the informal waste collectors earn less than 5000 Kenyan shilling per month. In this study majority of the respondents who earn less than Ksh. 5000 were below the age of 35 years. This implied that age factor is important in income generation in that the actors are in the process of developing networks of reciprocity which would guide them in their business endeavors and which will connect them to one another and benefit from this associations and hence as age increases so does the income.

Objective 3: To explore the influence of positive changes resulting from plastic waste management on livelihoods of informal settlement residents in Kajiado North Constituency. The research has established that poverty constrains the poor to work even in humane conditions without the basic protective items. The research revealed that majority which had a representation of 44% strongly agreed that recycling plastics has a positive influence on the livelihood of the people of the informal settlements in Kajiado North Constituency.

Objective 4: To examine the policies that influences the management of plastic wastes on the livelihoods of the residents of informal settlements of Kajiado North constituency. This research has also established that the popular policy for plastic waste management in Kajiado County is recycling where the informal settlers segregate for saleable plastic items and sell them to recyclers.

The type of policy adopted by the Kajiado residents is also dependent on the type of plastic waste to be disposed. The data showed that recycling was the most preferred policy of plastic waste management in Kajiado North Constituency by the individual actors at 81.8% followed by reuse and composting at 29.2% and 5.7% respectively. Refuse disposal (12%). A lot of ascription to recycling can be attributed to the fact that there are a number of individuals who have established themselves within Kajiado County Informal settlements and are able to collate the waste materials and transport them to Nairobi for recycling.

5.2 Conclusion

The problems facing developing countries in handling of plastic waste are not impossible to solve but they need concerted effort from all sectors of society. Management of plastic waste is

the responsibility of every resident. Meaning that an all-inclusive approach should be adopted in order to achieve any meaningful and lasting solution and eliminate the exploitation of the informal plastic waste collectors. This study also concludes that in spite of segregation of plastic waste materials providing a means of livelihoods to the urban poor, it also substantially reduce the final plastic waste that needs disposal in the relevant dumping sites which at the end has both financial and environmental benefits.

It is evident from the study that the actors in plastic waste management are oblivious of their working conditions and in search of livelihood end up working in deleterious conditions which are characterized by cuts, smoke fumes, bad smell, backaches and headaches. In a nut- shell the policies employed by the plastic waste actors in Kajiado North constituency, Kajiado County to earn a living which includes and not limited to recycling, reuse and composting contributes significantly to reducing the waste that is scattered all over the informal settlement areas.

5.3 Recommendations

The study found out that the residents of informal settlement are not too poor to manage plastic waste within the Kajiado North Constituency. With a pro-poor plastic waste management approach in policy-making, including structural subsidies to informal initiatives, recognition of the individual waste workers; and life among the informal Kajiado residents need not be a life of deprivation. They should be empowered through the public private partnership to ensure livelihood sustainability.

There should be a participatory approach in the management of Plastic Waste by involving all stakeholders who include the civil society, NGOS, CBOs and the informal sector so as to facilitate the planning process, mobilization of resources and the maintenance of economic, social and environmental infrastructure.

The study found out that a lot of plastic waste is left lying in areas and therefore the local authorities should undertake management reforms to bring an end to unsightly areas of uncollected or illegally dumped plastic wastes.

The study found out that composting is not a popular strategy in the Kajiado informal settlements because of the difficulty in selling the end product. A study should therefore be conducted on composting as a plastic waste management strategy that can be economically viable to the individual actors, the farmer and the environment in general. Marketing of the end product as an alternative to the organic fertilizers should be encouraged by learning the usefulness of the composted products.

Further research on the impact of plastic waste management on the health of the residents should be conducted as a case study to establish its effect on the healthy life of an individual.

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