**Assessment of Solid waste management in Munuki Town block Juba city council**

**Presented by: Wani Moses Joseph**

**Adm No; ACPM/109/2019**

**Email: wanim4278@gmail.com**

A RESEARCH PROPOSAL SUBMITTED TO AFRICA CENTRE FOR PROJECT MANAGEMENT STUDIES IN PARTIAL FULFILMENT OF REQUIREMENT FOR AWARD OF POSTGRADUATE DIPLOMA IN PUBLIC HEALTH.

2019

**Page-1**

**Declaration**

I Wani Moses Joseph do declare that this research proposal is my original undertaking and that it has never been submitted before to any higher institution of learning for the ward of a postgraduate diploma.

Date Signature

…………………………………………… …………………………………………..

This proposal has been submitted with the approval my supervisor;

Mr. Frederick Ratemo

Africa Project Centre

Date Signature

……………………………………………… …………………………………………………..

**List of Acronyms and Abbreviations**

**SWM**- Solid waste management

**SW**-Solid waste

**MSW**-Municipal solid waste

**LCDs**-less developed countries

**UNEP**-United nation environmental program

**WHO**- world health organization?

**UNDP**-United nation development program

**JCC**-Juba City council

**VOC**-Volatile organic compound.

**Page-2**

**ABSTRACT**

There are good opportunities for juba city council (South Sudan) to provide a wide range of urban services including solid waste management in the markets around juba city which have direct positive impacts on the people’s health working in the Markets particular Custom Markets, creation of employment opportunities and poverty reduction. This study how government involves the traders in the Markets in solid waste management in order to solve the problem of uncollected waste after failure of the municipal council. The study examines the types of solid waste generated, the method of storage, collection, segregation transportation and disposal, the willingness of the traders to participate and identify problems relating to solid waste management system in Custom Market. The methods used in the study include questionnaires, interviews and observations. It has been found that there is illegal dumping of waste and over 80% of people participated the questionnaires refused to pay collect fee. The success of the solid waste management system depends on the participation of the Market residents and has a great relation with its local economy. The finding from this study could be used in preparing improved solid waste management in Markets around juba city.

**Page-3**

**Table of contents**

**CHAPTER ONE-INTRODUCTION**

* 1. **Background of the study………………………………………………………………….5-7**
  2. **Problem statement………………………………………………………………………...8-9**
  3. **Objectives of the study……………………………………………………………………...9**
  4. **Research question and Justification……………………………………………………9-10**

**1.5 Scope and limitation of the study…………………………………………………………10**

**CHAPTER TWO-LITWEATURE REVIEW**

**2.1 Overview of the study………………………………………………………………….11-18**

**2.2 Conceptual Framework and Research gaps……………………………………………..19**

**CHAPTER THREE-METHODOLOGY**

**3.1 Study design, Area and Population………………………………………………………20**

**3.2 Data collection, sampling techniques and sample size determination………………20-21**

**3.3 Ethical consideration………………………………………………………………………22**

**CHAPTER FOUR-DATA PRESENTATION & ANALYSIS**

**4.1 data presentation and analysis………………………………………………………...23-27**

**CHAPTER FIVE- DISCUSIONS**

**5.0 Discussions………………………………………………………………………………28-29**

**6.0 Recommendation…………………………………………………………………………..29**

**7.0 Limitations of the study………………………………………………………………….. 30**

**8.0 Conclusion……………………………………………………………………………........30**

**9.0 Reference…………………………………………………………………………………………………………………….31**

**Page-4**

**Chapter one: Introduction**

**1.1 Background Information**

Environmental problems like poor solid waste management begin with people as the cause and ends with people as the victims. Although development is necessary for man-kind, it should be sustainable. Hence the growing demand for proper solid waste management is the need of the hour, to protect human health and the environment from potential hazards of inappropriate waste disposal (SUJATHA,2012). Solid wastes are non-liquid wastes that arise from human and animal activities and are discarded as useless or unwanted (Andrew Lako Kasmiro 2019). Solid waste is also defined by Medina (2000) as materials generated from human activities in areas such as markets, shops, hospitals, offices, etc. Solid waste includes; both organic and inorganic fractions such as kitchen refuse, products packaging, grass clippings, cloths, bottles, paper, paint cans, batteries, etc. Solid waste generated in the municipality, encompasses heterogeneous and homogeneous wastes from urban and peri-urban regions. Solid waste management (SWM) is associated with the control of waste generation, its storage, collection, transfer and transport, processing and disposal in a manner that is in accordance with the best principles of public health, economics, engineering, conservation, aesthetics, public attitude and other environmental considerations. From the days of primitive society, humans and animals have used the resources of the earth to support and to dispose of wastes. Historically, the disposal of human and other wastes did not pose a significant problem because the population was relatively small and the land available for assimilation of waste was relatively large (Tchobanoglous *et al*, 2014).The present day problem, however, has reached a great proportion in both developed and less developed countries (LDCs) including South Sudan. Globally, solid waste generation levels are approximately 1.3 billion tons per year, and are expected to increase to approximately 2.2 billion tons per year by 2025. This represents a significant increase in per capita waste generation rates, from 1.2 to 1.42 kg per person per day in the next fifteen years (World Bank, 2015). This increase is due to development and modernization, yet some of the greatest challenges to its management are felt mostly in the developing countries (Thomas, 1998).

**Page-5**

Industrialization, rapid population growth, urbanization and the changing consumption patterns have resulted in the generation of increasing amounts of solid waste and diversification of the types (Visvanathan and Glawe, 2006; Zurbrügg, 2002). The generation of municipal solid wastes and their amount vary from place to place to a great extent; the people’s standard of living, cultural practices and also climate and season can influence their waste generation pattern (Visvanathan and Glawe, 2006; UNEP, 2003). The situation in LDCs such as Ghana, Nigeria etc is mostly caused by lack of adequate solid waste disposal facilities (Fajehisan, 1998). In Kenya, solid waste offers numerous challenges which include clogging drainage and sewers. Like other cities in the world, solid waste management is a costly venture gobbling up to 50% of the municipality revenues. This has proved to be unsustainable resulting in endless heaps of garbage dotting the scenery (Ndugire, *et al*, 2005). In cities like Kampala alone, solid waste has been rated at 0.2 metric tons per person annually on average (Ngategize et al., 2001). Therefore, considering an urban population of 3.7 million people that is; 13.4% of the total population (Uganda Population secretariat, 2007), it means that approximately 740,000 metric tons of solid waste are generated in urban areas per year. Of this, only 41% solid waste generated is disposed of properly (UNDP, 2005). The remaining 59% is left uncollected thereby ending up dumped in drainage and sanitary drainage channels, natural water courses, manholes, undeveloped plots and road sides among other unfit places. Solid waste in Juba city is managed by the department of Environment and sanitation of Juba city council, solid waste quantities which are produced in the City of Juba are large and increasing with the growing affluence and improved standard of living. Municipal waste generation average rate reaching 0.5720kg/per person/day (source Juba city council 2017), the population of Juba city is 1.500.000 such population generate approximately 942 tons of waste per day. Rain season is a higher waste generation rate. Solid waste generation changes per day in addition to the recurring seasonal variations. Collection frequency also affects waste generation; in general, a more frequent collection produces more MSW. Increasing the urbanization is one of the affects in the overall rate and the quantity of generated waste is a socioeconomic indicator and a function of the degree of a nation’s development.

**Page-6**

Table 1. the amount solid waste generated from households in three blocks of Juba city (estimated in days per ton) (source: juba city records 2017).

|  |  |  |  |
| --- | --- | --- | --- |
| Juba city council | population | Unit (kg/person/day) | Waste amount (Ton/per) |
| Munuki Block | 675,000 | 0.572 | 386 |
| Juba block | 450,000 | 0.571 | 257 |
| Kator block | 375,000 | 0.798 | 299 |
| Total | 1,500,000 | 0.654 | 942 |

(Source: Maxwell scientific organization, 2014).

Every household generates waste arising from routine activities such as cooking, sweeping, serving of food, and bush cutting. The problems associated with the disposal of wastes in public places including are numerous and they include littering of food remains and other discarded materials. This can lead to the breeding of rats and other vectors of public health importance, i.e., biological agents of exposure (Sridhar &Ojediran. However, according to Obionu, 2007, Poor waste management and disposal could lead to various diseases, infections and infestation and these include fly transmitted diseases like myiasis, diarrhoea, typhoid, cholera; rodent transmitted disease like lassa fever plague, leptospirosis, murine typhus; mosquito borne diseases such as malaria, yellow fever, filariasis, and dengue hemorrhagic fever. Nevertheless, Oxford University press, 2016 also highlighted that, poor solid waste management may lead to formation of gases like methane, carbondioxide, hydrogen sulphide and mercury vapour etc which are emitted from land fill site and may constitute air contaminants and pollution.

**Page-7**

**1.2 Problem statement**

Solid waste management continues to be a major challenge for local governments in both urban and rural areas across the world (Wang *et al*., 2011).Inadequate collection, recycling or treatment and uncontrolled disposal of waste in dumps lead to severe hazards, such as health risks and environmental pollution (Eawag, 2008; Collivignarelli et al, 2004). Nevertheless, bad waste collection practices and improper municipal solid waste disposal contribute to local episodes of disease, regional water resource pollution, and global greenhouse gases (Zhu et al., 2008). A significant proportion of the disease burden in Africa is determined by environmental factors. 28% of the disease burden is attributed to the environment, and this reaches 36% in children under 14 years of age. Risks linked with these determinants can occur naturally or as consequences of human activity like the lack of sound management of solid waste (WHO and UNEP, 2010). Improper sanitation like contamination of water bodies with human waste lead to outbreak of environmental related diseases like malaria, diarrhea, cholera, typhoid, skin and eye infections as well as increased respiratory diseases from open burning of the garbage (Businge *et al*., 2010).Study conducted by Andrew Lako Kasmiro revealed that, Juba City suffers from the aggravating problem of solid waste at the density populated, the authority of solid waste in the city of Juba City lacks experience and effective practice in the collection, transportation and disposal of waste, that it is still uses traditional methods of collection and transport of conventional waste disposal randomly in old dumps where health standards are not available, and it operates its work without prior study to the city’s population increase and urbanization in the outskirts of the city, and its lack of control over waste collection process in all three blocks (districts) regularly. neighborhoods and the marginal areas of the city where piles of garbage on the roads, water canals and space on the outskirts of neighborhoods as is the case of the neighborhoods of Kator and the old market (Konyokonyo Market) and the main streams that this phenomenon has become a concern of the city’s population, but still a limited service was provided by the administration of Juba city council to some parts of the city, especially in the main streets, the city’s residents, in some neighborhoods. This study has proved that the traditional practice for solid waste collection and disposal is useless, for example, that the citizen burnt the waste nearby houses and some citizen carries their wastes to the main streams (Khor) and when it is raining the rain water wash all the garbage to the Nile. Lack of awareness of the health risks of solid waste among families, in general, and decision makers in particular were one of the major obstacles.

**Page-8**

The illiteracy of some families and workers of solid waste administration or around of the seriousness of such wastes in terms of the types of pests, diseases, and germs may transmit to the healthy and the resulting loss of lives, financial losses, and time which we desperately need. Improving solid waste collecting and disposal requires the ability and the proper approach, and it is linked to improving and maintaining the local infrastructure and as soon as possible due to the urgent need to upgrade local roads in some neighborhoods of the city so that the vehicles’ have the ability to gather during the raining season and in all conditions. Informed by the facts above, this paper seeks to have an assessment of the solid waste management system in Munuki town

**1.3.1 The main research objective**

1. To assess the solid waste management at households in Munuki town block juba city council.

**1.3.2 Objectives of the research**

1. To determine the types of solid waste generated at custom market in Munuki town block
2. To Identify the solid waste storage methods at the custom market in Munuki town block
3. To find out how solid waste are collected, segregated and transported to the dumping site.
4. To determine the solid waste disposal methods and disposal sites.

**1.4 Research Questions**

1. What are the types of solid waste generated at the households?
2. What are the methods used for the storage of solid waste?
3. What are the means used to transport the stored waste?
4. How is the solid waste stored are transported to the disposal sites?

**Page-9**

**1.5 Research Justification**

Against the above background, the findings of this study will help the juba city council to improve the ways of managing solid waste. This study will serve as a reference point for Juba City Council (JCC) and the other health implementing agents to maximize their interventions on solid waste management in residential areas. Not only that, the study will contribute to the existing body of knowledge on solid waste management and also stimulates further research on the subject in other areas within the municipalities.

**1.6 Scope and Limitations of the Study**

This study will be conducted in Custom Market, Munuki Town Block, Juba City targeting the traders, food and vegetable sellers as the population participating in the research to understand the sources, storage, transportation and disposal of solid waste generated in the Markets. The research is estimated to take four weeks (Week 50 Dec 2019 to Week-1 Jan 2020) to complete and will be conducted by once Academician and two Research assistants. Solid waste management is a major problem in the world in general and Juba city markets areas in particular and this pose a very serious health risks to the people living within the dumping sites and generation of greenhouse gases from landfills that has resulted in global that is been experienced in forms of floods, landslides and drought in the world. Therefore, an immediate solution is need to minimize the impact of the solid waste on the environment. However, the study is going to face numerous challenges which include; lack of willingness by the respondents to provides information on the generation of solid waste and disposal methods. Lack of internet and monetary resource to accomplish the research within the mentioned period.

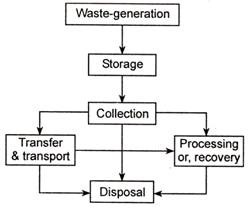
**Page-10**

**Chapter two: Literature review**

**2.0 Overview**

Waste is an unavoidable by-product of most human activity. Economic development and rising living standards in the world and in particular Asian and Pacific region have led to increase in the quantity and complexity of generated waste, whilst industrial diversification and the provision of expanded health-care facilities have added substantial quantities of industrial hazardous waste and biomedical waste into the stream with potentially severe environmental and human health consequences (United Nations, ESCAP). Solid waste can be classified into different types depending on their sources: industrial waste as hazardous, household waste is generally classified as municipal, biomedical waste or hospital waste as infectious and E-waste electronic waste

***Figure -1 Simplified diagram showing inter-relationship of the functional elements in a solid waste management system.***



***Source: Hceramum, 1993***

**Page-11**

**2.1.To determine the types of sloid waste generated**

Waste generation encompasses activities in which materials are identified as no longer being of value and are either thrown away or gathered together for disposal. For example, the warping of a candy bar is usually considered to be of little further value to the owner once the candy is consumed and more often than not it is just thrown away, especially outdoors. It is important in waste generation to note that there is an identification step and that this step varies with each individual waste. Knowledge of the quantities of solid wastes generated, separated for recycling, and collected for further processing or disposal is of fundamental importance to all aspects of solid waste management (Takele 2014). Globally, Composition of municipal solid waste provides a description of the constituents of the waste and it differs widely from place to place. The most striking difference is the difference in organic contents which is much higher in the low-income areas than the high income, while the paper and plastic content is much higher in high income areas than low income areas. This reflects the difference in consumption pattern, cultural and educational differences. In higher income areas disposable material and packaged food are used in higher quantities; this results in the waste having higher calorific value, lower specific density and lower moisture content.

In the case of lower income areas, the usage of fresh vegetables to packaged food is much higher. This results in a waste composition that has high moisture content, high specific weight and low calorific value (Bolaji, 2012).In Africa, solid waste is normally comprised of food wastes, rubbish, demolition and construction wastes, street sweepings, garden wastes, abandoned vehicles and appliances, and treatment plant residues. Quantity and composition of solid waste (SW) vary greatly for different municipalities and time of the year. Factors influencing the characteristics of solid waste are climate, social customs, per capita income, and degree of urbanization and industrialization. The composition of solid waste as collected may vary greatly depending upon geographical region and season (Gaurav at el, 2014)

**Page-12**

Most of the solid waste in South Sudan capital Juba that are seen to be occupying the streets in the city include paper bags, plastic bottles, food remains, metallic iron and other waste from demolitions (Maxwell Scientific Organization, 2014). Study conducted by Andrew Lako Kasmiro shown the Components of Juba city Municipal Solid Waste, are plastic (Bags and Bottles), the common wastes which comes from the city, and this poses high risk to the environment. In the absence of appropriate waste management most of these wastes are burned and possibly produce a considerable amount of VOC (Volatile Organic Compounds) in addition to this when it is buried it may stay non- degradable in the soil for along years about (30 years). Food waste (organic wastes) is the second large waste produce after plastics (bags and Bottles) 20% follow by Garden wastes 17%, and papers 13%, metals 6%, Textile (Clothes) 3% very little waste discarded. Population of Juba city is 1.500.000 such population generate approximately 942 tons of waste per day. Rain season is a higher waste generation rate. Solid waste generation changes per day in addition to the recurring seasonal variations. Collection frequency also affects waste generation; in general, a more frequent collection produces more MSW.

**2.2 To identify solid waste storage methods**

According to Tchobanoglous et al (1977), solid waste storage means a stage where solid waste is stored before it is collected. It could be stored in a skip or dustbins and not thrown away indiscriminately. According to them, storage is of primary importance because of the aesthetic consideration. Garbage and refuse generated in kitchens and other work areas should be collected and stored in properly designed and constructed water-proof garbage cans (waste bins). The cans or receptacles can be constructed from galvanized iron sheet or plastic materials. They should have tightly fitting covers. They must be of such size that, when full, can be lifted easily by one man. They should be located in a cool place over platforms, at least 30 centimeters above ground level. After putting in garbage, they should be kept covered. The bins must be emptied at least daily and maintained in clean conditions. An adequate number of suitable containers should be provided with proper plat forms with receptacles stand. The number may depend on the amount, type and establishments where the need arises. Suitable containers shall be water tight, rust resistant, tight fitting covers, fire resistant, enough size, light in weight, side handle and washable (Takele, 2004)

**Page-13**

The variables that impact the volume required for the storage of solid waste are: individual rate of waste generation, number of individuals living in the premises and frequency of collection. There are various methods of waste storage for both domestic and commercial waste. They include; plastic buckets (with Lids), Plastic bins (with Lids), Galvanized steel or plastic bins (with lids), disposable plastic bags and other items commonly used for storage of wastes e.g. cardboard, kerosene cans and containers (Flintoff, 1984). Wagner (2008) explained that solid waste in Germany must be sufficiently pre- treated before final disposal. Thermal and high performance mechanical, biological processes may be employed for this pre- treatment. Due to the current lack of sufficient operating capacity in the corresponding facilities, part of the waste stream must be held in interim storage until treated or until further utilization becomes possible. In addition, the temporary storage of solid waste is of relevance for the situation of other European countries which are under pressure to reduce the proportion of biodegradable waste going to landfill.

In the Accra households it is not uncommon to find open waste containers. Many households store their waste in baskets and plastic bags with no covers. The hot and humid weather conditions favor accelerated fermentation of organic matter making it a suitable breading place for insects and vectors (Prudence, 2014). According to Mabel (2008), in a household study on solid waste management, it indicated that the household wanted a communal bin or pit done outside their houses and the location of the communal bin or pit done in conjunction with the opinion of the residents. Fassler et al., (2009) conducted research on storage of solid waste, most of the respondents (67%) reported that solid waste was initially stored in dustbins at source because it has a sufficient capacity that is easy to empty and clean, long lasting to use compared to polythene papers. This concurred with a study by Jose, (2016) on Knowledge, attitude and practice on solid waste management among secondary school students. In his findings, it indicated that waste bins were highly preferred for solid waste storage (58%).

**Page-14**

**2.3 To find out how solid waste are collected, segregated and transported to dumping site**

**Collection**

Waste collection is a critical component to waste management. The economic and environmental  
performance of the entire system can be impacted by the way that materials are collected and sorted. In many instances, the collection point will be an interface where waste generators and waste collectors must be carefully managed if the system is to be effective. Waste generators require waste collection with minimal inconvenience, while collectors must be able to collect waste in a way that is compatible with the planned treatment and processing methods if the waste management system is to be sustainable (McDougall et al., 2001).  
Within many firms in the world, waste is generally handled in one of two ways: custodial collection, or self-haul collection. Custodial collection involves custodial staff collecting and transferring of waste. This typically involves emptying out and maintaining publicly accessible collection bins and transferring them to a larger storage container which is typically located in a centralized area with controlled access. With self-haul collection systems, employees are responsible for ensuring that their waste is managed and sent to a collection point. This essentially means that there are no custodial staff who are responsible for handling waste. Employees are responsible for collecting and handling waste as part of their regular duties. Examples of organizations which may not have dedicated custodial staff include restaurants, supermarkets and convenience stores. With organizations like this, a greater number of people are involved with managing and handling waste. Storage containers and storage areas must have enough room to allow for the easy movement of collection carts, access to the larger storage bins, and compliance with health and safety regulations (CCME, 1996). Zayani (2010) stated that collection of municipal solid waste is the responsibility of local municipalities in Egypt. However, in Cairo and other big cities of Africa, waste collection is subcontracted to local “zabaleen” (garbage collectors), and in recent years to private local and multinational companies. The average collection rate in urban areas is 30-77 %, in Cairo it ranges between 0 % in the slums and the poor neighborhoods and 90 % in the private residential compounds.

**Page-15**

Collection frequency in densely populated areas within developing countries should be every day or two, because the waste content is highly organic and warm temperatures lead to rapid decay of the wastes and to insect propagation, and space for waste storage on the resident's premises is often severely constrained; manual or animal powered pushcarts are often the principal mode of access and collection in slum and shanty neighborhoods; tractor or animal powered collection vehicles have potential if traffic speed is typically under 40 kilometers/hour; and long travel times between the-collection service area and the available land disposal sites suggest that transfer stations, whereby waste is transferred from a small vehicle or cart to a large vehicle, may prove economically viable. Often a city avoids selecting the most appropriate technology for its urban setting, because it has plans to upgrade roads and traffic conditions. It must be remembered that refuse management equipment is short-lived, with useful life periods for collection vehicles commonly estimated as being between 5 and 8 years. It is possible, and often desirable, to implement interim solutions using animals, carts and tractors, for example. These items are also quite salable, and may be auctioned if the city makes rapid progress in its upgrading program and wishes to retire these items before they are fully spent (Sandra, 2013)

**2.4 Transport of Solid Wastes**

In the field of solid waste management, the functional element of transfer and transport refers to the means, facilities, and appurtenances used to effect the transfer of wastes from one location to another, usually more distant, location. Typically, the contents of relatively small collection vehicles are transferred to larger vehicles that are used to transport the waste over extended distances either material recovery facilities or to disposal sites. Transfer and transport operations are also used in conjunction with material recovery facilities to transport recovered materials to markets or waste- to- energy facilities and to transports residual materials to landfills. Usually the collection vehicle is also used for the long-distance transport of refuse though it is becoming more common to transport refuse to a local “transfer station” where the waste is then transferred to a larger vehicle. Thus, it must be large enough to minimize the number of trips to the processing site, yet small enough to be maneuverable during collection. If the distance to the disposal site is large, then the waste is typically transferred to a larger vehicle such as truck trailer, rail car, or barge (Takele, 2004).

**Page-16**

Transfer stations are used to collect the refuse at a central location and to reload the wastes in to a vehicle where the cost per kilogram-kilometer ton-mile will be less for the movement of the ultimate waste to the disposal site. Transfer stations are employed when the disposal site is situated at significant distance from the point of collection. The transfer station can reduce the cost of transporting refuse by reducing man power requirement and total kilometers. When a collection vehicle goes directly to the disposal site the entire crew, driver plus laborers are idle. For a transfer vehicle only one driver is needed. As the distance from the centers of solid waste generation increases, the cost of direct haul to a site increases. Ideally, the transfer station should be located at the center of the collection service area (Takele, 2004). A transfer station may include stationary compactors, recycling bins, material recovery facility, transfer containers and trailers, transfer packer trailers, or mobile equipment. The transfer station should be located and designed with drainage of paved areas and adequate water hydrants for maintenance of cleanliness and fire control and other concerns like land scaling, weight scales, traffic, odor, dust, litter, and noise control. Transporting vehicles could be a modern packer truck (trailer), motor-tricycles, animal carts (appropriate for developing countries), hand carts and tractor. Transfer and transport station should provide welfare facilities for workers (lockers, toilets, showers); small stores for brooms, shovels, cleaning materials, lubricants, parking facilities for hand trucks, sweepers, refuse collectors, and office and telephone for the district inspector (Takele, 2004).

**2.5 To determine the solid waste disposal methods and disposal sites**

Solid waste disposal has been identified as a major cause of pollution and environmental threat. The quantity of solid waste grows faster than population (Vinod &Venugopal,2010). Globally, there are various methods of waste disposal including; landfilling, incineration, open burning, crude dumping, reuse, recycling and composting. However, each waste generated should be disposed off with an appropriate method considering its effective on human and environment (Hamer, 2003). In developing countries, final disposal of solid waste must be an inseparable part for planning of integrated waste management. This must go hand in hand with recycling strategies to minimize the quantities of waste requiring final disposal. The estimate of waste requiring final disposal needs to be based not on how much waste is produced but on the estimate of quantities left, requiring disposal.

**Page-17**

Municipalities could develop safe disposal practices like sanitary land filling, reuse, composting, incineration, gasification and pyrolysis. However, are there many reasons why safe disposal is rarely practiced. Municipal capacity in handling the waste, political commitment, finance and cost recovery, technical guidelines, location, institutional roles and responsibilities (Mansoor,2015).Juba city council, department of environment and sanitation is a body in charge of management of all waste types within three blocks of juba city but only the garbage collection just limited to the markets and business places, restaurants and roads, main streets and in some areas like-first and second-class residential areas, hence covering a small area of the city due to lack of fund, facilities, e.g. Tipper/Compactor trucks to collect the garbage, lack of private companies to take over residential areas in garbage collection.(Andrew Lako Kasmiro,2019). A cause for serious concern is that most localities dispose of, and sometimes burn, their waste in random open dumps that do not adherence to health and safety requirements. Local authorities use the burning method for volume reduction or for financial reasons. The budget for disposal is very small and does not cover further treatment. Thus, localities perform waste disposal services according to the available resources from the collection fees. In turn, collection services deteriorate because the localities have highly limited financial resources. The gathered information indicates that Juba does not employ and sorting or recycling processes for waste. Sorted recyclable wastes from households are also uncollected. In addition, specific containers for waste segregation are unavailable. people throw away materials as waste regardless of their possible benefits. These types of waste mainly include iron, aluminum, pipes, plastic bags, plastics, magazines, and newspapers.

**Page-18**

**2.6 conceptual framework**

**Problem**

**Approach**

**Mechanism**

**Participation and partnership, (public, private and popular sectors)**

**The Juba city council and municipalities as lead partners in SWM practices** provisions

**Wastes generators, shops, restaurants, Groceries, Metal workshop and Bars**

**1-Timely and reliable SWM services**

**2-Enhanced environmental cleanness**

**Output**

**2.7** **Research gaps**

Lack of fund from government for garbage collection, Lack of compactor Trucks to collect the garbage, higher rate of renting trucks for garbage disposal. Lack of private companies to take over residential area in garbage collection. Most of the staffs are not trained in the field of waste management, another thing is Impassable roads in some market parts. Unwillingness of some business owners in paying garbage collection fees, Low salaries for the cleaners. Deteriorating economy has made things difficult in the markets, etc

**Page-19**

**Chapter three: Methodology**

**3.1 Study Design**

The study will be a descriptive cross-section and observational studies, which will be carried out using quantitative method of data collection and observation in the course of collection of data (NEDARC 2010).

**3.2 Study Area**

Custom market juba city council Munuki town block. It is located about 10km East, away from the historic city center and the bank of the river Nile. The Market lies in the coordinates; latitude of 4.50’ 48.55’’ and Longitude of 31. 34’51.58.’’ The market was established in 1960s, the area was initially outside of the town limits until an industrial Zone, Hai Mauna, was established in 1970s, further down the road towards the mountain, Jebel Kujur (Jubainthemaking.com, European Journalism centre). As indicted by its name, custom was established as a checkpoint where goods coming in and out of juba were inspected and taxed. As a result of influx of goods and services, the area grew to the current densely populated market, with poor market structures and many illegal operating restaurants and shops, leading to production of large quantity of solid waste on daily bases littering the surrounding areas and the streets. No data on the exact number of shop and restaurants in Custom markets.

**3.3 Study population**

The study population will comprise of the shop owners (Traders), restaurant owners, vegetable and second hand cloth sellers in Custom market juba city council Munuki Town block.

**3.4 Data collection techniques**

Questionnaires and observation check list will be used for data collection during the study.

**Page-20**

**3.4.1 Sampling techniques**

The shop owners, vegetable and second cloth sellers will be selected randomly. The shop number is written on a small piece of papers, rolled and put in a small tin and shaken and the shop owner are asked picked the papers at a random and it will be the shop for the study. A sample size of 220 shops will be selected from 514 shops using stratified proportion to size sampling technique.

**3.4.2 Sample size determination**

The sample size is determine using Kish Leslie formula as below,



Where;

n= is the minimum sample size required.

Z= Standard normal deviation set at 95% confidence interval corresponding to 1.96.

P= Expected prevalence (proportion) 50%. This is because prevalence in same or related topic from other studies is not available.

d = Degree of error allowed set at 5% equivalent to 0.05

Therefore

n =

n = 384

Therefore: n = 384

To get the desired sample size, the formula nf =n/1+n/N is used.

Where: - nf = desired sample size pop<10,000

n= calculated sample size

N = total Number of shop and restaurant owners in Custom Market

nf =384/1+384/514

nf = 220

Therefore, a total of 220 shop owners will be interviewed

**Page-21**

Table-2 **Variables and indicators of variables**

|  |  |
| --- | --- |
| **Variables** | **Indicators of variables** |
| Waste generation | Activities in which materials are identified as of no value and are either thrown away or gathered together for disposal |
| On-site handling, shortage and processing | Activities associated with the handling, storage, and processing of solid wastes at or near the point of generation. |
| Collection of waste | Activities associated with the gathering of solid wastes and the hauling of wastes after collection to the location where the collection vehicle is emptied. |
| Transfer and transportation | Activates associated with (1) the transfer of wastes from the smaller collection vehicle to the larger transport equipment and (2) the subsequent transport of the wastes, usually over long distance to the disposal site. |
| Processing and recovery | Techniques, equipment and facilities used to improve the efficiency of recovering usable materials, conversion products, or energy from solid wastes. |
| Disposal | Those activities associated with ultimate disposal of solid wastes including those wastes collected and transported directly to a landfill site, semisolid wastes (sludge) from wastewater treatment plants incinerator residue compost, or other substances from the wires solid waste processing plants that are of no further use. |

**3.5 Ethical considerations**

An introductory letter from the Africa project center, department of Public Health. Clearance for conducting this research will be sought from the authorities of Munuki town block, chamber of Commerce Custom Market Juba city council. Written Consent will be obtained from the respondents prior to interviews. Any information obtained will be handled with high degree of confidentiality; as there is no mentioning of people’s names but using their signatures on the data collection tools.

**Page-22**

**3.6 Data processing and analysis**

Data will be entered in excel spread sheet version, it will be analyzed and presented inform of tables, graphs and pie-charts.

**Chapter four: Presentations of findings, analysis and interpretation**

**4.0 Solid waste generation**

Solid waste in Custom Market Munuki town block is manage by department of environment and sanitation of Juba city council. Solid waste quantities which are produced in the Custom Market are large and increasing with growing affluence, import of goods from East Africa, Europe, America and Asia as well improved standard of living. Municipal waste generation average 0.570kg/person/day (source juba city council 2017). Rain season is a higher waste generation rate, solid waste generation changes per day in addition to the seasonal variations. Collection frequency also affects waste generation in general, a more frequent collection produces the MSW. Increasing urbanization is one of the affects in overall generation of solid waste in many countries (Pokharel Viraraghavan et al.2005). the quantity of generated is socioeconomic indicator and a function of the degree of nation’s development. The difference in waste generation between cities in developed countries is 1.5-2kg/person/day and those in developing countries generally less than 1kg/person/day is noteworthy (Guermoud and al 2009). This significant difference is due to consumption modes, as industrialized countries consumes more products and use more packaging.

**4.1. Solid waste sources and composition**

This section provides sources and composition data produced in Custom Market of Munuki Town Block of Juba City Council. Solid waste sources identified in the studies included; shops, Restaurants, groceries, bars and carpentry and metal workshops with the Shops generation the largest of solid waste in the Market. The solid waste core generated in the Market include, food waste, plastics (bags and bottles), paper, textiles, Metals and gardens wastes (rotten fruits and vegetables).

**Page-23**

It contains mixed composition of waste including both degradable and non-degradable, and the waste are normally collected without sorting. Composing is one of the ways of recycling bio-gradable waste. Most of the non-degradable wastes are recyclable materials, whereas degradable waste can decompose. Plastics mainly come from water and fruits juice bags and containers (source Juba City Council).

**Table-3** Showing sources of solid waste generation and number of respondents

|  |  |  |  |
| --- | --- | --- | --- |
| s/n | Sources of solid waste | Number of respondents | Percentage of respondents |
| 1 | Shops | 97 | 44% |
| 2 | Restaurants | 48 | 22% |
| 3 | Vegetable | 44 | 20% |
| 4 | Bars | 18 | 8% |
| 5 | Workshops | 13 | 6% |

(Source, field survey Dec,2019)

**Figure-2** Showing percentage of Sources of Solid waste generation in Custom Market, Juba City Council, South Sudan. **Page-24**

At first it was difficult to identify the sources of Custom market waste generation. Based on the data collected, most of the waste comes from Shops 44% followed by 22% restaurants and considerable amount of daily waste need to be treated and followed by grocery, workshops and Bars the least as shown in table-3 and figure-2 above.

Table-4 showing different types of solid waste generated in Custom Market of Munuki Town Block, Juba City Council (Source, field survey, Jan 2020).

|  |  |  |  |
| --- | --- | --- | --- |
| S/n | Types of solid wastes | Number of respondents | Percentage of respondents |
| 1 | Plastics (bags and Bottles) | 90 | 42% |
| 2 | Food wastes | 44 | 21% |
| 3 | Grocery products (rotten fruits and vegetables) | 37 | 17% |
| 4 | Papers, cartons and empty boxes | 29 | 14% |
| 5 | Scrapes (Metals and saw dust) | 13 | 6% |
| 6 | Textile (old cloths and pieces of clothes) | 7 | 3% |

**Page-25**

**Figure-3** Showing the percentage of types of solid waste generated in Custom Market of Munuki town Block, Juba City (Source, field survey, Jan 2020).

The components of Market solid waste during the field survey and observed were plastics (bags and bottles) are the common waste shown on figure-3 41% according to respondents, this poses high risk to the environment. In the absence of appropriate waste management most of these wastes are burned and possibly produce a considerable amount of VOC (volatile organic compound) in addition to this once buried it may stay non-degradable in the soil for many years (30 years). Food wastes (organic waste) is second largest waste produced after plastic (bags and bottles) 20% as shown in figure-3 and table-4. This is followed by Garden waste 17%, Papers 13%, Metal work 6% and Textile discharging very little about 3%.

**4.2. Solid waste Collection, Transportation, Disposal and Recycling**

Juba city council, department of Environment and sanitation is a body in charge of management of all waste types within three Blocks (Districts) of Juba city but only the garbage collection just limited to the markets and business places, restaurants and road, main streets and in some areas like first- and second-class residential areas the collection is just covering small area and the rest of residential areas without collection services due to lack of fund, facilities e.g.; tipper/compactor trucks to collect the garbage’s, lack of private companies to take over residential areas in garbage collection.

**Page-26**

Juba city council department of Environment and sanitation has five zones all lies within the area map of Juba city administration managed by a zonal coordinator together with environmental officers and public health officers, rate collectors, supervisors. Operates on a centralized system where all the garbage trucks are sent from head office to the zones no containers provide by the city council.

Collection and transport are of significant importance in reducing waste accumulation, Solid waste collection and transport are often conducted in the morning’s hours. Lack of funding and inadequate maintenance causes a shortage of vehicles for waste collection, Juba city council ability to maintain waste collection is low and the 10 vehicles owns by Juba city council are broken out of three compactors provided by UNICEF in September 2016, one has already broken and not operational. Efficient solid waste collection depends on the proper selection of vehicles, which should be enforced with a consideration of road conditions, and availability of spare parts, servicing requirements, and haulage distances.

The gathered information indicates that Juba does not employ and sorting or recycling processes for waste. Sorted recyclable wastes from Markets are also uncollected. In addition, specific containers for waste segregation are unavailable. people throw away materials as waste regardless of their possible benefits. These types of waste mainly include iron, aluminum, pipes, plastic bags, plastics, magazines, and newspapers.

**Page-27**

**5.0. Chapter five. Discussions**

Juba City suffers from the aggravating problem of solid waste at the density populated, based on the data collection and analysis, it was revealed that the authority of solid waste in the city of Juba City lacks experience and effective practice in the collection, transportation and disposal of waste, that it is still uses traditional methods of collection and transport of conventional waste disposal randomly in old dumps where health standards are not available, and it operates its work without prior study to the city’s population increase and urbanization in the outskirts of the city, and its lack of control over waste collection process in all three blocks (districts) regularly. The Markets, neighborhoods and the marginal areas of the city where we find piles of garbage on the roads, water canals and space on the outskirts of Kator and the old market (Konyokonyo Market) and the main streams is a phenomenon and has become a concern of the city’s population, but still a limited service was provided by the administration of Juba city council to some parts of the city. The Main aim of the study attempts to examine the current situation and practice of Municipal solid waste management in Custom Market. However, laws and regulations to preserve the environment are not applied due to lack of a suitable mechanism by the administration of the solid waste in Juba without exception, while it was found that some developing countries apply regulations and texts that support and keep the environment clean. This study has proved that the traditional practice for solid waste collection and disposal is useless, for example, the residents of the Markets burnt the waste nearby shops and some traders carry their waste to the main Streets and Streams (Khor) and when it is raining the rain wash all the garbage to the Nile. Lack of awareness of the health risks of solid waste among families, in general, and decision makers in in particular were one of the major Obstacles. The illiteracy of some families and workers of solid waste administration or around of the seriousness of such wastes in terms of the types of pests, Diseases and germs may that be transmit to healthy people and resulting into loss of lives, financial losses and time which desperately needed Improving solid waste collection and disposal requires the ability and proper approach and it is linked to improving and maintaining the local infrastructure and as soon as possible due to the urgent need to upgrade local roads in the neighborhood of Markets so that vehicles have access together garbage during rainy season and in all collections.

**Page-28**

The study revealed a lack of awareness of the Citizens on how to get rid of Market waste routes properly, the respondents believe that the solid waste are thrown in open places in the city, rubbish and waste end to be burn as a suitable way of getting rid of wastes. The more applicable means of collecting waste is provision of container categorized into three different color of containers known as (green, blue, and brown colors), and they should be provided with a lid. For instance, the first container should be used for storing paper and cardboard, the second should be used for other recyclable materials, and the third one should be used for organic materials. It is preferred that the containers that will be used in institutions such as Restaurants, shopping centers, and Groceries should be designed according to the quality and quantity of waste generated by the institutions. Another important strategy for improving Market solid waste management in the city is that the roadside waste collection. It is a method where residents/traders sort recyclable items into the specific collection containers offered by the local authorities. Although many residents collect the relatively high valuable things from the domestic wastes before they place them into the collection sites, most reusable and recyclable items are used to be sent to dump site and burn them there without recycling. Solid waste collection is considered one of the most important processes in the management of solid waste the one who directs monitors and evaluates the performance daily or weekly collection process, the timetable should be design and given to drivers put programs specific time of collection.

**6.0. Recommendations**

According to the results from the data analysis, the following recommendations are presented and proposed to improve the Markets solid waste. (1) Municipal solid waste Management problem in South Sudan especially in Juba town required collective responsibility and authority. This responsibility should be shouldered by local authorities at the state and national level including: the private sector, government and non-governmental organizations. (2) The government should provide the best service to the society, the different unit operations involved in collection, storage, transport, recovery and disposal. (3) Reduce the use of drinks poly bottles for storing water; (4) Ban the use of plastic (bags and water bottles). (5) Encouraging use of (bag and water bottles) that environmentally friendly.

**Page-29**

(6) Recycling of solid waste should be considered as one of the alternatives to waste disposal. (7) The Public health authority should provide standard waste containers or garbage bags to each shop/Restaurant or Grocery and must be collected after three days. (8) The government should create the program of public health and environmental awareness on local radios and televisions.

**7.0. Limitations of the study**

Lack of fund from government for garbage collection, Lack of compactor Trucks to collect the garbage, higher rate of renting trucks for garbage disposal. Lack of private companies to take over residential area in garbage collection. Most of the staffs are not trained in the field of waste management, another thing is Impassable roads in some market parts. Unwillingness of some business owners in paying garbage collection fees, Low salaries for the cleaners. Deteriorating economy has made things difficult in the markets, etc

**8.0. Conclusion**

This study on solid waste disposal in Custom Market Munuki Town Block Juba City is intended to be a pointer to the problems of solid waste management and their implication to environmental health rather than offering scientific solution to them. The result of this study reflects in poor solid waste management as most of the disposed waste are done locally and, in most cases, burned regularly emitting high smoke in the air nearest to resident. The best way of solving the problem is provision of facilities and sanitary disposal of solid waste far away from the residential areas.

**Page-30**

**Reference**

1. Municipals solid waste management in juba city, a case study of juba city, South Sudan. Andrew Lako Kasmiro, <http://dx.doi.org/10.29322/IJSRP.9.01.2019>.
2. Solid waste management in Chennai city, Indian J. Edu. Inf. Manage., Vol. 1, No. 3, Sujatha. P & Janardhanam PVS, Mar 2012.
3. Tchobanoglous, Theisen, & Vigil, 2014, Solid Waste Management practices. Journal of Waste Management
4. Visvanathan, C. and U. Glawe, 2006. Domestic solid waste management in South Asian countries: A comparative analysis. Presented at 3rd South Asian Expert Workshop, August 30 - September 1, Kathmandu, Nepal
5. World Bank (2015): Waste generation, urban development series – knowledge papers
6. Sridhar, M.K.C., &Ojediran, O. (2014). The problems and prospects of refuse disposal in Ibadan City, Nigeria. Journal of Environmental Health, 46(6), 28-31.
7. McDougall, F. R., White, P. R., Franke, M., & Hindle, P. (2001). Integrated solid waste management: a life cycle inventory (2nd ed., p. 544). Blackwell.
8. Medina, M. (2000). Globalization, development, and municipal Solid waste management in third world cities
9. Sridhar, M.K.C., &Ojediran, O. (2014). The problems and prospects of refuse disposal in Ibadan City, Nigeria. Journal of Environmental Health, 46(6), 28-31.
10. Takele Tadesse (2004), Solid Waste Management, Ethiopia Public Health Initiative
11. Thomas-Hope, E., 1998. Solid Waste Management: Critical Issues for Developing Countries. Canoe Press, Kingston

**Page-31**

Appendices



(Source: Maxwell scientific organization, 2014) one of the dumping site in Juba city.

**Page-32**