Status of Financial Resources and Willingness to Pay for Solid Waste Management in Juba City, South Sudan

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ABSTRACT

Juba City councils establish and strengthen a fee collection system for securing financial resources and establishing transparent and systematic budget compilation, execution, and reporting processes to stabilize and restore the finances of Solid Waste Management. In the mid-term plan by 2025, the current fee collection system is planned to be reviewed, and systematic budget management using independent accounts is introduced. The fee collection from households by the blocks and quarter Councils and the department of environment and sanitation of Juba City Council strengthen the fee collection for market and commercial waste collection, it is strengthening the waste collection system of Juba through the procurement of waste collection vehicles by the JICA Grant Aid Project and relation-building with the private sector. Following the plans, it is important to secure the financial resources by strengthening the fee collection system. The findings of the study showed that (66.7%) of the respondents are willing to pay for solid waste management services in Juba from 2000 – 4000 SSP per household, per month. According to the survey conducted by JICA (2020), approximately 80% of the residents were willing to pay for the wastes collection fees and the results showed that 430 SSP per household, per month would be appropriate and the average monthly income of the residents in the study area was 5,200 SSP, which represents about 8% of their monthly income. The Department of Environment and Sanitation of Juba City Council has an independent account specialized in Solid Waste Management, but they don't make good use of the account. It is recommended to improve the transparency of the budget including revenue and expenditure, by using the account. In the long-term plan by 2030, it is planned to introduce a budget assessment for the transparency and sustainability of the budget requested to understand the whole SWM activities in Juba, it is important to compile the annual report and the annual plan for the following fiscal year on SWM every year (SWM Master Plan in Juba, 2020).

Keywords: Financial, Resources, Solid Waste, Management, willingness

INTRODUCTION

In Developing Countries, resources are scarce, and the dissemination of these limited resources is mishandled. Many municipalities are struggling to achieve an acceptable quality of service due to this financial problem (McAllister, 2015). The important essential terms, long-term financial costs as well as short-term operating costs, must be taken into account, and financial aspects for SWM concern budgeting, cost accounting, Cost reduction, Capital investment, and cost recovery (Schubeler, 1996; Coffey and Coad, 2010). Adequate budgeting, cost accounting, financial monitoring, and financial evaluation are important to the effectiveness of solid waste management (Schubeler, 1996). The ways to improve waste management are to improve the status of financial

resources, operating costs, and management cost recovery (Hufane, 2015). Solid Waste Management in developing countries is mainly attributed to technical inefficiencies and displays an array of problems (Shubeler et al., 2015; Coffey and Coad, 2010). Financial Pressure experienced by almost all local governments encourages the tendency to concentrate only on the short-term operating costs and ignore the longer-term financial costs. This tendency will result in a crisis in a few years (Coffey & Coad, 2010). Financial constraints, inadequate service coverage, equipment, inadequate landfill disposal, operational inefficiencies, ineffective technologies, and limited utilization of recycling initiatives are all constraints of solid waste management (McAllister, 2015).

Financing, the city government should allocate enough money for the provision of solid waste management, improving payment rates for collectors, providing incentives, and designing revenue generation mechanisms (Muche, 2016). However, to improve the financial situation, the municipalities must adopt strategies like waste segregation, and door-to-door collection with waste being collected daily or twice a week, and the waste that cannot be composted or recycled should be landfilled (Yaday, Devi & Singh, 2010). The financial effectiveness of municipal solid waste management (MSWM) is based on life cycle costs and long-term economic impact. Financial analysis is a very crucial input to strategic planning and investment programming (Yaday et al, 2010), unless funds are continuously available without any delay, it is impossible to run a regular collection service and any system that has been set up will collapse rapidly and come to stop (Coffey and Coad, 2010). According to Zurbrugg (2003), the main reason for inadequate collection services is the lack of financial resources to cope with the increasing amount of waste generated. The largest portion of the financial cost is spent on street sweeping, waste collection, and waste transportation, and no financial cost is allocated for modern disposal systems such as landfilling or incineration due to insufficient funding (Alam, Chowdhury, Hasan, Karanjit, and Shrestha, 2008). Also, Christen and Berne (1996) stated that improvement of financial aspects in municipalities' solid waste management can be achieved by attaching solid waste fees to the billing for another service, such as water supply (Schubeler, 1996).

The types of finance in Juba are own revenue and subsidy from the state government, and the subsidy is allocated for the City Council to cater for administration and operational costs. Juba City Council (JCC) gets its finances from approval fees for business, construction, tax, and license fees for commercial vehicles, charges for issuing trading licenses, and revenue from the blocks, including rental fees for assets such as exhausters, license fees for shops, and property tax. The revenue of the Department of Environment and Sanitation, in consultation with the Juba City Council (JCC) administration, sets the prices of the monthly fee for waste collection services. It collects fees for solid waste dischargers in big restaurants, hotels, Companies, UN compounds, NGO compounds, Institutions, Ministries, National parliament, Airport, Hospitals, Shops, Residents, Schools, factories, Petrol stations, Sewages, warehouses, Supermarkets, Radio/TV, Private electricity distributors, health Centre's, Environmental damages. The blocks collect fees from those various areas in Juba City (Samuel, J. Luate, 2015).

Basic Concept of finance on solid waste management in Juba, South Sudan Revenues,

Solid waste management (SWM) revenues in Juba come from three sources such as waste collection fees, issuing permission to sewerage tankers and waste collection vehicles, and fines and penalties. Most of the revenue comes from the waste collection fees, with the fees collected from markets accounting for 62% of the total. Markets: SSP 11,159,276 Hotels: SSP 2,070,000 Institutions: SSP 492,000 Issuing Permission to Sewerage Tanker: SSP 3,298,000 Issuing Permission to Waste Collection Vehicles: SSP 576,000 Fines and Penalties: SSP 500,000 Grand Total: SSP 18,095,276.

Expenditure: The total expenditure amount of the Department of Environment and Sanitation of JCC in FY2016/17 was about SSP 18 million: Wages & Salaries: SSP 8,382,186, Use of goods and services: SSP 9,100,290, Capital Expenditure: SSP 612,800, Grand Total: SSP 18,095,276. Currently, there is no official tariff for waste collection services. Waste management costs represent 30% of the city's budget, and costs represent 30% of the city's budget, which is a heavy burden on the city's finances. Indeed, the City Council relies on its budget, which is not supplemented by the national government. If the national and state governments were contributing up to 30% to support SWM, it would reduce the financial burden and result in return in the improvement of the service delivery and waste collection system. The rate schedule details the financial aspects of expenditures for the service delivery. Tariffs will be paid by households, private collection service providers,

business sectors, government institutions, non-governmental organizations, etc. Today, three Block Councils, operating under the supervision of the Juba City Council, have communicated with the citizens about the Waste Collection Fee Policy of the local government/Juba City Council. There has been a positive response from citizens.

Revision of Fee Collection System: The fee collection system for SWM in Juba. The primary sources of revenue of the Department of Environment and Sanitation of Juba City Council are market waste collection fees, commercial waste collection fees from large-scale dischargers, licensing fees for private collectors, penalties, and fines. As of 2020, Juba City Council has a private waste collectors registration system, but the number of officially registered collectors is very small. Instead, a lot of waste collectors, more than the registered collectors, were found during the incoming vehicle survey conducted in 2020, and some of them usually dump waste illegally within Juba. Therefore, it is necessary to strengthen the collection of fees for licensing of private collectors, penalties, and fines. The target for charging penalties and fines is not only waste collectors but also dischargers who dump waste illegally. In the case of private dischargers such as hotels and markets, the Department of Environment and Sanitation of the Juba City Council needs to collect the penalties and fines. In the case of residents, each block should charge the cost to them. The waste collection vehicles to be procured by the JICA Grant Aid Project will be provided to the Department of Environment and Sanitation of Juba City Council and blocks, but the Department has a responsibility for the management of all the vehicles. However, the blocks will bear the expenses for regular maintenance and repair of their waste collection vehicles, hence, the Department will charge the cost of the blocks every month. The main sources of revenue for the blocks are household waste collection fees. The blocks collect tax for all administrative services, but the waste collection fee is excluded. Since the procedure for changing the tax system is expected to be unclear and difficult, the blocks will collect waste collection fees separately from the tax. These resources will be used to secure operation and maintenance costs on SWM. However, it is difficult to secure funds for the procurement of new waste collection vehicles with only that revenue, therefore, it is necessary to consider external funds from international aid agencies.

Start of Fee Collection for Household Waste Collection: As of 2020, Juba doesn't collect fees from the residents since they don't provide sufficient household collection services to them. In the mid-term plan, fee collection for household waste will be started following the implementation of community-participatory waste collection and strengthening the officers and workers of municipalities. The collection of household waste shall be carried out by "fixed-time and fixed-place waste collection", and it is assumed that the target area is gradually expanded, and fee collection shall also be implemented according to the waste collection plan. Rate collectors of blocks visit each household and collect the fee for waste collection. Detailed information regarding fee collection, such as the amount of fee to be collected from each household, target, fee collection date, and method, etc, will be noted in "Regulation for Fee Collection". The rate and amount of the fee will be changed before and after the JICA Grant Aid Project. Until 2022, the standard amount will be 250 SSP / household/month based on the results of the household waste collection experimentally conducted by blocks in 2020. After 2023, the standard amount will be 430 SSP / household/month based on the results of the social awareness survey in some target areas by JICA in 2020. According to the survey, approximately 80% of the residents answered that they were willing to pay the waste collection fee, and the result showed that 430 SSP / household/month would be appropriate. The average monthly income of the residents in the study area was 5,200 SSP, which represents about 8% of their monthly income. According to "What a Waste 2.0 (World Bank, 2018), the average amount of waste collection fee in Sub-Saharan Africa is 10 – 40 USD / year (108 - 434 SSP monthly equally); therefore, 430 SSP / household/month is reasonable.

Strengthening Fee Collection for Market and Commercial Waste Collection: The Department of Environment and Sanitation of Juba City Council aims to establish sustainable SWM through strengthening fee collection for market and commercial waste collection, which is one of the main sources of revenue of the Department Regarding market waste collection, rate collectors of the Department will visit the shops of each market and collect the fee directly from them. As preparation, the Department is required to make a list of markets and shops in collaboration with the Chamber of Commerce at each market. This list is important to grasp the number of shops and calculate the amount of fee to be collected, and it must be updated accordingly. When the rate collectors visit markets, they need to bring the list and request the shops that paid the waste collection

fee to sign the list after the fee collection. This list can help to distinguish the shops which already paid the fee and the other shops that don't pay it every month. If some shops do not accept the payment of fees, rate collectors need to follow up on those shops by visiting them again and again. The Department of Environment and Sanitation of Juba City Council and/or JRSWMG are required to request the shops as a supervisor if the situation does not change. The amount of fee, target, frequency, and method will be described in "Regulation for Fee Collection.

Transparent and Planned Budget Management Using Independent Accounting: The Department of Environment and Sanitation of the Juba City Council has a bank account for SWM. Originally, the SWM costs should be managed in this bank account, but now the fee collected is managed without being deposited in the account. The SWM costs of the Department of Environment and Sanitation of the Juba City Council are planned to be independent from the general account of the Juba City Council. However, expenditures often exceed revenues, and they are financially supported by the central government, the state government, and the Juba City Council Headquarters, therefore, it is not ensuring financial independence and transparency. Improving fiscal and budgetary transparency and planning is a requirement for the stable operation of appropriate SWM, hence, Juba aims to review and strengthen its budget management system by making effective use of existing bank accounts. The fee for household waste collection shall be collected by rate collectors of blocks, and the fee for market and commercial waste collection shall be collected by rate collectors of the Department of Environment and Sanitation of Juba City Council. The fees collected by the rate collectors shall be delivered to the officers in charge of finance of each organization with a list of collection results, including payees and the amount collected, etc. After confirming that the actual amount of money collected and the records match, the officers in charge of finance shall deposit money into the bank account for the management of SWM costs. The officers in charge of finance need to keep an account book according to the flow of money. The amount of revenues and expenditures can be accurately grasped by recording the flow of money in the books. Bank account records and account books can be used effectively when considering future SWM project plans.

Concept of Budget Assessment: Budget assessment is to examine the suitability and adequacy of the budget requested for SWM plans. To implement stable financial management in the future, it is necessary to prepare an appropriate budget plan for each fiscal year and implement projects according to the plan. The municipalities need to introduce a budget assessment to expand their services with a limited budget.

Implementation of Budget Assessment: The management flow of budget assessment is shown in Figure 3-16. Budget assessment can be divided into three steps: (1) Compilation and submission, (2) Explanation and discussion, (1) Compilation and submission, (2) Explanation and discussion, and (3) Assessment. The budget plan will be prepared and submitted by the blocks and the Department of Environment and Sanitation of the Juba City Council as the implementing organization for SWM. Each block needs to prepare its budget plan and explain it to the Department of Environment and Sanitation of Juba City Council, and the Department is required to explain the overall budget plan to the officers and managers in charge of budget management in the Department. After the assessment, it is necessary to report the result to the senior management, such as the director and deputy director of the Department, for approval.

Budget Compilation, the blocks are supposed to submit their budget plan to the Department of Environment and Sanitation of the Juba City Council. Officers in charge of budget planning for each organization need to set standard unit prices referring to the past SWM cost, and determine the budget request content. In the case of continuing projects, the budget plan will be prepared by using the basic unit price set regarding the operating expenses of the previous fiscal year. In the case of new projects, it is impossible to set standard unit prices from their experience, hence, the cost shall be calculated based on the implementing plan on SWM. On the other hand, officers in charge of budget assessment shall confirm questions regarding the budget estimation with the officers in charge of budget planning based on the document submitted by them. During the assessment, the officers in charge of the budget assessment need to request corrections if they find any errors in it. The officers in charge of budget assessment are required to confirm whether the budget requested is suitable with the budget compilation policy and the SWM plan. The budget plan shall be revised if it is difficult to approve. Through this process, the final budget plan shall be compiled by the Department of Environment and Sanitation of Juba City Council, submitted to the implementing body of JRSWMG, and requested for the approval of the executive body

of JRSWMG. After the Mayor, the leader of JRSWMG, approves, the budget shall be allocated to each organization. The management flow of budget compilation is shown in Figure 3-17. Since the entire process is expected to take about five to six months, it is necessary to calculate the budget back from the first month of the new fiscal year.

Compilation of Annual Report and Annual Plan: Annual Report of Solid Waste Management. The implementing body of JRSWMG needs to prepare the annual report of SWM in collaboration with the Department of Environment and Sanitation of Juba City Council and the blocks every year. This report is necessary to be submitted to the executive body of JRSWMG and approved by the mayor as the leader of JRSWMG. Annual Plan of Solid Waste Management, the Annual Plan of Solid Waste Management which shows the activities plan for the following fiscal year, is prepared by the implementing body of JRSWMG, the Department of Environment and Sanitation of Juba City Council, and Blocks. After the annual plan is submitted to the executive body of JRSWMG and approved by the mayor as the leader of JRSWMG, the annual plan becomes valid. The annual plan will be prepared based on the results from the previous year.

Willingness to Pay for Solid Waste Management

Several studies have been conducted on the willingness to pay for solid waste management. Mahar et al (2007) investigated the current situation of waste garbage services in urban areas of Pakistan. The study was for the five major cities of Punjab in Pakistan. The study found that with the increasing population, the size of waste increased, which showed that poor-income households suffered more health problems as compared to higher-income households. The final results of the study indicated that many factors contributed to the collection of solid waste management. Inappropriate policies are used in the collection of urban waste in the five major cities; however, proper policies should be used to resolve this issue in urban areas.

Oyawole et al. (2016) State that the determinants of household payment to improved solid waste management services in Nigeria. In poor regions, many households suffer from many problems, including air pollution, and as a result, people from low-income families face severe health diseases. The reason behind these significant issues is that in developing countries, most households are unaware of environmental problems and have enough resources to increase their willingness to pay to improve solid waste management services according to their will. So, lower payments to improve solid waste management services increase the risk of health diseases. However, four villages were chosen from five Nigerian districts. The logistic regression model was used to understand the concept. The result indicated that nighty two percent (92%) of families are fully aware of the problem of garbage waste, while sixty-four percent (64%) are willing to pay to improve solid waste management. The indicated their willingness to pay is affected by various demographic factors such as education, gender, age of family head, size of families, and employment level of household head in South-eastern Nigeria. This study recommends proper policy implications to improve the economic status of households in poor-income families.

According to Rahji and Oloruntoba (2009), the different factors that are affecting households and personal preferences of interest in ward waste services in Nigeria. The purpose of this study is to find different factors that affect the household's willingness to pay for private disposal systems for solid waste in urban areas of Ibadan. Primary data has been used to collect the information of five hundred fifty-two (552) households in Ibadan. For the analysis of this study, logit models have been used. The final result of this study indicated that education, gender, income, occupation, and wealth owned by households have a positive impact on willingness to pay for private solid waste management services. The study provides some implications to improve the behavior of households' payment for private solid waste management. Akhar et al. (2017) investigated the household willingness to pay (WTP) to improve solid waste management services in Lahore. The main purpose of the study was to know the views of the Gulberg community of Lahore, considered the most densely populated area of Lahore, toward households willing to pay (WTP). The result showed that only wealthy households are more interested or willing to pay to improve solid waste collection than poor households or families. For the reduction of this problem among households willing to pay for solid waste management, we need some measures and policy suggestions to get rid of this problem in the future.

Thirumarpan and Dilsath (2016) analyzed the willingness behavior of the family head toward solid waste in Sri

Lanka. Solid waste management and environmental degradation increase continuously, which harms human health and causes many severe diseases. The study was based on data from five divisions of Batticaloa, Sri Lanka, in this paper. Therefore, different variables affect a household's interest in paying for this purpose. The study used a binomial logistic regression model to understand this concept. The result of this study indicated that a lower proportion of the population was willing to pay to get rid of this waste garbage, fifty-nine percent (59%), and the remaining population is not interested in improving waste services. The average income of the household is between thirty thousand (30,000) to thirty-five thousand (35,000), but eighty-six percent (86%) population is interested in paying every month, not daily. The quantity of waste produced by each household daily is three kilograms, which means the monthly payment ratio by each household is only sixty rupees, but at a very low rate, they are not interested in increasing the pay rate to improve solid waste management services. The result of this study showed that positive relationship between the number and spending activities of households and a negative relationship between genders, the number of wastes produced daily, and the disposal services of waste garbage. This concluded that higher-educated families attain a higher value of pay for solid waste management as compared to families that are comprised of lower-educated individuals. In the end, this study suggests some policy recommendations to increase the socioeconomic status of poorly educated families. In this way, we increase the household desire to improve solid waste management services.

In addition, Alhassan et al (2017) investigate different demographic factors that affect households' willingness to pay in Ghana. The study explained the important factors that are affecting household willingness to pay for solid waste management because many studies have been conducted to know the variables that are affecting household willingness to pay (WTP) to improve Solid waste management. However, due to some limitations, they do not find important factors that affect households' willingness to pay (WTP). Moreover, Boateng et al. (2019) examined household payments for improved solid waste management in four major cities: Accra, Takoradi, Kumasi, and Tamale in Ghana. Globally, two billion households are shortages approach to solid waste management. In descriptive statistics, logistic regression analysis is used, but the survey did not show good results. Only fifty-three-point-seven percent (53.7%) of households showed motivation or willingness to pay to improve solid waste management services. The result of this study showed that household willingness to pay is affected by many factors such as the education of the household head, income, and employment level of households, gender, and occupancy status of the household. Social influences are best presented by using financial services, but some needs of efforts and expertise are needed to improve household sustainable willingness to pay for solid waste management in Ghana. It is also emphasized that we need some efforts to improve measurement tools for better assessment of household willingness to pay for solid waste management.

Dika et al. (2019) assess the payment of household willingness to improve solid waste management in Addis Ababa. The secondary data was used to collect information on household willingness to pay by the contingent valuation method. The study used a logistic regression model to understand this concept. The result showed that a more significant number of families are fully aware of the problems of garbage waste, but not ready to pay more than seventy-eight percent (78%) and seventy-six percent (76%) of households are willing to cooperate only to improve solid waste management services, but not ready to pay. The final result of the study showed a positive relationship between the income of the household, family size, and the age of the household head, and a negative relationship between gender and education. This study recommends proper policy implications to improve the economic status of households' implications to improve the economic status of households and increase household willingness to pay to improve solid waste management.

All in all, Mulat et al. (2019) investigated different factors that affect household willingness to pay for improved solid waste management in Etopia. This study used primary data from Addis Ababa town, Injibara. The result of this study indicated that there is a positive relationship between education and willingness to pay for improved solid waste management and a negative relationship between gender and willingness to pay for solid waste management decreases with the increased population size of families, occupancy status indicated a positive relationship with the cost of solid waste management, if homeowner have not personal place, then he had to pay more cost of solid waste management as compared to those families that have personal land for living. This study recommended that proper policies should be adopted that improve household willingness to pay for solid waste management. The summary of this literature review provides knowledge about household willingness to pay. Now this study will bridge the gap in respect and make a valuable addition to the body of knowledge. This study

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will find out the household willingness to pay to improve solid waste management and household demographic factors that influence household willingness to pay.

RESULTS AND DISCUSSION

Monthly Household Income level in South Sudanese Pounds (SSP).

The findings show that the majority of the respondents had a household monthly income level of 3000 – 5000 SSP, represented by 41.7% of the total respondents. Followed by 29% of the respondents, had a monthly income that varied between 7000 - 9000 SSP. 16% of the respondents represented a monthly income of 13000 SSP and above. About 13.3% of the respondents had a monthly income ranging between 11000 – 13000 SSP. Very few households were in the category of high incomes, as represented by 10% of the households that had monthly incomes of 11000 – 13,000 SSP and above. The standard amount for waste proposals was 430 SSP per household, per month, based on the results of a social awareness survey by JICA (2020) in Juba. According to the survey conducted by JICA (2020), approximately 80% of the residents were willing to pay the waste collection fee and the results showed that 430 SSP per household, per month would be appropriate and the average monthly income of the residents in the study area was 5,200 SSP, which represents about 8% of their monthly income. According to World Bank (2018), the average amount of waste fee in Sub-Saharan Africa is $10 - $40/year (108 - 434 SSP monthly equally), however, 430 SSP per household, per month was reasonable.

This indicates that low per capita incomes in Juba city will result in low volume generation of solid waste, which can pose a lesser threat to environmental quality and human health. These results are consistent with the World Bank (2012) that the per capita income is below the global $57.00 per month ($1.90 per day), as well as the mean per capita income in Sub-Saharan Africa, which stands at $1.70 per day or $51.00 per month. Studies by Afroz et al. (2011), Gu et al. (2015), Kayode and Omole (2011), Maskey et al. (2016), Ogwueleka (2013), Sankoh et al. (2012), and Sujauddin et al. (2008) showed monthly income to have a positive impact on waste generation. With higher income, it is expected that increase demand for commodity products will increase, the consumption of which will ultimately produce more waste. Bandara et al. (2007) explained that the relatively high food consumption trends of higher income groups increased purchases of packaged products and reading materials, which will result in higher waste generation. Qu et al. (2009) in China found that family income hurts waste generation. Trang et al. (2017) classified those having higher income who dine outside more frequently than cook at home, whether it be at work or for leisure, thus generating less waste. Another study in China by Xu et al. (2016) explained that per capita household waste and income cannot be simply linearly correlated. Oftentimes in the early stages of urbanization, growth in family income leads to material consumption, which increases waste amount. However, as the urbanization level matures, it will have a gradual weakening positive effect, and in an advanced stage, the growth of income will barely have any positive effect (Table 1)

Table 1. Monthly Household Income level in South Sudanese Pounds (SSP).

Household Income	**Frequency**	**Percentage**
3000 - 5000 SSP	250	41.7
7000 - 9000 SSP	174	29.0
11000 - 13000 SSP	80	13.3
> 13000 SSP	96	16.0
Total	**600**	**100.0**

Source: Field data (2023)

Payment for own Solid waste

The finding of the study showed that majority (79.7%) of the respondents during the data collections don't pay for their solid wastes while 20.3% of the respondents pay for their solid wastes to the Payams, County and Juba

City Councils because there was awareness made by Juba city council and JICA on the collection of household wastes and the agreed amount being charge per household. Sankoh et al. (2012) showed number of rooms has a positive impact on generating more waste. Lebersorger & Beigl (2011) found that the percentage of buildings with solid fuel heating was one of the important factors influencing MSW. Kayode & Omole (2011) found a positive influence of the type of building on waste generation. While all these studies included certain features of dwelling, this study assesses how living in their own house impacts waste generation compared to tenants. During the test survey, it was observed that those who live in their own house are more caring about their surrounding and thus are more cautious in keeping their surroundings clean, which might impact their waste-generating behavior. Conversely, tenants might not care as much about their surroundings because they do not have a strong sense of belonging to that place; they are there only temporarily. Although most households live in their own house, households residing in rented houses have been increasing in urban areas of Nepal (CBS, 2014a) in Table 2

Table 2. Payment for own Solid waste

	Frequency	**Percentage (%)**
Yes	122	20.3
No	478	79.7
Total	**600**	**100.0**

Source: Field data (2023)

Monthly payment of Solid waste management in South Sudanese Pound (SSP)

The majority (50%) of respondents pay between 2000 and 4000 SSP for their waste, while 26.7% pay between 4000 and 6000 SSP per month for their households. About 13% of respondents pay between 6000 and 8000 SSP per month, and only 10% agree to pay 8000 SSP and above each month. This last group includes small-scale businesses, hotels, restaurants, universities, schools, churches, companies, hospitals, clinics, shops, NGOs, and factories in Juba County. The study categorized respondents based on household income variations (Table 3).

Table 3. Monthly payment for Solid waste management in SSP

Payment (in SSP)	**Frequency**	**Percentage (%)**
2000 - 4000 SSP	296	49.3
4000 - 6000 SSP	164	27.3
6000 - 8000 SSP	80	13.3
> 8000 SSP	60	10.0
Total	**600**	**100.0**

Source: Field data (2023)

Private trucks for **waste collection from door to door in residential areas**

The majority (58%) of respondents have never used private trucks for door-to-door solid waste collection from residential areas. However, some burn, bury, or throw their waste in open spaces or on the street, dig holes around their houses, and dispose of their solid waste in various ways. In contrast, 42% of respondents indicated that the Department of Environment and Sanitation of Juba City Council (JCC) and the Payams utilize many private collectors with dumping trucks and open trucks for waste collection. Despite this, few companies in Juba employ compactors for waste collection, and households pay 2,000 SSP, 4000 SSP, 6000 SSP, and 8000 SSP for waste collection services, depending on the level of service. The Department of Environment and Sanitation

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of Juba City Council has a registration system for private waste collectors and charges 20,050 SSP for each collector. The requirements for registration include providing their name, vehicle number, collection service area, and contact information. They are not permitted to collect waste from unregistered areas. In March 2020, about 10 private waste collectors were registered, but many unregistered private collectors were observed during the survey of incoming waste collection vehicles. A proposal for developing a management system for private collectors needs to be established. (JICA Project Team, 2020) as shown in Table 4.

Table 4. Private trucks for waste collection from door to door in residential areas

	Frequency	**Percentage (%)**
Yes	252	42.0
No	348	58.0
Total	**600**	**100.0**

Source: Field data (2023)

Willingness to Pay for Solid Waste Management Services

The findings of the study showed that a large majority of the respondents (66.7%) are willing to pay for solid waste management services in Juba, and they were willing to pay from 2000 – 4000 SSP per month. According to the survey conducted by JICA (2020) in Juba, approximately 80% of the residents were willing to pay for the wastes collection fees and the results showed that 430 SSP per household, per month would be appropriate and the average monthly income of the residents in the study area was 5,200 SSP, which represents about 8% of their monthly income. According to World Bank (2018), the average amount of waste fee in Sub-Saharan Africa is from $10 - $40/year, however, 430 SSP per household, per month was reasonable. And only 33.3% of the respondents were represented by those who were not willing to pay for solid waste management services fees.

Anjum, 2013, Eshum &Nyarko, 2011, Jones et al, 2010, Karthigarani & Elangovan, 2016, Mahima & Thomas, 2013, Roy & Deb, 2013, about 61% are willing to pay for the improved waste collection services. Thirumarpan and Dilsath (2016) analyzed the willingness behavior of the family head toward solid waste in Sri Lanka. Solid waste management and environmental degradation have increased continuously, which has brought a negative impact on human health and caused many severe diseases. The study used a binomial logistic regression model to understand this concept. The result of this study indicated that a lower proportion of the population was willing to pay to get rid of this waste garbage, 58%; the remaining population is not interested in improving waste services. The average income of a household is between 30,000 -35,000, but 86% population is interested in paying monthly, not daily. The quantity of waste produced by each household daily is 3 kg, which means the monthly payment ratio by each household is only sixty rupees, but at the very low rate, they are not interested in increasing the pay rate to improve solid waste management services. The result of this study showed that a positive relationship exists between the number and spending activities of households, and a negative relationship exists between genders number of waste produced daily and the disposal services of waste garbage. This concluded that higher educated families attain a higher value of pay for solid waste management as compared to those families that comprise lower educated families. In the end, this study suggests some policy recommendations to increase the socio-economic status of poor, educated families; in this way, we increase the household desire to improve solid waste management services.

According to Akhar et al. (2017) investigated the household willingness to pay to improve solid waste management services in Lahore was investigated. The main purpose of the study was to know the views of the Gulberg community of Lahore, that considered the most densely populated area of Lahore, toward households willing to pay. The result showed that only rich households are more interested or willing to pay to improve solid waste management as compared to poor households or families. For the reduction of this problem among households willing to pay for solid waste management, we need some measures and policy suggestions to get rid of this problem in the future (Table 5).

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Table 5. Willingness to pay for solid waste management services

	Frequency	Percentage (%)
Yes	400	66.7
No	200	33.3
Total	**600**	**100.0**

Source: Field data (2023)

The charges levied for solid waste.

The findings show that majority of the respondents (51%) indicated that the charges levied on solid wastes were high while 24% of the respondents' charges were at average, 15% of the respondents don't know charges on solid wastes and 10% of the respondents' rated charges on solid waste low. During the key informants' interviews with Sebit (2023), stated that the Juba city council referred a charge fee of SSP 2000 for solid waste collection. According to Monyoncho (2012) argued that the best way of managing solid wastes is the internalization of costs or levying charges for the use of the services. This is especially beneficial when a command-and-control policy is not effective and government intervention is necessary for this (Table 6).

Table 6. The charges levied for solid waste

Charge on solid wastes	Frequency	Percentage (%)
High	306	51.0
Average	144	24.0
Low	90	15.0
Don't Know	60	10.0
Total	**600**	**100.0**

Source: Field data (2023)

Waste collection services for the household

The finding showed that less than half of the respondents (32%) stated that the collection of waste services was provided twice a week to households. About 28.3% of the respondents cited that the collection of waste services is provided once a week, and 15% of the respondents stated that the collection of waste services is done every day. 12.3% of the respondents were others for whom the wastes didn't reach, followed by 7% of the respondents' collected waste services once a month, and only 5.3% of the respondents cited that the collection of waste services was twice a month. These are consistent with the study conducted in Ghana that a high rate of urbanization in African Countries contributes to a rapid accumulation of solid waste. Moreover, social and economic development that most African Countries have witnessed since the 1960s has also contributed to an increase in the waste generated per capita (Owusu et al, 2012; Ahmed and Ali, 2011). These results are consistent with Gabriel (2015), who noted that most households in major towns of South Sudan are not served by any waste collection and disposal service provider and therefore are forced to initiate their way of managing their solid waste, as indicated in Table 7.

Table 7. Waste collection services

Wastes collection	Frequency	Percentage (%)
Every day	90	15.0

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Once a week	170	28.3
Twice a week	192	32.0
Twice a month	32	5.3
Once a month	42	7.0
Others	74	12.3
Total	**600**	**100.0**

Source: Field data (2023)

Solid waste services ranking.

The findings of the study showed that the majority of the respondents (55%) ranked waste collectors' services as poor, while 20% of the respondents ranked the waste collectors' services as good. About 16.7% of the respondents ranked waste collectors' services very poor, and only 8.3% of the respondents who had ranked the waste collectors' services very good, as indicated in Table 8.

Table 8. Solid waste services ranking

Rank waste services	**Frequency**	**Percentage (%)**
Very good	50	8.3
Good	120	20.0
Poor	330	55.0
Very poor	100	16.7
Total	**600**	**100.0**

Source: Field data (2023)

Stakeholders for Solid Waste Management

The majority of the respondents (50.5%) were for the Juba City council under the Department of Environment and Sanitation, with the support of three blocks, while 29% of the respondents were for the County government (Juba County). About 10.8% of the respondents were for Non-Governmental Organizations (NGOs) JICA, UNMSS and UNICEF, 6.3% of the respondents were for National Government such as National Ministry of Environment and Forestry, Ministry of finance, Ministry of Health and only 3.3% of the respondents were for State government (State ministry of Environment and forestry, State Ministry of finance, State of Health. Solid waste in Juba is managed by the Department and Sanitation of the Juba City Council. Solid waste quantities, which are produced in Juba city, are large and expanding with the developing prosperity and improved standard of living. Municipal waste generation normal rate coming to 0.57kg/per person/day, the population of Juba is 1.500.000 million; such population produces roughly 950 tons of waste per day. The rainy season has a higher waste generation rate. Solid waste generation changes per day in addition to the recurring seasonal variation, and the collection recurrence also influences waste generation in common; a more visit collection produces more municipal solid waste. Expanding urbanization is one of the influences on the overall rate of solid waste production in South Sudan and many nations. The quantity of generated waste could be a financial indicator and a function of the degree of a nation's improvement. The distinction in waste generation between cities in developed nations (1.5-2kg/person/day) and those in developing nations (generally less than 1kg/inhabitant/day) is essential. This critical distinction is due to utilization modes as industrialized nations devour more items and utilize more packaging (Juba City Chamber 2017), as indicated in Table 9.

Table 9. Stakeholders for solid waste management

Stakeholders	Frequency	Percentage (%)
National Government	38	6.3
State Government	20	3.3
Juba City Council	303	50.5
Juba Government	174	29.0
NGOs	65	10.8
Total	**600**	**100.0**

Source: Field data (2023)

Challenges faced in the management of Solid Wastes.

The findings of the showed that majority of the respondents (24%) lack awareness while 20% of the respondents has mentioned lack of finance, respectively were a major challenge towards solid waste management, 14% of the respondents has stated that low waste collection rate and poor sanitation, 13% of the respondents argued that lack of legal system and policies for solid wastes management. About 12% of the respondent was lack of management of resources by Juba city council and Juba County, 10% of the respondents were waste collection from markets and institution where are not implemented regularly and 7% of the respondents was the corrupted government officers, which is the biggest challenges faced management of solid waste in Juba.

The findings of the study from the interviews with key informants showed that many challenges contributed to poor solid waste management in the study area. First of all, most residents lack proper information on solid waste management and also know-how on the best practices applicable in waste management in an urban setup. There is also a lack of funds on the part of residents to be able to finance waste management practices consistently. There is hardly any environmental policy in place by the government to combat poor solid waste disposal in the study area. These findings are in consistent with the study carried out in Kampala by the Namilyango college (2011) that identified several challenges related solid waste management which included lack of dumpsites due to ignorance of the community about the need for proper waste disposal, lack of finance, lack of legislation, lack of awareness among the public, lack of political support and lack of trained personnel for waste management.

These are consistent with the study done in Ghana by Peter (2002), which states that problems are encountered at all levels of waste management in particularly collection, transportation, and disposal. Generally, existing public facilities, including sanitary facilities are inadequate to serve the user population and the sheer volume of municipal solid waste generated in the Country's Urban center is overwhelming while existing waste disposal facilities are inadequate to deal with the quality and quantity of waste generated more sophisticated system are expensive and their maintenance requirements are high as indicated on the (Table 10).

Table 10. Challenges faced in the management of Solid Wastes.

Challenges	Frequency	Percentage (%)
Lack of finance	120	20.0
Lack of Awareness	144	24.0
Corruption by government officers	42	7.0
Lack of a legal system	78	13.0
Lack of management resources	72	12.0
Low waste collection rate and poor sanitation	84	14.0

Waste collection from markets and institutions is not implemented regularly	60	10.0
Total	**600**	**100.0**

Source: Field data (2023)

Sources of funding for Solid Waste Management practices

The findings of the study showed that 25% of the respondents find their sources for funding from the local revenue collections, and 23% of the respondents get their sources of funding from the County Government. About 17% of the respondents were donations from partners, 16% from the State government, 10% from the respondents from the Juba City Council, and 9% of the respondents from the National government. These are consistent with the study done in Khulna in Bangladesh by Norley (2009) that local governments are responsible for the collection and disposal of the wastes generated within their jurisdictions as well as for the operation and maintenance of their equipment. However, local government usually lacks the authority and resources to provide a satisfactory and economically viable service. Effective and efficient solid waste management depends upon an equitable distribution of responsibilities, authority, and revenue between the national government and all the local governments. In addition, according to Lusaka City Council (2004), solid waste management is the responsibility of the Lusaka City Council waste management unit. The waste management unit has partnered with Community-Based enterprises (CBEs) and was responsible for the day-to-day management of the waste system in peri-urban areas, as indicated in Table 11.

Table 11. The sources of funding for solid waste management

Sources of funding for solid waste	**Frequency**	**Percentage (%)**
Local revenue collections	150	25.0
State government	96	16.0
County government	138	23.0
National government	54	9.0
Juba City Council	60	10.0
Donation from partners	102	17.0
Total	**600**	**100.0**

Source: Field data (2023)

CONCLUSIONS

Based on the findings of the study, the following conclusions were made: Major sources, types, methods and quantity of solid wastes that were generated and disposed in Juba include residential wastes such as streets sweeping, follow by Agriculture such as food waste, Commercial waste which was the markets, hospital medical wastes, hotels and restaurant, Institutional wastes such as universities, colleges, schools and government ministries and construction wastes including demolition waste, and others wastes in Juba include: worn wastes, metallic wastes, hazardous wastes, plastic wastes, container wastes a significant portion of population does not have access to waste collection services and only a fraction of the generated wastes are collected by door to door collection system introduced by Juba City Councils (JCC), Japanese International Cooperation Agent (JICA) Non-governmental Organization (NGOs) and private companies.

The majority of the respondents knew solid waste disposal methods as represented by those digging a hole around the house and disposing, dumping, or burning. Some throw it in open space or on street of Juba for the collection, disposed on the backyards of the house, bury their wastes, throw it wastes in to the nearby the rivers/streams and throw in to the nearby ditches, most of the residents had little knowledge on solid wastes disposal, types of

diseases and diseases vectors associated to solid wastes which is caused by poor waste disposal while small portion of the respondents had moderate advanced knowledge on solid waste disposal, types of diseases and diseases vectors caused by poor wastes disposal in Juba Controlled Dumping Site (JCDS) and Mogoro Illegal Dumping site.

Open dumping was the popular method of waste disposal. Others are digging a hole around the house and disposing of, burning, throwing it on the streets, composting, and reusing. The majority of the respondents were not aware of the segregation of solid waste. Long distance to the JCDs dumping site, lack of environmental policies, lack of equipment, lack of vehicles, lack of skill, lack of environmental bills, lack of collection points, lack of awareness, lack of protective equipment for workers, misused of funds collected for solid wastes management and lack of understanding with National and State Ministries of Environment and forestry were the major challenges faced on solid waste management efforts by residents.

RECOMMENDATIONS

The National, State government, Juba city Council (JCC), and Japanese International Cooperation (JICA) should vigorously launch a widespread awareness campaign to deal with the negative perceptions and low knowledge of the community toward solid waste disposal methods. Government and JICA efforts to build more waste disposal sites in the study area should be supported, and the necessary budget allocated for solid waste in the Country. Improve on dumping sites road infrastructures in the area to support waste disposal. Since there are no waste collection bins, these should be strategically placed in identified central sites to reduce indiscriminate dumping and ease waste collection by Juba City Council and Juba County vehicles. The state government has to educate the residents on solid waste management. Government efforts to formulate policies on the solid waste Management, other types of solid waste, and incorporate with the existing order that will ban the use of plastic bags in Juba. The best arrangement is a public and private partnership working together to educate the people about the service providers and services. Organized cooperative solid waste companies should be encouraged to run their daily activities; the local authorities could provide the private collectors with the facilities or grant funding, and give them advice on how to run the services effectively.

The private sector can be contracted for waste service and treatment, local government needs to focus more on administration, monitoring, public education, and planning. Local governments need to enhance their capacities to arrange and support waste planning by coordinating with various agencies within the government, improving information transparency for public consultation, and collecting reliable basic data on waste properties and market demand for recycled products. To address these three aspects in practice, city and provincial governments need to alter their role and mindset, no longer acting only as service providers but rather as managers and coordinators. MSWM is an expensive undertaking if it is conducted in an environmentally sound manner. Involving the private sector should result in greater efficiencies. Preparing a strategic, integrated solid waste management plan for the city. The plan should be drawn taking into account the waste generation sources, quantity, characteristics, and the socio-economic and cultural structure of the city.

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