Research Article

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Assessing the Transport and Payment System of Municipal Solid Waste Management in Bishoftu City

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Abstract

Since not much research had been done in the study area regarding the Transport and Payment System of Municipal Solid Waste Management, the goal of this study was to assess the system in Bishoftu City. The researcher used a mixed approach in this study, combining quantitative and qualitative data. The study used questionnaires and interviews as data collection tool. The majority of respondents (55.1%) agreed that the city offers a safe municipal solid waste transportation service. The majority of respondents disagreed that the amount of solid waste generated by the household determines the charging. Nonetheless, most respondents concurred that all households should pay the same amount. The majority of respondents (55.1%) were willing to pay more for superior service. According to the findings, all community groups must have access to the current transportation infrastructure, which includes solid waste transportation vehicles and other accessories.

Keywords: Municipal Solid Waste, Transportation system, Payment System and waste management

1. Background of the Study

Humans use resources to support life. In the course they produce waste [1]. This author claims that in the past, waste disposal did not have a significant impact because the ecosystem's capacity for assimilation was not exceeded. Resources and the amount of waste produced were under tremendous pressure due to the quick population growth that was accompanied by a quick pursuit of economic development, the complexity of wastes driven by technology increasing, and the growth of urbanization [2,3]. Furthermore, reported that the majority of developing nations struggle with waste management, particularly with regard to handling the growing amount of municipal solid waste produced by urban residents [2]. Wastes are typically dumped and disposed of in an unplanned manner in gorges and slopes, or they are dispersed throughout urban areas in developing nations. The facilities, equipment, and knowledge needed for the collection, handling, processing, and disposal of solid waste are outdated. Adequate financial resources, technical expertise, and proper planning for solid waste management are lacking. Low public support for appropriate frameworks for collection and sorting is aggravating environmental and health-related issues in developing countries' urban areas [4]. However, in order to reduce the risk to the environment and public health, solid waste produced by people's daily activities needs to be appropriately managed. One of the main causes of disease transmission and environmental deterioration is the improper collection, transportation and disposal of solid waste. Local governments are in charge of providing SWM, but a significant portion of the population in developing nations does not receive this service from most administrations [5].

This state of affairs is primarily the result of the population's rapid growth, city growth, and depletion of financial resources. According to reports, the number of people living in cities in developing nations is growing by roughly 50 million annually, and these people have an increased need for services [5]. Because of this, it is challenging for the local government to meet the increasing demand for SWM services while also keeping up with this development. But the private sector has stepped in to fill the void left by the public sector's incapacity. In most developing-nation cities today, the private sector plays a significant role in the provision of solid waste services [6,7].

In cities of low- and middle-income nations, solid waste management (SWM) frequently accounts for a sizeable amount of the overall recurrent municipal budget [8]. The local authorities frequently struggle to provide sufficient and dependable services for everyone, despite the heavy financial burden. Municipalities in developing nations frequently devote 20–50% of their available municipal budget to solid waste management (SWM), which frequently only has enough money to serve less than 50% of the population, according to the World Bank and USAID [9,10]. Besides, there is also problem of solid waste transport facilities and payment system. These problems are also common in majority of cities in Ethiopia.

The transportation and payment system for municipal solid waste (MSW) in Ethiopia faces a number of difficulties, such as: Insufficient collection: Municipalities' ability to collect waste is insufficient to handle the volume produced. Illegal dumping: Illegal dumping accounts for about 25% of waste. Inadequate coordination: The stakeholders' integration and coordination are lacking [11]. Bishoftu is one of Cities in Ethiopia encountered with this problem.

1.1. Statement of the Problem

Globally, managing solid waste has proven to be a significant challenge for both developed and developing nations [12]. This challenge also common in the majority of Cities in Ethiopia. Bishoftu one of Cities in Ethiopia encountered with this problem. Rapid urbanization and population growth have resulted in raising a solid waste volume, which has increased the need for waste transportation facilities and well-structured payment system.

Several scholars studied research in the area of solid waste management used the few available research papers and project reports to examine the solid waste management system as it exists today [13]. He noted that ignorance of the value of the environment and inadequate waste management skills is the main issue with solid waste management. Research on Gondar town's current solid waste management service was done by [12]. The study's conclusions showed that Gondar Town's current MSWM system was totally dependent on the municipality, which offered a wide range of waste collection, transportation, and disposal services.

In other hand, evaluated the existing municipal sanitary fees, residents' willingness to pay (WTP) for better urban waste management, and proposed cost recovery mechanisms [14]. The findings showed that, among other things, residents' WTP for better solid waste management is strongly correlated with their income and level of environmental quality awareness.

Besides, studied to find out the determinants of households' willingness to pay for improved solid waste management in Ethiopia, Jimma Town. The researcher highlighted that a household's willingness to pay for better solid waste management is influenced by various factors, including their income, house ownership, and the quantity of waste they produce [15]. A cost-revenue analysis was conducted by using data spanning from July 2009 to June 2011 [16]. According to the analysis, Bahir Dar's SWM system's overall costs rose dramatically during this time, mostly as a result of growing waste transportation expenses. Using a binary logit econometrics model, calculated households' willingness to pay for enhanced solid waste management services and examined its determinant [17]. 86.3% of sample households were found to be willing to pay for better solid waste management services, according to the research. In order to improve solid waste management in Hawassa City, estimated residents' WTP using a contingent valuation method [18]. The results of the study demonstrated that, at the household level in Hawassa City, waste minimization techniques including reuse, recycling, waste separation, and creating compost from waste were uncommon.

Scholars that conducted research on Municipal Solid Waste Management both in the country and study area focused on solid waste management system, waste minimization techniques and house hold willing to pay for solid waste management [12-17] with less considering the transport and payment system of municipal solid waste. The existing municipal solid waste transport and payment system was not studied in Bishoftu City. The type and status of municipal solid waste transportation system was not well identified and documented. Besides, the existing payment system and the communities' willingness to pay for municipal solid waste management was not recognized and studied in the City. Hence, this study intended to assess the Transport and Payment System of Municipal Solid Waste Management in Bishoftu City.

1.2. Research Questions

1. How do you assess the existing Municipal Solid Waste transportation services?
2. What is the existing payment system of Municipal Solid Waste Management?
3. What is the level of Municipal Solid Waste Management payment system?

2. Objective of the Study

2.1. General Objective

To assess the transport and payment system of Municipal Solid Waste Management in
Bishoftu City

2.2. Specific Objectives

- To assess the existing Municipal Solid Waste transportation services
- To assess the existing payment system of Municipal Solid Waste Management
- To examine the level of Municipal Solid Waste Management payment system

2.3. Significance

The study will play a significant role for the Municipality of Bishoftu City in assessing the transport and payment system of Municipal solid waste. It also considerably contributes through providing information for policy makers in developing strategies for transport and payment system of Municipal Solid Waste

Management. Furthermore, the study will benefit as a reference for researchers who will conduct research in the area of Municipal Solid Waste management.

2.4. Scope of the Study

Geographically, the study was located in the Bishoftu City. On the other hand, employees of Municipality of Bishoftu City were the target population of the study.

Thematically, the study assessed the Transport and Payment System of Municipal Solid Waste Management in Bishoftu City. It also included issues such as the Municipal Solid Waste transportation services, the Municipal Solid Waste transportation facilities, the existing payment system of Municipal Solid Waste Management and the level of Municipal Solid Waste Management payment system. In conducting this study, the research used cross sectional data. However, the study didn't include the liquid waste management.

3. Research Method

3.1. Description of the Study Area

Bishoftu City is located 45 kilometers southeast of Addis Ababa, the capital of Ethiopia. Ethiopia's 2007 census report states that there were 100,114 residents in the City, with 52,176 women (52.2%) and 47,938 men (47.8%) making up the total population. It is situated at latitude 90 N and longitude 400 E, 1,950 meters above sea level. The region has maximum and minimum temperatures of 34.7 °C and 8.5 °C, respectively, and an average relative humidity of 61.3%. The rainfall occurs in two modes. It receives 1151.6 mm of rainfall annually, with 84% of that falling in the long rainy season from June to September and the remaining portion in the short rainy season from March to May. The City is currently organized into 11 Weredas and 3 Sub Cities (Bishoftu City Municipality, 2024).

The following Figure: 1 presents location map of Bishoftu City.

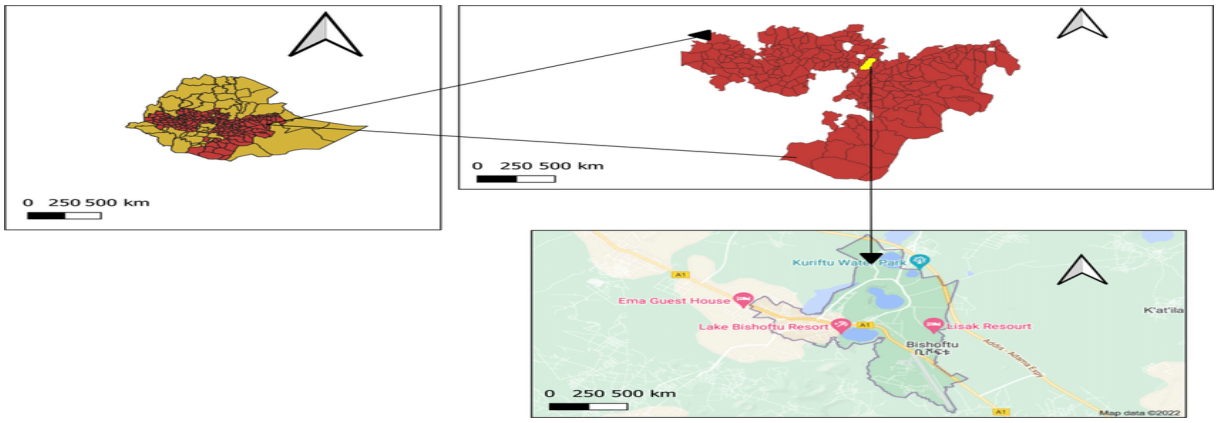


Figure 1: Map of Study Area

3.2. Research Approach

This study employed a mixed approach, combining both quantitative and qualitative data. The fundamental tenet of this kind of investigation, according to Creswell (2017), is that integrating qualitative and quantitative methods yields a deeper comprehension of a research problem than either approach alone.

3.3. Research Design

A research design, according to, is a form of investigation that combines quantitative and qualitative methods and offers detailed instructions for the design's procedures [19].

In this work, the researcher used descriptive design. This kind of research design presents the existing phenomena of the study (Creswell, 2014) [19].

3.4. Target Population

The population of the study is employees of Bishoftu City Municipality that account around 560.

4. Sampling Technique and Procedures

4.1. Sampling Techniques

Alvi (2016) claims that sampling techniques in the social science is an attempt to provide a clear and intelligible explanation of the different types of sampling approaches utilized in research projects. Purposeful and systematic sampling was used to choose the required sample for this study.

4.2. Purposive Sampling

Interviews for this study were conducted with the heads of departments, vice heads, and head of Bishoftu City Municipality.

4.3. Systematic Sampling

Defines systematic sampling as the procedure of choosing a random start followed by every nth case [20]. On the other hand, the subsequent participants are chosen using a repeatable process.

The study selected a sample of Municipality employees who work in Bishoftu City using the systematic sampling technique. To do this, the target employees of the Municipality were sorted based

on their list of numbers, and then components were selected on a regular basis from that sorted list. In the systematic sampling procedure, the random start was employed, and each element was chosen subsequently. In this case,

$$k = \frac{N}{n} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{equation (1)}$$

$$K = \frac{560}{233} = 2.4$$

Where K is the systematic sampling interval, n is the sample size, and N is the population size.
Therefore, the systematic sampling interval (k) is 560/233 = 2.4. The researcher used their list of numbers to select a sample every second interval from the population in a methodical manner.
First, a random selection was made from the list.

5. Sample Size

5.1. Sample Size Determination

The primary goal of the sample size calculation is to determine the necessary sample size. However, as Pourhoseingholi et al. (2013) point out, the largest sample size feasible is required for a research project. The sample size for the quantitative survey was decided under this heading.

Consequently, 233 were the total sample employees according to Yamane's formula (1967) (Equation 2). This was found out from the Bishoftu City Municipality's 560 employees in total. Equation (2) would have been utilized to calculate the sample size for a 95% confidence level and P=0.5, according to Yamane (1967).

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

Where e is the degree of precision and N is the size of the population. Using this formula, the researcher obtained the sample size for our population, N = 560 with + 5% precision, assuming a

95% confidence level and P = 0.5. $n = \frac{560}{1+560(0.05^2)} = 233.$

Therefore, the total sample size of the study was 233. Accordingly, 233 questionnaires were distributed to employees of Bishoftu Municipality and 227 questionnaires collected while six of them lost. Hence, the response rate was (227/233) x100%= 97.4.

6. Data Types and Sources

6.1. Data Source

The following section contains a list of the primary and secondary data sources that were used to gather the information for the study.

6.2. Primary Data

The study's primary data source was Bishoftu City Municipality employees.

6.3. Secondary Data

The secondary data was gathered from a variety of sources, such as annual reports, the Municipality database, various journal articles, and recorded data in the Municipality.

6.4. Data Collection Techniques

As it was covered in the next section, this study used a variety of instruments, including questionnaires, interviews, open-ended questions, and field observations.

6.5. Interview

Interviews was conducted with key informants from the Bishoftu City Municipality, such as the vice head, head of the Municipality, and department heads. This was accomplished by crafting structured interview questions. Topics to be covered in the interview include the payment system and transportation of Municipality Solid Waste. Conversely, the key informant interview was designed using structured interview questions.

6.6. Questionnaires

Self-administered questionnaires were distributed to Municipality of Bishoftu City employees for this survey. To ensure that every employee of Municipality of Bishoftu City has the opportunity to participate in the study, a random sample approach was used. The survey included the demographics and educational background of the participants.

6.7. Open-Ended Questions

This study covered the open-ended questions from the self-administered survey regarding the Municipality Solid Waste Transportation and Payment system. To develop a thematic interpretation, the researcher went over and categorizes the responses to open-ended interview questions.

The descriptions provided by the respondents were used to describe and provide context for the triangulation process. If survey respondents believe that their concerns are not adequately addressed in the questionnaire, they were able to express their views through the narrative. The open-ended questions were typed into a word document and then examined.

6.8. Field Observation

This study employed field observation to see the selected waste management site. With the information obtained from this tool, triangulation was used to make the interview results more concrete and accurate.

6.9. Data Analysis

The research analyzes both quantitative and qualitative data. The qualitative data was examined first, and then the quantitative data, and lastly the open-ended questions and field observations in order to triangulate the methodology, gather more information, and explain the quantitative findings. The qualitative data was examined using thematic analysis. The quantitative data was analyzed using SPSS software version 24. The quantitative approach made use of descriptive statistics.

7. Validity & Reliability

7.1. Validity

Validity, in the words of, is the degree to which the data accurately represents the research field [20]. Consequently, in order to determine whether the instruments employed in this study adequately cover all of the variables mentioned in the research question, their content validity was assessed. Furthermore, the face validity of the instrument was assessed by experts in consultation to ascertain whether the tool measures the intended concept accurately.

In addition, a pilot test was carried out to verify the validity of the instrument by developing and distributing questionnaires to thirty workers of Bishoftu Municipality. According to Srinivasan & Lohith (2017), the pilot survey serves as a replica and trail of the core survey. Finding any potential problems with the measuring device is the aim of a pilot survey. Consequently, the survey questionnaires contained the pertinent questions relating to Municipal Solid Waste transportation and payment system. Also, the phrasing of these questions was impartial and straightforward.

7.2. Reliability

Define reliability as the degree to which a tool yields consistent results [21]. Common metrics for evaluating reliability include test-retest, internal consistency, and inter-rater reliabilities. Determining how consistently an instrument's single item scores compare to the scores of a set of items that frequently combines multiple items to measure a single construct is the aim of internal consistency reliability.

The use of Cronbach's alpha is one of the most widely used techniques for assessing internal consistency reliability. However, sample sizes, score reliability, group variability, and item count can also affect the Cronbach's alpha value (Kimberlin & Winterstein, 2008). However, Cronbach's alpha was used in this study to evaluate the instruments' internal consistency. Accordingly, the Cronbach's alpha as depicted in Table 1 is 0.789; hence, there is strong reliability.

Reliability Statistics	
Cronbach's Alpha	N of Items
.789	21

Author Computed (2024)

Table 1: Reliability Test

7.3. Ethical Consideration

Letters of support for the research with different levels of officials was provided by the organization. The researcher took great care to gather the data while maintaining respondent privacy, confidentiality, and personal safety. The respondents' verbal consent was obtained by the researcher. Prior to every interview, the participants received an explanation of the study's purpose. Those who were willing to participate were interviewed. To make sure the information is accurate, comprehensive, and clear, the researcher reviewed it.

7.4. Dissemination of Results

Following collection, the information and data were organized and looked over. Data was presented using tables, figures, charts, and graphs, and descriptive statistics were analyzed using the Statistical Package for Social Science (SPSS).

8. Results and Discussion

The results of the primary data, which was gathered through the use of a structured questionnaire, were covered in this chapter. Using the descriptive statistics, the background information about the respondents is presented in the first section. Besides, the descriptive statistical analysis also used to answer the research questions that were first put forth at the start of the study.

9. Descriptive Statistics

9.1. Demographic Profile of Respondents

This section covered the various demographic profiles of the respondents, including age, gender, marital status and educational background. To provide readers with a more insightful analysis, the study's demographic variables aim to describe the characteristics of the sample, including the proportion of men and women, age range, level of education, and marital status. The following Table 2 presents gender profile of respondents.

	Gender		
		Frequency	Percent
Valid	Male	183	80.6
	Female	44	19.4
	Total	227	100.0

Source: Own Survey (2024)

Table 2: Presents Gender Profile of Respondents

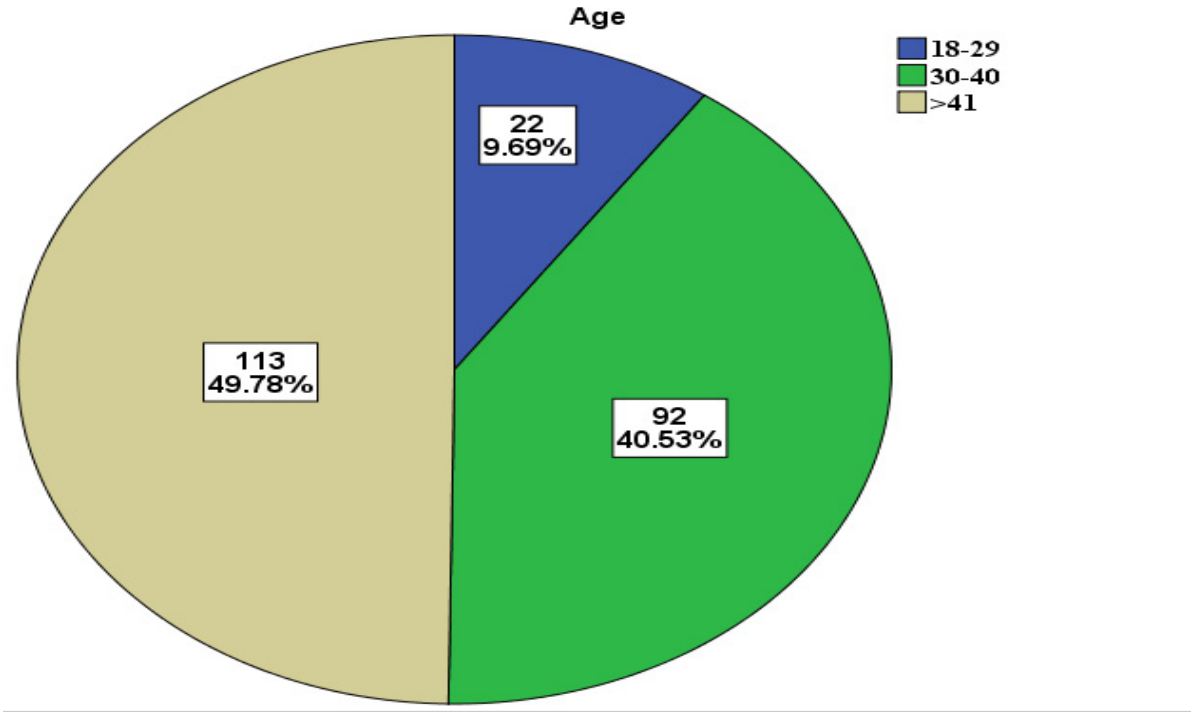
As Table 2 presents 80.6% of the respondents were males and the remaining 19.4% were females. This implies that the majority of respondents were male and there were no gender proportion among the employees of Bishoftu City Municipality. The following Figure 3 depicts the marital status of respondents.

Marital Status			
		Frequency	Percent
Valid	Single	11	4.8
	Married	216	95.2
	Total	227	100.0

Source: Own Survey (2024)

Table 3: depicts the Marital Status of respondents

The majority of respondents (95.2%) were married, while the remaining respondents (4.8%) were single, as shown in Figure 3 above. This shows that married individuals made up the majority of the Bishoftu City Municipality staff. Figure 2 presents the age profile of respondents.



Source: Own Survey (2024)

Figure 2: Depicts the Age Profile of Respondents.

Figure 2 shows that 49.78% of the respondents were above the age of 41, and 40.63% of the respondents were between the ages of 30 and 40 while 9.69% of the remaining respondents were between the ages of 18 and 19. This suggests that the majority of responders were above the age of 41. The following Table 4 depicts the educational background profile of the respondents.

	Education back	ground	
		Frequency	Percent
Valid	Degree	136	59.9
	MA/Msc and above	91	40.1
	Total	227	100.0

Source: Own Survey (2024)

Table 4: Depicts the Educational Background Profile of The Respondents

As Table 4 depicts, the majority of respondents (59.9%) were degree holder of employees of Bishoftu City Municipality while a master's degree holder in the sector were 40.1%. This suggests that employees with first degrees made up the majority of the responses. In the following section the Municipal Solid Waste Transportation and Payment System were discussed.

10. Municipal Solid Waste Transportation and Payment System

10.1. Municipal Solid Waste Transportation Services

There is safe transportation Service of Municipal Solid Waste in the City			
		Frequency	Percent
Valid	Strongly Disagreed	22	9.7
	Disagreed	12	5.3
	Neutral	46	20.3
	Agreed	125	55.1
	Strongly Agreed	22	9.7
	Total	227	100.0

Table 5: Depicts the Respondents' Level of Agreement On 'There Is Safe Transportation Service of Municipal Solid Waste in The City'

As the above Table 5 depicts 9.7 % of the respondents strongly disagreed that there is safe transportation Service of Municipal Solid Waste in the City. On the other hand, 5.3% and 20.3% of the respondents disagreed and became neutral on the statement respectively. The majority (55.1%) of the respondents agreed that there is safe transportation Service of Municipal Solid Waste in the City. The rest 9.7 % of the respondents strongly agreed on statement. The above stated data reveals that the majority of respondents agreed that there is safe transportation Service of Municipal Solid Waste in the City. The following Table 6 presents the respondents level of agreement on 'There is available handcart for Municipal Solid Waste Transportation'

There is available handcart for Municipal Solid Waste Transportation			
		Frequency	Percent
Valid	Strongly Disagreed	22	9.7
	Disagreed	46	20.3
	Neutral	69	30.4
	Agreed	67	29.5
	Strongly Agreed	23	10.1
	Total	227	100.0

Source: Own Survey (2024)

Table 6: Presents the Respondents' Level of Agreement On 'There Is Available Handcart for Municipal Solid Waste Transportation'

Table 6 reveals 9.7 % of the candidates strongly disagreed on the statement 'There is available handcart for Municipal Solid Waste Transportation'. The other 20.3% and 30.4% of the candidates disagreed and became neutral respectively. On the other hand, 29.5% of the candidates agreed on the statement 'There is available handcart for Municipal Solid Waste Transportation' while the rest 10.1% of the candidates strongly agreed on the same statement. This shows that the majority (30.4%) of the candidates became neutral that there is available handcart for Municipal Solid Waste Transportation. Table 7 presents respondents level of agreement on statement 'There is accessible tricycle for Municipal Solid Waste Transportation'.

There is accessible tricycle for Municipal Solid Waste Transportation			
		Frequency	Percent
Valid	Strongly Disagreed	33	14.5
	Disagreed	34	15.0
	Neutral	57	25.1
	Agreed	44	19.4
	Strongly Agreed	59	26.0
	Total	227	100.0

Source: Own Survey (2024)

Table 7: Presents the Respondents' Level of Agreement On 'There Is Accessible Tricycle for Municipal Solid Waste Transportation'

According to Table 7 demonstrates 14.5% of the participants strongly disagreed that there is accessible tricycle for Municipal Solid Waste Transportation while 15% disagreed on the statement. However, 25.1% of the participants became neutral that there is accessible tricycle for Municipal Solid Waste Transportation while the other 19.4% of the respondents agreed on the above statement. There remaining 26% of the candidates strongly agreed that there is accessible tricycle for Municipal Solid Waste Transportation. This reveals the majority (26%) of the participants strongly agreed that there is accessible tricycle for Municipal Solid Waste Transportation. The following Table 8 depicts respondents' level of agreement on 'There is available Tractor for Municipal Solid Waste Transportation'

There is available Tractor for Municipal Solid Waste Transportation			
		Frequency	Percent
Valid	Strongly Disagreed	34	15.0
	Disagreed	23	10.1
	Neutral	23	10.1
	Agreed	78	34.4
	Strongly Agreed	69	30.4
	Total	227	100.0

Source: Own Survey (2024)

Table 8: Depicts the Respondents' Level of Agreement On 'There Is Available Tractor for Municipal Solid Waste Transportation'

Table 8 depicts 15%, 10.1% and 10.1% of the respondents strongly disagreed, disagreed and became neutral on statement 'There is available Tractor for Municipal Solid Waste Transportation' respectively. However, the majority (34.4%) of the respondents agreed that there is available Tractor for Municipal Solid Waste Transportation respectively. The remaining 30.4% of the respondents strongly agreed on the same statement. The above stated data indicates the majority (34.4%) of the respondents agreed that there is available Tractor for Municipal Solid Waste Transportation. The following Table 9 indicates the respondents' level of agreement on 'There is accessible open truck for Municipal Solid Waste Transportation'

There is accessible open truck for Municipal Solid Waste Transportation			
		Frequency	Percent
Valid	Strongly Disagreed	11	4.8
	Disagreed	47	20.7
	Neutral	44	19.4
	Agreed	91	40.1
	Strongly Agreed	34	15.0
	Total	227	100.0

Source: Own Survey (2024)

Table 9: Presents the Respondents' Level of Agreement On 'There Is Accessible Open Truck for Municipal Solid Waste Transportation'

As Table 9 depicts 4.8% of the participants strongly disagreed that there is accessible open truck for Municipal Solid Waste Transportation while 20.7% of the participants disagreed on the same statement. In the other hand, 19.4%, 40.1% and 15% of the respondents became neutral, agreed and strongly agreed that there is accessible open truck for Municipal Solid Waste Transportation respectively. This reveals that the majority (40.1%) of the respondents agreed on the existence of accessible open truck for Municipal Solid Waste Transportation. The following Table 10 depicts respondents' level of agreement on 'There is available container carrier for Municipal Solid Waste Transportation'.

There is available container carrier for Municipal Solid Waste Transportation			
		Frequency	Percent
Valid	Strongly Disagreed	23	10.1
	Disagreed	33	14.5
	Neutral	81	35.7
	Agreed	79	34.8
	Strongly Agreed	11	4.8
	Total	227	100.0

Source: Own Survey (2024)

Table 10: Present Respondents' Level of Agreement On 'There Is Available Container Carrier for Municipal Solid Waste Transportation'

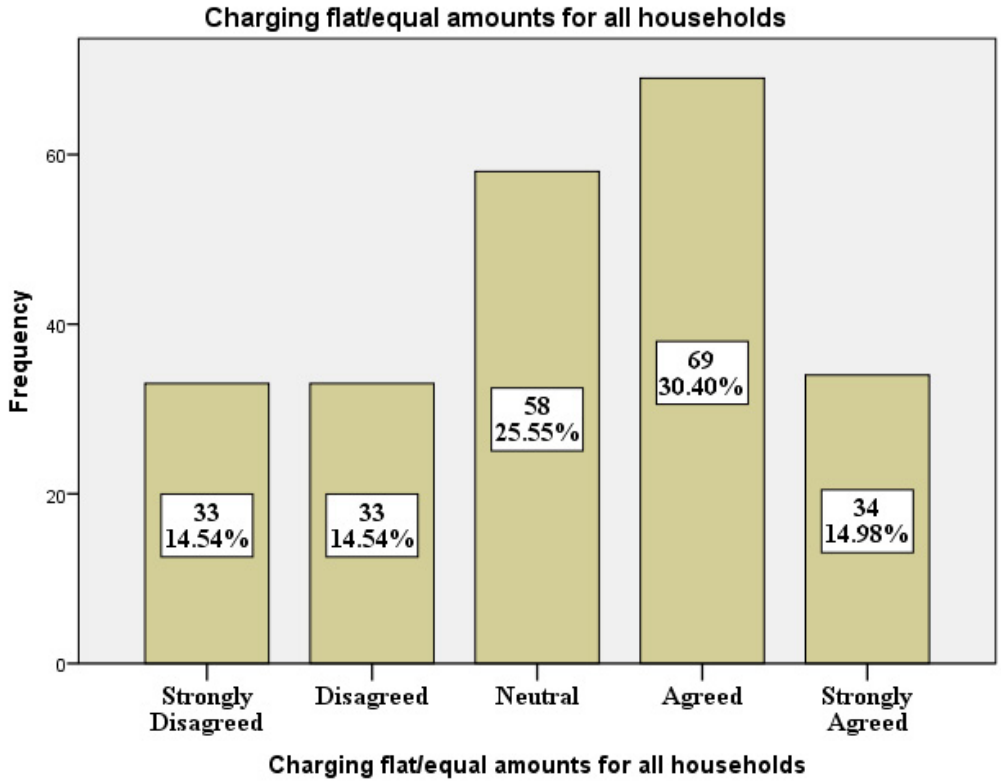
Table 10 demonstrates 10.1% of the candidates strongly disagreed that there is available container carrier for Municipal Solid Waste Transportation while 14.5% of the candidates disagreed. However, the majority (35.7%) of the respondents became neutral that there is available container carrier for Municipal Solid Waste Transportation. The other 34.8% of the candidates agreed on the same statement. The remaining 4.8% of the respondents strongly agreed that there is available container carrier for Municipal Solid Waste Transportation. The above stated data indicates the majority of the respondents became neutral in the existence of available container carrier for Municipal Solid Waste Transportation. The following Figure 3 presents respondents' level of agreement on 'charging depends on the amount/quantity of solid waste produced by the household'.

11. The Existing Payment System of Municipal Solid Waste Management

Source: Own Survey (2024)

Figure 3: presents respondents' level of agreement on 'charging depends on the amount of solid waste produced by the household'

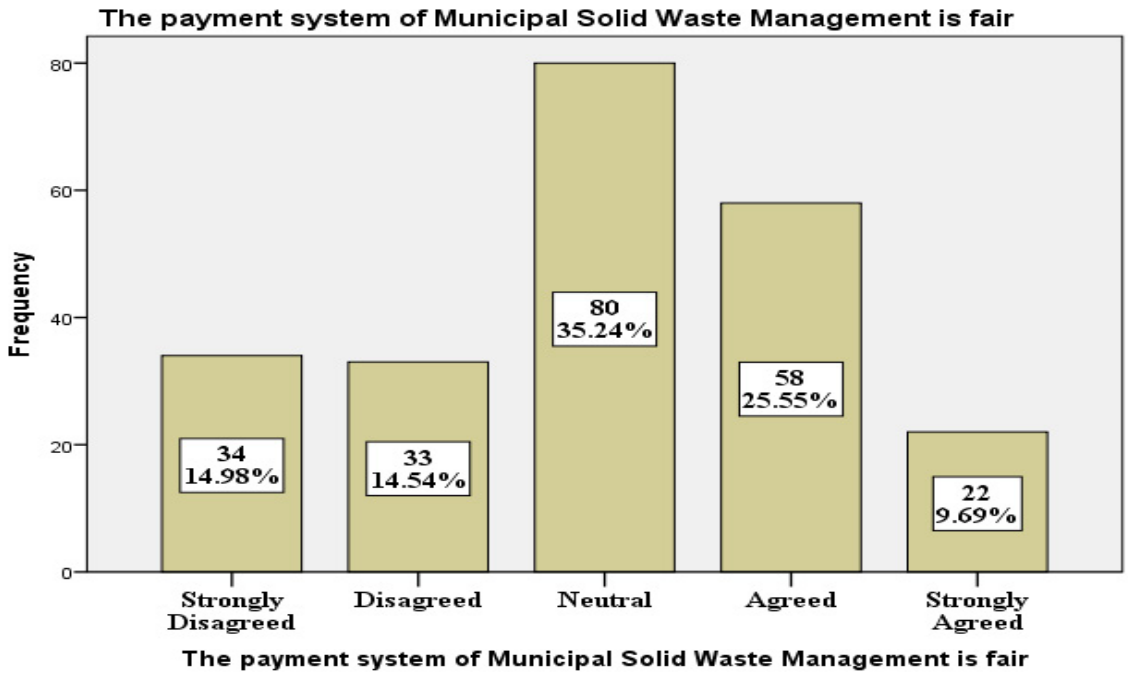
Figure 3 indicates 14.98% and 29.52% of the respondents strongly disagreed and disagreed respectively that charging depends on the amount of solid waste produced by the household while 25.11% of the respondents become neutral on the same statement. The other 19.82% of the participant agreed that charging depends on the amount of solid waste produced by the household. The remaining 10.57% of the respondents strongly agreed on the same statement. This revealed that the majority (29.52%) of respondents disagreed that charging depends on the amount of solid waste produced by the household. The following Figure 4 presents respondents level of agreement on 'charging is flat/equal amount for all households'.



Source: Own Survey (2024)

Figure 4: Presents Respondents' Level of Agreement On 'Charging Is Flat/Equal Amount for All Households'

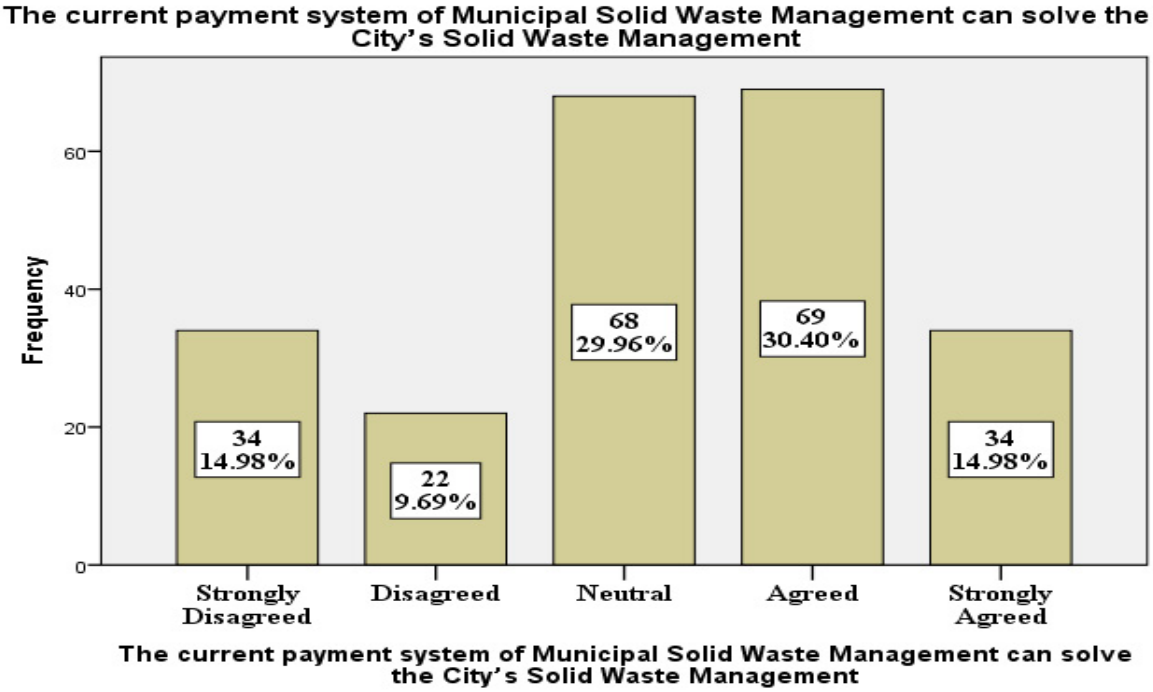
The above Figure 4 depicts 14.54% of the candidates strongly disagreed that charging is flat/equal amount for all households while 14.54% of the participants disagreed on the same statement. The other 25.55% of the respondents became neutral that charging is flat/equal amount for all households. However, the majority (30.40%) of the respondents agreed on the same statement. The rest 14.98% of the participants strongly agreed that charging is flat/equal amount for all households. The stated data indicates that the majority of the respondents agreed that charging is equal amount for all households. The following Figure 5 depicts respondents' level of agreement on 'The payment system of Municipal Solid Waste Management is fair'



Source: Own Survey (2024)

Figure 5: Depicts Respondents' Level of Agreement On 'The Payment System of Municipal Solid Waste Management Is Fair'

The following Figure 5 presents 14.98%, 14.54%, 35.24% and 25.55% of the respondents strongly disagreed, disagreed, became neutral and agreed respectively that the payment system of Municipal Solid Waste Management is fair. The rest, 9.69% of the respondents strongly agreed that the payment system of Municipal Solid Waste Management is fair. This indicates the majority (35.24%) of the participants became neutral that the payment system of Municipal Solid Waste Management is fair. The following Figure 6 presents respondents' level of agreement on 'The current payment system of Municipal Solid Waste Management can solve the City's Solid Waste Management'.



Source: Own Survey (2024)

Figure 6: Presents Respondents' Level of Agreement On 'The Current Payment System of Municipal Solid Waste Management Can Solve the City's Solid Waste Management'

As Figure 6 reveals 14.98%, 9.69% and 29.96% of the respondents strongly disagreed, disagreed and became neutral respectively that the current payment system of Municipal Solid Waste Management can solve the City's Solid Waste Management. However, the majority (30.40%) of the participants agreed that the current payment system of Municipal Solid Waste Management can solve the City's Solid Waste Management. The rest 14.98% of the participants strongly agreed that the current payment system of Municipal Solid Waste Management can solve the City's Solid Waste Management. This indicates that the majority of respondents accepted that the current payment system of Municipal Solid Waste Management can solve the City's Solid Waste Management. The following Figure 7 presents the extent of payment of waste collection per month

12. The level of Municipal Solid Waste Management Payment System

Source: Own Survey (2024)

Figure 7: Presents the Extent of Payment of Waste Collection Per Month

As Figure 7 presents 10.13% of the candidates said that the extent of payment of waste collection per month is too high. However, the majority (84.58%) of the respondents replied that the extent of payment of waste collection per month is Medium. The rest 5.29% of the respondents accepted that the extent of payment of waste collection per month is too low. This reveals the majority of the participants accepted that the extent of payment of waste collection per month is medium. The following Figure 8 presents respondents assessment about the price of waste collection fee.

Source: Own Survey (2024)

Figure 8: Presents Respondents Assessment About the Price of Waste Collection Fee

Figure 8 presents 10.13% of the respondents replied that the assessment of the price of waste collection fee is too high. However, the majority (80.18%) of the respondents said that the assessment of the price of waste collection fee is too medium. The other 4.85% of the candidates responded that the assessment of the price of waste collection fee is too low. The rest 4.85% of the respondents said that the assessment of the price of waste collection fee is others. This indicates the majority (80.18%) of the respondents accepted that the assessment of the price of waste collection fee is medium. The following Table 11 presents respondents willingness to pay higher fees for better service.

Would you be willing to pay higher fees for better service?			
		Frequency	Percent
Valid	Yes	125	55.1
	No	80	35.2
	Do not know	22	9.7
	Total	227	100.0

Source: Own Survey (2024)

Table 11: Presents Respondents Willingness to Pay Higher Fees for Better Service

Table 11 demonstrates the majority (55.1%) of the respondents were willing to pay higher fees for better service. On the other hand, 35.2% of the candidates were not willing to pay higher fees for better service. The rest 9.7% of the participants neither accepted nor rejected the willingness to pay higher fees for better service. This indicates that the majority (55.1%) of the respondents were willing to pay higher fees for better service. The following Table 12 depicts respondents' answer about current amount being paid for cleaning the neighborhood.

Current amount being paid for cleaning the neighborhood?			
		Frequency	Percent
Valid	<100 birr	215	94.7
	100-200 birr	12	5.3
	Total	227	100.0

Source: Own Survey (2024)

Table 12: Depicts Respondents' Answer About Current Amount Being Paid for Cleaning The Neighborhood

According to Table 12 depicts 94.7% of the respondents answered that the current amount being paid for cleaning the neighborhood is <100birr. On the other hand, 5.3% of the respondents said that the current amount being paid for cleaning the neighborhood is 100-200birr. The above stated data reveals the majority of the respondents believed that the current amount being paid for cleaning the neighborhood is <100birr. The following Table 13 shows respondent's willingness to pay for cleaning of the neighborhood.

How much amount will you be willing to pay for cleaning of the neighborhood?			
		Frequency	Percent
Valid	<100 birr	145	63.9
	100-200 birr	82	36.1
	Total	227	100.0

Source: Own Survey (2024)

Table 13: Shows Respondents Willingness to Pay for Cleaning of The Neighborhood

Table 13 depicts 63.9% of the respondents accepted that the amount of money willing to pay for cleaning of the neighborhood is <100birr. On the other hand, 36.1% of the candidates accepted that the amount of money willing to pay for cleaning of the neighborhood is 100-200birr. This reveals that the majority of respondents believed that the amount of money willing to pay for cleaning of the neighborhood is <100birr. The following Table 14 presents respondents' reason for not willing to pay a fee to cover the full cost of a waste collection service

Reason for not willing to pay a fee to cover the full cost of a waste collection service?			
		Frequency	Percent
Valid	Limitation of Money	68	30.0
	Unsatisfied with the service	91	40.1
	Lack of awareness	68	30.0
	Total	227	100.0

Source: Own Survey (2024)

Table 14: Presents Respondents Reason for Not Willing to Pay A Fee to Cover the Full Cost of a Waste Collection Service

As Table 14 depicts 30% of the candidates said that the reason for not willing to pay a fee to cover the full cost of a waste collection service is limitation of money. On the other hand, 40.1% of the respondents answered that the reason for not willing to pay a fee to cover the full cost of a waste collection service is unsatisfied with the service while the rest 30% of the participants replied that the reason for not willing to pay a fee to cover the full cost of a waste collection service is lack of awareness. This reveals that the majority of respondents accepted that the reason for not willing to pay a fee to cover the full cost of waste collection service is due to lack of satisfaction with the service. The following Table 15 presents respondents' response on the type of payment system of Municipal Solid Waste.

The type of payment system of Municipal Solid Waste			
		Frequency	Percent
Valid	Manual	219	96.5
	Online	8	3.5
	Total	227	100.0

Source: Own Survey (2024)

Table 15: Presents Respondents' Response on The Type of Payment System of Municipal Solid Waste

Table 15 depicts 96.5% of the respondents replied that the type of payment system of Municipal Solid Waste Management is Manual. In other hand, 3.5% of the participants said that the type of payment system of Municipal Solid Waste Management is online. This indicates that the majority (96.5%) of the respondents replied that the type of payment system of Municipal Solid Waste is Manual.

13. Interview and Observation Result

As discussion made with key informants during interview revealed, the municipal solid waste transportation services were not accessible for all groups of people. In fact there were attempts to make the municipal solid waste transportation system more accessible by the City's Municipality. There were different challenges of municipal solid waste transportation. Among others, limitation of well accessible route for transportation, inadequate vehicles for municipal solid waste transportation and problem of quality of transportation services were among the challenges manifested in the Municipality's solid waste transportation service.

The key informants also added currently the Municipality using open tractors for waste transportation. This were causing nuisance in the City through dropping some of the solid waste wastes on the road. Besides, since some the transportation vehicles were open tractor, it has been creating air pollution on the way crossing the City. Furthermore, as the waste that was transported visible, it affects the beauty of the City.

As far as the payment system of municipal solid waste is concerned the key informants during the interview said, the current payment system of municipal solid waste is in poor condition. The payment system is not online, it is paid through manual which vulnerable for frequent addition of payment fee by small scale enterprise that has been rendering this service. Besides, as the payment system relies on the amount of solid waste in m3, this let them collect and clean their specific site in the City. Anyone who produces solid waste liable for this payment system and the City also obtain 5% of this payment which increases the revenue of the City.

14. Summary of The Finding, Conclusion and Recommendation

The chapter incorporates summary of the findings which demonstrated the key result of the study. It included the finding of municipal solid waste transportation and payment system. The finding of the study stated under three objectives which incorporates the existing Municipal Solid Waste transportation services and the existing payment system of Municipal Solid Waste Management and I t level. The chapter also provided a summary of the study's key findings and, finally, offered suggestions for how to resolve the problems with the payment system and transportation of municipal solid waste.

15. Summary of the Finding

In this section, the finding of the study summarized as in the following:

- As descriptive statics revealed, the majority of respondents were male and there were no gender proportion among the employees of Bishoftu City Municipality.
- Married individuals made up the majority of the Bishoftu City Municipality staff and they were above the age of 41. Besides, employees with first degrees made up the majority of the responses.
- The majority (55.1%) of the respondents agreed that there is safe transportation Service of Municipal Solid Waste in the City.
- However, the majority (30.4%) of the candidates became neutral that there is available handcart for Municipal Solid Waste Transportation.
- There was strong agreement among the majority of the participants that there was accessible tricycle for Municipal Solid Waste Transportation.
- The majority (34.4%) of the respondents of Bishoftu City Municipality Employees agreed that there was available Tractor for Municipal Solid Waste Transportation.
- In other hand, the majority (40.1%) of the respondents agreed on the existence of accessible open truck for Municipal Solid Waste Transportation.
- The majority of the respondents became neutral in the existence of available container carrier for Municipal Solid Waste Transportation.
- There was disagreement among the majority of the respondents that charging depends on the amount of solid waste produced by the household.
- However, the majority of the respondents agreed that charging is equal amount for all households.
- The majority (35.24%) of the participants became neutral that the payment system of Municipal Solid Waste Management is fair.
- There was agreement among the majority of respondents that the current payment system of Municipal Solid Waste Management can solve the City's Solid Waste Management.
- The majority of the participants accepted that the extent of payment of waste collection per month is medium.
- Besides, the majority (80.18%) of the respondents accepted

that the assessment of the price of waste collection fee is medium.

- There was willingness by majority (55.1%) of the respondents to pay higher fees for better service.
- The majority of the respondents believed that the current amount being paid for cleaning the neighborhood is <100birr.
- The majority of respondents believed that the amount of money willing to pay for cleaning of the neighborhood is <100birr.
- There was acceptance by the majority of the respondents that the reason for not willing to pay a fee to cover the full cost of waste collection service is due to lack of satisfaction with the service.
- The majority (96.5%) of the respondents replied that the type of payment system of Municipal Solid Waste is Manual.

16. Conclusion

The study intended to assess the transport and payment system of municipal solid waste management in Bishoftu City. Accordingly, the majority of respondents generally concurred that the city offers a safe transportation service for municipal solid waste. The fact that there are handcarts available for municipal solid waste transportation, however, caused most of the candidates to become indifferent. Most participants strongly agreed that there was an accessible tricycle for the transportation of municipal solid waste.

The vast majority of Bishoftu City Municipality employees who responded concurred that there was a tractor available for the transportation of municipal solid waste. On the other hand, most respondents concurred that there should be accessible open trucks for the transportation of municipal solid waste. When it came to the availability of container carriers for the transportation of municipal solid waste, the majority of respondents became indifferent. The majority of respondents disagreed that the amount of solid waste generated by the household determines the charging. Nonetheless, most respondents concurred that all households should pay the same amount. The vast majority of participants expressed no opinion regarding the fairness of the Municipal Solid Waste Management payment system. Most respondents agreed that the city's solid waste management problem can be resolved with the current municipal solid waste management payment system. Most participants agreed that the monthly payment amount for waste collection is moderate. Furthermore, the majority of respondents agreed that the waste collection fee was priced in the medium.

The majority of respondents indicated that they would be willing to pay more for superior service. According to the majority of respondents, the neighborhood is currently cleaned for less than 100birr. Most respondents thought that <100birr was the maximum amount they would be willing to spend on neighborhood cleaning. The majority of respondents acknowledged that their dissatisfaction with the service was the reason they were unwilling to pay a fee to cover the entire cost of the waste collection service. The majority of respondents indicated that manual payment systems are the most common form of municipal solid waste payment systems.

References

1. Singh, J., & Ramanathan, A. L. (Eds.). (2010). Solid waste management: present and future challenges. IK International Pvt Ltd.
2. Tyagi, V., Fantaw, S., & Sharma, H. R. (2014). Municipal solid waste management in Debre Berhan City of Ethiopia. *J Environ Earth Sci, 4*(5), 98-103.
3. Ayele, B. G., & Assefa, E. (2021). Liquid Waste Management Practices and the Role of Communal Treatment Plant in the Eastern Industrial Park of Dukem town, Ethiopia. *J Waste Manag Disposal, 4,* 106.
4. Vaibhav Srivastava, V. S., Ismail, S. A., Pooja Singh, P. S., & Singh, R. P. (2015). Urban solid waste management in the developing world with emphasis on India: challenges and opportunities.
5. Kassim, S. M., & Ali, M. (2006). Solid waste collection by the private sector: Households' perspective—Findings from a study in Dar es Salaam city, Tanzania. *Habitat international, 30*(4), 769-780.
6. Ali, S. M. (1997). Integration of the official and private informal practices in solid waste management (Doctoral dissertation, Loughborough University).
7. Ayele, B. G. (2024). Pollution and Community Health Effects.
8. Scheinberg, A., Wilson, D. C., & Rodic-Wiersma, L. (2010). Solid waste management in the world's cities.
9. Henry, R. K., Yongsheng, Z., & Jun, D. (2006). Municipal solid waste management challenges in developing countries–Kenyan case study. *Waste management, 26*(1), 92-100.
10. Memon, M. A. (2010). Integrated solid waste management based on the 3R approach. *Journal of Material Cycles and Waste Management, 12,* 30-40.
11. Teshome, F. B. (2021). Municipal solid waste management in Ethiopia; the gaps and ways for improvement. *Journal of Material Cycles and Waste Management, 23,* 18-31.
12. Gedefaw, M. (2015). Assessing the current status of solid waste management of Gondar town, Ethiopia. *Int J Sci Technol Res, 4*(9), 28-36.
13. Cheru, M. (2016). Solid Waste Management in Addis Ababa: A new approach to improving the waste management system.
14. Hagos, D., Mekonnen, A., & Gebreegziabher, Z. (2013). Households willingness to pay for improved urban solid waste management: The case of Mekelle city, Ethiopia. *Ethiopian Journal of Economics, 22*(1), 107-138.
15. Batu, M. M., & Tolosa, E. F. (2016). Determinants of households' willingness to pay for improved solid waste management in Ethiopia: The case study of Jimma Town. *J Environ Earth Sci, 6*(2224-3216), 75.
16. Lohri, C. R., Camenzind, E. J., & Zurbrügg, C. (2014). Financial sustainability in municipal solid waste management–Costs and revenues in Bahir Dar, Ethiopia. *Waste management, 34*(2), 542-552.
17. Tassie, K., & Endalew, B. (2020). Willingness to pay for improved solid waste management services and associated factors among urban households: One and one half bounded contingent valuation study in Bahir Dar city, Ethiopia. *Cogent Environmental Science, 6*(1), 1807275.

18. Kayamo, S. E. (2022). Willingness to pay for solid waste management improvement in Hawassa city, Ethiopia. *Journal of Environmental Management, 302,* 113973.
19. Creswell, J. W., & Creswell, J. D. (2017). Research design: Qualitative, quantitative, and mixed methods approaches. Sage publications.
20. Taherdoost, H. (2016). Sampling methods in research methodology; how to choose a sampling technique for research. *International journal of academic research in management (IJARM), 5*.
21. Heale, R., & Twycross, A. (2015). Validity and reliability in quantitative studies. *Evidence-based nursing, 18*(3), 66-67.
22. Abrhame, E. (2018). Assessment of municipal solid waste management practices: A case study of Bishoftu city administration. *Addis Ababa University College of Business and Economics.*
23. Asmare, T. (2022). Satisfaction and Associated factors on Small Scale Solid Waste Collection Enterprises in Gondar City, North West Ethiopia (Doctoral dissertation).
24. Ayele, B. G. (2024). Environmental management policies, practices and compliance with National and International Standards in the Eastern Industrial Park, Dukem Town, Ethiopia.
25. Damtew, Y. T., & Desta, B. N. (2015). Micro and small enterprises in solid waste management: Experience of selected cities and towns in Ethiopia: A review. *Pollution, 1*(4), 461-427.
26. B. Girma (2021). The effects of environmental pollution of eastern industrial park on human health and comfort of Dukem Town, Ethiopia. *J Ind Pollut Control, 37*, 1-14.
27. JICAIIC (2005). Supporting Capacity Development for Solid Waste Management in Developing Countries, Towards Improving Solid Waste Management Capacity of Entire Society, Japan.
28. Kim, S. H. (1997). Modeling resident satisfaction: Comparison of the Francescato and Fishbein-Ajzen TRA models. University of Illinois at Urbana-Champaign.
29. Municipal Solid Waste Management Services in Kampala, Uganda. *Science Journal of Environmental Engineering Research.* Volume 2013, Article ID sjeer-143, 8 Pages, 2012.
30. Nanda, S., & Berruti, F. (2021). Municipal solid waste management and landfilling technologies: a review. *Environmental chemistry letters, 19*(2), 1433-1456.
31. Nguyen-Trong, K., Nguyen-Thi-Ngoc, A., Nguyen-Ngoc, D., & Dinh-Thi-Hai, V. (2017). Optimization of municipal solid waste transportation by integrating GIS analysis, equation-based, and agent-based model. *Waste management, 59*, 14-22.
32. Raje, D. V., Wakhare, P. D., Deshpande, A. W., & Bhide, A. D. (2001). An approach to assess level of satisfaction of the residents in relation to SWM system. *Waste management & research, 19*(1), 12-19.
33. Sahoo, S., Kim, S., Kim, B. I., Kraas, B., & Popov Jr, A. (2005). Routing optimization for waste management. *Interfaces, 35*(1), 24-36.
34. Šauer, P., Pařízková, L., & Hadrabová, A. (2008). Charging systems for municipal solid waste: Experience from the Czech Republic. *Waste management, 28*(12), 2772-2777.