



Assessment of Public Willingness to Pay for Solid Waste Management in Yangon, Myanmar

Mya Lwin Lwin Aung



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Front cover photo: Waste disposal site in Yangon City, Myanmar. Photo by Mya Lwin Lwin Aung

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October, 2016

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The Economy and Environment Program for Southeast Asia (EEPSEA) was established in May 1993 to support research and training in environmental and resource economics.

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ASSESSMENT OF PUBLIC'S WILLINGNESS TO PAY FOR SOLID WASTE MANAGEMENT IN YANGON, MYANMAR

Mya Lwin Lwin Aung

EXECUTIVE SUMMARY

Solid waste management is a major environmental concern for countries in Southeast Asia, particularly for Yangon City in Myanmar, where there is much room for improvement. This study aimed to assess the willingness to pay of the local communities in urban and suburban Yangon for waste disposal management.

Household surveys were conducted in two urban townships (i.e., Botahtaung and Pazundaung), and interviews were also conducted in two suburban townships (i.e., Insein and North Okkala) in order to develop a better understanding of the residents' perceptions of the problems in and solutions to solid waste management. The intention was to analyze the socioeconomic profile and behavior of the respondents alongside their willingness to pay (WTP) for better solid waste management (SWM) services.

This study explored the current SWM program in the targeted city's central business district (CBD) and its periphery. The study also gauged the residents' level of knowledge of the importance of a SWM program. Likewise, this study determined the respondents' WTP for SWM services and the socioeconomic factors (e.g., education, age, type of occupation, earnings, and years of residence) that affect their willingness by using the survey method. Contingent evaluation with socioeconomy and attitude in the suburban region were also surveyed to supplement findings in the targeted urban area. Accordingly, the resulting data were analyzed.

The respondents quantified their WTP for improved SWM by choosing from five bid prices: MMK 800 (USD 0.8); MMK 1,000 (USD 1.0); MMK 1,500 (USD 1.5); MMK 2,000 (USD 2.0); and MMK 3,000 (USD 3.0). Most of the respondents were willing to pay only MMK 800 (USD 0.8), whereas only a minority chose MMK 3,000 (USD 3.0). The respondents' WTP on SWM gradually increased as the bid prices increased. Majority of the respondents from Botahtaung (62%) and Pazundaung (56%)—or a total of 229 respondents—preferred a monthly payment scheme.

Survey findings also show that the parametric estimate of the mean WTP (MWTP) was at MMK 1,104 (USD 1.10) per month, whereas the nonparametric estimate was at MMK 1,086 (USD 1.09) per month. By multiplying the MWTP from both estimates with half of the 1.09 million households in Yangon, it was determined that the potential revenue that could be generated from SWM would be MMK 607.20 million (USD 0.61 million) and MMK 597.30 million (USD 0.60 million), according to parametric and nonparametric estimates, respectively. Thus, the revenue of the Yangon City Development Committee would be twice its current revenue. This research aims to support the improvement of policies on contributions to SWM.

1.0 INTRODUCTION

1.1 Background and Rationale

Yangon is the largest commercial city in Myanmar, with a high population density and a total population of about 5.2 million individuals (CSO 2014). In recent years, Yangon City has encountered a significant increase in solid waste generation that has caused adverse effects on human health and on the environment. The main sources of solid waste are from household kitchens, markets, hotels, and gardens, with 60% of the solid waste coming from household kitchens. This waste problem is further exacerbated by the uncontrolled urbanization and growth of businesses and industries in the city. With the rapid urbanization occurring over the last decade, some other townships have also become densely populated; yet the development of utility services in some peripheral and suburban areas is still lagging. Among these services is solid waste management (SWM), which is the focus of this study.

The poor SWM in Yangon is a result of a number of factors, such as the lack of planning and legislation, insufficient public awareness and financial support, and the use of obsolete equipment, among others. The public agency responsible for SWM is the Disposal and Cemeteries Department of the Pollution Control and Cleansing Department (PCCD) under the Yangon City Development Committee (YCDC). The YCDC was first established in 1922 through the Yangon Municipal Act. It was later transformed into a municipal committee in 1973, and then transformed to become the Yangon Regional Council after 1974, before it finally became a government department. After 1977, the YCDC was officially established as a government organization.

Of the 20 departments currently under the YCDC, it is the PCCD that is in charge of SWM. The PCCD is also responsible for pollution control and industrial waste water management, cemetery and public toilet management, and waste to energy technologies. The YCDC has three main functions in relation to SWM: collection, transportation and final disposal, and monitoring of generated solid waste and daily collection density. One of the initiatives of the YCDC is to promote public awareness about the problems in waste management. Thus, to improve waste collection and transportation to the final disposal area, the YCDC also provides green and blue bags¹ to encourage households to practice proper waste segregation.

SWM in Yangon City is financed by the service charges collected by the YCDC. Prior to March 2012, the YCDC collected three different rates for its services every quarter: MMK 1,800 (USD 1.8); MMK 1,350 (USD 1.35); and MMK 900 (USD 0.9). The rates depended on the location and the type of service provided. Households in the six townships within the central business district (CBD) paid the highest rate of MMK 1,800 (USD 1.8) per quarter (basic calculation rate at MMK 20 [USD 0.02] per day) because the YCDC could provide them with better services. People from the nine townships connected to the CBD were charged the middle rate of MMK 1,350 (USD 1.35) per quarter (basic calculation rate

¹ People should utilize the green and blue bags for waste disposal. The green bag should be used for dry waste or recyclables (e.g., paper, bottle, metal, plastic, etc.), whereas the blue bag should be used for wet waste, especially kitchen waste. The YCDC charges for these standard bags.

at MMK 15 [USD 0.015] per day), as the YCDC could not provide the same kind of services enjoyed by those located in the CBD. Households in the suburban townships paid the lowest rate of MMK 900 (USD 0.9) quarterly (basic calculation rate MMK 10 [USD 0.01] per day).

Since April 2012, the YCDC has increased the amount it charges to the nine townships connected to the CBD from MMK 1,350 (USD 1.35) to MMK 1,800 (USD 1.8) per quarter. In the 10 suburban townships formerly paying MMK 900 (USD 0.9) per quarter, the service charge has been raised to MMK 1,350 (USD 1.35). This rate increase covers improvements in services, which households in these townships can expect from the YCDC. The eight remaining satellite townships are still being charged the same rate since the YCDC could not provide them with better services.

Table 1 summarizes the YCDC's service fees, although some households also pay for additional services from private collectors.² The two townships in the urban area and the two townships in the suburban area comprise the study site of this research project. Although the YCDC plans to offer improved SWM services, upgrading its infrastructure would require additional investment in tool kits and machinery, an amount unlikely to be raised even if the service charges are increased. With the current budget available, the government cannot upgrade machinery and equipment or increase its manpower. Thus, the YCDC has tried to call for tender for private waste collection services, which would mean further increases in service charges. So far, there have been seven applications, and the YCDC is now negotiating for better services at the lowest possible cost with two of these companies.

Table 1. Charges for solid waste management

Township	Service Charge before March 2012	Service Charge since April 2012
Six CBD townships (Urban area) Kyauk Ta Da, Pabe Dan, Lan Ma Daw, Latha, Botahtaung, Pazundaung	MMK 1,800 (USD 1.8)	MMK 1,800 (USD 1.8)
Nine townships (Connected to the CBD) Dagon, Ah Lon, Kyi Myin Dine, San Chaung, Ba Han, Mingalr Taung Nyunt, Tarmwe, Yankin, Kamar Yut	MMK 1,350 (USD 1.35)	MMK 1,800 (USD 1.8)
10 townships (Suburban area) Thingan Gyun, South Dagon, North Dagon, South Okkala, North Okkala, Thar Ke Ta, Daw Bon, Mayangone, Insein, Hlaing	MMK 900 (USD 0.9)	MMK 1,350 (USD 1.35)
Eight townships (Satellite township) East Dagon, Dagon Seik Kan, Dala, Seikgyi Kanaungto, Mingalardon, Shwe Pyi Tha, Hlaing Tharyar, Seik Kan	MMK 900 (USD 0.9)	MMK 900 (USD 0.9)

Source: YCDC (2012)

Notes: (1) USD 1 = MMK 1,000 (2) CBD = Central Business District

²Data on this were also collected and are shown in another section.

1.2 Research Objectives

The primary aim of this study was to develop a better understanding of the attitudes of the residents in Yangon regarding the SWM in the CBD and in the townships within the CBD's periphery. Specifically, the study aimed to

1. assess the level of awareness of residents in Yangon City about the importance of the SWM program,
2. find out their willingness to pay (WTP) for improved SWM, and
3. identify the factors that affect such willingness.

1.3 Scope of the Study

Botahtaung and Pazundaung townships were chosen as the sites for this WTP study. These towns are among the urban townships; they are populated mainly by residents rather than by business vendors and their shops. In the last decade, the capital city of Yangon has expanded rapidly, outpacing the expansion of urban infrastructure and utility services.

Household surveys were also conducted in two suburban townships, namely, Insein and North Okkala townships. The data gathered from two sites were used mainly to understand the respondents' socioeconomic profile and differences in waste disposal (if any), attitudes toward service charges, and assessment of SWM services.

2.0 LITERATURE REVIEW

2.1 Literature on Solid Waste Management (SWM)

A number of researchers from neighboring countries have analyzed SWM by using the contingent valuation method (CVM) focusing on households' WTP. One such paper reviewed for this study was authored by Vanitha (2011) of Bharathiar University in India. The author attempted to "estimate the possible recovery of cost for household solid waste management in Coimbatore City based on ability to pay and willingness to pay and to identify the determinants of WTP" (Vanitha 2011, p. 1).

Solid waste is a problem that must be properly managed. Although it is generally understood that proper waste management helps protect human health and the environment and helps to preserve natural resources, one important thing that many do not realize is that proper solid waste management also helps mitigate the effects of climate change.

In another study by Altaf (1996), the author questioned the conventional presumption that households accord less priority on SWM (compared to other urban

services) and are unwilling to pay for it. This research also showed that simple and inexpensive household surveys can provide valuable inputs to the planning process.

Waste generation increases with population growth and economic development. Improperly managed solid waste poses a risk to human health and to the environment. Uncontrolled dumping and improper waste handling can cause various problems such as water contamination, pest infestation, and increased flooding due to blocked drainage canals or gullies, which may also lead to safety hazards such as fire or explosion. Improper waste management also increases greenhouse gas emissions, which also contribute to the effects of climate change. Planning for the effective implementation of a comprehensive program for waste collection, transport, and disposal—alongside activities to reduce or recycle waste—could help to eliminate these problems (EPA 2002).

SWM is a problem not only for Myanmar but also for other developing countries such as the Philippines where rapid urbanization and industrialization have led to increases in the solid wastes generated by households. In the Philippines, SWM has been identified by majority of the households in Miag-ao³ as a major environmental issue. Improved solid waste collection services have also been identified by households as the primary solution to SWM problems in the municipality (Geganzo and Guillermo 2013).

2.2 Literature on Contingent Valuation Method (CVM)

2.2.1 Review of the theory of CVM

CVM is used to estimate both use and nonuse values of environmental services. It involves directly asking people through the survey method on how much they would be willing to pay for improved environmental services. In some cases, people are also asked for the amount of compensation they are willing to accept to give up specific environmental services. It is called “contingent” valuation because people are asked to state their WTP, which is contingent on a specific hypothetical scenario and description of the environmental service.

CVM is a stated-preference technique—as in the individual respondent “states” his or her preference. The challenge in the research design is in developing a scenario of the hypothetical goods, which will be provided to the respondents should they be willing to pay for them.

CVM, which is widely used to assess the benefits of public and nonmarket goods, usually includes the continuous method and the discrete method. The continuous method includes the open-ended bidding approach and the payment card approach, whereas the discrete method or dichotomous format includes single-bound and double-bound formats. The continuous format generates a lower estimated WTP than a dichotomous choice (DC) format do because respondents presented with a DC format tend to answer more in the affirmative. Moreover, protest zeros tend to occur when DC respondents are presented with very high bid values.

³ Miag-ao is a first-class municipality in the province of Iloilo, Philippines.

Past criterion validity tests of CVM have been of two basic types: field experiments and laboratory experiments. The field experiments fall into two groups: those of WTP for hunting permits (Bishop and Heberlein 1979; Alberini, Boyle, and Welsh 1986), and those involving contributions (essentially donations) toward environmental improvements (Seip and Strand 1992; Duffield et al. 2007; Champ et al. 1997). The latter set of studies has the advantage of focusing on public goods, which is an important focus in CVM, although it is subject to potential free-riding when measuring actual payments because donations are used as a payment vehicle. Laboratory experiments that compare actual cash and hypothetical WTP have the advantage of careful control of procedures, use of a well-defined good, and avoidance of free-riding. Most lab experiments have used common market goods such as a chocolate bar (Kealy, Dovidio, and Rockel 1988); a house-plant (Boyce, Little, and Russell 2003); a painting or map (Neill 1995); and a juicer, a calculator, and a box of chocolates (Cummings and Taylor 1999).

2.2.2 Review of CVM studies on SWM

Khattak, Khan, and Ahmad (2009) have observed that the growing quantity of solid waste is one of the most important environmental hazards prevailing in developing countries. It is difficult for the government in developing countries like Pakistan to address the problem adequately due to scarce resources. Accordingly, public awareness and the public's monetary contribution could help the government overcome the menace of solid waste. This study was undertaken to quantify the public's WTP and to identify the determinants of their WTP. This paper drew from a household survey conducted in the urban areas of the Peshawar district in Pakistan from September to October 2008, the results of which indicated that 49% of the sample households were willing to pay for better SWM services. Interestingly, 53% of the respondents were already satisfied with the existing SWM services. The results further showed that household size, household income, and higher educational attainment were important determinants of a household's WTP for better SWM services. Both the households and town/tehsil municipal administration emerged as vital parties to be consulted for better SWM services (Khattak, Khan, and Ahmad 2009).

In another study conducted in Kenya, Cheserek, Syagga, and Olima (2012) observed that due to high population growth rates and increasing household disposable incomes, the municipality of Eldoret has had to deal with enormous solid waste generation. However, SWM is a public good that could not be optimally provided under perfectly competitive market conditions due to indivisibility and non-excludability in consumption. Most attempts at solving waste problems in Kenya have focused on the supply side of waste disposal and collection. These have not been successful, but the paper suggested the use of demand-oriented valuation. Accordingly, the study analyzed the economic value of improved SWM in Eldoret based on 199 sampled household respondents, and employed CVM and multiple regression techniques to identify the determinants of the WTP values. Results showed that the residents' mean WTP (MWTP) for better SWM was at KES 363 per month, indicating their desire for improved waste management. The study also found that the MWTP was influenced by income, education, age, and total disposal methods available to the household.

WTP estimates can then be used by urban planners and administrators to determine the socially optimal charges for solid waste services as well as use them to estimate taxable revenues (Cheserek et al. 2012).

3.0 METHODOLOGY

3.1 Selection of Study Areas

The YCDC services 32 of the 33 townships in Yangon: 6 townships in the CBD, 21 suburban townships, and 5 satellite townships. About 5.1 million people live within the city's total area of 794.43 km². Mingalardon is the largest, with an area of 112.85 km², but it was excluded from the study since it is primarily an industrial zone. Meanwhile, the most populated township of Pazundaung—with an average population density of 53,112/km²—was one of the areas selected for this study.

As shown in Figure 1, household surveys were conducted in four townships consisting of two urban and two suburban townships. This study focused mainly on household expenses and the respondents' WTP for waste disposal in the six urban townships. Thus, Botahtaung and Pazundaung townships were selected since these are the main CBDs with higher concentration of residential areas. As mentioned earlier, household surveys were also conducted in the suburban townships of Insein and North Okkala, but mainly for the purposes of understanding the socioeconomic profile and the differences in waste disposal (if any), attitudes toward service charges, and assessment of SWM services.

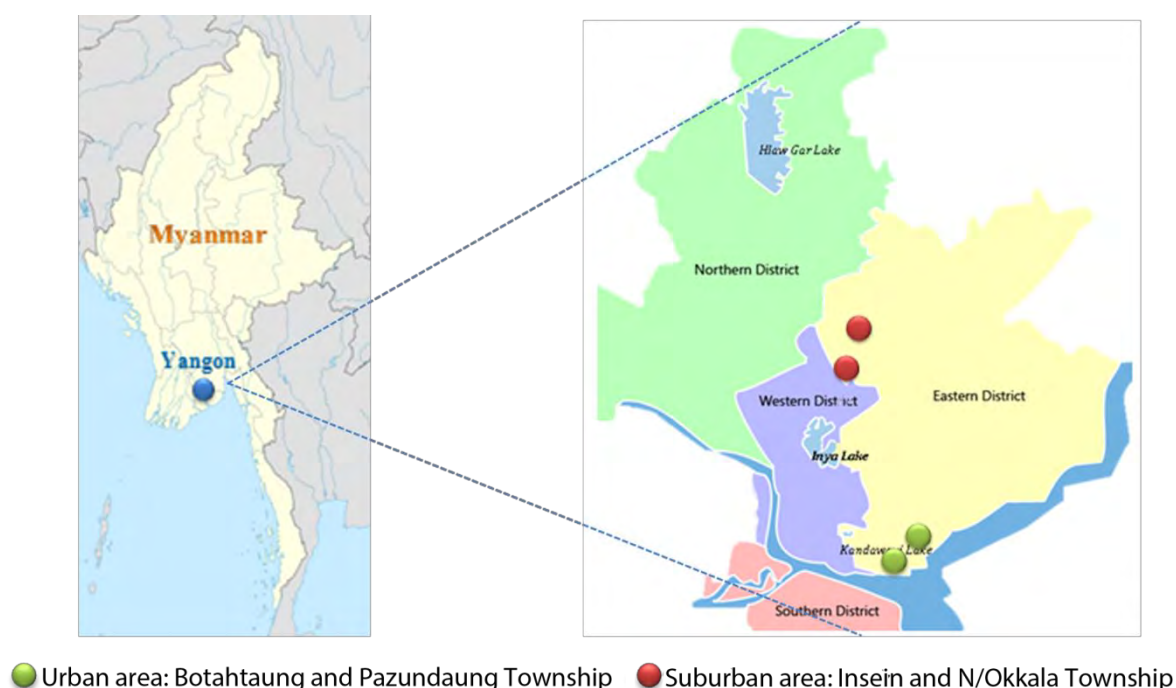


Figure 1. Map of Yangon and location of study areas

3.2 Number of Respondents

Two hundred respondents from each of the two urban townships (a total of 400 respondents) were interviewed. As shown in Figure 2, they were divided into five subgroups of 40 respondents, with each group answering to one of the five bids. The five bids used were MMK 800 (USD 0.8); MMK 1,000 (USD 1.0); MMK 1,500 (USD 1.5); MMK 2,000 (USD 2.0); and MMK 3,000 (USD 3.0). Of the 400 respondents, only 390 were included in the final analysis because 10 were not able to complete the survey. Eighty individuals were surveyed for each bid, except for the MMK 3,000 (USD 3.0) bid, in which 70 individuals were interviewed. As with the sample selection, the bids that each respondent answered to were also randomly selected.

For the two suburban areas, 200 respondents from each township (a total of 400 respondents) were also interviewed (Figure 3). However, the resulting data collected were not used to calculate the MWTP. The data collected from the two suburban areas were mainly for the purpose of understanding the differences (if any) in waste disposal and in the attitudes toward service charges and assessment of the SWM services.

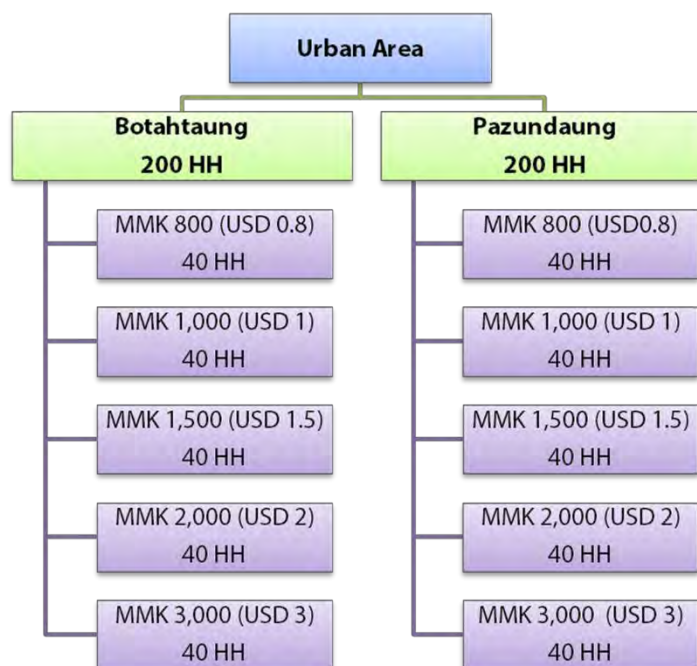


Figure 2. Respondents in selected urban areas and their bids

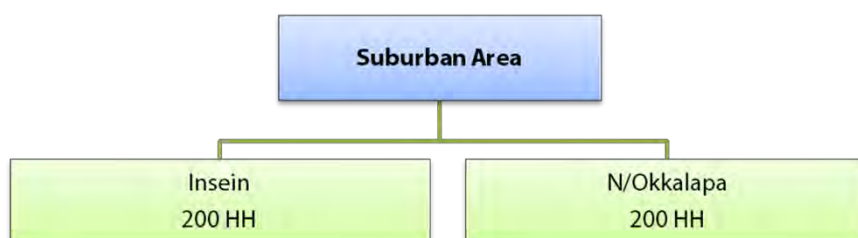


Figure 3. Respondents from selected suburban areas

3.3 Structure of the Questionnaire

The following steps were followed to develop the questionnaires:

- | | |
|----------|--|
| 1st step | Conduct focus group discussion (FGD) with YCDC officers. |
| 2nd step | Draft FGD outline based on recent data from the YCDC. |
| 3rd step | Conduct FGDs with urban and suburban households (10 households each). |
| 4th step | Draft questionnaire and bids for pretest (implement after each pretest and re-implement the pretest about four times). |
| 5th step | Finalize questionnaire and bids using data from the pretest. |

The data for the final analysis were then collected from face-to-face interviews with respondents in selected townships based on the finalized questionnaire.

3.3.1 Questionnaire structure and the CV scenario

The questionnaire was drafted based on the information obtained from the three FGDs and four pretests that had been conducted⁴ and from the in-depth interviews with the YCDC government officials. Secondary data were also obtained from various sources including census data and published and unpublished reports and papers.

The final questionnaire consisted of three sections. The first section focused on the respondents' general profile. This section also involved the impact of the current SWM services and charges on respondents' attitude and their knowledge about SWM. The second section contained proposed improvements to the current SWM services offered by the YCDC, questions on whether respondents were or were not willing to pay for these improvements, and the reasons behind their willingness or unwillingness to pay.⁵ The last part inquired about the socioeconomic profile of the respondents.

The variables included in the logit regression were factors that would most likely influence the respondents' willingness or unwillingness to pay for higher SWM service charges. Such factors include type of building, length of stay, solid waste volume (total number of bags), educational level, responsibility, gender analysis, age, and income. Details on these variables, the possible values, and the expected coefficient signs used in the logit regression analysis are provided in Table 2 below.

⁴ FGDs were organized between February and March 2014 with (i) YCDC officers, (ii) households from urban areas, and (iii) households from suburban areas. A total of 210 respondents were interviewed in the four pretests conducted from April to May, 2014.

⁵ Five new bids (MMK 800; MMK 1,000; MMK 1,500; MMK 2,000; and MMK 3,000) were set up for 40 respondents for each bid from the selected survey areas.

Table 2. Details used in logit regression analysis

Variable	Values	Expected Coefficient Sign	Assumptions
WTP	Yes, No		
Bids	Five bids in the split sample: MMK 800 (USD 0.8)	-	The higher the bid is, the less likely respondents would be willing to pay.
	MMK 1,000 (USD 1.0)		
	MMK 1,500 (USD 1.5)		
	MMK 2,000 (USD 2.0)		
	MMK 3,000 (USD 3.0)		
Age	Age of respondents	+	Older people may understand the environmental and health-related problems; they are also more able to afford paying for better SWM services.
Gender	Male, Female	-	The expectation that female respondents would be more willing to pay than the male respondents would be based on the observation that female members of the household are generally responsible for overseeing household matters.
Education	Number of years educated	+	Education may increase respondents' awareness of better solid waste management and therefore, their willingness to pay.
HH income	Midpoint of reported income	+	The higher the income is, the better one can afford to pay for SWM services.
Length stay	Period of time respondents have been living in this place	+	The longer respondents have stayed in their area of residence, the greater their attachment to it; hence, the higher the probability that they would be willing to pay.
SW bags	Number of bags of solid waste	+	The volume of household waste is expected to influence the respondents' willingness to pay for additional SWM charges.
Distance	Minutes' walk	+	The greater the walking distance is, the higher the probability that they would be willing to pay.

Note: HH = household, SW = solid waste

3.4 Description of CV Scenario

The hypothetical good that the respondents were asked to pay for was improved SWM. Each respondent was given a picture book containing figures that s/he could look at while the enumerator read out the information. The hypothetical scenario is described in four sections as illustrated in the pages of the picture book (Figure 4).

In the first section, the current solid waste disposal system, in which people take their waste to the bins nearest to their houses, was explained. Although the YCDC tries to implement daily collection, this has not always been possible. As a result, uncollected garbage is left on the streets. This may cause a foul smell, have a bad effect on people's health, and leave residential areas messy and dirty.

The second section describes the proposed improvement in SWM services. In this scenario, every household would have waste bins nearby so that people would not need to walk far to throw their waste. Waste would also be punctually collected at least thrice a week to eliminate the foul smell, keep the environment clean, and lessen waste-related health problems. The third page illustrates that implementing the proposed improvements would require more bins, more vehicles, and more skilled workers—which means that additional investments would be needed. The fourth page then raises questions such as where the extra budget needed to implement better SWM could come from, and whether the government has the funds to cover everything. It also explains that full government funding may not be possible. Although the government has a big budget, there are so many other sectors in which the budget should be spent. Since one of the most reliable sources of funding would be people's contributions, the fourth section goes on to explain the need to analyze people's assessment about the current situation and their willingness to pay for the proposed improved SWM services.

The respondents were asked whether they were certain about their "Yes" responses. Those who answered "not so certain," "not certain," or "not certain at all" were all recorded as not willing to pay.



Figure 4. Pages of the picture book used in the survey

3.5 Payment Mechanism

Respondents were asked if they would be willing to pay the YCDC more if the collection services would improve as described.

3.6 Elicitation

By using single-bound dichotomous choice, five bids were set up based on the information gathered from the FGDs. A series of pretests confirmed the selected bids. These were MMK 800 (USD 0.8); MMK 1,000 (USD 1.0); MMK 1,500 (USD 1.5); MMK 2,000 (USD 2.0), and MMK 3,000 (USD 3.0) per month. Negative responses to the WTP question on the proposed bids were followed by an open-ended question asking the respondents to specify what amount they would be willing to pay.

3.7 Cheap Talk

Due to the hypothetical nature of the survey, respondents may not have enough incentive to report their actual WTP bids. To address this limitation, a “Cheap Talk” script was added, and enumerators were instructed to inform the respondents of the common “hypothetical bias” situation. A hypothetical bias situation is a condition where respondents would answer “yes” without much thinking or say that they are willing to pay even though they are not or are unsure about whether or not they wanted to pay the given amount at that moment.

The following script was therefore prepared to give them enough time to think about their own budgetary constraints and consider their responses before answering anything in the questionnaire. During survey administration, enumerators were asked to read the script as shown in Figure 5:

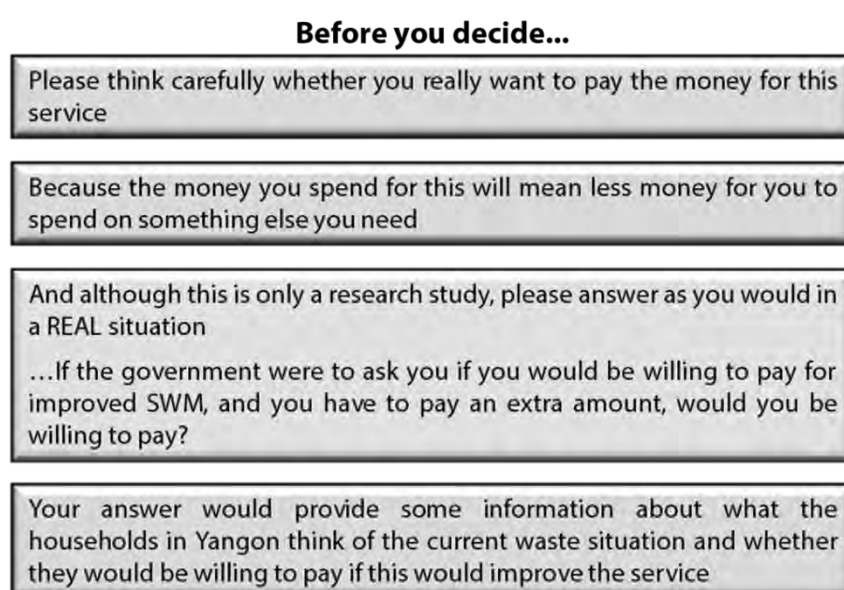


Figure 5. “Cheap Talk” script

4.0 EMPIRICAL RESULTS

4.1 Socioeconomic Profile of Respondents

Altogether, there were 390 respondents from urban townships Botahtaung and Pazundaung; the former had 10 less respondents than the latter. About 53% of the respondents were female, while 47% were male. Most of the interviewed respondents were 45 years old or above, graduates, and self-employed.

The survey respondents were categorized into four age brackets: 25 years old or younger, between 25 and 35 years old, between 35 and 45 years old, and 45 years old and older. The largest number of respondents from both urban townships came from the eldest age group, while the second largest group was composed of respondents between 35 and 45 years old.

As for educational attainment, the largest group in Botahtaung was composed of university graduates, while the second largest group was the high school graduates. The opposite was the case in Pazundaung, as the percentage of respondents who completed high school was slightly higher than that of university graduates. Only a few people completed masters or PhD degrees.

In terms of occupation, around 30% of the household heads in Botahtaung were self-employed, while the percentage of both government staff and salaried employees was around 23%. This employment profile of the respondents in Pazundaung was somewhat similar, as both townships are located in Central Yangon; but the two largest groups were government staff and salaried employees.

The average household size was five people with two income-earning adults. The average total household income per month was about MMK 475,000 (USD 475) in Botahtaung and around MMK 516,000 (USD 516) in Pazundaung.

To validate their responses about household income, household heads were also asked for the amount of their monthly electricity bills. The respondents reported spending an average of about MMK 15,000 (USD 15) for electricity in Botahtaung; Pazundaung respondents reported only MMK 12,000 (USD 12). The mean electricity expenses in both townships came up to about MMK 13,000 per month.

Table 3 below summarizes the profile of the respondents in the urban townships selected for this study.

Table 3. Profile of respondents in Botahtaung and Pazundaung townships

Profile		Botahtaung		Pazundaung		Pooled	
		Freq	%	Freq	%	Freq	%
Are you the person who decides on household expenses?		190	100	200	100	390	100
Age							
Under or equal to 25 years		18	9	8	4	26	7
Between 25–35 years		25	13	27	14	52	13
Between 35–45 years		61	32	58	29	119	31
45 years and above		86	455	107	54	193	49
Gender							
Male						183	47
Female						207	53
Educational qualification of the respondent							
High school		60	32	83	42	143	37
Undergraduate		28	15	27	14	55	14
Graduate		89	47	73	37	162	42
Master degree holder		9	5	9	5	18	5
PhD degree holder		3	2	2	1	5	1
No answer		1	1	6	4	7	2
Occupation of the household head							
Government staff		43	23	25	13	68	17
Salaried employee		41	22	42	21	83	21
Craftsman		6	3	9	5	15	4
Self-employed		57	30	73	37	130	33
Student		9	5	1	1	10	3
Trader		14	7	19	10	33	8
Retired		18	9	20	10	38	10
General worker		2	1	11	6	13	3

Table 3 continued

Profile	Botahtaung		Pazundaung		Pooled	
	Value	Std. Dev.	Value	Std. Dev.	Value	Std. Dev.
Total household income per month	475.53	316.55	516.75	321.36	496.67	319.28
Total number of household members						
Adults (15+)	3.38	1.58	3.71	0.83	3.55	1.66
Children (-15)	0.74	0.99	1.727	0.88	0.78	0.94
How many household members earn an income?	1.94	1.05	2.13	0.89	2.04	0.98
How many cars do you have?	0.33	0.57	0.16	0.44	0.24	0.52
How much do you pay for electricity every month?	14,955.26	9,810.74	11,515.00	5,920.73	13,191.03	8,225.69

4.2 Situation on SWM

In general, the respondents generate around five YCDC standard-sized bags (16 x 28 inches) of trash per week. A total of 377 respondents (97%) reported that they bring their waste to the nearby municipal garbage stations for disposal. Among the 377 respondents, 177 (93%) came from Botahtaung whereas 200 (100%) came from Pazundaung. Only 3% of the respondents did not want to take their waste to the disposal site; instead, they opt for private service providers who bring all of their household waste to the collection site.

Private collectors are happy to collect as much rubbish as they can in order to earn more money. The amount that households pay them depends on the volume of waste they collect. Around 24% of the respondents said they also occasionally pay private collectors to take away their household garbage, while 2% dump their solid waste in open spaces or nearby streams or drains because they do not want to bring their waste to garbage stations or pay private waste collectors.

Only a few respondents store their solid waste in their own rubbish bins, and many usually throw their waste within the day. Only 29% of the respondents in both townships use containers to store solid waste in their building or compound. A large percentage of the respondents said that the existing garbage stations are already conveniently located, although a nearer location is still more preferable. About 42% of the respondents also thought that the SWM services provided by the YCDC were better compared to the previous year's; 47% said that there was hardly any difference; and only 10% (40 respondents) thought that the service has gotten worse (Table 4).

This study considered three different types of accommodation: individual housing, individual housing with spacious land, and apartment housing. Majority of the respondents lived in apartments, and only a few lived in individual housing with land. The survey did not include households living in condominiums and luxurious houses because such dwellings have their own waste collection services, where service charges are higher than that of the YCDC.

Over half of the respondents were long-time residents and have stayed in their homes for over 10 years. About 20% have been residents for 2–5 or 6–10 years, whereas only 8% said they have lived in their homes for about a year.

Currently, the YCDC is the only public service provider; no private company exists that provides solid waste management or solid waste collection services. There are, however, some people making money by offering waste collection services. Most of these are adolescents or young children. Poor children become private waste collectors for vendors and for a number of households who stay on the top floors of high-rise buildings or who live far away from the disposal areas. These children were initially asked to take out trash for a small tip, but this eventually became common practice and a way for children to make some money. They earn not only from the service tips but also from money they make by selling reusable and recyclable things.

Table 4. Solid waste disposal pattern

Question	Botahtaung		Pazundaung		Pooled	
	Value	SD	Value	SD	Value	SD
How many bags of SW are generated in your house/week?	5.12	2.228	4.25	1.485	4.67	1.932
Question	Freq	%	Freq	%	Freq	%
How do you dispose of your solid waste?						
Take it to the nearby secondary municipal garbage station	177	93	200	100	377	97
Throw SW in an open space or somewhere	4	2	0	0	4	1
Throw it into nearby streams or drain	2	1	3	2	5	1
Give to private collectors	62	33	30	15	92	24
Do you have a storage container for solid waste in your building/compound?	89	47	23	12	112	29
Is it conveniently located?	149	78	160	80	309	79
How do you assess the system of waste collection in your township (compare the current year with the previous year)?						
Better	45	24	120	60	165	42
Worse	18	9	22	11	40	10
Unchanged	127	67	58	29	185	47

Note: SD = standard deviation, SW = solid waste

About 25% of the respondents use private waste disposal services for the convenience they offer at a low cost, but the rest (75%) do not want to spend any money or throw their waste themselves. Thus, they complain about the YCDC's services or reason out that their waste should be collected from their houses.

The YCDC currently collects service charges for waste collection on a quarterly basis. Some households use other payment schemes with private service providers for their own convenience. The households' willingness to pay for these charges depended on the types or systems of their payment. For example, some households preferred to pay MMK 1,000 per month, but did not want to pay MMK 3,000 per quarter. Only 31% of the respondents from Botahtaung and 37% of the respondents from Pazundaung preferred a quarterly payment system. About 62% and 56% of the respondents from Botahtaung and Pazundaung, respectively, preferred the monthly payment scheme; thus, the total percentage of respondents from both townships who preferred monthly payments was 59%. The remaining 7% (28 respondents) did not have any preference for a specific type of payment (Table 5).

Another factor that can influence the households' decision making was the distance between one's house and the YCDC collection sites where the household waste needs to be brought. Currently, the average length of time to walk the distance between one's home and the dumping area is around four minutes.

Half of the respondents from Botahtaung and around 40% of those from Pazundaung thought that solid waste collection was a big problem not only for themselves but for their neighborhood as well (Table 6). They were mainly concerned about the health problems that the foul odor and the insects may bring and about the destruction of scenic beauty caused by improper waste management. About 38% (147 respondents) said odor was the worst problem for them, while 18% (72 respondents) believed that it was the presence of harmful insects and rats. Meanwhile, 11% of the respondents considered the deterioration of scenic beauty as the biggest problem. From this information, one could gather that most people have to deal with the serious health problems caused by the foul smell as well as the pests because of poor waste management.

To have better SWM and to reduce current problems, there was a general agreement over the things that should be improved: upgrade equipment and machinery, increase human resources, implement rules and regulations, and provide secondary disposal sites in more convenient locations. Around 38.7% (151 respondents) suggested that following rules and regulations is important to improve solid waste management. Although the YCDC has been telling people to use green and blue bags when disposing of their solid waste and to tie these bags, nobody follows the procedure. People use any bags to dispose of their trash, and they just throw them without any care. Around 23% of the respondents from both townships also thought that the YCDC should place secondary disposal sites closer to residential areas to make waste disposal more convenient and to help ensure that waste bags reach the bins properly.

Table 5. Solid waste disposal system by housing type

Attribute	Botahtaung		Pazundaung		Pooled	
	Freq	%	Freq	%	Freq	%
Type of accommodation where respondents live						
Individual house	17	9	91	46	108	28
Individual house with land	2	1	7	4	9	2
Apartment	171	90	102	51	273	70
Which services do you use to dispose of your waste?						
Public	122	64	170	85	292	75
Public and private	68	36	30	15	98	25
Service fees (public and private)						
Quarterly	127	67	171	86	298	76
Monthly	46	24	29	15	75	19
Weekly	5	3	0	0	5	1
Daily	2	1	0	0	2	1
Depends on volume	6	3	0	0	1	6
Depends on floor and distance	4	2	0	0	4	1
How far is your home from the dumping area (minutes' walk)?						
	Value	SD	Value	SD	Value	SD
	4.33	2.698	4.09	2.371	4.21	2.535

Note: SD = standard deviation

Table 6. Opinions on solid waste management

Attribute	Botahtaung		Pazundaung		Pooled	
	Freq	%	Freq	%	Freq	%
Do you think solid waste collection is a big problem? "Yes"	103	54.0	50	25.0	153	39.0
What kind of problems have you faced due to poor waste disposal?						
Poor health	63	33.2	63	31.5	126	32.0
Foul odor	64	33.7	83	41.5	147	38.0
Deterioration of scenic beauty	34	17.9	9	4.5	43	11.0
Breeding places for harmful insects and rats	29	15.3	43	21.5	72	18.0
Others	0	0.0	2	1.0	2	1.0
What is most important in order to improve solid waste management?						
Upgrade the use of machinery	44	23.2	29	14.5	73	18.7
Increase human resources	42	22.1	38	18.0	78	20.0
Follow rules and regulations	81	42.6	70	35.0	151	38.7
Provide more convenient locations for secondary disposal sites	26	13.7	65	32.5	91	23.3
Who do you think is responsible for properly managing SW in your township?						
Government	11	6.0	12	6.0	23	6.0
Households	11	6.0	3	2.0	14	4.0
Both parties	168	88.0	185	93.0	353	91.0

Approximately 20% of the respondents recommended increasing human resources and upgrading the use of machinery. Around 20% also wanted waste to be collected on time; although most of the collectors seem busy collecting waste all day, most of the waste still ends up left on the streets. They also wished to upgrade the machinery and tools since using suitable vehicles and tools can speed up waste collection and disposal. Likewise, most (91% or 353 respondents) strongly agreed that both those in charge of SWM and individual citizens have to take equal responsibility for proper waste disposal. Meanwhile, 4% (14 respondents) answered that people should be mainly responsible, while 6% (23 respondents) answered that since they already pay taxes, solid waste disposal should be the government's responsibility.

4.3 Willingness to Pay for Improved SWM

The respondents' willingness to spend money on SWM was examined using five different bid prices: MMK 800 (USD 0.8); MMK 1,000 (USD 1.0); MMK 1,500 (USD 1.5); MMK 2,000 (USD 2.0); and MMK 3,000 (USD 3.0). Figure 6 shows the urban households' WTP for SWM at different amounts.

Among the 390 respondents interviewed, 292 use only public solid waste management services, whereas the remaining 98 use both private and public waste collectors. The 292 respondents who use the YCDC's services exclusively pay MMK 600 per month. This is much lower than the mean price of MMK 1,596.94 that households using the services of both YCDC and private collectors pay monthly.

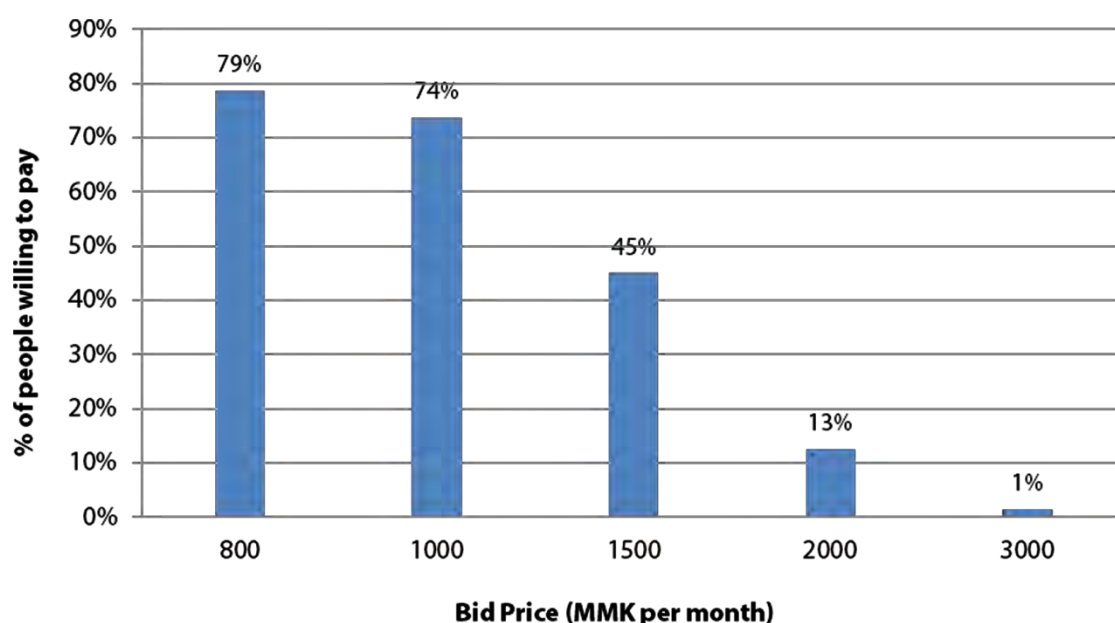


Figure 6. Urban households' willingness to pay for solid waste management

Note: USD 1 = MMK 1,000

As can be seen from the above figure, the respondents' willingness to spend money on SWM gradually decreases as the bid price (in MMK) increases. About 79% of the respondents were willing to pay the lowest bid price of MMK 800 (USD 0.8), which is not much higher than the current charge of MMK 600 (USD 0.6) (Table 7). About 74% of the respondents were willing to pay MMK 1,000 (USD 1.0). However, about 45% of the respondents started to become concerned when the bid price went up to MMK 1,500 (USD 1.5). Although some respondents had already spent a similar amount for private services, they still did not want to take that much responsibility for themselves.

Only 13% of the respondents were willing to pay for the bid price MMK 2,000 (USD 2.0) to get better facilities and environment; only 1% wanted to pay MMK 3,000 (USD 3.0). However, when asked follow-up questions to confirm their willingness, they gave different answers and did not seem as certain.

The respondents' WTP depended on their expectations about improved services (Table 8). For instance, 49% of respondents from Botahtaung and 29% of those from Pazundaung believed that spending more for these services would make solid waste disposal more convenient.

Table 7. Willingness to pay at different service charges

Attributes		Respondents Who Said "Yes"		Pooled
		Public	Public & Private	
Service charges to improve municipal waste disposal	MMK 800 (USD 0.8)	49	20	69
	MMK 1000 (USD 1.0)	47	15	62
	MMK 1,500 (USD 1.5)	25	19	44
	MMK 2,000 (USD 2.0)	23	6	29
	MMK 3,000 (USD 3.0)	2	3	5
Total		146	63	209

Table 8. Reasons why people are willing to pay more

Reasons	Botahtaung		Pazundaung		Pooled	
	Freq	%	Freq	%	Freq	%
It will be more convenient	56	49	28	29	84	40
All the waste would be collected	54	47	54	57	108	52
Others	4	4	13	14	17	8
Total	114	100	95	100	209	100

The table also shows that the amount that people are willing to spend for SWM depends on whether the waste collection system would be conveniently located relative to where they live, and on how much cleaner and more beautiful their communities would become. A total of 54 respondents from each township said that a bigger budget would help to ensure that all waste would be duly collected, whereas 8% of the total respondents (four persons from Botahtaung and 13 persons from Pazundaung) were willing to pay more because they are expecting that doing so would help the community maintain its cleanliness and scenic beauty.

To get a more accurate measure of the respondents' WTP, the researchers adjusted their responses for certainty. Table 9 shows that 12% of the respondents who said "yes" were uncertain; thus, their responses were recorded as "no" even if their initial answer was "yes." This was because when asked with a follow-up question, they did not give a clear confirmation of their affirmative answer.

There were also some other reasons why the respondents were not willing to pay for the new bid prices (Table 10). About 33% of the respondents said that there was no need to pay more since they were already paying taxes. The second most common reason (about 20% of the total number of respondents) was that they did not think there would be any improvement even if they pay more. About 14% of the respondents believed it was not their responsibility to take action, and the same percentage thought that the current system was already acceptable. Lastly, 9% of respondents answered that they could not afford to spend more money, or they wanted to first get more information about what will be done with the additional money to be collected.

Table 9. Certainty of improved solid waste payment consideration

Certainty	Botahtaung		Pazundaung		Pooled	
	Freq	%	Freq	%	Freq	%
Very certain	54	28	26	13	80	21
Certain	90	47	82	41	172	44
Not so certain	18	9	73	37	91	23
Not certain	19	10	13	7	32	8
Not certain at all	9	5	6	3	15	4

Table 10. Reasons of those not willing to pay

Reasons	Botahtaung		Pazundaung		Pooled	
	Freq	%	Freq	%	Freq	%
Have no responsibility	10	13	15	14	25	14
Have already paid taxes	35	46	25	24	60	33
Cannot afford to pay more	6	8	11	10	17	9
Current system is acceptable	7	9	19	18	26	14
Need more information	11	14	6	6	17	9
No improvement even with extra charge	7	9	29	28	36	20

4.4 Factors Determining WTP

The factors that determine the WTP of the respondents were done separately for those who only use public services, those who use both public and private services, and the pooled data. Results are presented in Tables 11a, 11b, and 11c.

Table 11a presents the results for those who use only public services. Results show that the significant variables include number of waste bags, level of education, household income, length of stay, distance, and bids. The variable *number of waste bags* was significant at the 90% confidence level; the negative sign of the coefficient indicates that people with more bags of solid waste would be less likely to be willing to pay. The *HH income* and *education* variables were significant at 95% confidence level; the positive sign of the coefficient indicates that people with higher income would be more likely to be willing to pay. The variables *Range new*, *Distance per minute* and *Long stay* were significant at the 99% confidence level; the negative sign of the coefficient indicates that the higher the bid is, the less likely one would be willing to pay. The variable *Constant* was significant at the 99% confidence level; the positive sign of the coefficient indicates that respondents generally think that the program is good and that welfare would improve if the program would be implemented.

Table 11b presents data on the 98 respondents who said that they use both public and private services. The result of the logit analysis for this group shows that only two variables were significant: *Bids* and *Number of waste bags*. The coefficient sign of the two variables were consistent with expectations. That is, that the coefficient sign of the *Bid price* was negative, while the sign of the coefficient for the *Number of waste bags* was positive. This implies that the greater the amount of waste, the higher the probability that households would be willing to pay.

For the pooled data presented in Table 11c, the significant variables were *Bids*, *HH income*, and *Length of stay*. The variable *Bid* was significant at the 99% confidence level. The negative sign of the coefficient indicates that the higher the bid is, the less likely that one would be willing to pay. The variable *HH income* was significant at the 99% confidence level, and the positive sign of the coefficient indicates that people with higher incomes would be more likely to be willing to pay. The variable *Length stay* was significant at the 90% confidence level, and the negative sign of the coefficient indicates that people who have stayed there longer would be less likely to be willing to pay. Lastly, the variable *Constant* was significant at the 95% confidence level. The positive sign of the coefficient indicates that, overall, respondents thought that the program was good and that welfare would improve if the program will be implemented.

The results of the binary logistic regressions are shown as *household income*, and their WTP was positive and significant level at $p < 0.01$.

Table 11a. Results from logit regression analysis for the respondents who use public service

Determinant Variables	B	Std. Err.	Wald	df	Sig.	Exp(B)
Age_HH	-.034	0.178	0.036	1	0.850	0.967
Gender_HH	-.095	0.312	0.092	1	0.761	0.910
Long_Stay	-.467	0.157	8.848	1	0.003	0.627
Education	0.293	0.131	4.996	1	0.025	1.340
HH_Income	0.270	0.116	5.382	1	0.020	1.310
Distance_minutes	-.0224	0.070	10.368	1	0.001	0.799
SW_Total_Bag	-.0166	0.087	3.671	1	0.055	0.847
Bids	-.0002	0.000	58.756	1	0.000	0.998
Constant	5.302	1.112	22.783	1	0.000	201.848
-2 Log likelihood	Cox & Snell R Square			Nagelkerke R Square		
257.541a	0.396			0.528		

Table 11b. Results from logit regression analysis for the respondents who use both public and private services

Determinant Variables	B	Std. Err.	Wald	df	Sig.	Exp(B)
Age_HH	0.164	0.292	0.315	1	0.575	1.178
Gender_HH	-.0168	0.556	0.091	1	0.763	0.846
Long_Stay	0.265	0.293	0.824	1	0.364	1.304
Education	0.093	0.285	0.107	1	0.743	1.098
HH_Income	0.207	0.213	0.941	1	0.332	1.230
Distance_minutes	0.096	0.105	0.837	1	0.360	1.101
C_SW_Total_Bag	0.235	0.134	3.081	1	0.079	1.265
Range_New	-.0002	0.001	18.097	1	0.000	0.998
Constant	0.340	1.870	0.033	1	0.856	1.405
-2 Log likelihood	Cox & Snell R Square			Nagelkerke R Square		
90.261a	0.318			0.436		

Table 11c. Results from logit regression analysis for the respondents for all respondents

Determinant Variables		B	Std. Error	Wald	df	Sig.	Exp(B)
Pooled	Age	-.007	0.010	0.452	1	0.502	0.993
	Education	0.125	0.075	2.729	1	0.099	1.133
	HHincome	0.001	0.000	6.746	1	0.009	1.001
	Bids	-.003	0.000	83.530	1	0.000	0.997
	Gender	0.050	0.269	0.034	1	0.854	1.051
	Lengthstay	-.0224	0.134	2.805	1	0.094	0.799
	Wastebags	-.042	0.066	0.412	1	0.521	0.959
	Distance	-.076	0.057	1.805	1	0.179	0.927
	Constant	3.314	1.280	6.705	1	0.010	27.494
-2 Log likelihood		Cox & Snell R Square			Nagelkerke R Square		
341.949a		0.388			.521		

4.5 Estimation of Mean Willingness to Pay

The parametric approach was used to estimate the mean and median WTP. The mean WTP was estimated using the formula:

$$\text{Mean WTP} = -\alpha/\beta$$

where β is the coefficient on the bid amount and α is the estimated constant.

4.5.1 Parametric estimate for public services user

Based on the result in Table 11a, α is equal to 5.302 and β is -0.002 . Thus,

$$\text{MWTP} = -5.302/(-0.002) = \text{MMK } 2,651/\text{month} = \text{USD } 2.65/\text{month}.$$

4.5.2 Parametric estimate for both public and private services user

Based on the result in Table 11b, α is equal to 0.34 and β is -0.002 . Thus,

$$\text{MWTP} = -0.34/(-0.002) = \text{MMK } 170/\text{month} = \text{USD } 0.17/\text{month}.$$

4.5.3 Parametric estimate for total respondents

Based on the result shown in Table 11c, α is equal to 3.314 and β is -0.003 . Thus,

$$\text{MWTP} = -3.314/(-0.003) = \text{MMK } 1,104/\text{month}.$$

4.5.4 Nonparametric estimate for total respondents

The MWTP was estimated for the pooled samples only. The lower bound estimates, as shown in Table 12, is MMK 1,086.3 per month.

Table 12. Nonparametric estimate

Amount (MMK/month)	% Yes	Total Respondents	Lower Bound	Amount (MMK/month)
< 800	0.21	80	0	0
800–1,000	0.05	80	800	3,200
1,000–1,500	0.29	80	1,000	23,200
1,500–2,000	0.30	80	1,500	36,000
2,000–3,000	0.14	80	2,000	22,400
> 3,000	0.01	70	3,000	2,100
	1.00			86,900
MWTP (lower bound)		1,086.3		

Note: USD 1 = MMK 1

4.6 The Potential to Mobilize Funds

The potential funds to be mobilized from both parametric and nonparametric methods of estimating the MWTP are presented in Table 13. The values per month are described in the second column whereas the total number of households is shown in the third column. Results show that the parametric value among households is MMK 1,104.00 (USD 1.104) per month, while the nonparametric value is only MMK 1,086.00 (USD 1.086) per month. Multiplying the MWTP values from both parametric and nonparametric estimates with 50% of the 1.09 million households in Yangon (CSO 2014), the potential revenue that can be generated is estimated to be MMK 607.20 million (USD 0.61 million) and MMK 597.30 million (USD 0.60 million), according to the parametric and nonparametric estimates, respectively. Thus, these findings imply that there would be a 100% increase in the YCDC's revenue because it would be earning around twice its current revenue.

Table 13. The parametric and nonparametric data of MWTP

Attribute	Amount (MMK/month)	No. of HH Used to Multiply MWTP	Potential Revenue (in million MMK)
MWTP from parametric	1,104.00 (1.104)	0.55 million	607.20 (0.61)
MWTP from nonparametric	1,086.00 (1.086)	0.55 million	597.30 (0.60)

Notes: (1) Values in () are the USD equivalent. (2) USD 1 = MMK 1,000

5.0 CONCLUSION AND RECOMMENDATION

Based on the findings from previous surveys and research studies, SWM services have many shortcomings; hence, there has been general discontent among the households. Over the past two or three years and with support from some organizations, concerned government agencies have tried hard to improve their services. However, it has not been possible to improve all aspects of SWM.

In this present study, household surveys were conducted in two urban and two suburban townships. In the suburban area, households in the two most populated townships of Insein and North Okkala in Yangon City, Myanmar were interviewed to obtain information as to how the residents assess the SWM services they receive and about their recommendations on how such services can be improved. Altogether, 800 households were interviewed, consisting of 400 from urban townships and 400 from suburban townships. The MWTP, however, was calculated based only on the 400 households interviewed from the urban townships.

As stated earlier, information from the suburban townships was used only for the purpose of understanding the respondents' profile, waste disposal, and attitudes toward the YCDC. The results presented were based on household interviews of two urban

townships of Botahtaung and Pazundaung, with around 53% were females and 47% were males. As for educational background, majority of the respondents from Botahtaung were college graduates while those from Pazundaung were high school graduates. Majority of the respondents were also over 45 years old, and many of them were government staff or salaried workers.

Almost all respondents (i.e., 93% from Botahtaung and 100% from Pazundaung) dispose their waste by bringing them to nearby secondary municipal garbage stations. Based on survey results, 42% of the respondents thought that the current SWM system was better than the previous year's, but 47% said that there was hardly any difference. About 10% believed that services actually worsened.

When asked about their preferences regarding payment schemes for SWM services, the largest group (62% of those interviewed in Botahtaung and 56% in Pazundaung) said they preferred a monthly payment system. The willingness to spend money on SWM was measured using five different bid prices: MMK 800 (USD 0.8); MMK 1,000 (USD 1.0); MMK 1,500 (USD 1.5); MMK 2,000 (USD 2.0); and MMK 3,000 (USD 3.0). Results show that majority were willing to pay only MMK 800 (USD 0.8), while a small minority of households was willing to spend MMK 3,000 (USD 3.0). WTP on SWM gradually decreased as the bid price in MMK increased. One of the main factors influencing this decision was the issue of trust. As such, there is an urgent need for households and for the YCDC staff to reach mutual understanding regarding SWM in Yangon, and accordingly establish a SWM improvement scheme.

The study also estimated that the expected increase in the YCYDC's revenue should service charges be increased. Results show that YCDC's revenue is expected to increase by 100%. Nevertheless, the estimated cost would be three to four times the collected amount; thus, most of this would still be shouldered by the government.

Although some of the households did not want to pay more for the YCDC to improve its services, they have occasionally spent more money on similar services provided by other organizations as they find these to be more satisfactory. Thus, the government could work on improving public trust in the system. Another thing to consider is the respondents' monthly income. Although the households keep their expenses within their income range, they may get trapped in a problematic cycle if they have to constantly pay for bigger SWM service charges.

Lastly, by multiplying the MWTP from both parametric and nonparametric estimates with the 1.02 million households in Yangon, the study estimates that the potential revenue to be generated from higher service charges would be USD 0.563 million and USD 0.552 million for parametric and nonparametric estimates, respectively. Thus, the increase in revenue would be around twice the current revenue of the YCDC.

Overall, it can be concluded that to improve the sewage management system, all other sectors related to YCDC have to be equally collaborative and participative in order to achieve success in SWM, and thereby contribute to the holistic development in the country of Myanmar.

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