

## **KNOWLEDGE AND PRACTICE ON SOLID WASTE DISPOSAL OF HOUSEHOLDS IN SHWE PYI THAR TOWNSHIP, YANGON REGION\***

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### **Abstract**

The environment offers the provision for survival of human beings, animals, and plants. Worldwide efforts are being made to increase awareness of environmental protection. Improper solid waste disposal is one of the major causes of environmental degradation, pollution, and the outbreak of diseases. Waste management is a cross-cutting issue that touches on various aspects of social and economic development, and extensively related to global challenges such as public health, climate change, resource efficiency, sustainable production and consumption, and so on. In Myanmar, considerable challenges concerning waste management have been faced as a result of increasing income and consumption, urban population growth, and lack of effective waste treatment and disposal options. Hence, this study aims to determine the knowledge and practice of solid waste disposal among households in Shwe Pyi Thar Township. Two-stage sampling was used in data collection and the Chi-square test and binary logistic regression model were applied in the data analysis. The findings of the study revealed that a significant association between gender, education, income, and knowledge on solid waste disposal, while only education and income have a significant association with practice on solid waste disposal. Furthermore, the respondents with high knowledge have a practice towards solid waste disposal of the municipal system. Without community participation, it is not possible to improve the solid waste disposal system, and the people's awareness of their important role in strengthening the waste management system is also necessary.

**Keywords:** Solid waste disposal, Knowledge, Practice, Chi-square test, Logistic regression

### **Introduction**

Solid waste is the unsolicited or unusable solid things generated from combined residential, industrial, and commercial activities. Management of solid waste reduces sore laminates' adverse impacts on the environment and human health and supports economic development and improves quality of life. The amount of solid waste has been increasing rapidly and its composition has been changing due to rising urbanization and change in lifestyle and food habits. There has been arisen in the amount of waste being generated daily by each household with an increase in the global population and the rising demand for food and other essentials. If the households' waste management and disposal are improperly done, it can cause serious impacts on health and problems to the surrounding environment. (Kiran et al., 2015)

World Bank's (2012) estimated that there was 5,616 tons/day, with per capita waste generation totaling 0.44 kg/capita/day solid waste generation in Myanmar. This figure was expected to reach about 21,012 tons/day with 0.85kg/capita/day by 2025 (Hoornweg and Bhada, 2012). Waste in Myanmar generates from several waste streams, such as households, commercial and business establishments, institutions, public areas, hotels, restaurants, hospitals, and industries. In Myanmar, due to industrialization and urbanization, which have accompanied economic growth, together with gradual shifts in consumption and production patterns have precipitated immense challenges in managing waste generation from all of these various sectors.

Significant waste management becomes a big problem because of rapid urbanization and industrialization. In Myanmar, Yangon Region is the major business center and consists of 44

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townships. According to the 2014 Population and Housing Census, the population of the Yangon Region is 7.355 million and it is 14.29% of the total population of Myanmar. Its average population density is 5363.6 per square kilometer. Due to its largest population, the demand for proper solid waste management is much higher compared to the other regions. Generally, 1,690 tons of daily municipal waste is generated from the households, commercial centers, institutions, industries, health care, garden, street sweeping, whereas the waste from demolition and workshop (oil, sewage) are not included with a rate of 0.396 kg per capita per day in Yangon city. In the composition of the solid waste generation, 76 % is organic, 10 % is plastic, 4 % is textiles and papers and 10 % is wood, rubber, leathers, metals, glasses, crockery, and stones. (IGES, 2014)

Furthermore, The Control of pollution and Cleansing Department (PCCD), in charge of solid waste management for Yangon City, cannot run by their revenue because of the fees they charge for the services are quite low and are not enough to finance for all the officers and labors, thus it has to depend on the regional government's subsidy. (AIT, 2015)

In Myanmar, people primarily dispose of their waste to the dust bins provided by Yangon City Development Committee (YCDC) and to the brick tanks near the sidewalk. According to Initial Graphics Exchange Specification (IGES, 2014) people are disposing of their waste in 3472 dust bins and 617 brick bins every day. There are specific times to allocate for waste disposal from brick 6:00 to 10:00 am and 6:00 to 11:00 pm. However, the neighborhood can dispose of their waste to the dust bin at any time. The problem is that there is no single transfer station for solid waste management in Yangon. Thus, recyclable and non-recyclable waste in between the sources of the waste and final dumping sites cannot be filtered from the waste.

Although the relevant department and ministry have written laws and regulations, there is some weakness in enforcing them. Not only that, there has not been a proper solid waste as well as the leachate management and also all six final dumping sites in Yangon are open. To extend the public awareness of solid waste management in the community in Yangon, the SWM2 project (Environmental protection and sustainable development: building local capacities on solid waste management in Myanmar) has been initiated composting and producing fertilizer project in Shwe Pyi Thar Township since 2014. It has four activities: distributing calendars, training, awareness campaign, and Lan Thant (clean street) pilot project Asian Institute of Technology (AIT, 2015). However, the community's participation, coordination, and cooperation concerning the systematic solid waste disposal are still needed to be strong.

Nowadays, there exists no precise and consistent data on the total waste generation in the country. There is no concrete data that show the waste disposal management of the local population for possible intervention. People's involvement to improve solid waste disposal systems is essential and their roles are significant. Hence, this study was undertaken to assess the knowledge and practice of the community towards waste disposal, to explore the determinants of knowledge and practice on the solid waste disposal among households and to evaluate the association between the knowledge and practice on solid waste disposal among household in the urban area of Shwe Pyi Thar Township, Yangon Region which can play an important role in the management of solid waste in the study area.

## **Methodology**

### ***Method***

The knowledge and practice of households towards solid waste disposal were analyzed by descriptive methods. Besides, the Pearson chi-square test was used to examine the association between socioeconomic and demographic characteristics and knowledge, and practice towards solid waste disposal. Furthermore, the binary logistic regression analysis is applied to explore the determinants of knowledge and practice towards the solid waste disposal of the households.

### ***Study Design and Study Area***

The design of the study was a cross-sectional descriptive study upon knowledge and practice of solid waste disposal among households in the urban area of Shwe Pyi Thar Township. A sample survey is conducted during the second week of November 2019 with permission from wards and township administrative authorities. Shwe Pyi Thar Township is situated in the northern part of the Yangon Region and included in one of the six townships where the final waste dumping site for the entire city existed. According to the 2014 Population and Housing Census, the total population in the urban area of Shwe Pyi Thar Township is 279,795 and the total number of households is 58,511. There are 23 wards in the urban area of Shwe Pyi Thar Township.

### ***Study Population and Sample Size Determination***

The target population was persons aged 18 years and above residing in the urban area of the township and the study population was those who were from the randomly selected households of the selected wards. Exclusion criteria were persons under 18 years of age, very ill persons and persons unwilling to participate in the study. From the selected sample households, household head, or someone from this household were interviewed by the face-to-face method using a structured questionnaire.

The two-stage sampling design was used in the survey. Among 23 wards in the urban area of Shwe Pyi Thar Township, a sample of 4 wards was selected by simple random sampling in the first stage. In the second stage, the sample households were proportionately chosen from the sample wards selected in the first stage by simple random sampling. Using Cochran's (1977) formula, the sample was determined with the confidence interval of 95%, degree of precision of 8%, and the estimated prevalence rate of 50% since there was no prior study in this area. The minimum sample size was obtained as 150. Assume that the response rate is 93%. Therefore, the required minimum sample size was 162 households. The required sample from each sample ward was allocated as follows:

**Table 1 Sample size allocation**

<b>Sample ward number</b>	<b>Total no. of households</b>	<b>No. of sample households</b>
2	636	19
3	1,010	30
12	2029	61
20	1,746	52
<b>Total</b>	<b>5,421</b>	<b>162</b>

**Source:** Township administrative office (2019)

## **Results**

### ***Socio-economic and Demographic Characteristics of the Respondents***

Among the sample respondents, more than half (88) were female (54%), most of the respondents (97) were older than 30 years (60%) and the majority (129) have high school and above educational level (80%). Most of the respondents (125) reported that they are currently employed (77%). Concerning migration, 104 respondents have been migrated to Shwe Pyi Thar Township more than 5 years ago (64%). More than three-fourth (77%) of respondents had monthly income 200000 kyats and above. More than half (88) of the respondents are Bamar (55%) followed by Kayin with 51 respondents (31%) and only 21 are others (13%) which include Danu, Kachin, Kaya, Mon, Rahkine, Shan, Lahu, Lisu, Palaung, Pa O, and Wa.

### **Knowledge of Solid Waste Disposal of Households**

Regarding knowledge level of respondents about waste disposal were assessed by 5 points including (i) Available Kinds of Disposal System (ii) Color and Type of Bag for Waste defined by Municipality (iii) Knowledge on Payment of Tax for Waste and Cleaning Services (iv) Learning How to Dispose Waste in School/from Parents (v) Methods of waste disposal that cause the minimum pollution to the environment. There were 15 questions. Among respondents, the maximum score of 15 and a minimum of 3 were obtained for knowledge on solid waste disposal. Respondents who got 7 and above scores are considered as high knowledge level and those had less than 7 scores are considered as low knowledge level on solid waste disposal. Knowledge of solid waste disposal of sample households is found as follows.

**Table 2 Knowledge level of the respondents**

Knowledge level	No. of respondents	Percent
Low	71	44
High	91	56
Total	162	100

Source: Survey data (2019)

According to Table (2), it is found that 56 % of the respondents have a high level of knowledge and 44% of those have a low level of knowledge concerning solid waste disposal.

The result of the Pearson chi-square test was shown in Table (3). It was observed that education level, monthly income, and race of the respondents have a significant association with their knowledge of solid waste disposal.

**Table 3 Results for association between socio-economic and demographic characteristics and the level of knowledge on solid waste disposal**

Socio-economic and Demographic Characteristics	Knowledge level		$\chi^2$	P-value
	Low	High		
<b>Gender</b>				
Male	30	44		
Female	41	47	0.60	0.439
<b>Age</b>				
Below 30	29	35		
30 years and above	42	56	0.09	0.758
<b>Education level</b>				
Below high school	29	4		
High school and above	42	87	32.66***	0.000
<b>Employment status</b>				
Unemployed	14	22		
Employed	57	69	0.46	0.498
<b>Migration period</b>				
Below 5 years	27	30		
5 years and above	44	61	0.45	0.503
<b>Monthly Income</b>				
Below 200,000 kyats	12	24		
200,000 kyats and above	59	67	2.07**	0.015
<b>Race</b>				
Others	9	12		
Kayin	16	36		
Burma	46	43	5.84*	0.054

\*, \*\*, \*\*\* represent 10%, 5% and 1% level of significant respectively.

Source: Survey data (2019)

The binary logistic regression model was applied to discover the determinants of knowledge on solid waste disposal of respondents since the knowledge level (dependent variable) is dichotomous (high and low) and high level is considered as a reference category. As shown in Table (4), it was observed that respondent is female, their high school and above education level and monthly income of 200,000 kyats and above have a significant association with their knowledge on solid waste disposal.

**Table 4 Results of binary logistic regression analysis of knowledge on solid waste disposal**

Dependent Variable (Knowledge)						
Independent variables	Coefficients	Odds Ratio	z	P-value	95% Confidence Interval	
					Lower	Upper
Constant	-1.23	0.29	-1.29	0.198	0.045	1.901
<b>Gender</b>						
Male (ref)						
Female	-1.02	0.36**	-2.43	0.015	0.159	0.822
<b>Age</b>						
Below 30 (ref)						
30 years and above	0.31	1.36	0.77	0.441	0.619	3.002
<b>Education level</b>						
Below high school (ref)						
High school and above	3.44	31.2***	5.26	0.000	8.652	112.497
<b>Employment status</b>						
Unemployed (ref)						
Employed	-0.10	0.90	-0.21	0.836	0.342	2.381
<b>Migration period</b>						
Below 5 years (ref)						
5 years and above	0.25	1.29	0.61	0.541	0.572	2.904
<b>Monthly Income</b>						
Below 200,000 kyats (ref)						
200,000 kyats and above	-0.99	0.37*	-1.88	0.060	0.130	1.044
<b>Race</b>						
Others (ref)						
Kayin	0.45	1.56	0.68	0.500	0.427	5.735
Burma	-0.65	0.52	-1.08	0.279	0.163	1.689

\*, \*\*, \*\*\* represent 10%, 5% and 1% levels of significance respectively.

**Source:** Survey data (2019)

According to Table (4), it can be said that female respondents are 0.64 times less likely to have high knowledge of solid waste disposal than males since the odds ratio is 0.36 and statistically significant at 5% level. Again, it is found that respondents with high school and above are about 31 times more likely to have high knowledge on solid waste disposal than their education is below high school level since the odds ratio is 31.2 and statistically significant at 1% level. Furthermore, it is observed that the respondents with a monthly income of 200,000 kyats and above are 0.63 times less likely to have high knowledge on solid waste disposal than those with below 200,000 kyats of monthly income since the odds ratio is 0.37 and statistically significant at 10% level.

### ***Practices on Solid Waste Disposal of Households***

There are 5 kinds of solid waste disposal by respondents' households such as door to door waste collection by municipal, garbage bin/tank, and garbage truck provided by municipal, private garbage trolley, and others. Practice on solid waste disposal of sample households in Shwe Pyi Thar Township is found as follows.

**Table 5 Kinds of solid waste disposal practice**

<b>Practice</b>	<b>No. of respondents</b>	<b>Percent</b>
Door to door waste collection by municipal	16	10
Garbage bin / tank by municipal	91	56
Truck by municipal	19	12
Private garbage trolley	33	20
Others	3	2
<b>Total</b>	<b>162</b>	<b>100</b>

**Source:** Survey data (2019)

Table (5) shows that 65% of the respondents practice on a garbage bin/tank provided by municipal, 12% of the respondents practice on a truck provided by municipal and 10% of the respondents practice on the door to door waste collection by municipal for their solid waste disposal. Nearly 2% of respondents have the practice of throwing in the street or into the ditch in lack of availability of trash bin nearby. Therefore, most (78 %) of the respondents practice on the municipal system whereas only 20% of the respondents practice on the private system for their solid waste disposal.

The result of the Pearson chi-square test was shown in Table (6). It was observed that the education level and monthly income of the respondents have a significant association with their practice on solid waste disposal.

**Table 6 Results for association between socio-economic and demographic characteristics and practice on solid waste disposal**

Socio-economic and Demographic Characteristics	Practice		$\chi^2$	P-value
	Municipal system	Private system		
<b>Gender</b>				
Male	57	17	0.04	0.833
Female	69	19		
<b>Age</b>				
Below 30	49	15	0.09	0.764
30 years and above	77	21		
<b>Education level</b>				
Below high school	16	17	20.57***	0.000
High school and above	110	19		
<b>Employment status</b>				
Unemployed	30	6	0.83	0.363
Employed	96	30		
<b>Migration period</b>				
Below 5 years	45	12	0.07	0.792
5 years and above	81	24		
<b>Monthly Income</b>				
Below 200,000 kyats	32	4	3.31*	0.069
200,000 kyats and above	94	32		
<b>Race</b>				
Others	15	6	0.76	0.683
Kayin	42	10		
Burma	69	20		

\*, \*\*, \*\*\* represent 10%, 5% and 1% levels of significance respectively.

**Source:** Survey data (2019)

The binary logistic regression model was applied to investigate the determinants of practice on solid waste disposal of respondents since practice (dependent variable) is dichotomous (municipal and private systems) and practice on municipal is considered as a reference category. The municipal system which includes door to door waste collection provided by municipal and garbage bin/tank provided by municipal garbage truck provided while the private system includes private garbage trolley provided and others. As shown in Table (6), it was observed that respondent's high school and above education level and monthly income of 200,000 kyats and above have a significant association with their practice on solid waste disposal.

**Table 7 Results of binary logistic regression analysis of practice on solid waste disposal**

<b>Dependent Variable (Practice)</b>						
<b>Independent variables</b>	<b>Coefficients</b>	<b>Odds Ratio</b>	<b>z</b>	<b>P-value</b>	<b>95% Confidence Interval</b>	
					<b>Lower</b>	<b>Upper</b>
Constant	0.77	2.16	0.79	0.427	0.322	14.465
<b>Gender</b>						
Male (ref)						
Female	-0.46	0.63	-1.00	0.319	0.255	1.561
<b>Age</b>						
Below 30 (ref)						
30 years and above	0.62	1.86	1.35	0.177	0.754	4.596
<b>Education level</b>						
Below high school (ref)						
High school and above	2.28	9.78***	4.51	0.000	3.626	26.355
<b>Employment status</b>						
Unemployed (ref)						
Employed	-0.48	0.62	-0.80	0.422	0.193	1.991
<b>Migration period</b>						
Below 5 years (ref)						
5 years and above	-0.34	0.71	-0.68	0.495	0.272	1.877
<b>Monthly Income</b>						
Below 200,000 kyats (ref)						
200,000 kyats and above	-1.27	0.28**	-1.98	0.048	0.079	0.987
<b>Race</b>						
Others (ref)						
Kayin	0.50	1.65	0.70	0.482	0.407	6.704
Burma	0.42	1.52	0.65	0.518	0.424	5.479

\*, \*\*, \*\*\* represent 10%, 5% and 1% levels of significance respectively

**Source:** Survey data (2019)

According to Table (7), it is observed that respondents with high school and above are about 10 times more likely to practice the municipal system of solid waste disposal than their education is below high school level since the odds ratio is 9.78 and statistically significant at 1% level. Moreover, it is observed that the respondents with a monthly income of 200,000 kyats and above are 0.72 times less likely to practice the municipal system of solid waste disposal than those with below 200,000 kyats of monthly income since the odds ratio is 0.28 and statistically significant at 5% level.

#### ***Association between Knowledge and Practice on Solid Waste Disposal of Households***

Pearson chi-square test was used to explore the association between the knowledge level and practice on solid waste disposal of respondents. As shown in Table (8), it was found that the association between respondents' knowledge level and practice on solid waste disposal is statistically significant at 1% level.



**Table 8 Results for association between knowledge and the practice on solid waste disposal**

Knowledge level	Practice on waste disposal		$\chi^2$	P-value
	Municipal system	Private system		
Low	47	24	9.81***	0.002
High	79	12		

\*\*\* represents 1% level of significance

Source: Survey data (2019)

## Discussions

The findings of this research indicated that more than half of respondents have a high level of knowledge on solid waste disposal and more than three-fourth of respondents practice on the municipal system of solid waste disposal.

The results showed that there is a significant relationship between the socio-economic and demographic characteristics such as education level, monthly income of household and race of the respondent, and respondent's knowledge on solid waste disposal. Results of binary logistic regression analysis show that female respondents are less likely to have high knowledge on solid waste disposal than male, respondents' education with high school and above are more likely to have high knowledge on solid waste disposal than their education is below high school level and respondents with a monthly income of 200,000 kyats and above are less likely to have high knowledge on solid waste disposal than those with below 200,000 kyats of monthly income. The result of the education level has a positive influence on knowledge is similar to Jatau (2013), Laor et al. (2018), and Seng et al. (2018).

In terms of respondent's practice on solid waste disposal, the socio-economic and demographic characteristics such as education level and monthly income of households have a significant relationship between respondent's practices on solid waste disposal. From the binary logistic regression analysis, it is observed that respondents with high school and above are more likely to practice the municipal system of solid waste disposal than their education is below high school level, and the respondents with a monthly income of 200,000 kyats and above are less likely to practice the municipal system of solid waste disposal than those with below 200,000 kyats of monthly income. The result of the education level has a statistically significant influence on practices supported the findings of Jatau (2013) and Laor et al. (2018).

Moreover, it is observed that the association between respondents' knowledge level and practice on solid waste disposal is statistically significant. The result is consistent with Laor et al. (2018).

## Conclusion

According to this study, most of the respondents suggested providing more trash bins in every possible public place. Regular collection of waste twice a day should be practiced at all townships from avoiding emission and preventing rodent and either animal harboring. Garbage trucks should collect waste not only from the main road but also from the streets as well as lanes. On the other hand, the community should dispose of waste by separated dry and wet waste properly as well. Respondents requested to conduct awareness about waste management in the community and especially to add in the school syllabus. They also suggested enforcing a fine

system to those who litter on the road and improperly dispose of their household waste in the environment.

Based on the findings, the following points were recommended.

- The government should promulgate and enforce policies on waste management. Laws of acts should be issued in line with waste management being necessary to impose the law at the same time.
- Public awareness should be provided on waste segregation to the household level through media and ensure to spread to the grass-root level of the country.
- Municipal service charges should be increased (proper rate) for collection service to change the mindset of the public that they will take into account and discipline in discarding the waste and it would be really helpful for the department to run better and to provide the necessary equipment.
- Logistical support (vehicles and additional workers) is needed and comprehensive solid waste management planning should be developed.
- Cooperation and coordination with multilevel stakeholders and promotion of Public-Private Partnership.
- Knowledge of waste management should be promoted focusing primarily on the group with a lower level of education through organizing workshops, seminars, and conferences on waste management by YCDC and public health educators.
- The Government and NGOs should support to undertake community-based projects on knowledge, attitudes, and practices associated with waste management to create public awareness and systematic practices related to waste management.

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