

Plastic Bottle Waste in Mandalay

Identifying recycling knowledge and practices among residents

May Myat Noe^{1*}, Harris Rosenblum^{2,3}, Myo Thandar Soe¹, Linn Htike San¹, Aye Thandar Lwin¹ and,
Tomoyuki Shibata^{3,6}

^{1*}*Department of Zoology Mandalay University, myatnoe797121209@gmail.com*

²*School of Public Policy, University of Southern California, hrosenbl@usc.edu*

³*Global Environmental Health LAB, admin@gehla.org*

⁶*Northern Illinois University, tshibata@niu.edu*

* Corresponding Author: May Myat Noe, Nga/5-38 Myat Thu Kha Lane Street, 64*65 Street, Mandalay, Myanmar, myatnoe797121209@gmail.com,

Abstract

The amount of plastic waste polluting Mandalay has been growing rapidly. Minimal knowledge of recycling benefits and practices, as well as a lacking recycling and waste management infrastructure adds to the problem. The purpose of this pilot study was to better understand the recycling practices of residents in Mandalay. The pilot project surveyed individuals around Mandalay University and online about demographic information, recycling knowledge, and waste managing behaviour. The preliminary results indicated that most respondents, about 68%, used 20-liter water containers as their primary source of water. Small water bottles, from 300 ml to 1 liter, accounted for 15% of the respondent's primary source of water. About 75% of respondents re-used their small plastic water bottles when they finished using them. Of those that re-used their bottles, 36% re-used their bottles four or more times. 33% of respondents thought recycling was not important and 33% thought recycling was very important. Reducing plastic waste in Mandalay is becoming increasingly important, as plastic waste floods our streets, rivers, and countryside. The initial data demonstrate a need to further study the mechanisms of plastic bottle waste in Mandalay in order to best address this growing issue.

Keywords: Plastic bottle waste; sustainable waste management; responsible production and consumption; recycling behaviour

1. Introduction

Myanmar, like many other Southeast Asian Countries, is facing rapid urbanization and population growth. These forces often outpace a city's ability to properly manage the consequences that follow, such as increasing consumption and the subsequent waste generation. The World Bank predicted that solid waste generation in the 38 'lower-income' countries, including Myanmar, would be more than double in the next 20 years (World Bank, 2012). Solid waste generation in Myanmar has been estimated to grow from 5,616 tons per day in 2012 to 21,012 tons per day by 2025 (World Bank, 2012). A 2016 report from the Institute for Global Environmental Strategies stated that about 60% of Myanmar's municipal waste comes from households and that over half of Myanmar's total waste generation is created by three major cities: Mandalay, Yangon, and Nay Pyi Taw (Gamaralalage, Hengesbaugh, & Ohnmar, 2016). Additionally, about 13% of the country's total waste is made up of plastic (Gamaralalage, Hengesbaugh, & Ohnmar, 2016).

As increasing amounts of plastic pollute Myanmar's communities, cultural treasures, and environment, the problem has become more visible. A sustainable movement has grown throughout the country in response to growing pollution, lack of waste management infrastructure, and the impacts of climate change (Myanamore, 2018). Improving recycling and waste management infrastructure's capacity is not the only way to address the problem. However, if households are responsible for the most of plastic waste generated in Myanmar, how can knowledge, attitude, and individual waste management practices impact this growing issue. Previous research has identified that knowledge attitude, and practice are significant predictors of recycling behaviour (Babei, et al, 2015). Understanding the public's concerns, preferences and knowledge towards recycling and waste management, as well as their recycling behaviour is the first step in building a successful waste management system (Chung and Lo, 2004). Many studies have examined the relationship between knowledge, awareness, and practice with regard to citizen participation and waste management programs (Barr, 2007, Byrne and O'Regan, 2014, Ehrampoush and Baghiani Moghadam, 2005, Nasrabadi et al., 2008, Pakpour et al., 2014, Pearson et al., 2012, Rahardyan et al., 2004). Knowledge and attitude towards a behaviour, such as recycling, affect how, why, and if people choose to participate in that behaviour. Therefore, it is important to understand all the factors that impact individual and household recycling practices.

This pilot study attempts to illuminate some of the factors connecting recycling knowledge, attitude, and practices among urban residents in Myanmar. Understanding the mechanisms behind plastic waste generation is essential for tackling this growing threat to Myanmar's environment and additional studies are needed to highlight the best path forward.

2. Methods

2.1 Study Site

The study took place in Mandalay, the second largest city in Myanmar. Due to limited time and resources samples both in person and online were gathered via a convenience sample. A total of 59 local residents were identified during face-to-face interviews around Mandalay University and online via a Facebook link to the survey.

2.2 Data Collection

This study was approved by Myanmar Ministry of Education and Institutional Review Board at Northern Illinois University. A survey was created electronically on a program called KoboToolbox in order to systematically collect and gather data quickly and efficiently. The questionnaire consisted of 11 closed-ended and 2 open-ended questions focused on demographics and recycling knowledge, attitudes, and practices (KAP). Prior to conducting the survey, respondents were told that participation was entirely voluntary and that they could stop at any time. Any respondent who failed to give consent did not participate and no respondents under the age of 18 participated (Table 1).

Table 1: Questionnaire Structure

Number	Question	Content	Type
Q1	Consent	Preliminary	Dichotomous
Q2	Age	Demographic	Open-ended
Q3	Gender	Demographic	Multi-choice
Q4	Education	Demographic	Multi-choice
Q5	Occupation	Demographic	Multi-choice
Q6	Income	Demographic	Open-ended
Q7	Primary source of drinking water	Background	Multi-choice
Q8	Buying frequency	Practice	Likert-scale
Q9	How many 500ml water bottles purchased daily	Practice	Multi-choice
Q10	What do you do with your plastic bottles when you finish using them	Practice	Multi-choice
Q11	If you re-use, how many times do you re-use it	Practice	Multi-choice
Q12	How much do you know about the benefits of recycling	Knowledge	Likert-scale
Q13	How important is recycling to you	Attitude	Likert-scale
Q14	If you recycle or reuse your bottles, how do you do it	Practice	Multi-choice

2.3 Statistical Analysis

Statistical analyses were gathered using Excel and SPSS 25. Due to the preliminary nature of the pilot study, descriptive statistics were performed for participants knowledge, attitude, and practices. For normal distributions, quantitative variables were expressed as means $\pm$ standard deviation while non-normal distributions were expressed as medians (range). A Chi-squared test was used to compare categorical variables

with a 2-sided p-values less than 0.05 considered significant.

3. Results and Discussion

Table 2 shows the demographic characteristics of the sample. About 71% of the study participants who responded to the survey were female. The median age of respondents was about 24 years. 40% of respondents were students, and most had at least a university level education.

Table 2: Demographics of the Survey Respondents

	Frequency	Percentage/Median
N = 45		
Gender		
Male	13	28.9%
Female	32	71.1%
Age (Median)		
		24
Education Level		
Primary School	5	11.1%
Secondary School	4	8.9%
High School	5	11.1%
University	17	37.8%
Graduate	14	31.1%
Occupation		
Student	18	40.0%
Street Vendor	7	15.6%
Business Owner	5	11.1%
Teacher/Professor	3	6.7%
Government	1	2.2%
Construction	1	2.2%
Health/Medical	1	2.2%
Other	9	20.0%

About 68% of respondents reported that 20 Liter water bottles were their main source of drinking water (Figure 1). This may contribute to rising plastic use and waste if a majority of Myanmar households are relying on plastic water containers as their primary mechanism for drinking water. 37.8% of respondents stated that they never purchased small water bottles during the day. However, 55.5% of respondents stated that they purchased at least one half-liter bottle of water daily. 75.6% of respondents stated that they re-used their plastic bottles after using them. Of those that re-used their bottles, 35.6% re-used their bottles four or more times. Most respondents claimed that they either sold the empty plastic bottle or re-filled it with water or other liquids.

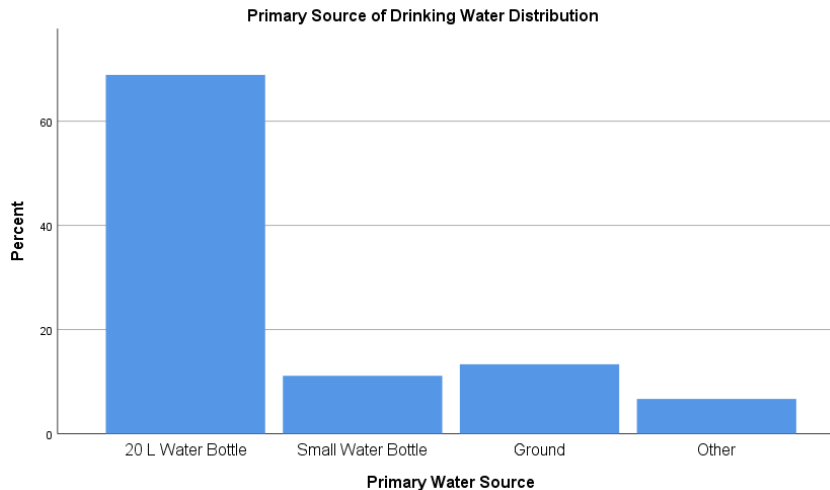


Figure 1: Responses about Primary Source of Drinking Water

When it comes to knowledge and attitudes, 46.7% of respondents claimed that they did not know anything about the benefits of recycling, while 33% believed that recycling was very unimportant. However, 33% responded that they believed recycling was very important. These findings suggest that a proper educational campaign demonstrating the benefits of recycling could improve public awareness and attitude towards recycling behavior. It is also important to see how certain demographic characteristics affect respondents' answers. Educational level appears to have a slightly positive correlation ($r=.377$, $p < 0.05$) with recycling importance, however no positive correlation existed between education level and knowledge of recycling benefits ($r= 0.270$, $p = >0.05$) based on this preliminary data (Figure 2 &Table 3).

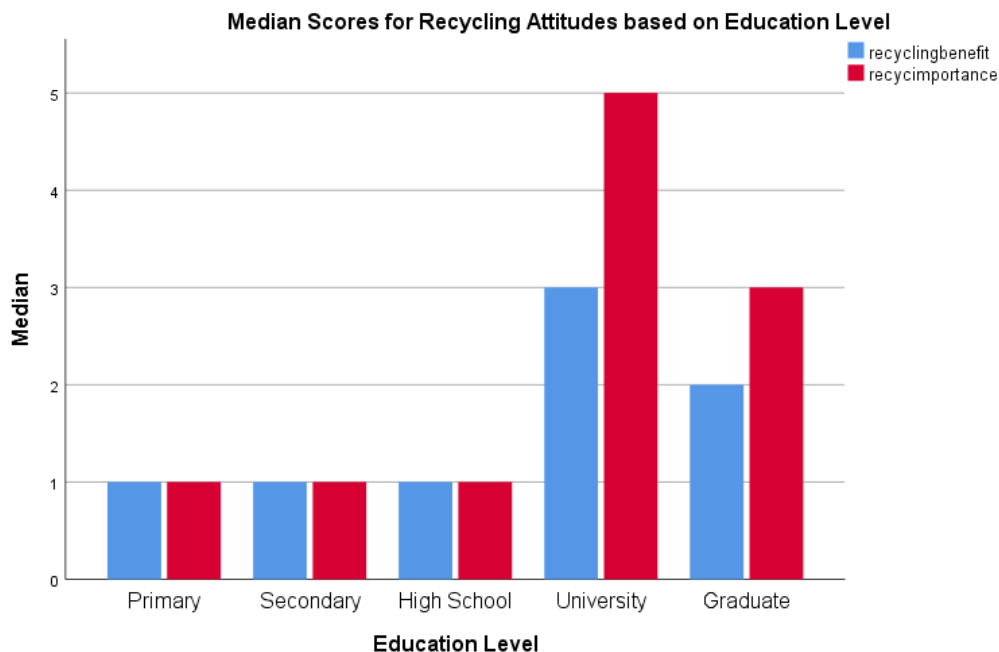


Figure 2: Bar graph of relationship between education level and recycling attitude

Table 3: Bar graph of recycling importance and education level**Correlations**

		Recycling Benefit	Recycling Importance
Education Level	Pearson		
	Correlation	0.27	.377*
	Sig. (2-tailed)	0.077	0.013
	N	44	43

*Correlation is significant at the 0.05 level (2-tailed)

There was a statistically significant difference between the recycling knowledge ($p = 0.015$) and attitude ($p = 0.007$) of participants with a high school level education and those with a university level education ($p < 0.05$).

4. Conclusions

Due to the preliminary nature of this pilot, much of the data collected and analyzed offers only limited insight into the knowledge, attitude, and practices regarding (KAP) recycling in Mandalay. More thorough studies need to be developed in order to gain a deeper understanding of how the public awareness and attitude toward recycling and waste management impact behavior. While some of the results align with previous research, such as higher educational level corresponding to more knowledge and better attitudes towards recycling, the study was limited by a small sample size and non-random sampling methodology.

Despite this pilot study's limitations, it offers a path forward for researchers in Myanmar. Growing waste, particularly plastic waste, requires immediate attention. Myanmar faces the growing threat of climate change, increasing burdens of urbanization, and limited infrastructure to deal with the exponential growth of waste generation. Continuing to study the KAP relationships to waste management will help the country develop cost effective ways of dealing with this plastic waste. Data on Myanmar's current waste generation patterns and characteristics are lacking. Therefore, additional research should also focus on gathering more accurate waste generation data and methods of improving waste management infrastructure. By addressing both individual behavior and state-wide capacity, Myanmar will be even more equipped to handle this growing problem.

Acknowledgements

The authors thank the Ministry of Education for supporting the 5th workshop and collaborate research for Sustainable Development Goals in Myanmar and other scholars and staff from Global Environmental Health LAB for assisting the team throughout the development of this pilot project. The authors also thank all local people who participated in or administered the survey.

References:

- [1] World Bank, "What A Waste; A Global Review of Solid Waste Management", Urban Development Series, Knowledge Papers, 2012, available at: <http://go.worldbank.org.libproxy2.usc.edu/BCQEP0TMO0> (accessed 10 October 2019).
- [2] Gamaralalage, Premakumara Jagath Dickella; Hengesbaugh, Matthew; Ohnmar, May Tin Hlaing, "Quick Study on Waste Management in Myanmar: Current Situation and Key Challenges", Institute for Global Environmental Strategies, 2016, available at: https://archive.iges.or.jp/files/research/scp/PDF/20160613/17_Quick_study_Web.pdf
- [3] Myanmar, "Myanmar Targets Plastic Waste in Growing Green Movement", Myanmar.com, 2018, available at: <https://www.myanmar.com/2018/06/myanmar-targets-plastic-waste-in-growing-green-movement/>
- [4] Babaei, Ali Akbar et al. "Household Recycling Knowledge, Attitudes and Practices Towards Solid Waste Management." *Resources, Conservation & Recycling* 102 (2015): 94–100. Web.
- [5] Chung, Shan-Shan, and Lo, Carlos W. H. "Waste Management in Guangdong Cities: The Waste Management Literacy and Waste Reduction Preferences of Domestic Waste Generators." *Environmental Management*, vol. 33, no. 5, Springer-Verlag, Sept. 2004, pp. 692–711, doi:10.1007/s00267-004-0020-2.
- [6] Barr, Stewart. "Factors Influencing Environmental Attitudes and Behaviors: A U.K. Case Study of Household Waste Management." *Environment and Behavior*, vol. 39, no. 4, Sage Publications, July 2007, pp. 435–73, doi:10.1177/0013916505283421.
- [7] Byrne, Susan, and O'Regan, Bernadette. "Attitudes and Actions Towards Recycling Behaviours in the Limerick, Ireland Region." *Resources, Conservation & Recycling*, vol. 87, Elsevier B.V, June 2014, pp. 89–96, doi:10.1016/j.resconrec.2014.03.001.
- [8] Ehrampoush, M, et al. "Survey of Knowledge, Attitude and Practice of Yazd University of Medical Sciences Students About Solid Wastes Disposal and Recycling." *Iranian Journal of Environmental Health Science & Engineering*, vol. 2, no. 2, Jan. 2005, pp. 26–30, <http://search.proquest.com/docview/19464052/>.
- [9] Nasrabadi et al., "Evaluating Citizen Attitudes and Participation in Solid Waste Management in Tehran, Iran.(Practical Stuff!)(Survey)." *Journal of Environmental Health*, vol. 71, no. 5, National Environmental Health Association, Dec. 2008, pp. 30–40.
- [10] Pakpour, Amir H, et al. "Household Waste Behaviours Among a Community Sample in Iran: An Application of the Theory of Planned Behaviour." *Waste Management*, vol. 34, no. 6, Elsevier Ltd, June 2014, pp. 980–86, doi:10.1016/j.wasman.2013.10.028.
- [11] Pearson, Heidi C, et al. "Recycling Attitudes and Behavior Among a Clinic-Based Sample of Low-Income Hispanic Women in Southeast Texas (Recycling Attitudes and Behavior)." *PLoS ONE*, vol. 7, no. 4, Public Library of Science, Apr. 2012, p. e34469, doi:10.1371/journal.pone.0034469.
- [12] Rahardyan, B, et al. "Resident's Concerns and Attitudes Towards Solid Waste Management Facilities." *Waste Management*, vol. 24, no. 5, Elsevier Ltd, 2004, pp. 437–51, doi:10.1016/j.wasman.2003.11.011