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PLASTIC WASTE AND POTENTIAL INTERVENTION FROM UNIVERSITY STUDENTS: KHULNA UNIVERSITY AS A CASE OF BANGLADESH

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ABSTRACT

Over the past century, plastic has become an increasingly common and convenient manufacturing material, replacing more traditional materials such as glass, aluminum, and natural fibers (Andrady and Neal, 2009)..Plastic is undoubtedly a remarkable material in terms of its variety of applications and uses. But the deploring issue is not one square mile of ocean surface anywhere on earth is free of plastic pollution. In Bangladesh, the statistic is so alarming that 0.15 kilogram per person plastic waste is emitted to the ocean (Meijer et al. 2021) which is larger in ratio than many of the countries of Asia. This scenario has generated the Urgency of rethinking existing Plastic-waste management systems.

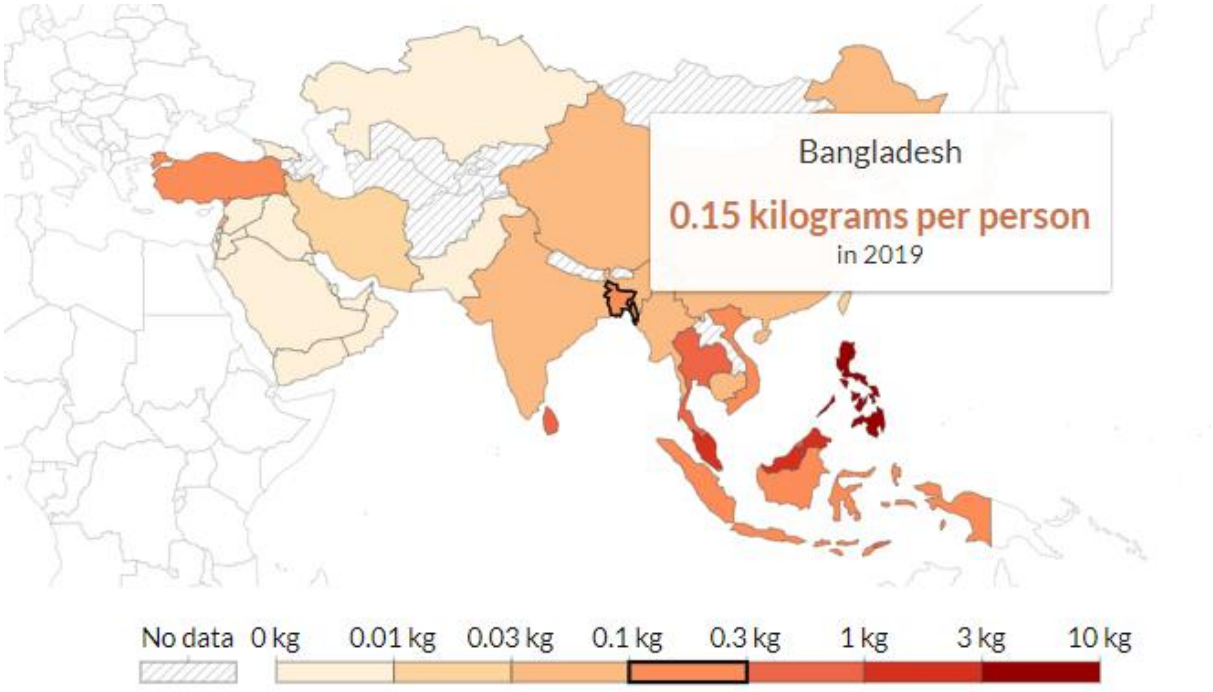

Figure.1: Plastic waste emitted to the ocean per capita, 2019.Source: Meijer et al. (2021).

This study aims to investigate the use pattern of plastic and its destination as a waste. It also intends to develop a sustainable chain of plastic-waste management systems engaging university students of Bangladesh. This paper describes how the current method and practice of plastic waste disposal around a university campus works based on literature review, survey, and mapping at Khulna University and its surrounding area. The analysis offers a sustainable management method that includes student involvement and turns waste into resources while also influencing users' behavioral patterns around the use of plastic. This paper also presents a framework that links all of Bangladesh's universities and makes the system broadly sustainable.

INTRODUCTION

Industrialization, population growth and the rise in welfare accelerated the pressure of human activities on the environment (Ari and Yilmaz 2016). More intensive use of natural resources due to increased production and consumption. Waste production has unavoidably increased to a point where it endangers both the environment and human health (Donmez and Degirmen 2016). Any material, substance, or byproduct that is no longer required or useful is considered waste. If it is not properly disposed of, it harms the environment (Uzunoglu 2014). Waste is produced in almost every country in the world in enormous amounts each year (Sanli et al. 2011). Education and awareness-building are required because waste endangers the environment, threatens human health, and threatens the existence of other living things. This means that environmental protection, resource conservation, and issues related to waste generation, collection, and disposal are all addressed by waste education (Agrawal 1990).

Plastic waste is the most harmful to the environment and to people among all types of waste. Despite the fact that its first widespread commercial use and production dates to the 1950s, plastic has since become an integral part of human development (Hosler, Burkett and Tarkanian,1999). According to the World Bank, Bangladesh's annual per capita plastic consumption in urban areas tripled over the previous 15 years, rising from 3.0 kg in 2005 to 9.0 kg in 2020. Plastic bags and other LDPE packaging materials were used five times as much in 2020 as they were in 2005. Only 31% of the 977,000 tons of plastic used in 2020 were recycled. Single-use plastics like shopping bags, packs, and wrappers accounted for the majority of improperly managed plastic waste.

Developing a more environmentally sustainable management of waste depends upon consumers' willingness to engage in "greener" consumption behaviors (Peattie,2010). One of the best places to begin this effort is at the institutional level. When a large number of people are employed by well-organized institutions or businesses, those institutions or businesses develop into large gathering spaces with all the necessities for energy, water, and resources. The proper management of the waste that these communities produce on a daily basis is one of these necessities. Universities are a good example of places where many people regularly travel to work or study. However, they make use of the university's various services, such as the cafeterias, canteens, photocopy machines, and so forth, independently of their task. Universities today can be compared to small towns because they have numerous campuses and buildings where the use of resources like energy, water, paper, and other services like restaurants, cleaning, and photocopying is significant. Numerous people's and businesses' daily operations are impacted by all of these issues. Additionally, they have a number of negative direct and indirect effects on the environment. Universities must acknowledge their institutional responsibility because of this. (Solís,2008). In industrialized nations, the development of university waste management systems (UWMS) began 20 years ago, and there are both institutional and voluntary programs (Armijo de Vega et al., 2003).

At Khulna university there exist a well-designed waste management system ranging from waste collection to waste treatment plant. In spite of having an organized system the waste, especially the plastic waste is found in several locations. The query of what is the reason behind the unwillingness of a number of people to use the system is the center to this study. The study is an attempt to analyze the behavioral pattern of user groups while using the components of waste management system such as - waste bin. The analysis offers a set of attributes that should be included in a waste management system to make it efficient and sustainable.

STUDY METHODOLOGY

This research explores the university area in a descriptive and qualitative manner. In research that focuses on environmental-behavioral research, a case study is frequently used because it is a comprehensive in-depth investigation that reveals the qualitative details from the users' perspective and the observer's perspective (Tellis,1997). As a result, case studies are used as a comprehensive research strategy, and on-site observation, questionnaire surveys, and interviews serve as the main data collection tools. The idea that a structured waste management system is available and that there is room to reshape it is what drives the choice of case study. In November 2022, the initial field survey was completed. In order to gather information, both questionnaire surveys and interviews use a set of structured questions. perspectives of the place being studied. The questionnaire survey is carried out among users and visitors of the campus. Another layer of the survey is conducted in online mode with

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the same questionnaire. Questionnaires are in Bangla for a better understanding of the larger group of participants

For the analysis, the data were categorized into ages 12–20, 20–30,30–55 and above 55 .95.1% of the respondents belonged to the 20-30 age group and most of them(90.2%) are university students.

The study outcome is observed and analyzed among the user. Observation and photo-documentation of the prevailing conditions of the campus are supplementary to the qualitative analysis.

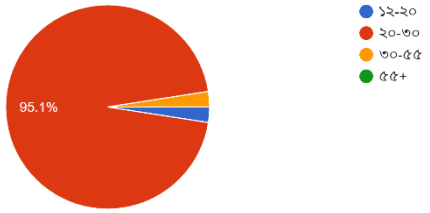

Figure 1 Age demography of participants (Source: Authors)

CASE STUDY ANALYSIS

The site of case study,Khulna University located in Gollamari, near the river Moyur, beside the Sher e Bangla Road (Khulna-Satkhira highway).The University campus has several buildings distributed in three main zones: academic buildings and five residential hall for students, sports fields, a library, the central mosque, central administration offices and the university canteen. There is also a commercial zone (Ágora), which is open to the whole town, and which has been also taken into account in our study.

Figure 2 Location of the site (Source: Authors)

Knowing the make-up, the volume, and the distribution of the waste generated in a university's facilities is the first step in putting measures in place to implement a waste management plan. These variables should be examined over a year because the waste composition and generation depend on the climate, among other things. In 2016 (Gallardo et al.). Therefore, the goal of our study is to understand the current situation. To that end, a survey was administered in person, and several managers of the cleaning service and waste management were interviewed. To pinpoint the location of the campus area's waste source, a graphical map (Figure-03) was developed. Several images are labeled with their appropriate contexts so that the current situation can be visualized.

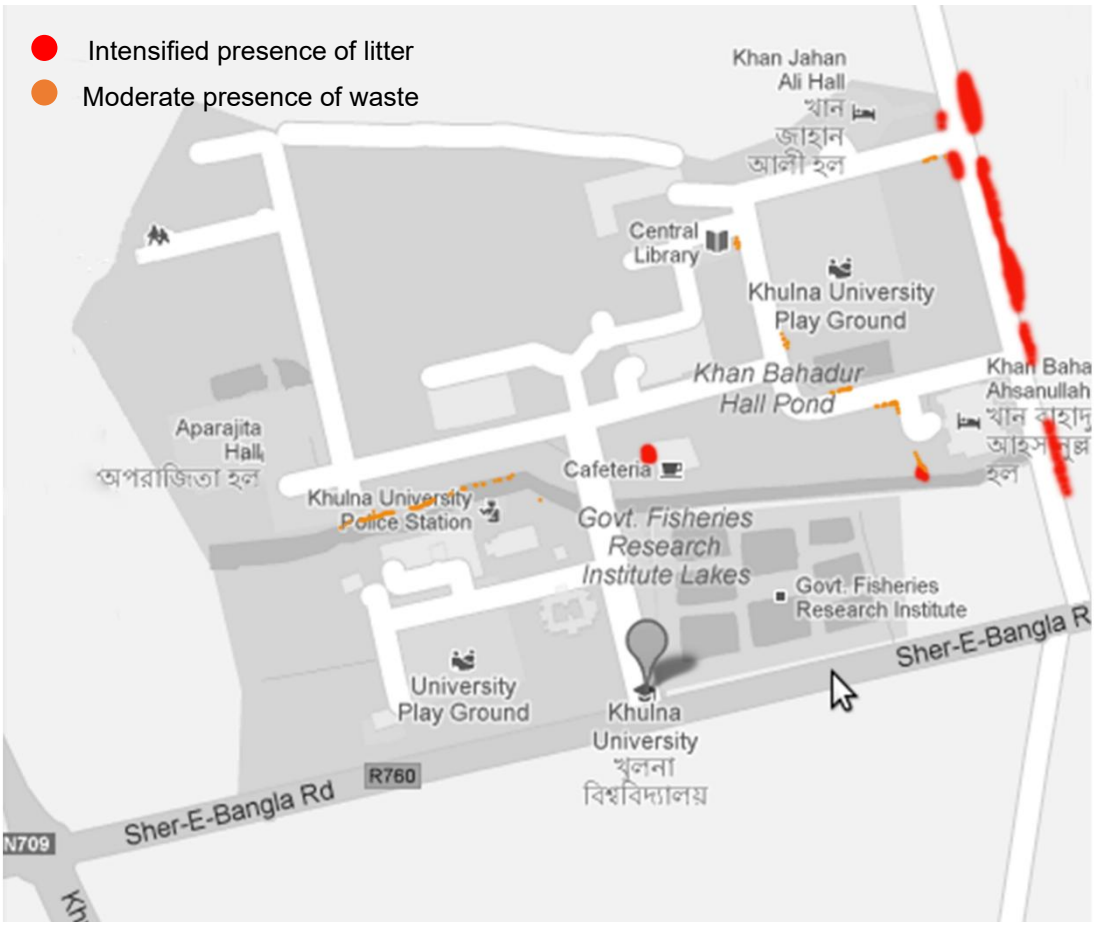

Figure 3: Waste source map (Source: Authors)

The map shows that the hall road area has the most intensified presence of waste. Though this area is not included in the administrative area of the university campus, the major users are the students. And the behavioral pattern them to waste impact a lot to the environment of the zone.

Figure 4 Presence of waste in hall road (Source: Authors)

The waste generated from the 61 shops of hall road is not well managed. One single shop of fruit juice is responsible for 150+ one-time plastic cups during the summer season. One-time plastic cup, straws, and plastic packets are major litter seen all over the road.

A well-equipped waste management system is present on university property and is kept up by university authorities. The interesting fact is that despite having a system, it is frequently discovered that users are not using the trash can. Quite frequently, litter is found in front of the trash can. There

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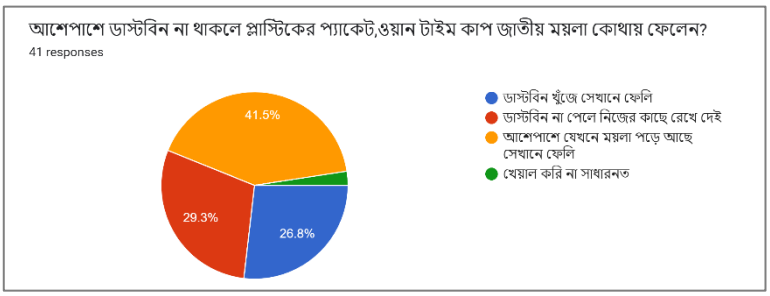
are plenty of trash cans nearby, particularly in the walkway next to the campus lake. Unfortunately, the lake is polluted. The primary motivating factor for starting this research was this scenario.

Figure 5 Existing scenario of waste management in campus area (Source: Authors)

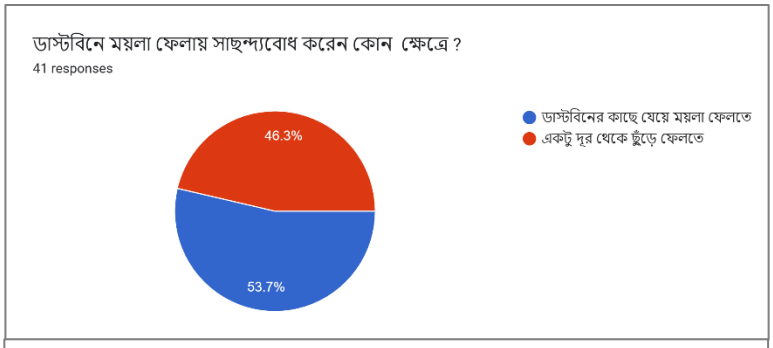
FINDINGS AND DISCUSSION

The result of the questionnaire survey has guided us to understand the perception and the behavior pattern of the user group. The Survey was conducted in Bangla and kept as it was to present in the paper.



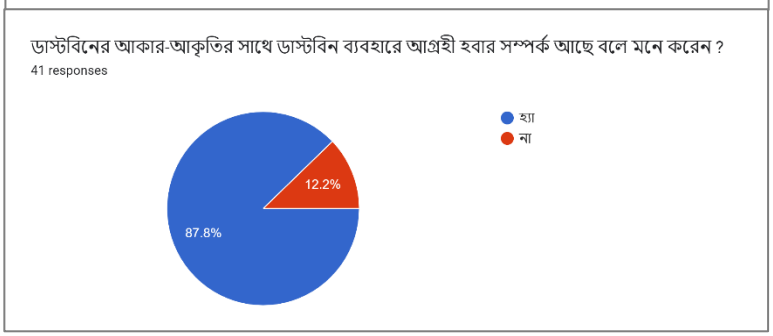
Findings:41.5% of participants of the survey used to throw trash in a place where there was trash presented from before in the case of not having a waste bin.

This type of place needs to negotiate differently that create awareness among the users.

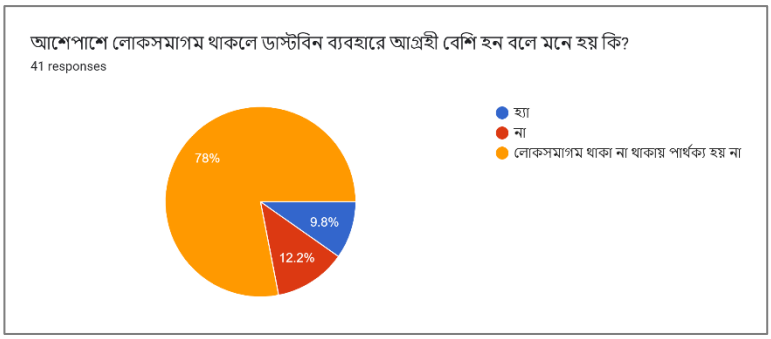


Findings: Though most of people throw trash maintaining a short distance a major number of 46.3% prefer to throw it from away.

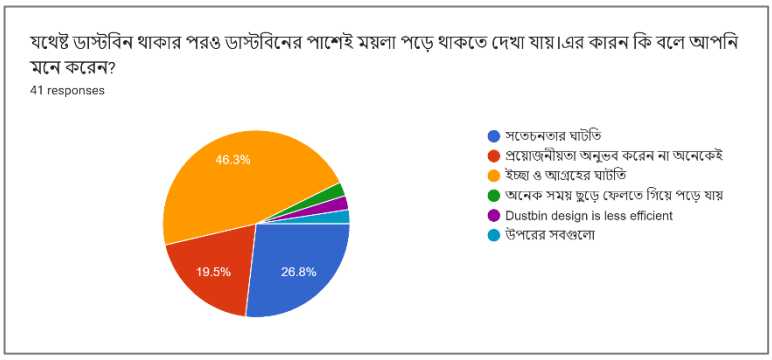
The design of waste bins needs to address this behavioral pattern of users.



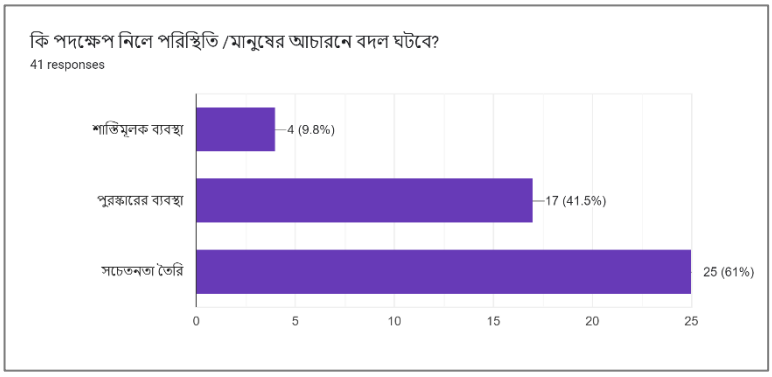
Findings:87.8% of participants think the shape of the waste bin impacts to influence the use of waste bin.



Findings: Almost all participants agree on that presence of a crowd doesn't affect the use pattern of dustbins.



Findings: According of most of the participants the reason behind seeing the trash here and there is the lack of awareness and willingness.



Findings: To improve the scenario award giving system is suggested by 41.5% participants.
Raising awareness is seen as a primary tool changing human behaviour, particularly in circumstances where particular environmental problems emerge. (Conke 2018) which is suggested by the most of participants.

Educating the public to view waste as a resource rather than as something that should be thrown away is necessary, according to Williams and Taylor (2004). Additionally, Lehman and Geller (2005) noted that knowing the effects of a behavior has an impact on its repetition and maintenance, particularly in pro-environmental behavior. And when it comes to raising awareness, student initiatives will be more long-lasting, such as: a special

club for students that addresses environmental issues and campus waste management. In order to create a sustainable system of waste management that not only addresses the technical issue but also addresses behavioral issues as a crucial component of the overall system, a network of clubs from various universities that share the same idea can have a positive impact.

LIMITATIONS AND CONCLUSION

Our study took place on only a university campus. We acknowledge that the findings might have been different for other areas. Furthermore, the findings of our study are limited to the participants who have participated in the survey. Apart from that, the study was incepted from the notion of finding the answer to why people are not being sensitive to managing waste specially plastic waste. Our findings offer that the design of every component of the waste management system needs to design addressing the behavior pattern of the user group. And student engagement—a subject that hasn't yet been discussed in Bangladesh—lays the foundation for the success of waste management on university campuses.

REFERENCE

Andrady, A.L. and Neal, M.A., 2009. Applications and societal benefits of plastics. Philosophical Transactions of the Royal Society *B: Biological Sciences*, 364(1526), pp.1977-1984

Conke, L.S., 2018. Barriers to waste recycling development: Evidence from Brazil. *Resources, conservation and recycling*, 134, pp.129-135.

de Vega, C.A., Ojeda-Benítez, S. and Ramírez-Barreto, M.E., 2003. Mexican educational institutions and waste management programmes: a University case study. *Resources, conservation and recycling*, 39(3), pp.283-296.

Gallardo, A., Edo-Alcón, N., Carlos, M. and Renau, M., 2016. The determination of waste generation and composition as an essential tool to improve the waste management plan of a university. *Waste management*, 53, pp.3-11.

Hosler, D., Burkett, S.L. and Tarkanian, M.J., 1999. Prehistoric polymers: rubber processing in ancient Mesoamerica. *Science*, 284(5422), pp.1988-1991.

Kerlikowske, K., Smith-Bindman, R., Abraham, L.A., Lehman, C.D., Yankaskas, B.C., Ballard-Barbash, R., Barlow, W.E., Voeks, J.H., Geller, B.M., Carney, P.A. and Sickles, E.A., 2005. Breast cancer yield for screening mammographic examinations with recommendation for short-interval follow-up. *Radiology*, 234(3), pp.684-692.

Meijer, L.J., van Emmerik, T., van der Ent, R., Schmidt, C. and Lebreton, L., 2021. More than 1000 rivers account for 80% of global riverine plastic emissions into the ocean. *Science Advances*, 7(18), p.eaaz5803

Peattie, K., 2010. Green consumption: behavior and norms*. Annual review of environment and resources*, 35(1), pp.195-228.

Tellis, W., 1997. Introduction to case study. *The qualitative report*, 3(2), pp.1-14.

Williams, I.D. and Taylor, C., 2004. Maximising household waste recycling at civic amenity sites in Lancashire, England. *Waste Management*, 24(9), pp.861-874.

World Bank. (n.d.). Meeting Bangladesh's Plastic Challenge through a Multisectoral Approach. [online] Available at: https://www.worldbank.org/en/news/feature/2021/12/23/meeting-bangladesh-s-plastic-challenge-through-a-multisectoral-approach#:~:text=use%20and%20pollution.- [Accessed 30 Dec. 2022].