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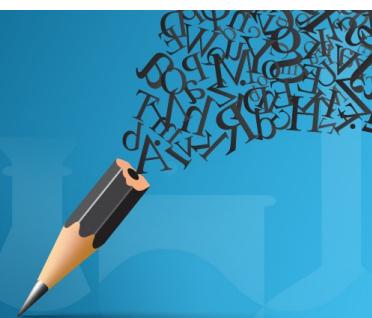
Campus Community Participation on Single-Bin Recycling System

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Abstract. This study will explore the potential of a single-bin recycling system as an alternative recycling system at Universiti Malaysia Kelantan, Jeli Campus. Besides that, this study will determine community participation in the single-bin recycling program and identify its challenges. The research approaches used in this study were fieldwork and case studies. Besides that, random stratified sampling was applied to select 300 respondents among UMK Jeli campus populations. Data were collected via questionnaires distribution, observation, and fieldwork. The result shows that the participation level of the campus community toward a single-bin recycling system was moderate. However, the weight of the recyclable items collected has increased through weeks and shows that the single bin-recycling system was acceptable and effective for the UMK Jeli campus. However, there are challenges in executing a single bin recycling program, such as the limited type of recyclables accepted by local vendors and contamination of recyclables collected. The campus community did not seem aware of the recyclables that cannot be sold to the local vendors. The findings of this study are beneficial to the campus and other institution to improve their recycling program in the future.

INTRODUCTION

The concept of sustainability on campus began to gain the attention of universities around the world in 1990. More than 300 universities worldwide signed the Talloires Declaration in 1990 [1]. The Talloires Declaration is a platform incorporating sustainability concepts in learning, research, and operations in higher education institution [2]. Thus, various activities and initiatives towards sustainable development have been carried out in institutes of higher learning at home and abroad. For example, sustainability in solid waste management in higher education institutions has become one of the sustainability issues gaining increasing attention and causing concern of various parties locally and globally [3].

The recycling program is an activity that often receives attention in higher education institution as a sustainability initiative in solid waste management. Higher education institution is among the significant contributors to increased solid waste generation, and most of the solid waste generated has the potential to be recycled [4]. Recycling is a very effective method of reducing the quantity of solid waste generated.

Many higher education institutions in and outside the country have taken the initiative to implement recycling programs on campus throughout the year. However, most recycling programs implemented in Malaysia's higher education do not show positive results because they are temporary (ad-hoc). Many awareness campaigns have been implemented in a local higher education institution. However, the recycling rate among the campus community only increased during the campaign. Although they know the importance of recycling practices, the recycling rate will

decline if no campaign is implemented. Due to several factors, some do not have time to practice recycling, uncomfortable existing recycling systems, and poorly managed recycling stations [5].

Simple and efficient recycling systems and technologies need to be introduced to the campus community to improve recycling practices [6]. A single-bin recycling system or a single bin recycling system is one method of collecting curb side recyclables [7]. This system is also an alternative recycling system to multi-bin recycling systems. This system has also been introduced and implemented in Canada since 1983 and has successfully reduced the quantity of solid waste sent to landfills [8]. In Malaysia, a multi-bin recycling system of three blue, orange and brown bins is used to collect recyclable items according to a predetermined classification [5]. Past studies have shown that the three-bin recycling system adopted in Malaysia has various problems such as requiring high costs, more space and has given confusion to the community [9]. A single-bin recycling system requires only low cost, little space, and is not confusing [7]. Therefore, this study explores community involvement in recycling programs that use a single-bin system on campus. The study results can contribute to improving the collection system of recycled items on campus and a guide to facing the challenges of implementing recycling programs in higher education institutions.

METHODS

Research Design

In this study, community involvement in the recycling program implemented will be examined. In addition, the effectiveness and challenges of implementing a single bin recycling system in the study area were identified. Figure 1 shows the flow chart of the implementation of a single-bin recycling system in the study area which includes three main phases namely situation analysis, system application and data analysis. The division of the implementation phase is very important to ensure that the study can be conducted more systematically and smoothly.

The design of this study is based on quantitative and qualitative approaches through field studies and case studies. The sampling of the study was made based on the total population of the community in the study area. Data were obtained based on several instruments used such as situation analysis, questionnaires and participatory observations. The data obtained were analysed through statistical analysis and content analysis. Quantitative data were analysed using descriptive and inferential statistics. While qualitative data were analysed using interpretive and reflective methods [10].
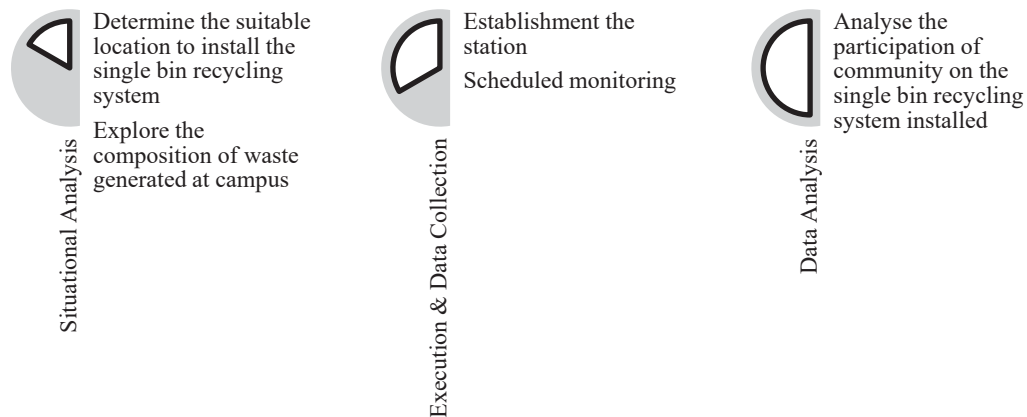
Situational Analysis
- Determine the suitable location to install the single bin recycling system
- Explore the composition of waste generated at campus

Execution & Data Collection
- Establishment the station
- Scheduled monitoring

Data Analysis
- Analyse the participation of community on the single bin recycling system installed

FIGURE 1. Flowchart of Research

Sampling Method

The sampling technique used in this study was based on the suitability of population characteristic [11]. The number of academic and non-academic staff is precisely in the UMK Jeli campus's Buildings. Therefore, the stratified random sampling technique is more appropriately used to allow campus community selected as a respondent. A total of 300 respondents, consisting of students and staff of UMK Jeli Campus, participate in this study.

Data Analysis

Quantitative data obtained in this study were analysed using Statistical Package for Social Sciences (SPSS) software. In comparison, content analysis is applied through interpretive techniques and reflection on qualitative data. Descriptive statistical analysis is applied to describe the study's findings in terms of frequency and percentage to describe the socio-demographic diversity of the respondents. In addition, inferential analysis like t-test and ANOVA are used to formulate data by explore the factors that influence participation of respondents.

RESULTS AND DISCUSSION

Socio-demographic Profile

Table 1 shows the profiles of the respondents in this study. The majority of the respondents were women with 53.3%, while the percentage of male respondents was only 46.7%. The difference in the percentage of men and women is influenced by the number of communities in the Malaysian Institute of Public Higher Education, which women monopolize compared to men [12]. Accordingly, the majority of the respondents are teenagers between the ages of 19 to 29 years. In contrast, only some of the respondents are adults aged 30 years and above. The significant difference between the number of adolescent and adult respondents was influenced by the number of communities in the UMK Jeli campus, most of which consisted of students. The average age distribution of the respondents was 28 years. Accordingly, 25% of the respondents are academic staff, while only 8.3% are non -academic staff. In addition, 71.7% of the respondents are Malays, while 21.7% of Chinese respondents and 6.7% of respondents are Indians. A total of 90% of the respondents are communities from the Faculty of Earth Science, Faculty of Agro-based Industry and Faculty of Bioengineering and Technology, while the remaining 10% are staffs from the others unit at UMK Jeli campus.

TABLE 1. Recyclables collected from single bin recycling system

Participation statement	Percentage (%)
Gender	
Male	53.3
Female	46.7
Age	
<19 years old	8.3
20-29 years old	58.3
30-39 years old	5.8
40-49 years old	17.6
>50 years old	10.0
Ethnic	
Malay	71.7
Chinese	21.7
Indian	6.6
Education Level	
Certificate/STPM	2.5
Diploma	4.2
Undergraduate	50.0
Postgraduate	43.3
Marital Status	
Married	33.3
Single	66.7
Type of Occupation	
Academic Staff	25.0
Administration Staff	8.3
Students	66.7

Campus Community Participation on Single Bin Recycling System

The study's findings show that the level of awareness of respondents towards the environment and recycling practices is high. However, statistic shows that the level of respondents' involvement in the single-bin recycling system provided is moderate with mean 3.36, (σ=0.68). The level of participation among the campus community is measured based on the use of single-bin recycling containers or bins provided. The response given by the respondents are consistent because the standard deviation recorded is slight at 0.68.

The statements related to the participation of the campus community in the implementation of the recycling system (Table 2). The majority of the respondents were more likely to recycle paper and boxes than aluminium cans and plastic items. In addition, most respondents rarely take recyclable items from home or hostel to put in containers and recycling bins provided, which indicate that most of the recyclables collected from single-bin recycling system are from the office and hostel wastes.

TABLE 2. Recyclables collected from single-bin recycling system

Participation statement	Mean/ (Standard Deviation)
Recycle aluminum can wastes by using single-bin recycling system	3.1 (0.71)
Recycle paper wastes by using single-bin recycling system	4.2 (0.83)
Recycle plastic wastes by using single-bin recycling system	3.6 (0.59)
Recycle box/cardboard wastes by using single-bin recycling system	3.8 (0.91)
Bring recyclables from home to use single-bin recycling system	2.1 (0.72)

Garces et al. [13] asserted that the socio-demographics of each individual would influence their behaviour in recycling practices. In this study, implementing a single-bin recycling system is influenced by several group of socio-demographic factors such as difference in age, marital status and type of occupation, as shown in Table 3. Based on the statistical analysis, respondents were aged 30 years and above, married, and staff showed good participation in the single-bin recycling system. While other socio-demographics such as gender, ethnic, and educational level did not show a significant relationship with respondents' participation in the single-bin recycling system.

TABLE 3. Significant of difference group socio-demographic influence participation of community on single-bin recycling system

Socio-demographic	P-value
Gender	0.661
Marital Status	<0.001**
Age	0.014*
Type of Occupation	<0.001**
Ethnic	0.418
Education Level	0.191

*Significant at p-value <0.05, **Significant at p-value <0.001

Ewert and Baker [14] found out that the age and gender differences will influence individuals to concern about environmental care. Older women and individuals have more significant worries about environment than younger men [15, 16]. The statements argued above are similar to the findings obtained in this study. Women have a high awareness of the importance of the environment and have a greater understanding of recycling systems than men. In addition, people aged 30 and above have a high level of awareness of environmental care and awareness the importance of recycling practices. These adults also have a better understanding of the recycling system. The involvement of adults in the single-bin recycling system implemented is better than that of adolescents. According to Grønhøj and Thøgersen [17], adolescent behaviour is strongly influenced by their environment. Adolescents tend to recycle if their peers practice recycling. However, they will nullify their intention to practice recycling if others around them, especially peers, do not practice recycling [18].

Accordingly, the weight of recyclable items is also an indicator of the single-bin recycling system's effectiveness. The statistic shows white paper recorded the highest collection percentage with 39%followed by mixed paper with 30%, boxes/cartons 18%, plastic items 9%, and aluminium cans 4%. The study's findings show that the weight of recycled items collected increases every week, as shown in Table 4. These statistics can prove the effectiveness of the single-bin recycling system implemented. Although the number of individuals who participated cannot be known

clearly, the increase of recyclable items every week is an indicator of the effectiveness of the recycling system. According to Garau and Pavan [19], number of people involved in the programs or initiatives is a significant indicator to measure success.

TABLE 4. Recyclables collected from single bin recycling system

Weeks	Total Weight (kg)
Week 1	15
Week 2	16
Week 3	18
Week 4	30

Challenges of Single-Bin Recycling System

The single-bin recycling system uses only one container or bin for the collection of all types of recyclables. Therefore, contamination of recyclable items with impurities such as food waste is a significant challenge in this study. This problem is also faced by Kovacs et. al. [20] in their research of recycling activities implemented at Kansas States University. Recycling processing requires recycled items that are homogeneous that is free from impurities known as foreign matter. These foreign materials will cause a negative impact during the production process of new products. Contamination of recycled items can be avoided by ensuring that no foreign matter, especially food waste, is put into the containers and bins provided. Therefore, warnings in this regard need to be done more carefully.

The price of recycled goods is constantly changing, influenced by several factors such as control of raw material, tariffs, and trade agreements between countries. Thus, price control of recyclable goods can help ensure the success of recycling programs implemented over a long time [21, 22]. Price control of recyclable goods can be done by establishing a local or local recycled goods processing industry. However, the price of recycled goods in Malaysia is still low compared to other countries such as Thailand. The existence of a collection network of recycled items that profit before being sold to the processing plant. Past studies have shown that recycling activities in Malaysia are profit-oriented [5]. Therefore, recycling is seen as an opportunity to make a profit. As a result, recycled items with low market prices will be ignored. In the context of this study, unstable prices of recyclable goods will disrupt the process of collecting recyclable goods. When the selling price is high, everyone wants to recycle, and when the selling price plummets, the recycled items will be sent to landfills.

In addition, there are individuals in the UMK Jeli Campus's community still confused about items that cannot be sold to recycling collection agents. The study's findings found plastic waste that could not be sold to recycling agents, such as plastic wrap and plastic bags put into the containers and bins provided. In Malaysia, only certain plastics such as PET and DHPE are accepted by recycling agents for sale to processing plants. Therefore, the dissemination of information related to the types of plastics that can be sold to recycling agents needs to be done more carefully and planned.

CONCLUSION

The study results showed that the single-bin recycling system could reduce the quantity of solid waste generated by campus even though the respondents' involvement in the system is moderate. Respondent's involvement in the recycling system is influenced by several significant socio-demographic factors, namely age, marital status, and type of employment. However, this study is a small scale where only involve the UMK Jeli campus. Studies on a larger scale, such as state and national levels. It could provide a more effective impact to reduce the quantity of solid waste disposal. The integration of sustainability approaches in the framework of institutions of higher learning is seen as one of the severe initiatives to address the ecological and social challenges of the present and the future. Reducing the quantity of solid waste disposed of is one of the objectives that need to be given attention under the environmental care component in a higher education institution. In this regard, the formation of programs such as resource conservation and recycling in higher education is critical. It needs to be given attention to achieve the vision of sustainability. Therefore, a paradigm shift among the higher education community is significant so that awareness of sustainability can be promoted to various levels of society.

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