

Reducing Waste Disposal from Universiti Kebangsaan Malaysia Campus By 2-Bins Recycling System

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Abstract—This is a study on the 2- bins recycling system at Universiti Kebangsaan Malaysia (UKM) year 2010 to reduce waste disposal at landfills. Fifty sets of 2-bins recycling system were allocated in the Faculty of Engineering and Built Environment, Universiti Kebangsaan Malaysia (UKM). The number of recyclable items found in the recycling and mixed waste bins served as dependent measurements. Results indicated that the recycling containers successfully recovered recyclable items by 49.5%, but still a high proportion of recyclable items thrown into the mixed waste container which is 50.5% which indicates wrong bins usage. Awareness programs are required to increase rate of participation among students.

Keywords: Recycling, 2 bins system, campus

I. INTRODUCTION

“Green Campus” is not a new concept in sustainability. University/campuses have done so many efforts to manage the waste in the campus such as University of Northern British Columbia, Autonomous University of Baja California, Massey University, Leeds University, and Cornell University [1, 2, 3, 4 & 5]. Mostly, they are using the compost method to manage the organic waste, which gives the highest percentage of waste in the waste composition. In addition, recovery of recyclable items at source is an important way to educate the public and reducing the rate of waste disposal.

On 18th December 2008, UKM has signed a Memorandum of Agreement (MoA) with Alam Flora Sdn Bhd to establish and to apply an Integrated Solid Waste Management at UKM [6]. The MoA open ways to the university in achieving its mission on Zero-Waste campus and to be a role model for other universities in Malaysia [6]. The analysis of waste composition of UKM and the total daily waste for UKM main campus (includes faculties, centres, institutes and dormitories) has been conducted for a year. Waste stream in UKM campus consists of 45.3% are recyclable items, 46.5% compostable items and 8.2% non-recyclable items [7]. Result shows that approximately 45.3% recyclable items could be recycled but in this study, those wastes were found to be dumped into landfill. Hence, separation at sources could be a good practice to recover the recyclable items.

Many researches has been done on people’s values, beliefs, and attitudes in recycling compliance among public[8, 9, 10 & 11]. Hence, the study of 2 bins recycling system is needed for UKM. The objective of this paper is to evaluate the effectiveness of 2 bins recycling system in recovering the recyclable items at source and, thus reducing the rate of waste disposal in UKM.

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II. MATERIALS AND METHODS

Design and Materials

Fifty waste stations were located throughout the Faculty of Engineering and Built Environment, FKAB. Ten waste stations were observed in the four-storey academic building, FKAB. Each station consists of two types of container: a commingled recycling bin and a mixed waste bin. The utility of these 2-bins system was used to test the attitudes and acceptance of students. The commingled recycling container had a general symbol of recycle without any notices (Figure 1 (a)). The swing cover lids are placed on top with “please no wet and dirty rubbish” tenor and the body of the container is orange colour (Figure 1 (b)). The mixed waste container is a standard garbage container available in market.

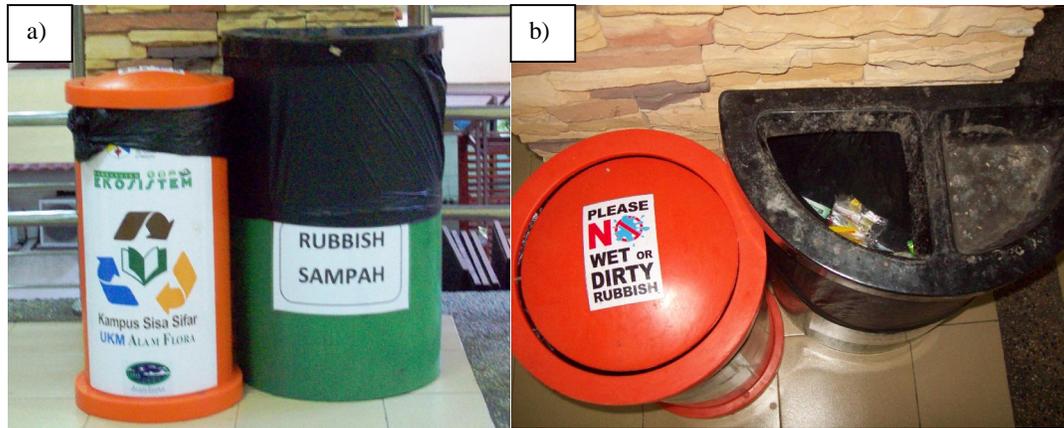


Figure 1 Image of 2-bins system

Procedure

Ten waste stations were randomly picked up for the segregation process. The segregation process was done during academic session and the items in the 2-bins recycling system were sorted into two main groups; recyclable and non-recyclable materials [13]. Each category of the waste are weighed and recorded (Figure 2).

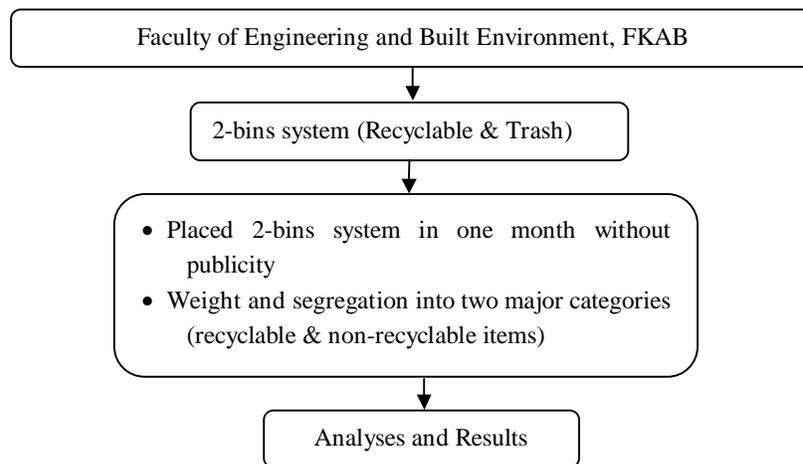


Figure 2 Flow chart of 2-bins system study

III. RESULTS AND DISCUSSIONS

Table 1 shows the monthly waste generation in whole UKM campus, Bangi from 1st July 2009 till 31st July 2010. The highest daily waste generation in UKM is 5.70 ton/day and the lowest is 3.02 ton/day. Average daily waste generated in UKM was high, compared to the University of Northern British Columbia, Autonomous University of Baja California, Massey University, Leeds University, and Cornell University due to high population rate in UKM which is 22,000 citizens [1, 2, 3, 4 & 5]. Besides that, waste generated in UKM was affected by academic session, semester break season and the fasting month for Muslims. Hence, June 2010 had the lowest waste collection because of the semester break, while the peak season is in July 2009 and 2010, which is the new intake for an academic session.

Table 1 Waste Generation in UKM, 2009-2010

Month	Total Waste Disposal in Landfill (ton/month)	Average Daily Waste Disposal(ton/day)
July-09	176.63	5.70
August-09	156.64	5.05
September-09	128.09	4.27
October-09	169.85	5.48
November-09	145.14	4.84
December-09	112.22	3.62
January-10	105.69	3.41
February-10	145.60	5.20
March-10	151.28	4.88
April-10	150.5	5.02
May-10	118.7	3.83
June-10	90.5	3.02
July-10	175.2	5.65

The results in Table 2 and Table 3 showed that the 2-bins system still needed improvement at the faculty because 65.3% of the content in commingled recycle container is recyclable items while the others were non-recyclable items. There is still high amount of waste which is 34.7% due to non-recyclable items was being throwing into recycle bins. This shows that, publicity and awareness are needed to educate the public/staffs/students on the correct usage of recycling bins. Hence, in order to achieve a good practice, a good publicity and awareness programs are required. For mixed waste bins, the content was 58.7% non-recyclable items while the percentage for recyclable items is 41.3%.

Table 2 Composition of Commingled Recycle Containers

Recycle Bin (Orange bin)		
Recyclable Items	Amount(gram)	Percentage(weight/weight)
Papers	283.8	31.1%
Tetrapak	47.9	5.2%
Aluminum Can	110	12.0%
Plastics	155.3	17.0%
Non-Recyclable Items	Amount(gram)	Percentage(weight/weight)
Tissue Papers	32.4	3.5%
Plastic Bag	7.6	0.8%
Food Container (polystyrene)	55.7	6.1%
Food Wrapper(Plastic packaging)	39.1	4.3%
Food Waste	60.2	6.6%
Miscellaneous	121.9	13.3%
Total	913.9	100.0%

Table 3 Composition of Mixed Waste Containers

Mixed Waste Bin		
Non-Recyclable Items	Amount(gram)	Percentage(weight/weight)
Tissue Paper	154.8	10.5%
Plastic Bag	279	18.9%
Food Container	81.6	5.5%
Food Wrapper	19.1	1.3%
Food Waste	239.5	16.2%
Misc	92.3	6.3%
Recyclable Items	Amount(gram)	Percentage(weight/weight)
Glass	8.8	0.6%
Papers	179.6	12.2%
Tetrapak	131	8.9%
Aluminum Can	152.5	10.3%
Plastics	127.2	8.6%
Metals	0.9	0.1%
Others	8.5	0.6%
Total	1474.8	100.0%

The 2-bins recycling system is a useful yet simple facility to ensure the public/staff/students separate the recyclable items at source. If the public/staff/students were ignorant, the institutions must either appoint staffs to separate the recyclables items from source, or eliminate recycling programs altogether [12]. Publicity is needed due to high proportion of recyclable items was found in the mixed waste bins (Figure3). The 2-bins recycling system could be a good option to ensure students to separate the recyclable items because many past researches showed that the compliance is increasing when recycling bins are placed closer to users, and the physical features of the bins will also influence the recycling compliance [12]. Hence, for this study, colourful and special design of recycling bins is provided and placed in the areas which easily accessible/located by the users.

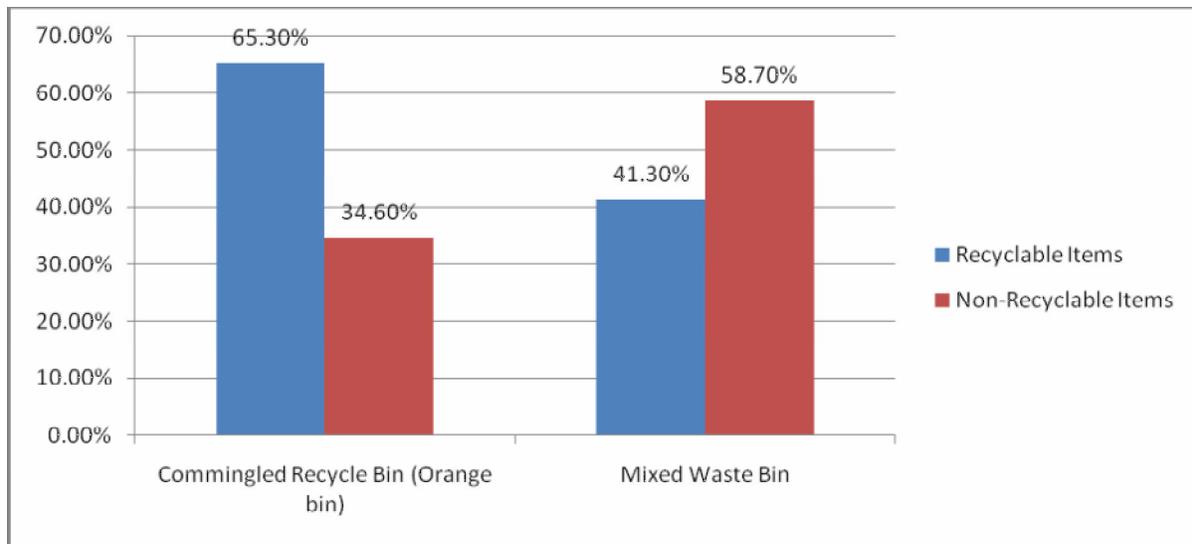


Figure 3 Summary of 2-bins system in FKAB, UKM

IV. CONCLUSIONS

The study has been successful in highlighting waste diversion from landfills at UKM and the results from the experiments of the 2-bins recycling system in FKAB indicated a sustainable method of reduce waste disposal in UKM. Recovery rate for the 2 bins system is 49.5% [recyclable items in orange bins (597gram)/total recyclable items in the system (1205.5gram)] in the commingled recycling containers. Due to the lack of publicity of usage of this commingled recycle bins, some users still throw the recyclable items into mixed waste bins. If the 2-bins system could be implemented in UKM with good publicity of usage of commingled recycling bins, at least 49.5% recyclable items could be diverted rather than dumping into landfill. Future studies on the 2-bins system after the publicity and education programme will promote pro-environmental behaviors as an important step for UKM toward “Zero Waste Campus”.

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