

Informal Recycling Activities in Universiti Kebangsaan Malaysia: Student Perspectives

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ABSTRACT

One of the major challenges in solid waste management in Universiti Kebangsaan Malaysia (UKM) is how best to work with informal recycling sector to improve efficiency in recycling. In order to find the best way to integrate the informal and formal sectors of recycling in UKM, UKM needs to document, understand and build on existing informal collection and recycling systems. However, base-line data on informal recycling activities in UKM are non-existence. The purpose of this paper is to discuss base-line data on informal recycling activities in UKM. Quantitative survey method was employed to collect data on informal recycling activities in UKM, and one hundred students responded to a set of questionnaire. Descriptive mean and standard deviation were obtained. Reliability and validity were tested to approve the variables used. The results of this paper indicated that according to students, the informal recyclers in UKM were amongst the cleaning service workers with a mean score of 3.18 compared to other categories of informal recyclers such as residential college staffs (2.34), students (2.28), support staffs (2.15), cafeteria staffs (2.11), academic staffs (2.04) and administrative staffs (2.03). Students clarified that informal waste recycling collectors and collecting waste recycling parties were itinerant waste buyers with the mean scores of 2.93 and 2.59, respectively. Students also identified recycling micro and small enterprise (MSEs) as the main trading party (2.96) compared to other parties. Materials collected by the informal recyclers in UKM were mostly papers (3.37). Of all recyclables, paper was accumulated the most with a range of volume between 5 to 9 kilograms per day. In addition, paper also gain the highest in profit obtained which is from RM 11 to RM 19 per day. The findings of this study form a basis of understanding on unacknowledged recycling activities by informal recyclers in UKM.

Keywords: *Informal Recycling Activities; Students; Universiti Kebangsaan Malaysia.*

INTRODUCTION

The informal recycling sector refers to the waste recycling activities of individual waste pickers who extract the recyclables, reuse and sell materials from mixed waste. Recyclable materials that are recovered by informal recyclers often eventually reach formal sector factories or exporters. Municipalities often consider informal recyclers a problem. Indeed, unorganized waste picking can have an adverse impact on neighborhoods and cities. Informal recyclers often scatter the contents of garbage bags or bins to salvage anything of value. Unfortunately, municipal employees who load waste into municipal trucks often separate recyclables as they load, and sell what they find unofficially to informal sector dealers (Scheinberg et al., 2010). Insufficient collection, uncontrolled street collection points and improper disposal in open dumps allow refuse to be readily available for informal waste recycling through scavenging or waste picking (Wilson et al., 2005). According to Medina (2008), waste pickers can be seen at work around the world. In developing countries about 1 percent of the urban population (at least 15 million people) survive by salvaging recyclables from waste. The push factors that people into waste picking are fundamentally economic. Many poor people, faced with a choice between starving or waste picking, choose the latter. Co-operatives formed by informal sector workers may undertake some (formal) work under contract to a municipal authority while also being involved in informal recycling (Scheinberg et al., 2010).

Wilson et al (2005) and Xinwen Chi (2010) suggested that prohibiting or competing with the informal collectors and informal recyclers is not an effective solution to improve the efficiency of recycling systems. Ezeah (2013) stated that it has been proven that integrating existing informal recycling structure into formal systems makes waste management sense as there is clear potential to strengthen formal-informal alliances. It can also provide employment (Ezeah, 2013; Medina, 2006), reduce poverty (Medina, 2006; Gunsilius, 2010), protect the livelihoods of some of the most disenfranchised sections of society (Ezeah, 2013), provide a supply of secondary raw materials (Ezeah, 2013), improve competitiveness of the industry (Medina, 2006) and enhance environmental protection and sustainability (Ezeah, 2013; Medina, 2006). Medina (2006) suggested three models for organizing waste pickers have proved to be successful that are microenterprises, cooperatives, and public-private partnerships.

Based on solid waste management issues in UKM, Kiar-Ghee Tiew et al. (2010) found that 30.0% of the total solid waste in UKM are recyclables such as newspapers, magazines, cardboards and paper boxes, aluminum cans, plastic bottles, rubber, leather and wood, and glass. However, a formal waste management sector in UKM recorded only 1.7% of the recyclables are recycled by Alam Flora Sdn Bhd. Another 28.3% of the recyclables are suspected to be recycled by the informal recycling sector in UKM which was never recorded.

One of the major challenges in solid waste management in Universiti Kebangsaan Malaysia (UKM) is how best to work with informal recycling sector to improve efficiency in recycling. In order to find the best way to integrate the informal and formal sectors of recycling in UKM, UKM needs to document, understand and build on existing informal collection and recycling systems. However, base-line data on informal recycling activities in UKM are non-existence. Thus, the purpose of this paper is to discuss base-line data on informal recycling activities in UKM: (a) categories of informal recyclers; (b) categories of informal waste recycling collectors; (c) trading parties; (d) collected materials; (e) accumulation of volume of recyclables; and (f) profit obtained.

METHODS AND MATERIALS

Quantitative survey method was employed to collect data on informal recycling activities in UKM, and cross-sectional research design was used where data were collected on the same respondent will not be repeated at the other point of time. A questionnaire survey was used as research instrument to review students' perspective on informal recycling activities in UKM. Questionnaires distributed to a sample of 500 participants who are students, academic staffs, administrative staffs, support staffs, residential college staffs, cafeteria staffs, and cleaning service workers. However, this paper focused on sample of 100 students as participants.

This paper presented the results of a survey which questionnaire items newly constructed by a group of UKM researchers. The survey covers seven aspects: categories of informal recyclers, categories of informal waste recycling collectors, trading parties, collected materials, accumulation of volume of recyclables, profit obtained and demographic information. Likert scale was used in this questionnaire to indicate five levels of certainty of the statements given (Table 1.0: Level of Likert Scale). In addition, open-ended (comments) question was provided for respondents to specify their own opinions on informal recycling activities in UKM. Simple random sampling was applied in which each UKM students has an equal chance of being chosen.

Table 1. Level of Likert Scale

Variables	Likert Scale
A. Categories of informal recyclers	4: most (21 people and more) 3: many (11 to 20 people) 2: a few (six to 10 people) 1: less (one to five people) 0: none
B. Categories of informal waste recycling collectors	4: most (21 people and more) 3: many (11 to 20 people) 2: a few (six to 10 people) 1: less (one to five people) 0: none

C. Trading parties	4: most (21 people and more) 3: many (11 to 20 people) 2: a few (six to 10 people) 1: less (one to five people) 0: none
D. Collected materials	4: plenty 3: many 2: some 1: little 0: none
E. Accumulation of volume of recyclables	4: 15 kg and above 3: 10 to 15 kg 2: five to nine kg 1: one to four kg 0: none
F. Profit obtained	4: RM 30 and above 3: RM 20 to RM 29 2: RM 10 to RM 19 1: RM 1 to RM 9 0: none

A reliability test conducted to obtain Cronbach's Alpha values to assess the reliability of each item in the questionnaire. Table 1.0 showed Cronbach's Alpha values of the scales ranging from 0.763 to 0.900 which is strong values of reliability. This showed that the items in the questionnaire were reliable and the participants understand the questions given.

Table 2. Alpha Cronbach's Values

Scale	Number of Item	Cronbach's Alpha
A. Categories of informal recyclers	7	0.835
B. Categories of informal waste recycling collectors	8	0.825
C. Trading parties	6	0.813
D. Collected materials	7	0.763
E. Accumulation of volume of recyclables	7	0.891
F. Profit obtained	7	0.900

A validity test also conducted to show whether or not the scales represented the proposed underlying constructs under study. According to de Vaus (2002), if the Kaiser-Meyer-Olkin (KMO) values above 0.700, then the correlations, on the whole,

are sufficiently high to make factor analysis suitable. The KMO values in this paper is above 0.700 which adequately to make factor analysis suitable.

Table 3. Kaiser-Meyer-Olkin's Value

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.737
Bartlett's Test of Sphericity	Approx. Chi-Square	2971.656
	df	861
	Sig.	.000

Table 2.1 showed the items loaded in two factors of factor analysis. The variables (A) categories of informal recyclers, (B) categories of informal waste recycling collectors and (C) trading parties loaded more highly in the factor 1 than factor 2, while the variables (D) collected materials, (E) accumulation of volume of recyclables, and (F) profit obtained, are highly located in factor 2. This results showed that different variables measuring the same items which is the factor 1 measures the parties who involving in informal recycling activities in UKM while the factor 2 measures the recyclables material in informal recycling activities in UKM.

Table 4. Construct of Factor Analysis

Variables	Items	Factor	
		1	2
A. Categories of informal recyclers	A.1. I know that they are listed below are informal recyclers in UKM:		
	1. Students	.629	
	2. Academic staffs	.852	
	3. Administrative staffs	.804	
	4. Support staffs	.747	
	5. Residential college staffs	.733	
	6. Cafeteria staffs	.682	
B. Categories of informal waste recycling collectors	7. Cleaning service workers	.578	
	B.1. I know that those listed below are a collector of recyclable materials:		
	1. Itinerant waste buyers	.626	
	2. Street waste picking	.615	
	3. Municipal waste collection crew	.680	
	4. Waste picking from dumb	.726	
	B.2 I know that informal recyclers in UKM sell recyclable materials to the following parties:		
	1. Itinerant waste buyers	.686	
	2. Street waste picking	.744	
	3. Municipal waste collection crew	.804	

Variables	Items	Factor	
		1	2
	4. Waste picking from dumb	.833	
C. Trading Parties	E.1. I know that the informal recyclers in UKM sell recycled materials to the following:		
	1. Local industries (including craftsmen and artisans)	.425	
	2. Primary and secondary dealers	.713	
	3. Recycling micro and small enterprises (MSEs)	.766	
	4. Junk shops	.683	
	5. Intermediate processors	.632	
	6. Brokers and wholesalers	.809	
D. Collected Materials	C.1. I know that collected materials of informal recyclers at UKM are as follows:		
	1. Plastic	.880	
	2. Paper	.710	
	3. Cardboard	.662	
	4. Aluminium	.826	
	5. Steel	.655	
	6. Glass	.516	
	7. Textiles	.843	
E. Accumulation of volume of recyclables	D.1. I know that the amount of recyclables collected per day by the informal recyclers in UKM are as follows:		
	1. Plastic	.696	
	2. Paper	.777	
	3. Cardboard	.791	
	4. Aluminium	.686	
	5. Steel	.547	
	6. Glass	.557	
	7. Textiles	.606	
F. Profit obtained	F.1. I know that profit per day are collected by the informal recyclers in UKM are as follows:		
	1. Plastic	.765	
	2. Paper	.783	
	3. Cardboard	.762	
	4. Aluminium	.670	
	5. Steel	.659	
	6. Glass	.744	
	7. Textiles	.544	

In this paper, data were analyzed using descriptive analysis and to facilitate this analysis, Statistical Package for the Social Science (SPSS) version 19.0 was used. Descriptive analysis is to assess the mean score and standard deviation. Mean score showed the tendency of the average value of students' perspective on informal recycling activities in UKM, while standard deviation showed an "average distance" between all scores and the mean

FINDINGS AND DISCUSSIONS

Demographic Characteristics of Participants

Table 5.0 showed demographic characteristics of the participants. The male students were slightly high than female students. Majority of participants (90.0%) were students between 21 to 25 years old while students below 20 years old and students between 26 to 31 years old were minority in this study. Almost all students were single while 2.0% students were married. More than half (63.0%) participants were bachelor degree students, followed by students with STPM or matriculation level. Most of the students in this study have no monthly income (95.0%) and a few students have monthly income ranging from RM 1,001 to RM 2,000.

Table 5. Demographic Characteristics

Demographic Characteristics	Percentage (%)
Gender	
Male	51.0
Female	49.0
Total:	100.0
Age	
Below 20 years old	6.0
21 –25 years old	90.0
26 –31 years old	4.0
Total:	100.0
Marital Status	
Single	98.0
Married	2.0
Total:	100.0
Educational level	
PhD	0.0
Master Degree	2.0
Bachelor Degree	63.0
Diploma	6.0
STPM or Matriculation	28.0
SPM	1.0
Total:	100.0
Monthly Income	
No income	95.0
Below RM 1,000	1.0
RM 1,001 – RM 2,000	4.0
Total:	100.0

The parties involving in informal recycling activities in UKM

Categories of informal recyclers

Table 6.0 showed the results that according to students, the informal recyclers in UKM were amongst the cleaning service workers with a mean score of 3.18 compared to other categories of informal recyclers such as residential college staffs (2.34), students (2.28), support staffs (2.15), cafeteria staffs (2.11), academic staffs (2.04) and administrative staffs (2.03). The cleaning workers tend to be the informal recyclers because their scope of work involves clearing and cleaning waste at the university such as at administrative offices, lecture rooms, lecturers' rooms and students' hostel. The most consistently visible form was the cleaning service workers separate recyclable and re-usable materials from the waste before it's been removed and collect by the formal recyclers (Alam Flora Sdn. Bhd) in UKM.

According to Parizeau (2013), in addition to recovering materials and re-usable items from the waste stream, majority (71%) of informal recyclers having "clients" who regularly separated and saved recyclable materials for them. Minority reported that they only collected pre-separated materials and did not open garbage bags to find materials for resale or re-use. While most clients give the informal recyclers these materials for free, and only six per cent (6%) of informal recyclers reported that they paid for at least some of the materials they received, either in kind or at a set price. Wilson et al. (2006) stated that normally, informal waste recycling is carried out by poor and marginalised social groups who resort to scavenging or waste picking for income generation and some even for everyday survival.

Table 6. Categories of informal recyclers

I know that they are listed below are informal recyclers in UKM:	Mean Score	Standard Deviation
1. Students	2.28	±0.89
2. Academic staffs	2.04	±0.79
3. Administrative staffs	2.03	±0.82
4. Support staffs	2.15	±0.86
5. Residential college staffs	2.34	±0.83
6. Cafeteria staffs	2.11	±0.97
7. Cleaning service workers	3.18	±0.90

Categories of informal waste recycling collectors

Students clarified that informal waste recycling collectors and collecting waste recycling parties were itinerant waste buyers with the mean scores of 2.93 (Table 7.0) and 2.59 (Table 8.0), respectively. Parizeau (2013) found that informal recyclers act at different levels of the waste management system while Gunsilius (2010) stated that the informal recyclers is socially stratified in a pyramid with scrap collectors (waste pickers and itinerant waste buyers) at the bottom and re-processors at the

top. Various actors such as retailers, stockists and wholesalers occupy the strata in between. The majority of retailers are former waste pickers who have managed to assemble some capital and to take up another activity.

Parizeau (2013) and Wilson et al. (2006) shared the scenario related to informal recycling collectors which is itinerant waste buyers go from house to house and collect or buy the recyclable materials. Street waste pickers separate the wastes that are not brought to the material recovery facility and are left at different corners. The personal sorting wastes at the material recovery facility (at barangay level as well as at the level of shopping malls and markets) is mostly not paid by the barangays or the companies, but do the sorting in exchange for receiving the sellable materials contained in the waste. These are thus informal workers that are nevertheless integrated into the formal collection system. Municipal officials of the general service office in charge of waste management have encouraged the collection company and some shopping mall material recovery facility to engage former informal waste collectors as workers. On the way to the dumpsite, both the formal garbage crew and other informal waste workers, also known as "jumpers", recover more material from the trucks before they reach the disposal facility. These "jumpers" have nevertheless become rare because the provider now uses closed compaction trucks that make recovery difficult once the waste has been put into the truck.

Table 7. Categories of informal waste recycling collectors

I know that those listed below are a collector of recyclable materials:	Mean Score	Standard Deviation
1. Itinerant waste buyers	2.93	±0.91
2. Street waste picking	2.81	±0.96
3. Municipal waste collection crew	2.86	±0.90
4. Waste picking from dump	2.90	±0.96

Table 8. Categories of parties of informal recycling collectors

I know that informal recyclers in UKM sell recyclable materials to the following parties:	Mean Score	Standard Deviation
1. Itinerant waste buyers	2.59	±0.99
2. Street waste picking	2.01	±1.09
3. Municipal waste collection crew	2.22	±1.13
4. Waste picking from dump	2.20	±1.16

Trading Parties

Students also identified recycling micro and small enterprise as the main trading party (2.96) compared to other parties including local industries, primary and secondary dealers, junk shops, intermediate processors and brokers and wholesalers (Table 9.0). Micro and small enterprise is the main trading party to informal recyclers because they selling activities reflect the spatial separation between home and worksites. Parizeau (2013) found that most of the informal recyclers selling their materials at a depot near their home. The most cited reasons for choice of selling location were the prices offered by the depot and the convenience of the location (i.e. close to home or work). In addition, Parizeau (2013) also found that the majority of informal recyclers (82.0%) relied on one depot for selling their materials, 15.0% frequented two depots and three per cent (3.0%) sold at more than two locations on a regular basis. Most informal recyclers reported that they sold to more than one depot and sold different materials to different depots, depending on the prices on offer.

Table 9. Trading Parties

I know that the informal recyclers in UKM sell recycled materials to the following:	Mean Score	Standard Deviation
1. Local industries (including craftsmen and artisans)	2.00	±1.03
2. Primary and secondary dealers	2.56	±0.95
3. Recycling micro and small enterprises	2.96	±0.82
4. Junk shops	2.40	±1.01
5. Intermediate processors	2.36	±0.97
6. Brokers and wholesalers	2.80	±1.06

The recyclables materials in informal recycling activities in UKM

Collected Materials

Table 10.0 indicated that according to students, materials collected by the informal recyclers in UKM were mostly papers (3.37) and followed by plastic (3.20). While, the less materials collected by the informal recyclers in UKM was textiles with the lowest mean score 1.45. Parizeau (2013) stated that some informal recyclers specialized in the materials they collected while others collected a diversity of materials. Some relied on the availability of materials in their zone of work (for example, the profusion of white paper waste in the downtown business district made this the exclusive material collected in this zone for some). Others made decisions about which materials were worth collecting based on fluctuations in the prices offered by depots. Parizeau (2013) also found that the highest recyclables material collected by informal recyclers in Buenos Aires were papers, cardboards and newspapers. It is clear that those working in informal recycling, in particular, have a high degree of specific knowledge about identifying materials and marketing them and making use of them in a flexible manner (Scheinberg, et al., 2010). Besides that,

according to Wilson et al. (2006), the degree to which a particular material is recycled depends on income levels, the existence of local and national markets, need for secondary raw materials, level of financial and regulatory governmental intervention, prices of virgin materials, international trade in secondary raw materials and relevant treaties.

Table 10. Collected Materias

I know that collected materials of informal recyclers at UKM are as follows:	Mean Score	Standard Deviation
1. Plastic	3.20	±0.82
2. Paper	3.37	±0.66
3. Cardboard	2.25	±0.90
4. Aluminium	2.55	±1.05
5. Steel	1.95	±1.13
6. Glass	1.93	±1.10
7. Textiles	1.45	±0.96

Accumulation of volume of recyclables

Students also indicated that of all recyclables, paper was accumulated the most with a range of volume between 5 to 9 kilograms per day (with mean score 2.54). According to Ezeah (2013) and (Parizeau, 2013) the recyclable materials most frequently targeted are plastic, paper and cardboard, metal scrap (aluminium, steel, tin), glass, bottles, rubber, wood and textiles. Usually metal, paper is preferred due to their incredible recycling potential and long life span.

Table 11. Accumulation of volume of recyclables

I know that the amount of recyclables collected per day by the informal recyclers in UKM are as follows:	Mean Score	Standard Deviation
1. Plastic	2.22	±1.21
2. Paper	2.54	±1.11
3. Cardboard	1.58	±0.99
4. Aluminium	1.78	±1.11
5. Steel	1.56	±1.09
6. Glass	1.55	±1.11
7. Textiles	1.22	±1.00

Profit Obtained

Table 12.0 showed that, participants rated paper as the highest in profit obtained with mean score 2.27 which is from RM 11 to RM 19 per day. Parizeau (2013) found that the prices the informal recyclers received for their collected materials were influenced by many variables, including world demand, local demand, seasonal variation and selling location (e.g. downtown depots near the work zone offered lower prices in exchange for convenience; depots specializing in particular materials sometimes offered higher prices). Besides that, Gunsilius (2010) viewed that in many countries, informal recyclers contribute significantly to waste management and resource efficiency by collecting, sorting, trading and sometimes even processing waste materials. These activities also provide an income opportunity for large numbers of poor people. Although informal sector activities very often take place outside official and formal channels, they nevertheless contribute significantly to the national economy.

Table 12. Profit Obtained

I know that profit per day are collected by the informal recyclers in UKM are as follows:	Mean Score	Standard Deviation
1. Plastic	2.19	±1.20
2. Paper	2.27	±1.15
3. Cardboard	1.62	±1.02
4. Aluminium	2.06	±1.16
5. Steel	2.10	±1.27
6. Glass	1.68	±1.05
7. Textile	1.37	±1.06

Parizeau (2013) also found that the informal recyclers in Bueno Aires gained the average daily income per person \$27.92 pesos (approximately US\$ 9.31) and the median was \$23.33 pesos per person per day (US\$ 7.78). Average monthly income was \$614.18 pesos (US\$ 204.73) and the monthly median income was \$520 pesos (US\$ 173.33). While, Gunsilius and Cortes (2010) found that in Philippine, aluminum was recyclable that obtained the highest profit (US\$0.75 per kilograms) and followed by plastics (US\$ 0.21 per kilograms). The lowest profit obtained of recyclable was cardboard (US\$ 0.01 per kilograms)

CONCLUSION

The findings of this study form a basis of understanding on unacknowledged recycling activities by informal recyclers in UKM. By documenting, evaluating, understanding and building upon existing systems, a long term supportive policy framework can be introduced. Proposed interventions or policy changes need to consider the specific circumstances of the informal sector, in order to avoid unexpected impacts. While, cooperatives are often held up as a sustainable solution

to the problems associated with informal recycling. Informal recyclers can provide improved working conditions, improved incomes and skill sets, and opportunities for community development and collective action. When informal recycling are integrated into urban governance structures, it can help improve waste diversion rates and create more sustainable waste management systems.

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