Southeast Asia Psychology Journal
Vol 1 (2012) 68-80
http://www.cseap.edu.my/sapj

Factors predicting recycling behaviour among Malaysian

Jasmine Adela Mutang[a], Sharifah Azizah Haron[b]
Psychology and Social Health Research Unit, School of Psychology and Social Work, Universiti Malaysia Sabah[a]
Fakulti Ekologi Manusia, Universiti Putra Malaysia[b]

A B S T R A C T

Malaysia is facing a crisis in solid waste management due to rapid urbanization and high concentration of population. Sadly, public participation in recycling is still very low despite rigorous campaigns conducted by the government. Only a small amount of solid waste generated in Malaysia is recycled – far below the rate of 15 to 40 percent in developed countries. This study examines the recycling behaviour among urban households within the Klang Valley area. Specifically, the purpose of the study is to determine factors that increase the probability of recycling behaviour among households. Data analysis technique used consisted of bivariate analysis and logistic regression. The results of logistics regression testing for socio-demographic and psychological characteristics show partial significance at a probability level of .050. The result of Hosmer and Lamershow Goodness-of-fit shows total significance at .050. The logistic model that utilizes study data drawn from the 342 samples and the results of the Binomial Logistic Regression indicate that recycling increased among respondents who are married, possess higher education levels have positive values towards the environment and positive attitudes towards recycling. Interestingly, gender, different types of employment status, types of accommodation, house ownership, and knowledge of recycling were not reliable predictors of recycling behaviour. The findings of the study could be used for designing recycling schemes although it is clear that a one-size-fits-all approach is not acceptable.

ARTICLE INFO

Southeast Asia Psychology Journal Classification Codes
4050
4060

Keywords:
recycling behaviour, recycling attitude, values towards the environment

Correspondence address:
jasmine@ums.edu.my

1. Introduction

Malaysia is facing a crisis in solid waste management due to rapid urbanization and high concentrations of population (Reme, 2003). The total waste generation against a total Malaysian population of 26 million as projected in the Eighth Malaysian Plan (2001-2005) in the year 2005 is estimated to reach 9.5 million tonnes a year with a per capita generation rate of 1.2kg/day. This figure is expected to increase year by year along with the increase in the per capita generation rate (Theng, 2003). Currently, waste is either land-filled or incinerated but with severe implications for the environment and human health. As for recycling, sadly a mere two percent of solid waste generated in Malaysia was recycled with the remainder ending up at landfills. This rate is far below that in developed countries such as Switzerland (22%), Denmark (19%), Germany (16%), Netherlands (16%), and Finland (15%) as reported by Warmer (1995). Even in comparison with our neighbouring country, Singapore; their recycling rate is higher at 40 percent with a 50 percent target by 2010 (Reme, 2003).

International trends reflect incineration and recycling being particularly popular in densely populated countries such as Japan and the Netherlands (Agamuthu, 2001). Incinerators with state-of-the-art pollution control equipment are formidably expensive. Once the authorities invest in incineration, they often do not have enough money to invest in waste reduction. The cost of construction, procurement and operation of an incinerator is exorbitant. The initial stages of procurement of equipment and construction would run to more than RM1.5 billion and may cost another RM50 million a year to maintain although the life-span of such incinerators is only about 21 years (Khiew, 2003). Therefore, it's vital for Malaysia to consider adopting a more

sustainable approach to the waste problem that is safer and more cost effective without destroying the environment.

However, without public participation and contributions, recycling domestic waste would not be possible. It is reported that over 80 percent of the 2400 recycling bins nationwide have been misused. Consumers are chucking things regardless of what the bins are meant to hold and whether items are recyclable or not (Elizabeth & Chelvi, 2003). Thus, increasing public awareness for conserving the environment through recycling activities is one major step to be achieved to make recycling a lifestyle in choice in Malaysia. This is especially true as public participation in recycling is still very low despite rigorous campaigns conducted by the government.

In order to develop relevant programmes to increase the awareness and participation in recycling activities, it is important to understand public current recycling behaviours. Thus, this study attempted to answer the following question:

1. What are the demographic and psychological profiles of the recycler and non recycler?

2. Literature Review

Nyamwange (1996) argued that recycling is considered to be beneficial as it minimizes the use of virgin resources and energy, reduces air and water pollution and saves sanitary landfill space. The Ministry of Housing and Local Government summarized the benefits of recycling in Malaysia as follows: (1) recycling reduces waste which in turn reduces the need for landfills and dumpsites; (2) recycling reduces pollution and saves energy; (3) recycling is cheaper in the long run compared with maintaining landfills and other systems; (4) recycling creates up to five times more jobs than waste disposal alone; and (5) recycling improves cleanliness and quality of life.

We live in an age of escalating environmental consciousness where recycling takes place on an increasing scale and in almost every nation (Christer, 2006). According to Hansmann, Bernasconi, Smieszek, Loukopoulos, and Scholz (2006), less than 30 percent of municipal waste is recycled in most European nations. As for Malaysia, the Ministry of Housing and Local Government has targeted a cut in waste generation of 20% by the year 2020 ("Recycling Waste", 2005). Malaysian consumers generate massive amounts of waste, mainly food waste, and the recycling rate is very low (only five to seven percent) despite the recycling campaign introduced in 2000.

People choose to participate in recycling for a variety of reasons. Recycling behaviour is usually associated with defining the characteristics of the 'recycler' and 'non-recycler' (Barr, Gilg, & Ford, 2001). There are many studies that investigate the motivating factors behind people's recycling behaviours. A review by Schultz et al. (1995) showed that past studies had focused on personal factors that influenced recycling behaviours. The personal factors investigated by forty-one studies included attitude, knowledge, demographic variables and personality variables.

In order to ensure that future efforts to enhance recycling schemes are effective, it is important to build up an understanding of the common characteristics of participants. To determine the characteristics of recyclers and non-recyclers, the best segmentation tool is to look at their demographic characteristics (Antonia, 2001). Hansmann et al. (2006) stated that certain demographic variables such as age, education, income and types of households are often associated with recycling behaviour.

According to Clarke (1999), knowledge is the body of facts and principles concerning environmental and recycling issues that have been accumulated by mankind through learning. The relationship between environmental knowledge and recycling has frequently been confirmed (Bratt, 1999). Thørgesen (1994) suggested that knowledge is an important variable explaining recycling behaviour.

Values are considered to be enduring beliefs about the self, abstract in nature, which serve to guide both attitudes and behaviour (Rokeach, 1973). Values are functional in focusing attention on what is important in a situation and thus assisting the person in making more efficient decisions (Dietz & Stern, 1995). In

research done by Smeesters et al. (2001), participants most often expressed social and civil duty as their values to sort garbage, that is, sorting garbage is part of being a "good citizen". A second, less dominant source of motivation is environmental values. Most other studies find 'environmental values' as the most important motive for recycling behaviour (De Young 1986; Hopper & Nielsen 1991; Oskamp et al., 1991).

Motivation is the drive to perform specific behaviour. According to Ryan and Deci (2000), to be motivated means to be moved to do something. People have not only different amounts but also different kinds of motivations. For example, it may be obvious that the most likely people to participate in recycling programmes are those who are motivated to do so (Katzev, Blake & Messer 1993) but people may differ in the types of motives that underlie their behaviours. Some people may be more intrinsically motivated to recycle. They may be driven by environmental values, civic duty, self-respect or by a pursuit for a better future for the next generation. Although these people were obliged to recycle, they might even recycle in case of voluntary, non-mandatory recycling programmes. Others may behave in certain ways because of social norms. That is, people driven by conformism or fairness might be very sensitive to what other people do. Smeesters, Warlop, Abeele and Ratneshwar (1999) indicated that the decision to recycle or not might be heavily influenced by social norms. Some people may recycle because they want to behave like the majority of people but unfairness perceptions (e.g., littering, waste burning in the backyard) might urge them to also defect on the recycling system (Smeesters et al., 2001).

Hornick et al. (1995) came up with several variables that might affect recycling behaviour. Two basic types were identified. First, incentives for social behaviour and second, facilitator or hindrances for the social behaviour. These can be either internal or external to the individual. Demographic variables were also looked at. Their study led to a broad model in which the many variables affecting consumer-recycling behaviour are classified into four theoretical groups: extrinsic incentives, intrinsic incentives, external hindrances and internal hindrances.

In the case of Malaysia awareness of recycling is high among Malaysians (82%) but very few actually practise recycling for various reasons. Price fluctuations and low or erratic demand for recycled materials are some of the factors for poor responses (Agamuthu, 2001). According to Agamuthu (2001), there are many limitations to recycling in Malaysia. The definition of waste itself is a problem and varies among different nations. Material classified as waste by one country may not be so in another country. The situation is also different in developing countries where there is a lack of incentives for technology development and hence for recycling. Based on literature reviewed, internal facilitators have the highest predictive power towards recycling behaviours. Extrinsic facilitators reflect the lowest predictive power towards recycling. Extrinsic incentives and intrinsic incentives occupy the spot between the two types of facilitators. To induce short-term recycling, external economic incentives are the most useful. To induce long-term recycling, intrinsic incentives are much better.

2.1 Hypothesis of the Study

H1 : The recycling behaviour of the Klang Valleys' households is influenced by gender, ethnic, marital status, education attainment, work sector, type of accommodation, house ownership, age, household size, income, values toward the environment, attitude towards recycling and knowledge of recycling.

3. Methods

3.1. Sample

A total of 500 respondents were targeted in this study. However, only 342 respondents were successfully interviewed with a response rate of 68.4%. The remaining 31.6% declined to be interviewed. Graph 3.1 shows the location of the recycling centres and Table 1 indicates the number of interviewed respondents in this study. Table 3.1 shows that Zone Two has a 100% percent response rates, followed by Zone Four (71%), Zone Three (69%) and Zone Five (69%). Zone One had the lowest response rate with only 68 respondents being successfully interviewed and answered the questionnaire out of one hundred that was distributed.

Table 1: The Selected Location of Recycling Centres and Number of Samples.

	Location of Recycling Centre	Expected Sample (n)	Interviewed Sample	Response Rate,%
Zone 1	Taman Sri Gombak, Gombak	100	68	68%
	Tmn Nirwana, Ampang			
Zone 2	Jalan SS22/47, Damansara Jaya	100	65	65%
	Seksyen 17/12, Petaling Jaya			
Zone 3	Jalan 5/7D, Desa Pandan , KL	100	69	69%
	Taman Maluri, Cheras			
Zone 4	Precint 8, Putrajaya	100	71	71%
	Precint 16, Putrajaya			
Zone 5	South City Plaza, Serdang	100	69	69%
	Carrefour Subang Jaya			
	Total Sample (N)	500	342	68.4%

3.2 Location

The data were collected within the area of Klang Valley which consists of Kuala Lumpur and its adjoining cities in the state of Selangor and Federal territories of Putrajaya. The rationale for choosing this area was because it is the major producer of household waste. The sampling technique utilized in the data set was multistage sampling. In the first phase, the Klang Valley area was divided into five zones as follows: Zone One (Ampang/Ulu Klang/ Gombak/Sentul/Wangsa Maju), Zone Two (Petaling Jaya/Damansara/Bangsar/ Puchong), Zone Three (Kuala Lumpur/Kampung Baru/Cheras), Zone Four (Putrajaya) and Zone Five (Bangi/Kajang/Serdang/Subang Jaya).Then, recycling centres within these areas were identified. Two recycling centres within each zone were randomly selected to represent each zone. In the second phase, housing areas within a two kilometre radius of the representative recycling centres in each zone were identified and randomly selected for the study. Finally, within each housing area, alternate houses were chosen for the study. A total of 100 houses were randomly chosen in each zone.

3.3 Instrument

The instrument for data collection was in the form of a questionnaire written in *Malay*. The questionnaire was divided into seven sections (A-G):

Section A: Demographic information;

Section B: Recycling Attitudes;

Section C: Knowledge of environmental issues and recycling;

Section D: Recycling behaviour (declared reduction, reuse and recycling behaviour as well as respondent willingness to undertake these actions);

Section E: Motivations for performing the behaviours for recyclers,

Section F: Hindrance for not performing the behaviours for non-recyclers (asked respondents to assess a series of statements alluding to possible barriers and motivations for undertaking each action); and

Section G: Values towards the environment.

Section B to Section F was developed based on recycling literature and adapted from Tonglet, Philips, and Read (2004) and Barr, et al. (2001). Section G was adapted from the New Ecological Paradigm Scale by Dunlap, R. E., Van Liere, K. D., Mertig, A. G. and Jones, R. E. (2000).

4. Findings

4.1 Sample Characteristics

A total of 342 respondents were interviewed in this study. Of the 342 cases 45% were males with mean age of 33.97 and the standard deviation of 8.96 (Table 4.1). The respondents consisted of 62% Malays, 26.0% Chinese and 12.0% Indians, where the ethnicity composition in this study is similar to the Malaysian population ratio (Department of Statistic Malaysia, 2001).

4.2 Socio-demographic Characteristics of the Recyclers and Non-recyclers

Only about 38% out of the 342 sample interviewed were recyclers. When looking into recycling status (Table 2) within gender, the distribution of males and females were about the same. That is, 37.7% and 38.3% respectively. The Chi-square test is not significant. However, a slightly greater percentage of female recycled more than male, presumably because recycling was seen as part of domestic chores usually undertaken by female.

When recycling status was examined across ethnic groups, the proportion of Malay and Indian respondents were about the same at 43.5% and 43.9% respectively followed by the Chinese (18%). The heterogeneity of distribution of recycling status for different ethnic group was supported by the chi square test of homogeneity which is significant at α=.001 with χ^2= 20.521, *d.f*=2 and *p*=.001. While most studies in the West do not consider ethnicity Ramli (2001) suggests that in a multi-ethnic society like Malaysia, the ethnic group of the respondent may be important. However he does not specify the direction of the influence.

Table 2: Socio-demographic Characteristics by Recycling Status

Variables	Recycler		Non-recycler		χ^2 value
	n=130	%	n=212	**%**	
Gender					
Male	58	37.7	96	62.3	0.150
Female	72	38.3	116	61.7	
Ethnicity **					
Malay	96	45.3	116	54.7	20.521
Chinese	16	18.0	73	82.0	
Indian	18	43.9	23	56.1	
Marital status**					
Currently Single	32	23.5	104	76.5	24.405
Married	92	50.0	92	50.0	
Other single	6	27.3	16	72.7	
Educational Attainment*					
Primary school and lower	4	36.4	7	63.6	5.897
Secondary school	62	46.6	71	53.4	
Tertiary education	64	32.3	134	67.7	
Work status					
Employee	97	37.7	160	62.3	0.140
Employer	8	42.1	11	57.9	
Self employed	10	35.7	18	64.3	
Not Working	4	21.1	15	78.9	
Unpaid Family Worker	11	57.9	8	42.1	

Type of accommodation					
Landed property	59	39.3	91	60.6	2.822
High Rise property	71	37.0	121	63.0	
House ownership					
Yes	38	31.7	82	68.3	3.159
No	92	41.4	130	58.6	
Age	36.01	9.03	32.72	8.69	
Household size	5	1.98	4	1.62	
Income	1750.78	1613.32	1918.11	1741.95	
Household income	2834.14	2299.08	2748.91	2810.82	

*** Significant at α= .001 * Significant at α= .05*

There is an obvious difference in distribution of recyclers between married and single respondents. Specifically 50% were those who were currently married compared 23.5% of those who were single (including those who were divorced or separated). The Chi-square test of homogeneity was found significant at α=0.001 with χ^2=24.405, *d.f*=2, and *p*=.001. Therefore, it is concluded that the distribution of recycling status for both recycler and non-recycler groups is not homogenous. It was also noted that in terms of educational attainment, the crosstabulation indicated that the percentage of recyclers among those with secondary school education (46.6%) was the highest, while respondents with primary school education or lower and those with tertiary education belonged to the non-recyclers group (63.6% and 67.7%) respectively. The Chi-square was found significant α= .05 with Pearson χ^2=5.897, *d.f*=2, and *p*=.015. This result contradicts the statement by Samdahl and Robertson (1989) in early research which stated that higher educational attainment was presumed to raise environmental consciousness. Arkkelin, Schroeder, Suchodoski, Skrenes and Rodriquez (2000) also stated that higher educational attainment also facilitated better understanding and appreciation of the benefits of recycling.

The study indicated that most of the respondents who recycled were the unpaid family workers (57.9%) as followed by those who worked as employers (42.1%), employees (37.7%), self-employed (35.7%) and those currently not working (21.1%). However, the Chi-square test was also found to be not significant. In short, regardless of significant differences, unpaid family workers (students, housewives and retirees) recycled more. Landed property dwellers (terraced, semi-detached, bungalow) were observed to recycle slightly more than those staying in landed property (flats, apartments, and condominiums) with 39.3% and 37.0% respectively. It could be because those who lived in high rise properties had less storage space compared with those living on landed property. There is no significant difference found. In general, the recycler group was, on average, four years older than the non-recycler group with bigger household sizes and higher household incomes than the non-recycler group.

Besides socio-economic factors, psychological factors such as values, attitudes and knowledge of the environment and recycling is considered important influences on behaviour by many social scientists. The purpose is to understand how to encourage environmentally responsible behaviour. Hence, factors that influence pro-environmental behaviour must be identified. The current study attempts to investigate the psychological characteristics (values, attitudes and knowledge of recycling) of recyclers and non-recyclers.

Referring to Table 3, a chi-square test of independence was conducted to assess the relationship between values towards the environment (positive and negative) and recycling status (recyclers and non-recyclers). The finding of crosstabulations table for values towards the environment and recycling status was found to be significant [Pearson χ^2 (*df*=1, *N* = 342) =57.435, *p*=.0001]. It means that recycling status depends on values towards the environment. Table 4.5 reveals that a significant percentage (62%) of the recyclers had positive values towards the environment. On the other hand, the majority (79%) of the non-recyclers was found to have negative values towards the environment. This suggests that, in general, recyclers have better values towards the environment in the test compared with non-recyclers. The Cramer's V value obtained (*V* = .416) indicates that the strength or magnitude relationship between values towards the environment and recycling status is at a moderate level. The percentage of cells with an expected count of less than five was at

0.0% suggesting that the analysis conducted was valid or appropriate. Studies by several researchers (De Young, 1986; Hopper & Nielsen, 1991; Oskamp et al., 1991) found that environmental values were the most important motive for recycling. Oskamp et al., (1991), who studied the recycling value structure empirically, found that values related to the environment (e.g. sustaining life, providing for future generations) were the most important. A better understanding of the values driving recycling behaviour will be necessary for the development of an effective recycling programme.

4.3 Psychological Characteristics of Recyclers and Non-recyclers

A chi-square test of independence was also conducted to assess attitudes towards recycling (positive and negative attitude) related to recycling status (recyclers and non-recyclers). The finding of crosstabs analysis for attitudes towards recycling and recycling status was found to be correlated or related [Pearson χ^2 (*df*=1, *N* = 342) = 60.527, *p*= .0001]. The Cramer's V value obtained (*V* = .427) indicates that the strength or magnitude relationship between attitudes towards recycling and recycling status is at a moderate level. The percentage of cells with expected count of less than five was at 0.0% suggesting that the analysis conducted was valid or appropriate.

Table 3: Psychological Characteristics of Recyclers and Non-recyclers

Variables	Recycler		Non-recycler		χ^2
	N	%	N	%	value
Values towards the environment					
Positive	88	62.0	54	38.0	57.435**
Negative	42	21.0	158	79.0	*p*=.0001
Attitude towards recycling					
Positive	79	66.4	40	33.6	60.527**
Negative	51	22.9	172	77.1	*p*=.0001
Knowledge of recycling					
High	56	35.9	100	64.1	0.392
Low	74	39.8	112	60.2	*p*=.531

**Significant at α= .01

A chi-square test was also conducted with knowledge of recycling (high and low) and recycling status. The findings of crosstabs analysis were found to be not correlated for knowledge of recycling and recycling status. Looking at the level of knowledge of recycling by recycling status, surprisingly both recyclers (39.8%) and non-recyclers (60.2%) have low levels of knowledge of recycling.

4.4 Factors that Increase the Probability of Recycling

The socio-economic variables included age, gender, ethnic, marital status, education attainment, work sector, type of accommodation, house ownership, household size and household income. The psychological characteristics included knowledge of recycling, attitude towards recycling and values towards recycling.

Chi-square analysis was employed between recycling status and the selected variables before the analysis of binary logistic regression to test whether there are significant differences between variables. Table 4 and Table 5 present the result of the chi-square analysis. The following variable shows a significant relationship with recycling status: ethnic [Pearson χ^2 (2, *N*=342) =11.716, *p*=.001], marital status [Pearson χ^2 (2, *N*=342) =23.204, *p*=.001], education attainment [Pearson χ^2 (2, *N*=342) =5.897, *p*=.015], attitude towards the environment [Pearson χ^2 (2, *N*=342) =60.527, *p*=.001] and values towards the environment [Pearson χ^2 (1, *N*=342) =57.435, *p*=.001].

An independent-samples t-test (Table 4) was conducted to compare the mean age, household size, and household income for recycler and non-recycler respondents. A preliminary assumption testing was conducted to check for normality and equality of variance with no serious violation noted. There was significant difference in the mean [*M*=3.291, *SD*=9.83; *t*(340)=3.348, *p*=.001] and household size [*M*=0.835, *SD*=0.205, *t*(306)=3.317, *p*=.000] for recyclers and non-recyclers.

Table 4: Socio-demographic Characteristics by Recycling Status

Variables	Recycler		Non-recycler	
	N	%	N	%
Gender				
Male	58	37.7	96	62.3
Female	72	38.3	116	61.7
χ^2=0.15, *p*=.903,Ø=0.007				
Ethnicity**				
Malay	96	45.3	116	54.7
Others (Chinese & Indian)	16	18.0	73	82.0
χ^2=11.716, *p*=.0001,Ø=0.191	18	43.9	23	56.1
Marital status**				
Married	32	23.5	104	76.5
Single (Single,divorced,widow or separated)	98	47.6	108	52.4
χ^2=23.204, *p*=.0001,Ø=0.267				
Educational Attainment**				
Below Tertiary Level	66	45.8	78	54.2
Tertiary level and above	64	32.3	134	67.7
χ^2=5.897, *p*=.015,Ø=-0.137				
Work sector				
Employed	115	37.8	189	62.2
Unemployed(Not Working, unpaid Family Worker)	15	39.5	23	60.5
χ^2=0.140, *p*=.708,Ø=-0.030				
Type of accommodation				
Landed property	59	39.3	91	60.6
High-Rise property	71	37.0	121	63.0
χ^2=2.822, *p*=.093,Ø=0.097				
House ownership				
Owner	38	31.7	82	68.3
Non-owner	92	41.4	130	58.6
χ^2=0.823, *p*=.364,Ø=0.055				
Age**	36.01	9.03	32.72	8.69
t=-3.348, *df*=340, *p*=.001				
Household size**	5	1.98	4	1.62
t=-4.062, *df*=306, *p*=.0001				
Income	1750.78	1613.32	1918.11	1741.95
t=0.887, *df*=340, *p*=.376				
Household income	2834.14	2299.08	2748.91	2810.82
t=-0.291, *df*=340,*p*=.771				

*** Significant at α=.001 * Significant at α=.05*

Table 4.5: Psychological Characteristics of Recyclers and Non-recyclers

Variables	Recycler		Non-recycler		χ^2
	N	%	N	%	value
Values towards the environment**					
Positive	88	67.7	54	25.5	χ^2=57.435
Negative	42	32.2	158	74.5	*p*=.0001
					Ø=0.416
Attitude towards recycling**					
Positive	79	60.8	40	18.9	χ^2=60.527
Negative	51	39.2	172	81.1	*p*=.0001
					Ø=4.27
Knowledge of recycling					
High	56	43.1	100	47.2	χ^2=0.392
Low	74	56.9	112	52.8	*p*=.531
					Ø=0.040

*** Significant at α=.001*

Binary Logistic Regression

Table 4.6 is the summary table of binary logistic regression analysis of the likelihood of being a recycler or a non-recycler. The model is feasible for the next analysis because its probability point of Hosmer and Goodness-of-Test are .420 which is more than .050. It means there is no real difference between predicted and observed results. The Negelkerje R Square value = 0.361 which means the model explained 36% variance by the logistic model. Since all the Standard Error (S.E) value displayed in Table 4.11 are less than 5.0, it shows that there is no multicolinearity and indicates that this model is statistically stable.

Table 4.6: Logistic Regression Predicting Who Will Recycle

Variable	***β***	***SE***	***Odds Ratio***	***p***
Attitude towards recycling	1.220	.327	3.387	.001
Values towards the environment	1.107	.309	3.026	.001
Marital status	.944	.316	2.571	.003
Education	-.618	.298	0.539	.038
Household size	.138	.081	1.148	.086
Ethnicity	.350	.323	1.419	.278
Age	.017	.017	1.017	.342
Constant	-2.960	.727	.052	.001

R square =0.361, *df*= 8; χ^2=8.140; *p*=0.420

Generally, binary logistic regression was conducted to assess whether the seven predictor variables were significant in the previous bivariate analysis: ethnicity, marital status, educational attainment, age, household size, attitudes towards recycling and values towards the environment significantly predicted an individual being a recycler or a non-recycler. The Omnibus Tests of Model Coefficients table indicates that, when all seven predictor variables were considered together, the Model or equation is significant [χ^2=8.764, *df*=8, N=342, p=.002].

After excluding the non-significant variables the final regression model produced for the profile of a recycler is:

$$\log[P/(1-P)] = \beta_o + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + e$$

$$= -2.960 + 0.944\ (\text{married}) - 0.618\ (\text{secondary and below}) + 1.220\ (\text{positive attitude}) + 1.107\ (\text{positive values})$$

$$\text{Prob (event)} = 1/(1+e^{-z})$$

$$\text{Prob (Recycler)} = 1/[1^{+-e-2.960+\ (0.944\ \text{married})-(0.618\ \text{secondary and below})\ +\ (1.220\ \text{positive attitude})\ +\ (1.107\ \text{positive values})}] + e$$

$$\text{Odds} = \text{Prob (Recycler)} / 1\text{-Prob (Non-recycler)} = \frac{1/[1+e^{-2.960+\ 0.944\ (\text{married})\ -\ 0.618\ (\text{secondary and below})\ +\ 1.220\ (\text{positive attitude})\ +\ 1.107\ (\text{positive values})}]}{1/[1+e^{-2.960+\ 0.944(\text{married})\ -\ 0.618(\text{secondary and below})\ +\ 1.220\ (\text{positive attitude})\ +\ 1.107\ (\text{positive values})}]}$$

Table 6 presents results of the logistic regression analysis. Note that of the seven variables only marital status, educational attainment, attitude, and values are significant. Ethnicity, age, and household size were not significant. Note also that Exp (B) gives the odds ratios for each variable. Considering the odds ratios at 95% confidence interval, married persons are 2.6 times (95% *CI*=4.778-1.384) more likely to recycle. Interestingly, educational attainment has a negative relationship which indicates that those who obtained secondary education and above are 0.6 less likely to recycle (95% *CI*=0.968-0.300). Individuals who have positive attitudes towards recycling are 3.4 times (95% *CI*=6.427-1.785) more likely to recycle as compared with those who hold negative attitudes towards recycling which is consistent with the study's hypothesis. The odds of correctly estimating whether one is a recycler improved threefold if the individual valued the environment (95% *CI*=1.75-5.413).

5. Discussion

Therefore, it is concluded that the distribution of recycling status for both recycler and non-recycler groups is not homogenous since the Chi-square test of homogeneity was found significant at α=0.001 with χ^2=24.405, *d.f*=2, and *p*=.001.

The results of this research indicate that marital status, attitude and values affect the likelihood of being a recycler or a non-recycler. Being a recycler was more common among those married, those who had secondary school education or lower or who were individuals who had positive attitudes towards recycling and positive values towards the environment.

People choose to participate in recycling for a variety of reasons. Recycling behaviour is usually associated with defining the characteristics of the 'recycler' and 'non-recycler' (Barr, Gilg, & Ford, 2001). There are many studies that investigate the motivating factors behind people's recycling behaviours. A review by Schultz et al. (1995) showed that past studies had focused on personal factors that influenced recycling behaviours. The personal factors investigated by forty-one studies included attitude, knowledge, demographic variables and personality variables.

In general, findings suggest that recycling behaviour (to recycle or not) is related to attitude toward recycling and values toward the environment. The more positive the attitude towards recycling and values towards the environment, the better the chance a person has to recycle. The opposite result was obtained on the level of knowledge of recycling. This may seem a bit strange since recycling behaviour tends to be associated with knowledge of recycling. A possible explanation for this inconsistency may be due to recycling-specific knowledge about recycling and "local" waste situation. Even though the relationship between environmental knowledge and recycling has frequently been confirmed (Bratt, 1999), research by Oskamp et al. (1991), for example, does suggests that knowledge about the specifics of recycling programmes is a better predictor of actual behaviour than is knowledge about recycling in general. People recycle or do not recycle for many reasons. Two basic types of variables were identified based on Hornik et al. (1995) whose extensive

meta-analysis of 67 empirical studies on recycling: motivation or incentives for recycling and hindrance (barriers) to recycling were consulted.

6. Conclusions

A total of 342 respondents were interviewed, consisting of 62% Malays, 26% Chinese and 12% Indians. The ethnic proportions of the sample reflected the ethnic mix in Peninsular Malaysia. The percentage of males and females in the sample is almost equal, though female respondents formed the higher percentage (55%). The mean age of the sample was 34 years and the majority of them (53.8%) are currently married. The mean family size of four for the sample is considered small. Possibly it's because most of the respondents are still at the early stage of the family life cycle, as indicated by their mean age while the household income was RM2789.46.

Of the 342 sample interviewed only 38% were recyclers and the rest (62%) were non-recyclers. In short, the following variables were found to be significant when the Chi-square test of homogeneity was administered: ethnicity, marital status, educational attainment, values towards the environment and attitudes towards recycling. It means that the proportions of respondents across the variables who were recyclers and non-recyclers were significantly different. The highest percentage of recyclers were Malays (45.3%), those who were married (50%), those with secondary school education (46.6%), those who possessed positive values towards the environment and respondents who possessed positive attitudes towards recycling. However, the distribution of recycler and non-recycler across other variables such as gender, different types of employment status, types of accommodation, house ownership and knowledge of recycling were not significant.

Finally, logistic modelling that utilizes study data drawn from the 342 sample and the results of the Binomial Logistic Regression indicate that recycling increased among respondents who were married, with secondary school and below educational level, positive values towards the environment and had positive attitudes towards recycling. Interestingly, gender, different types of employment status, types of accommodation, house ownership and knowledge of recycling were not reliable predictors of recycling behaviour. Thus, knowledge and provision of recycling facilities are not enough to stimulate recycling.

7. Implications and Recommendations

The results above provide important benchmarks for current recycling behaviour. The following points can be considered for recommendations and further studies as well as suggestions on what can be done to encourage the public to participate more fully in recycling activities.

Although findings suggest that demographic and socio-demographic variables except for marital status are of little use and policy makers cannot influence them, such information nevertheless allows authorities to target education and awareness campaigns to specific groups in society for maximum effectiveness. The results suggest that awareness campaigns designed to appeal specifically to married people, those with secondary school education levels, those who have positive values towards the environment and positive attitudes towards recycling could raise the level of recycling. Should the 'carrot approach' to recycling yield less than satisfactory results, the 'stick approach' of passing regulations to ensure some minimum level of participation in recycling and enforcing penalties for failing to do so may be considered. The Solid Waste and Public Cleansing Management Bill 2007 is expected to be enforced in April 2008 which requires households to separate their items ("Separate Trash," 2007). Rubbish will not be collected from households which refuse to separate their waste items.

As mentioned above, a direct outcome of the research has been to initiate an ongoing process of education, publicity and awareness-raising coupled with further academic enquiry to produce greater understanding of household determinants: motivation and hindrance to recycling besides the socio-demographic and psychological characteristics. These behaviours are reliably associated with patterns of factors that can be altered through intervention. By understanding the basic motivations determining behaviour, critical factors can be identified as targets of recycling campaigns. Therefore, more research is needed to explore the rates, determinants and hindrances to recycling in Malaysia.

The limitation of this study is that only one type of pro-environmental activity (recycling) was considered. It would be interesting to replicate this study for a series of pro-environmental behaviours (e.g. reduce, reuse). Moreover, information on pro-environmental behaviour such as recycling differences between urban, suburban and rural communities is important in order to conduct differentiated campaigns. Further studies should be extended using more representative samples of the population. Involving the whole of Malaysia could also lead to a global assessment of recycling behaviour.

8. Acknowledgement

This study was supported in part by Ministry Of Science, Technology and Innovation research grant.

References

Agamuthu, P. (2001). *Solid Waste: Principles and Management*. Institute of Biological Science, University of Malaya.

Arkkelin, D., Schroeder J., Suchodoski K., Skrenes J., & Rodriquez, M. (2000). Psychological Studies on Recycling. Paper presented to Annual meeting of the Midwestern Psychological Association, Chicago, Illinois. Retrieved from: http://www.valpo.edu/ services/recycling/recycling commitment.html

Barr, S., Gilg, A. W., and Ford, N.J. (2001).Differences between household waste reduction, reuse & recycling behaviour: a study of reported behaviours, intentions and explanatory variables. *Journal of Environmental and Waste Management*, *4*(2), 69-82.

Bratt, C. (1999). The impact of norms and assumed consequences on recycling behaviours. *Journal of Environmental Behaviour*, *31*(5), 630-656.

Christer, B. (2006). The assessment of household's recycling costs: The role of personal motives. *Journal of Ecological Economics*, *56*, 560-569.

Clarke, M.J. (1999). Introduction to waste prevention and recycling. Retrieved from http://www.geo.hunter.cuny.edu/~mclarke/Introductiontowastepreventionandrecycling.htm

De Young, R. (1986). Some psychological aspects of recycling. *Journal of Environment and Behaviour, 18*, 435 – 449.

Dunlap, R. E., Van Liere, K. D., Mertig, A. G. and Jones, R. E. (2000), New Trends in Measuring Environmental Attitudes: Measuring Endorsement of the New Ecological Paradigm: A Revised NEP Scale. *Journal of Social Issues*, 56: 425–442. doi: 10.1111/0022-4537.00176

Eighth Malaysian Plan (2001-2005). Economic Planning Unit, Prime Minister's Department, Malaysia.

Elizabeth, J. & K.T. Chelvi. Cover story: Recycling makes slow progress. *The Star News*, October 20, 2003.

Hansmann, R., Bernasconi, P., Smieszek, T., Loukopoulos, P. & Scholz, R.W. (2006). Justifications and self-organization as determinants of recycling behaviour: The case of used batteries. *Journal of Resources, Conservation & Recycling 47,* 133-159.

Hopper, J., & Nielsen, J.M. (1991). Recycling as altruistic behaviour: Normative and behavioural strategies to expand participation in a community recycling program. *Journal of Environment and Behaviour*, *23*(2), 195 - 220.

Hornick, J., Cherian, J., Madansky, M & Narayana, C. (1995). Determinants of Recycling Behaviour : A Synthesis of Research Results. *The Journal of Socio-Economics*, *24*(1), 105-127.

Hornick, J., Cherian, J., Madansky, M & Narayana, C. (1995). Determinants of Recycling Behaviour : A Synthesis of Research Results. *The Journal of Socio-Economics*, *24* (1), 105-127.

Katzev, R., G. Blake, & B. Messer (1993). Determinant of participation in multi-family recycling programs. *Journal of Applied Social Psychology 23,* 374-385.

Khiew, L.T. (2003). *No Incinerators for Broga, No Incinerators for Malaysia.* Unpublished article: Memorandom to the Department of Environment, Ministry of Science & Technology.

Nyamwange, M. (1996). Public Perception of Strategies for Increasing Participation in Recycling Programs. *The Journal of Environmental Education*, *27*(4), 19-22.

Oskamp, S., Harrington, M.J., Edwards, T.C., Sherwood, D.L., Okuda, S.M. & Swanson, D.C., (1991). Factors influencing household recycling behaviour. *Environment and Behaviour*, *23*(4), 494 - 519.

Reme, A (2003). *Incinerator or landfill*. The New Starits Times Interactive, (www document), Retrieved 9 July, 2004 from http://StraitsTimes,Singapore Incinerator or Landfill.htm

Tonglet M., Phillips, P.S., Read, A.D. (2004). Using the Theory of Planned Behaviour to investigate the determinants of recycling behavior: a case study from Brixworth, UK. *Journal of Resources, Conservation and Recycling, 41,* 191-214.

Rokeach, M. (1973). *The nature of human values*. New York: The Free Press.

Ryan, R. M., & Deci, E.L (2000). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Journal of Contemporary educational Psychology, 25*, 54-67.

Samdahl, D.M., & Robertson, R. (1989). Social determinants of environmental concern: Specification and test of the model. *Journal of Environment and Behaviour*, *21*(1), 57 - 81.

Schultz, P.W., Oskamp, S., & Mainieri, T. (1995). Who Recycles and When? A Review of Personal and Situational Factors. *Journal of Environmental Psychology*, *15*, 105-121.

Smeesters, D., Warlop, L., & Abeele, P. V. (2001). *Between green words and green deeds:overview of results and practical implications.* Lauven: Department Toegepaste Economische Watenschappen, Katholieke Universiteit Leuven.

Theng, L.C. (2003). *Proper Solid Waste Management for Healthy Living: Importance and Key to Success*. IMPAK, Issue 3/2003. Quarterly Bulletin of the Department of Environment (DOE) Ministry of Science and the Environment, Malaysia.

Thøgersen, J. (1994). A model of recycling behaviour, with evidence form Danish source separation programs. *International Journal of Research in Marketing*, *11*, 145 -163.

Tonglet, M., Philips, P.S. and Read, A. D. (2004). Using the Theory of Planned Behaviour to investigate the determinants of recycling behaviour: a case study from Brixworth, UK. *Journal of Resources, Conservation and Recycling, 41,* 191-214.