Household Waste Recycling Behavior in Thailand: The Role of Responsibility

Achapan Ittiravivongs[+]

Graduate School of Business and Commerce, Keio University, Japan

Abstract. This research aims to investigate the factors influencing waste recycling behavior of Thai households and examine the role of responsibility as a moderator. The results of logistic regression analysis of 381 random samples in Bangkok indicated that attitude toward recycling, subjective norm of engaging communities, awareness of recycling benefit, perceived facility condition, perceived recycling skill, and degree of responsibility significantly influence household recycling intention. The moderating effects of responsibility were found on economic incentive and perceived recycling facility condition. Higher responsibility level tends to weaken the impacts of economic incentive and perceived facility condition on willingness to recycle of household.

Keywords: recycling, household waste, responsibility, moderating effect, logistic regression, Thailand.

1. Introduction

Waste problems are among the most urgent challenges of environmental and social issue in Thailand. The amount of generated solid waste had risen from 30,640 tons per day in 1993 to 41,410 tons per day in 2009 whereas less than 40% of total were properly managed [1]. Though over decades that recycling has been encouraged as a tool to reduce the harsh effects of excessive solid waste on environment and society, the current recycling participation rate in Thailand is still rather low. Only approximately 20% of over 15 million tons of annual generated household solid waste are being recycled whereas it is estimated that the potential recycling rate in Thailand is as high as 40-60% [2]. Since the achievement of recycling programs depends largely on the active and sustained involvement of people, this research proposed to obtain insights into household waste recycling behavior in Thailand by gaining an understanding of what factors influence households' decision to participate in recycling.

2. Theoretical Frameworks

Theory of reasoned action (TRA) and theory of planed behavior (TPB) have been well recognizable as model that provide framework to explain the determinants of a behavior. The TRA suggests that behavior is a direct function of intention which is formed by attitude toward that behavior and subjective norm. When one has high intention, it is likely that he or she will perform the behavior [3]. In addition to the attitude and subjective norm, TPB includes perceived behavioral control (PBC) into the model to capture non-volitional behavior or those requiring resources, opportunities, and specific skills. The PBC refers to the individual's possible beliefs of difficulty in completing a certain behavior, and it influences both intention and behavior. The TRA and TPB have been extensively applied to predict recycling behavior in many occasions [4-9]. However, many researchers supported that there are other variables, which are not completely covered by TRA and TPB, that predict environmental behaviors [4-5, 9-16]. Some also argued that the theories fail to sufficiently predict moral related behaviors [17-18]. Since recycling is often classified as a pro-social behavior within moral domain [18-19], it is notable to include moral concept into the study framework to

permit a better understanding of recycling behavior. One of prominent moral model is Schwartz's norm activation model (NAM) [20-21]. The model posits that the activation of pro-social behavior is most likely when one is aware of the positive consequences of the behavior and he or she feels responsible for that. The study combined the TPB and NAM together with relevant variables suggested in previous researches into the framework to investigate factors influencing recycling intention and examine which extent moderating effect of responsibility influences intention to recycling of households.

3. Research Design

3.1. Sampling and data collection

The data of this research were obtained from personal interviews based on a structured questionnaire, designed follow the previous literatures [7-9, 11, 22]. To examine the quality of the questionnaire items, pre-tests were hold two times in November and October 2010 prior to the main survey which conducted during the period of December 2010 to January 2011. The internal consistency of question dimensions was measured by Conbach's alpha coefficient [23] which indicates the degree to which a set of items measures a single unidimensional latent construct, values from 0 to 1. The results of the second pre-test were satisfied in every question with the alpha coefficients ranged from 0.71 to 0.88. The verified questionnaire survey consisted with 3 parts; 1) respondent profiles, 2) questions regarding recycling behavior and intention, and 3) six-point scales question items on psychological, situational, and economic factors (strongly disagree=1 to strongly agree=6). The Bangkok capital city was selected for the study area. The target population was individuals who have been inhabited in Bangkok not less than 90 days. Multi-stages sampling method was applied to gather research samples. The inner-Bangkok area, which is classified as residential and business area [24], was selected as the interest group. Pathumwan district was randomly selected from 21 inner-Bangkok districts by drawing lots. The number of requiring samples was calculated by Krejcie and Morgen's sampling formula [25]. According to the population and housing statistic provided by Department of Provincial Administration [26], 381 samples were required at 5% margin error for Pathumwan district which has a population of 58,858 people (male 27,463; female 31,395) as of 2009. In the final stage, the number of sample required for 4 sub-districts in Pathumwan district was calculated by the ratio-sampling method.

3.2. Analysis methodology

Logistic regression analysis was employed to estimate significant effects of explanatory variables in the study. Parameters in logistic regression model are estimated by maximum likelihood method. The statistical significance of each coefficient is evaluated using the Wald test. The regression coefficient represents the change in the logit of the probability from a unit change in the associated predictor, holding other factors constant [27]. The goodness-of-fit of the logistic regression models in this study was analyzed using a) the Omnibus test, which is a likelihood-ratio chi-square test whether the coefficients of the variables in the model are all jointly equal to zero; b) the Hosmer & Lemeshow goodness of fit test, which examines the null hypothesis that the model adjust well to the data; and c) the Nagelkerke R^2 ,which reveals the amount of variation in the outcome variable that is explained by the model, having maximum value equal to 1 [28-29].

4. Data Analysis

Most of the respondents were female (56.7%), completed undergraduate school (63.3%), single (70.9%), and having personal monthly income in a range of 10,001 to 20,000 Thai baht (41.7%). The median age of the respondents was 28 years old. The samples demonstrated appropriate representatives of Bangkok population which 52.4% is female, median age is a range of 20 to 34 years old, per capita income on average equal to 11,284 Thai baht [30]. However, the sample group was better educated than the populations which have average years of educational attainment at 12 years [31]. Of total 381 samples, 231 respondents (60.6%) reported that they have intention to recycle.

Principal component analysis (PCA) was carried out prior to constructing the logistic regression model to examine the empirical dimensions of questionnaire data measured on ordinal scales [32-33]. The results of the PCA performed with thirty items showed no problematic collinearity across dimensions. The factor loadings demonstrated 11 dimensions. All components in aggregate explained 91.98% of the total variance

in the data. KMO=0.741 showed a modest sampling adequacy of factor analysis. The Bartlett's test is highly significant at p-value equal to .00, approved that the PCA is applicable.

The logistic regression analysis on intention to recycle was computed in three stages. The recycling intention variable was measured by self-report binary scale, coded as 1 = 'have intention' and 0 = 'have no intention'. In the first stage, explanatory variables from the TPB framework and situational variables were installed into the model. The result is summarized in model 1, table 1. Hosmer and Lemeshow test was significant. Omnibus test of model coefficients was significant. Nagelkerke R Square equalled to .68. Attitude toward recycling, external subjective norm (norm of involving communities outside household), perceived facility condition, and perceived recycling skill were significantly predicted recycling intention. In the next stage, awareness of recycling benefit and responsibility from the NAM framework were inserted into the model. Hosmer and Lemeshow test became insignificant indicated that the model adjusted well to the data when including NAM variables into the model. Omnibus test of model coefficients was significant both at step and model level. Nagelkerke R Square equalled to .69, revealed that adding NAM variables into the model improved, though slightly, a more accuracy of the model. Both awareness of recycling benefit and responsibility were significantly predicted recycling intention. To estimate the moderating effect of responsibility, interaction terms of the responsibility with the predictors were injected into the model in the third stage. Hosmer and Lemeshow test was not significant revealed that the model fitted well to the data. Omnibus test of model coefficients was significant. The Nagelkerke R Square increased to .75. The coefficient of interaction terms demonstrated significant moderating impacts of responsibility on two predictors; economic incentive and perceived facility condition. With higher responsibility, it is likely that the intention to recycling depends less on the condition of recycling facility. In addition, though economic incentive was not a significant predictor in the main effect estimation, responsibility significantly moderated the impact of economic factor. When responsibility level is higher, it is probable that recycling intention depends less on economic incentive. A higher responsibility is likely to diminish the crowning-out phenomenon from economic variables [18, 34].

Table. 1: Results of the main effects and moderating effects of recycling intention

Predictors	Model 1			Model 2			Model 3		
	B	Sig.		B	Sig.		B	Sig.	
Attitude toward recycling	.753	.008	**	.657	.031	*	.561	.137	
Internal subjective norm	-.007	.972		-.033	.872		-.069	.751	
External subjective norm	.381	.020	*	.334	.047	*	.429	.022	*
Economic incentive	-.107	.534		-.099	.567		-.032	.863	
Perceived space needed for recycling	-.315	.088		-.257	.163		-.246	.238	
Perceived time needed for recycling	.049	.789		-.031	.868		-.230	.311	
Perceived facility condition	1.551	.000	**	1.506	.000	**	1.968	.000	**
Perceived recycling skill	1.013	.003	**	.963	.005	**	1.344	.001	**
Adequacy of recycling information	-.124	.562		-.115	.611		-.214	.407	
Awareness of recycling benefit				.384	.039	*	.484	.020	*
Responsibility				.428	.012	*	.706	.011	*
Attitude toward recycling by responsibility							.278	.268	
Internal subjective norm by responsibility							-.324	.109	
External subjective norm by responsibility							.207	.140	
Economic incentive by responsibility							-.844	.002	**
Perceived space needed for recycling by responsibility							.450	.360	
Perceived time needed for recycling by responsibility							.329	.154	
Perceived facility condition by responsibility							-.603	.010	**
Perceived recycling skill by responsibility							.092	.762	
Adequacy of recycling information by responsibility							1.104	.096	
Awareness of recycling benefit by responsibility							.239	.123	

Statistically significant at the *0.05 and **0.01 level.

5. Conclusion and Discussion

The results from the logistic regression analysis supported the theory of planed behaviour as attitude toward recycling, external subjective norm, and perceived beliefs of difficulty in completing recycling (perceived facility condition and perceived recycling skill) significantly explained intention to recycle. In addition, the study verified that recycling tends to be an altruism behavior as recycling intention appeared to be shaped by awareness of the need and household responsibility. The degree of responsibility both provided direct effect on recycling intention and moderated the impacts of economic incentive and facility condition on willingness to recycle of households.
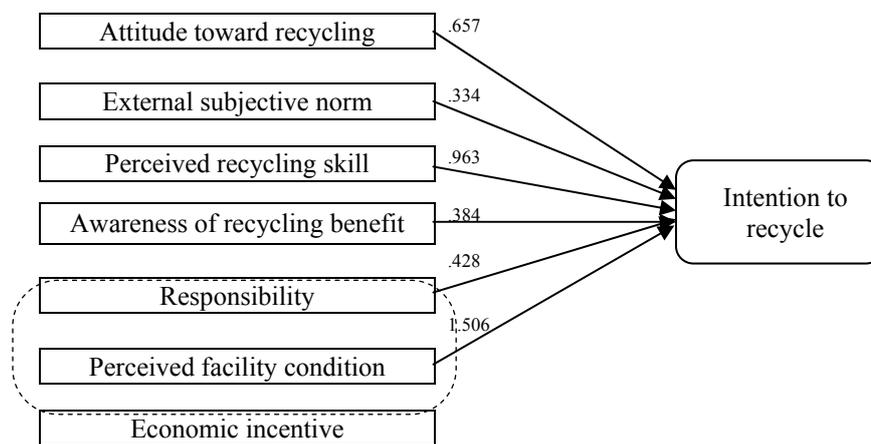
Fig. 1: Path diagram of factors determine recycling intention

The outcomes of the study provide some directions to improve recycling participation in Bangkok. First, improving of recycling facilities, services and relevant support systems should be primarily concerned. Intensive attentions should be paid on the service accessibility and standard of disposal containers. The facility and service should be comfortable to get access and a universal standard of classification of separation container as well as sorting criteria should be clearly specified. Moreover, people should be well educated how to recycle household waste in practice; what materials should be separated, how to sort, and where to deposit them. The support systems and recycling skills are crucial because these factors were found to largely affect recycling intention. Policy for reinforcing positive attitude toward recycling should also be carefully taken notice. Besides, people's recycling intention tends to depend on recycling norm of their engaging communities. Thus, it is important to make recycling an activist and favorable practice performed by a majority of people in the societies. In addition, scheme on increasing people's awareness and responsibility on recycling participation need to be concentrated. People with higher responsibility are not only likely to have intention to recycle; their intention also tends to be less sensitive on external factors as recycling facilities and economic factors.

6. References

[1] Pollution Control Department (PCD), Ministry of Natural Resources and Environment. *Thailand State of Pollution Report 1993-2009*. Rungsilp printing: Bangkok.

[2] P. Shapkota, N. Coowanitwong, C. Visvanathan, and J. Trankler. Potentials of recycling municipal solid waste in Asia vis-a-vis Recycling in Thailand. *SEA-UEMA Project*, 2006, pp. 195-229.

[3] M. Fishbein, and I. Ajzen. *Belief, attitude, intention, and behavior: An introduction to theory and research*. Reading, Addison Wesley: Boston, 1975.

[4] S. Cheung, D. Chan, and Z. Wong. Reexamining the theory of planned behavior in understanding wastepaper recycling. *Environment and Behavior*. 1999, **31**(5): 587-612.

[5] P.-Y. Chu, and J.-F. Chiu. Factors influencing household waste recycling behavior: Test of an integrated model. *Journal of Applied Social Psychology*. 2003, **33**(3): 604-626.

[6] L.M. Goldenhar, and C.M. Connell. Understanding and predicting recycling behavior: an application of the theory of reasoned action. *Journal of Environmental Systems*. 1993, **22**(1): 91-103.

[7] S. Taylor, and P. Todd. An integrated model of waste management behavior: A test of household recycling and composting intentions. *Environment and Behavior*. 1995, **27**(5): 603-630.

[8] S. Taylor, and P. Todd. Understanding Household Garbage Reduction Behavior: A Test of an Integrated Model. *Journal of Public Policy & Marketing*. 1995, **14**(2): 192-204.

[9] M. Tonglet, P.S. Phillips, and M.P. Bates. Determining the drivers for householder pro environmental behavior: waste minimization compared to recycling. *Resources, Conservation and Recycling*. 2004, **42**(1): 27-48.

[10] S. Barr. *Household Waste in Social Perspective: Values, Attitudes, Situation and Behavior.* Aldershot publisher: Ashgate, 2002.

[11] J. Boldero. The prediction of household recycling of newspapers: The role of attitudes, intentions, and situational factors. *Journal of Applied Social Psycholog.* 1995, **25**(5): 440-462.

[12] H.R. Hungerford, and T. Volk. Changing learner behavior through environmental education. *Journal of Environmental Education*. 1990, **21**(3): 8-21.

[13] R. Gamba, and S. Oskamp. Factors influencing community residents' participation in commingled curbside recycling programs. *Environment and Behavior*. 1994, **26**(5): 587-612.

[14] A. Sia, H.R. Hungerford, and A.N. Tomera. Selected predictors of responsible environ-mental behavior: An analysis. *Journal of Environmental Education*. 1986, **17**(2): 31-40.

[15] P. Vicente, and E. Reis. Factors influencing households' participation in recycling. *Waste Management & Research*. 2008, **26**(2): 140-146.

[16] J. Vining, and A. Ebreo. What makes a recycler? A comparison of recyclers and non-recyclers. *Environment and Behavior*. 1990, **22**(1): 55-73.

[17] F.G. Kaiser, M. Ranney, T. Hartig, and P.A. Bowler. Ecological behavior, environmental attitude, and feelings of responsibility for the environment. *European Psychologist.* 1999, **4**(2): 59-74.

[18] J. Thøgersen. Recycling and morality. A critical review of the literature. *Environment and Behavior*. 1996, **28**(4): 536–558.

[19] J.R. Hopper, and J.N. Nielsen. Recycling as altruistic behavior. Normative and behavioral strategies to expand participation in a community recycling program. *Environment and Behavior*. 1991, **23**(2): 195-220.

[20] S.H. Schwartz. Normative influences on altruism. *Advances in experimental social psychology.* 1977, **10**: 221-279.

[21] S.H. Schwartz, and J.A. Howard. Explanations of the moderating effect of responsibility denial on the personal norm-behaviour relationship. *Social Psychology Quarterly.* 1980, **43**(4): 441-446.

[22] P. Valle, E. Reis, J. Menezes, and E. Rebelo. Behavioral Determinants of Household Recycling Participation: The Portuguese case. *Environment and Behavior*. 2004, **36**(4): 505-540.

[23] L. Cronbach. Coefficient alpha and the internal structure of tests. *Psychometrika*. 1951, **16**(3): 297-334.

[24] BMA data center, Bangkok Metropolitan Administration, Thailand. http://203.155.220.118/info/Default.asp

[25] R.V. Krejcie, and D.W. Morgan. Determining sample size for research activities. *Educational and Psychological Measurement*. 1970, **30**(3): 607-610.

[26] Department of Provincial Administration, Ministry of Interior, Thailand. The 2009 population and housing census, http://www.dopa.go.th

[27] D.N. Gujrati. *Basic econometrics*. McGraw-Hill Book Company: New York, 2003.

[28] D. Hosmer, and S. Lemeshow. *Applied Logistic Regression*. John Wiley and Sons: New York, 2000.

[29] J. Long. *Regression models for categorical and limited dependent variables*. Sage: London, 1997.

[30] National Statistical Office and Office of the National Economic and Social Development Board, Core Economic Indicators of Thailand 2008, http://service.nso.go.th/nso/nsopublish/indicator/indEco51.pdf

[31] Office of Education Council, Ministry of Education, Thailand. Average Years of Educational Attainment of Thai

Population 2009 online, http://www.onec.go.th/onec_administrator/uploads/Book/991-file.pdf

[32] I.T. Jolliffe. *Principal Component Analysis*. 2nd edition, Springer-Verlag: New York, 2002.

[33] J. Shlens. A tutorial on Principal Component Analysis, Princeton University,

 http://www.cs.princeton.edu/picasso/mats/PCA-Tutorial-Intuition_jp.pdf

[34] B.S. Frey. Morality and Rationality in Environmental Policy. *Journal of Consumer Policy*. 1999, **22**(4): 395-417.