# Factors influencing on residents' household waste separation behavioral intention: Evidence from Ho Chi Minh City, Vietnam

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#### ABSTRACT

<b>DOI:</b> 10.46223/HCMCOUJS.	Household solid waste has become a serious problem in			
econ.en.11.1.542.2021	Ho Chi Minh City, Vietnam over the last 10 years, resulting in			
	significant side effects on the environment. Although various			
	programs of waste separation at source have been deployed, they			
	have stopped at the level of the pilot - programs and have			
	generally not been replicable. Based on the Theory of Planned			
	Behavior (TPB), this study was examined the key factors			
	influencing waste separation behavioral intention of residents in			
Received: June 12 <sup>th</sup> , 2020	Ho Chi Minh City (HCMC), Vietnam's economic center. By			
Revised: August 19th, 2020	using SPSS 20.0 software for the sample size of 487 residents, the			
Accepted: August 20th 2020	regression models are used to process and explain data. The			
	research detects six factors, namely Attitude towards waste			
	separation; Social norms; Perceived behavioral control;			
	Knowledge about waste separation; Laws and regulations;			
	Propaganda that significantly directly affected residents			
	'behavioral intention, Knowledge about waste separation being			
	the strongest construct significantly to predict individuals'			
	intention. Of the six above-listed constructs, only Perceived			
Keywords:	behavioral control had a negative impact on residents' waste			
waste separation, behavioral	separation behavioral intention. The findings from this research			
intention, the Theory of Planned	may help policy-makers have a better understanding of residents'			
Behavior, Ho Chi Minh City	waste separation behavioral intention.			

#### 1. Introduction

HCMC is the core of Vietnam's largest urban area, heading towards a population of 12 million in 2025. It is the megacity and the economic center of the country. The economic and industrial development led to massive immigration into HCMC in recent years, causing an average immigration rate of 250.000 people per year from 2007 to 2015 (General Statistics Office of Vietnam, 2014). HCMC is facing a steady increase in the household solid waste volume, and municipal waste takes the main part of the solid waste generated. The total volume of Municipal Solid Waste is estimated at 8.100-8.300 tons/day (excluding waste sludge). It not only causes serious pollution problems, which are not conducive to the environment and human health (Nguyen & Schnitzer, 2009) but also retards the sustainable development of society.

The concept of separating household solid wastes is not new to Vietnamese people, especially to those living in urban cities such as Hanoi, HCMC, Da Nang City... From 2006 to 2009, the 3R (reduce, reuse, recycle) initiative funded by the Japan International Cooperation

Agency was implemented by the HCMC Urban Environmental Company in selected central districts (Nguyen, Nguyen, Zhu, & Le, 2015). The key activities of the 3R initiative included the provision of waste bins, the introduction of new source-separated collection bins, and environmental education for children (Ngo & Pham, 2011). The government extended the 3R policy and confirmed its determination of increasing the quantity of national waste separation at source and also by implementing the National Strategy on Integrated Solid Waste Management through to 2025. But they have stopped at the level pilot - programs and have generally not been replicable.

Faced with the problem of rapid household solid waste, HCMC authorities have established legislative and institutional groundwork related to waste separation. Based on the Environmental Protection Law 2015 and the Decree No. 38/2015/ND-CP on waste management, HCM authorities issued Decision No.44/2018/QD-UBND dated 14/11/2018 about the regulation on waste separation. However, waste separation in HCMC is currently facing actual difficulties. Residents' unwillingness to sort waste, users' limited awareness and difficulties in sorting waste are among the reasons for arising serious problems of household solid waste in HCMC.

To clarify antecedents and drivers that motivate individuals to separate solid waste, recent studies have employed the Theory of Planned Behavior (TPB) and focused on the impact of motives namely attitude, subjective social norm, and perceived behavioral control on recycling behavior (Ayob, Sheau-Ting, Jalil, & Chin, 2017; Mahmud & Osman, 2010). Moreover, several other studies have emphasized the important impacts of situational factors such as past experiences, income, and inconvenience on household waste separating behavioral intention (Desa, Kadir, & Yusooff, 2011; Philippsen, 2015; Ramayah, Lee, & Lim, 2012). However, it seems to be that few studies were conducted by exploring the influences of these combined factors on waste separating behavioral intention. Consequently, the need for a more comprehensive picture drawing on related influencers is crucial, which can provide both decision-makers and agencies with an in-depth understanding that can be used to enhance separating rates.

From the research gaps above, it is very urgent and necessary to have a comprehensive study to help understand the social and psychological impacts on residents' behavior toward waste separating, and in moving people on to other pro-environmental behaviors. This study aims to answer the question of what the factors influencing residents' waste separation behavioral intention are.

# 2. Literature review

# 2.1. The Theory of Planned Behavior (TPB)

The Theory of Planned Behavior (TPB) was proposed by Ajzen in 1985. The TPB was extended from the Theory of Reasoned Action (TRA) by adding perceived behavioral control constructs, which is considered one of the most effective socio-psychological models in predicting and explaining social behaviors (Ajzen, 1991). In TPB, the performance of individuals' behavior is determined by their behavior intentions which influenced by three conceptually independent constructs, consisting of attitudes toward behavior (personal attitude and individual conduct), subjective social norm (influence or social pressures to perform a behavior), and perceived behavioral control (indicates individuals' perceived ease or difficulty of performing the particular behavior).

As of its launch, the TPB has been used to explore a wide variety of sustainable behaviors, for instance: sustainable transportation use (Donald, Cooper, & Conchie, 2014),

household energy-saving (Webb, Soutar, Mazzarol, & Saldaris, 2013) and has gained considerable success. It is apparent that TPB is a useful and powerful framework for supporting researches related to sustainable behavior and this approach can be applied to most behaviors (Poškus, 2015). To be specific, there is strong evidence proving that TPB is successful in most research on separating (Ayob et al., 2017; Mahmud & Osman, 2010); therefore, TPB is now considered as a preferred theory providing a systematical framework for analyzing the determinant elements affecting separation and/or recycling behavior (Ramayah et al., 2012; Tonglet, Phillips, & Read, 2004).

Recently, researchers have extended the TPB model in several studies about recycling behavior by adding some variables such as recycling experience, laws, and regulations, propaganda ... with the hope to improve the predictability of the model. The reason behind this extension is supposed to have a considerable contribution to sustainable behavior. Following the original TPB, this study adds three latent variables, namely, Knowledge about waste separation, Laws and regulations, and Propaganda, and constructs a model with waste separation intention as a dependent variable to explore the influencing factors of people's intention toward separating household waste. Figure 1 displays the extended theoretical model.



Figure 1. Extended theoretical model

# 2.2. Attitude towards waste separation

Attitude refers to an individual's positive or negative attitude in performing a particular behavior with some degree of favor - disfavor, like-dislike, satisfaction - dissatisfaction, or goodbad polarity (Eagly & Chaiken, 1993; McEachan, Conner, Taylor, & Lawton, 2011). As attitude is a relatively persistent and stable psychological construct, many studies have confirmed the influence and prediction of attitude on waste separation behavioral intention (Best & Mayerl, 2013; Nixon & Saphores, 2007). This study defines attitude as people's perception and tendencies of behavior toward waste separation. If people hold a positive attitude toward waste separation, then they become more aware of the importance of waste separation and are consequently more intent on engaging in separating waste, and vice versa (Chen & Tung, 2014). Based on the above discussions, the following hypothesis is proposed.

H1: Attitude is positively related to waste separation intention

#### 2.3. Subjective social norms

Subjective social norms are normally supposed to capture the individual's perception of being important to others in his or her social environment wish or expect him or her to behave in a certain way (Ajzen, 1991). In this study, subjective social norms are defined as the approval of others' expectations, such as family norms (Olsen, 2001).

The findings within the literature are mixed, but most studies reported that subjective social norms are an independent and important variable in explaining consumer intention (Ajzen, 1991). Subjective social norms have been shown as an important factor in explaining the motivations toward waste separation in some studies (Ayob et al., 2017; Mahmud & Osman, 2010).

In the context of East Asian culture, society encourages collectivism rather than individualism. Thus, individuals are easily influenced by leaders and even related organizations. In this study, subjective social norms refer to the influence of external social pressure on the willingness of people to sort waste. The greater the social pressure that people perceive about waste sorting, the stronger their willingness to participate (Matthies, Selge, & Klöckner, 2012; Ru, Wang, & Yan, 2018). Thus, the following hypothesis is proposed:

# H2: Subjective social norms are positively related to waste separation intention

#### 2.4. Perceived behavioral control

Ajzen (1991) focused on perceived behavioral control as the person's beliefs as to how easy or difficult the performance of the behavior is likely to be. The more resources and opportunities an individual thinks he or she possesses, the fewer obstacles or impediments they anticipate, and the greater should be their perceived control over the behavior. He also suggested that control factors can be either internal to the person (e.g., skills, abilities, power of will, and compulsion) or external to the person (e.g., time, opportunity, and dependence on others). Perceived behavioral control is defined in this study as an integrated measure of internal and external resources that make it easy to act upon the motivation to separate wastes.

Previous studies have proven that the inclusion of perceived behavioral control improves the TPB model's ability to predict or explain intention (Armitage & Conner, 2001; Verbeke & Vackier, 2005). However, perceived behavioral control fails to predict intention in quite many cases (Eagly & Chaiken, 1993; McMillan & Conner, 2003). Therefore, this study includes perceived behavioral control together with attitudes and social norms and expects that it has a positive effect on intention. Thus, the following hypothesis is proposed:

#### H3: Perceived behavioral control is positively related to waste separation intention

#### 2.5. Knowledge about waste separation

Knowledge about waste separation is divided into two categories (Zhang, Huang, Yin, & Gong, 2015). The first one focuses on general knowledge about facts, concepts, and usefulness of waste separation. The second one involves specific waste separation technology (Fryxell & Lo, 2003). This study defines knowledge about waste separation as general knowledge about waste separation. Knowledge is considered to be one of the key drivers of waste separation. A variety of articles have shown that there is a significant relationship between knowledge about waste separation and waste separation intention (Hansmann et al., 2006; Wang, Guo, & Wang, 2016).

H4: Knowledge about waste separation is positively related to waste separation intention

# 2.6. Laws and regulations, propaganda

Yu, He, Li, Huang, and Zhu (2014) proved that the laws and regulations had a positive effect on the willingness of residents to separate. Wang et al. (2016) found that promulgation and public spread of the laws and regulations improved environmental awareness among residents and in turn making them ready to sort waste. Noehammer and Byer (1997) founded that compulsory recycling programs launched by the government had a higher participation rate than voluntary resident recycling. Vietnam is a government-leading country which means all levels of government are responsible for issuing legislation on waste separation. In a nutshell, laws, and regulations ruled by the government play a vital part in waste sorting.

Moreover, propaganda could motivate residents to realize the significance of household waste separation and hence perform separate collections better. De Feo and De Gisi (2010) presented the idea that propaganda and citizen encouragement could encourage residents to separate waste. Accordingly, the following research hypothesis can be concluded:

H5: Laws and regulations positively impact waste separation intention

H6: Propaganda is positively related to waste separation intention

# 3. Research methodology

# 3.1. Set up the measuring scale and design the questionnaire

The research is carried out with two main steps: preliminary research and formal research. The preliminary research is performed by in-depth interviews. Ten citizens are invited to engage in face-to-face interviews. This approach is to identify factors that affect waste separation intention. It helps adjust observed variables and measurement scale to a particular situation of waste sorting, as well as related terms. The interviewers use a semi-structured questionnaire that lists the main questions to ask during the interview and which can be changed to make them appropriate to each respondent. Specifically, 29 draft statements of six constructs developed from the literature review are presented to respondents for their assessment. The result of preliminary research shows that almost all factors/variables are rather sufficient, clear, and understandable.

This result directs the design of the quantitative questionnaire for the next step of the research process. The completed scale is built-in Table 1 including Attitude towards waste separation (6 items), Subjective social norm (5 items), Perceived behavioral control (5 items), Knowledge about waste separation (4 items), Laws and regulations (4 items), Propaganda (3 items), and Waste Separation Intention (4 items).

# Table 1

Measurement scale of the main constructs

Item code	Observed variables	Source
Attitude	towards waste separation (AT)	
AT1	Waste separation is good	Philippsen
AT2	Waste separation is wise	(2015), Ayob et al. (2017), focus group
AT3	Waste separation is beneficial	
AT4	Waste separation is everyone's responsibility	discussion

Item code	Observed variables	Source				
AT5	Waste separation is commendable					
AT6	I am interested in waste separation					
Subjectiv	ve social Norm (SN)					
SN1	Most people who are important to me support waste separation					
SN2	My family thinks that I should do waste separation					
SN3	My friends think that I should do waste separation	Philippsen				
SN4	My colleagues think that I should do waste separation	(2015)				
SN5	The people who are doing waste separation that I know always say good things about this regulation					
Perceive	d behavioral control (PC)					
PBC1	I have no time for waste separation					
PBC2	Waste separation is difficult	Mahmud and				
PBC3	Waste separation takes too much time	Osman (2010),				
PBC4	Waste separation is costly for equipment	discussion				
PBC5	Waste separation is not easily technically correct	-				
Knowledge about waste separation (KNO)						
KN1	Waste separation is a primary way to protect the environment	D1 '1'				
KN2	Waste separation is a primary way to conserve natural resources.	(2015), focus				
KN3	I understand how to separate waste	group				
KN4	I understand the laws and regulations about waste separation	discussion				
Laws and regulations (LR)						
LR1	Government policy would influence me to separate waste					
LR2	The laws and regulations require the responsibilities of residents to separate waste	Yu et al. (2014), focus				
LR3	I will obey the laws and regulations about waste separation	- group discussion				
LR4	The laws and regulations					
Propaga	nda (PP)					
PP1	Propaganda about waste separation raise the residents' awareness about waste separation W					
PP2	Propaganda about waste separation creates motivation to separate	(2016), focus				
PP3	Propaganda about waste separation affect positively to residents' waste separation intention	discussion				
Waste Se	paration Intention (SI)					

Item code	Observed variables	Source
SI1	I intend to separate waste as a habit	
SI2	I intend to separate waste if the government supply equipment	Ayob et al. (2017)
SI3	I am willing to participate in waste separation programs hold by the government	
SI4	I am willing to tell my relatives about waste separating experiences	

Source: The researcher's data analysis

The questionnaire in this study includes two main sections, which were designed to fulfill the research objectives and several key requirements from the research hypotheses. The first section focuses on the measurement of the construct in the research model. Questions on attitude towards waste separation, social norms, perceived behavioral control, knowledge about waste separation, laws and regulations, propaganda, and behavioral intentions were included. Studying factors impacting separation behavior intention uses the scale Likert that is 5 levels as follows: level 1: very disagreed; level 2: disagreed; level 3: normal; level 4: agreed; level 5: very agreed. In the second section, questions on demographic characteristics were asked, including gender, age, and education level.

# 3.2. Method for choosing sample and sample scale

The sampling method adopted is convenience sampling. Hair, Black, Babin, and Anderson (2010) emphasize the number of samples must be at least five times the number of observed variables, the result ensures accuracy. Thus, a sample size of 155 or more can be accepted for this research. A total of 500 questionnaires were delivered, and 494 attained samples. After screening and removing invalid questionnaires (those were not fully completed or the answers were one - scale dimension), a total of 487 valid samples were used for further analysis.

# 4. Analysis of research result

# 4.1. Descriptive statistics

Table 2 presents detailed information on respondents' general socio-demographic characteristics. Among the participants, 52.36% (n= 255) were females and 47.63% (n=232) were males. Most respondents were between 45 to 60 years old (31,21%, n=152), followed by above 60 years old (27,11%, n=132). Only 83 interviews (17.04%) who are under 30 years old.

Regarding the respondents' education level, the high school group accounts for 26.24%, the university or above group accounts for 23.99%. Most of the respondents are a trader (18.89%), followed by Retiree, Housewife with 90 people (18.48.%). Thus, the research sample is suitable for research purposes.

# Table 2

Demographic Variables	Group	Frequency	Percentage (%)
Candan	Female	255	52.36
Gender	Group Frequency Percenter   emale 255 52   fale 232 47   30 83 17   0-45 120 24   5-60 152 33   60 132 27   rimary school 46 9   econdary school 95 19   figh school 128 20   College/Vocational ducation 101 20   Iniversity or above 117 24   Civil servant 73 14   Office worker 49 10   Vorker 39 8	47.63	
	< 30	83	17.04
4 70	GroupFrequencyPercentFemale $255$ $52$ Male $232$ $47$ $< 30$ $83$ $17$ $30-45$ $120$ $24$ $45-60$ $152$ $33$ $>60$ $132$ $27$ Primary school $46$ $99$ Secondary school $95$ $19$ High school $128$ $26$ College/Vocational education $101$ $26$ University or above $117$ $24$ Retiree $90$ $118$ Office worker $49$ $106$ Trader $92$ $148$ Worker $39$ $88$ Housewife $90$ $148$ Othere $54$ $117$	24.64	
Age	45-60	152	31.21
	>60	132	27.11
	Primary school	46	9.44
	Secondary school	95	19.51
Educational level	High school	128	26.28
	College/Vocational education	101	20.74
	University or above	117	24.03
	Retiree	90	18.48
	Civil servant	73	14.99
	Office worker	49	10.06
Profession	Trader	92	18.89
	Worker	39	8.01
	Housewife	90	18.48
	Others	54	11.09

Demographic profile of respondents (n=487)

Source: The researcher's data analysis

#### 4.2. Testing for reliability of the scales

Before testing the hypotheses, we initially test the measurement items for each of the constructs in the model via Cronbach's alpha. The reliability test result shows that all the Cronbach's alpha of the scales is rather high (the minimum of Cronbach's alpha is 0.781), and the item-total correlations of all items are also high (the minimum is 0.513), after deleting the items SN4 because of its item-total correlations is 0.288 < 0.3. Thus, all measurement items (except for SN4) should be tested using Exploratory Factor Analysis (EFA).

To guarantee convergent validity, items with factor loadings, which are not significant or below 0.5, are eliminated (Bagozzi, 1994). At the first rotated round, six components are extracted and two items are deleted (AT6: I am interested in waste separation and LR2: The laws and regulations require the responsibilities of residents to separate waste) because of low factor loading (<0.5). Table 3 indicates the second round result of exploratory factor analysis based on 28 variables. The six factors of independent variables are extracted at least an Eigenvalue of 1.049, all factor loadings are higher than 0.5, ranging from 0.571 to 0.807. The highest cumulative coefficient is 61.878%.

# Table 3

Factor analysis and reliability

Contract	C	Factor loading					
Construct	Code	1	2	3	4	5	6
	AT2	.756					
	AT1	.707					
Attitude towards waste	AT5	.663					
sepuration (TTT)	AT4	.637					
	AT3	.622					
	PC4		.721				
	PC5		.700				
Perceived behavioral control	PC2		.641				
(10)	PC1		.635				
	PC3		.564				
	SN3			.785			
Subjective social Norm (SN)	SN5			.742			
Subjective social Ivorili (SIV)	SN1			.731			
	SN2			.695			
	KT1				.738		
Knowledge about waste	KT3				.675		
separation (KNO)	KT2				.615		
	KT4				.571		
	PP2					.768	
Propaganda (PP)	PP3					.757	
	PP1					.736	
	LR4						.807
Laws and regulations (LR)	LR1						.735
	LR3						.707
Waste Separation Intention (SI)	SI1	.747					
Cronbach's Alpha = .806	SI2	.775					
Eigen value = 2.529	SI3	.744					
Cumulative $\% = 63.236$	SI4	.760					
Cronbach's Alpha		.805	.781	.809	.738	.809	.827
Eigen value		8.1600	1.651	1.486	1.282	1.223	1.049
Cumulative %		34.001	40.881	47.073	52.414	57.510	61.878

Source: The researcher's data analysis

Waste Separation Intention is uni-dimensional with four observed items. With Varimax rotation of principal component method, only one component is extracted and gets Eigenvalues of 2.529. The KMO coefficient is 0.798 and Barlett's test of sphericity has high significance (Sig. = 0.000). All four-factor loadings are higher than 0.7, and Cronbach's alpha is 0.806.

# 4.3. Correlation analysis

Correlation coefficients are used to quantify the level of the close relationship between two or more variables. The absolute value of the correlation coefficient closes to 1 when the variables have a tight linear correlation. If the correlation is lower than 0.85, discriminant validity exists between two variables (John & Benet-Martinez, 2000). Table 4 summarizes the correlation matrix of six constructs which were analyzed by Pearson with a 2-tailed assumption. The correlation of each pair of constructs is from -0.647 to 0.708 (lower than the conditional index of 0.85) which proves that the main constructs gain discriminant validity. Thus, the measurement scale meets the requirement of measuring different constructs.

#### Table 4

Correlation matrix

	SI	РС	KNO	LR	SN	AT	рр
~-		10	<b>R</b> 10	ER 52.1**	5.0**	A1	11
SI	1	647	./08	.524	.562	.602	.632
PC		1	548**	419**	<b>-</b> .418 <sup>**</sup>	547**	536**
KNO			1	.397**	.466**	$.500^{**}$	.473**
LR				1	.428**	.476**	.403**
SN					1	.431**	.455**
AT						1	.482**
PP							1

Note: \*\* Pearson correlation is significant at p<0.01 level (2-tailed)

Source: The researcher's data analysis

#### 4.4. Multiple regression analysis

After confirming the acceptability of the measurement model, the estimation of the regression model is performed. The estimated results are shown in Table 5. This table details the results of the multiple regression model to test the relationship between the major factors and waste separation intention. VIF indexes vary from 1.463 to 1.845 (less than 10) and Tolerance indicators are higher than 0.1, which indicates very low multicollinearity among the variables.

### Table 5

Regression analysis

Independent variables	Beta coefficient	t value	Sig.	Tolerance	VIF
РС	177	-3.460	.001	.542	1.845
KNO	.345	7.022	.000	.586	1.706
LR	.115	2.530	.012	.684	1.463
SN	.130	2.812	.005	.660	1.514
AT	.120	2.416	.017	.570	1.753
PP	.211	4.386	.000	.604	1.655
Adjusted $R^2 = .689$		F value = 82.297		F sig. $= 0.000$	

Source: The researcher's data analysis

The adjusted R<sup>2</sup> of the regression model of 0.689 implies that 68.9% of the variance of the dependent variable is generally explained by six independent variables in the model. The F-value with significance at p < 0.001 indicates that the outcome model is very suitable for the collected data, and there is a good fit between the dependent variable and predictors (F value = 82.297; F sig. = 0.000). Six independent variables are affecting the dependent variable at a statistically significant level (p<0.05). There are five factors that affect positively waste separation intention. They are ranked as following orders: Knowledge about waste separation ( $\beta$ 1= 0.345); Propaganda ( $\beta$ 2= 0.211); Subjective social norm ( $\beta$ 3=0.130); Attitude towards waste separation ( $\beta$ 4=0.120); and Laws and regulations ( $\beta$ 5=0.115). The factor Perceived behavioral control affect negatively to waste separation intention ( $\beta$ 6= - 0.177).

The results of relationships between the independent variables and the dependent variable in the regression model lead to the conclusion that the hypotheses (H1, H2, H3, H4, H5, and H6) cannot be rejected.

#### 5. Conclusions, meanings, and limitations

The purpose of this study is to extend the Theory of Planned Behavior by including Knowledge about waste separation, Propaganda, and Laws and regulations to explain the intention to separate household waste in HCMC. The findings support all the proposed hypotheses; therefore, this study generates some contributions in both academic and practical fields.

As this study shows, Knowledge about waste separation is the strongest influence on household waste separating intention. Consequently, it is indispensable to build up educational campaigns that may raise people's awareness and beliefs about the benefits of waste sorting in conserving natural resources as well as reducing the use of landfills and emissions of greenhouse gasses. By realizing how beneficial waste separating is, it would motivate residents to sort household waste and further foster these habits among residents.

Besides that, the findings from this study revealed that Propaganda and Attitude towards waste separation are the primary influencing factors in activating residents' household waste separation intention. That shows the fact that those who participate actively in waste separation do so mainly because they understand that waste separation is a cost-effective way of enhancing environmental quality, and increasing socio-economic sustainability. In addition, with regard to the significance of social pressure in developing residents' household waste separation intention. Therefore, public media and communication campaigns should be designed appropriately with the aim to attract more and more people to perform waste sorting behavior.

Moreover, Laws and regulations significantly and positively affect people's intentions toward waste separation. Enforced legislation is one of the best examples of stricter measures that should be put in place to control the waste issue at the point sources, and in this way, it may lead to increased effectiveness of sorting waste rate and encouraging residents' engagement. Laws and regulations which emphasize the incorporation of all relevant stakeholders' responsibilities should be established and implemented in order to contribute to a successful waste separating and management system. First, domestic policies at all levels should be integrated on the basis of these methods and plans. Relevant laws and regulations should be systematized and completed. Second, policy implementation should be strengthened to implement a system of pollution responsibility. Individuals or organizations that refuse to sort of waste should be severely punished.

The result indicating that another important factor that helps to encourage residents to

participate in household waste sorting is the convenience of sorting. In fact, the result of this study depicts that recycling behavior is impeded by the inconvenience of recycling. Thus, the need for providing the available accessibility of waste collection infrastructure may be put as one of the top priorities and guide people to sort waste properly.

However, some limitations of this study should be noticed. First, the present research is based on a convenience sample from some districts in HCMC so the results cannot represent the whole of the population in HCMC. Future studies should expand to a more representative sample. Second, the extended TPB model has only considered the context of Knowledge, Propaganda, and Laws and regulations. The present investigation is not specifically designed to evaluate factors that are related to habit, cost of classifying waste, and past experience. Next, the study has not measured actual behavior; thus, the gap between intention and future behavior is problematic in inference, and a longitudinal design is encouraged. These problems should be explored in future work.

#### References

- Ajzen, I. (1985). From intentions to actions: A theory of planned behavior. In J. Kuhl & J. Beckmann (Eds.), Action-control: From cognition to behavior (pp. 1-39). Heidelberg, Germany: Springer.
- Ajzen, I. (1991). The theory of planned behavior. Organizational Behavior and Human Decision Process, 50, 179-211.
- Armitage, C., & Conner, M. (2001). Efficacy of the theory of planned behaviour: Meta-analysis of the theory of planned behavior. *British Journal of Social Psychology*, 40(4), 471-499.
- Ayob, S. F., Sheau-Ting, L., Jalil, R. A., & Chin, H. C. (2017). Key determinants of waste separation intention: Empirical application of TPB. *Facilities*, 35(11/12), 696-708.
- Bagozzi, R. P. (1994). Measurement in marketing research. In R. P. Bagozzi (Ed.), Principles of marketing research (pp. 1-49.). Cambridge, MA: Blackwell.
- Best, H., & Mayerl, J. (2013). Values, beliefs, attitudes: An empirical study on the structure of environmental concern and recycling participation. *Social Science Quarterly*, 94(3), 691-714.
- Chen, M., & Tung, P. (2014). Developing an extended theory of planned behavior model to predict consumers' intention to visit green hotels. *International Journal of Hospitality Management*, 36, 221-230.
- De Feo, G., & De Gisi, S. (2010). Public opinion and awareness towards MSW and separate collection programmes: A sociological procedure for selecting areas and citizens with a low level of knowledge. *Waste Management*, 30(6), 958-976.
- Desa, A., Kadir, N. B., & Yusooff, F. (2011). A study on the knowledge, attitudes, awareness status and behaviour concerning solid waste management. *Procedia - Social and Behavioral Sciences*, 18, 643-648.
- Donald, I., Cooper, S., & Conchie, S. (2014). An extended theory of planned behaviour model of the psychological factors affecting commuters' transport mode use. *Journal of Environmental Psychology*, 40, 39-48.

- Eagly, A. H., & Chaiken, S. (1993). *The psychology of attitudes*. Fort Worth, TX: Harcourt Brace Jovanovich.
- Fryxell, G. E., & Lo, C. W. (2003). The influence of environmental knowledge and values on managerial behaviors on behalf of the environment: An empirical examination of managers in China. *Journal of Business Ethics*, 46(1), 45-69.
- General Statistics Office of Vietnam (GSO). (2014). *Statistical handbook of Vietnam*. Hanoi, Vietnam: GSO.
- Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). *Multivariate data analysis*. Englewood Cliffs, NJ: Prentice Hall.
- Hansmann, R., Bernasconi, P., Smieszek, T., Loukopoulos, P., Loukopoulos, P., & Scholz, R. (2006). Justifications and self-organization as determinants of recycling behavior: The case of used batteries. *Resources Conservation and Recycling*, 47(2), 133-159.
- John, O. P., & Benet-Martínez, V. (2000). Measurement: Reliability, construct validation, and scale construction. In H. T. Reis & C. M. Judd (Eds.), *Handbook of research methods in* social and personality psychology (pp. 339-369). Cambridge, UK: Cambridge University Press.
- Mahmud, S. N. D., & Osman, K. (2010). The determinants of recycling intention behavior among the Malaysian school students: An application of theory of planned behavior. *Procedia-Social and Behavioral Sciences*, 9, 119-124.
- Matthies, E., Selge, S., & Klöckner, C. A. (2012). The role of parental behaviour for the development of behaviour specific environmental norms - The example of recycling and reuse behaviour. *Journal of Environmental Psychology*, 32(3), 277-284.
- McEachan, R. R. C., Conner, M., Taylor, N. J., & Lawton, R. J. (2011). Prospective prediction of health-related behaviours with the theory of planned behaviour: A meta-analysis. *Health Psychology Review*, 5(2), 97-144.
- McMillan, B., & Conner, M. (2003). Applying an extended version of theory of planned behavior to illicit drug use among students. *Journal of Applied Social Psychology*, 33(8), 1662-1683.
- Ngo, C. K., & Pham, L. P. (2011). Solid waste management associated with the development of 3R initiatives: Case study in major urban areas of Vietnam. *Journal of Material Cycles and Waste Management*, 13(1), 25-33.
- Nguyen, U. N., & Schnitzer, H. (2009). Sustainable solutions for solid waste management in Southeast Asian countries. *Waste Management*, 29(6), 1982-1995.
- Nguyen, T. H., Nguyen, T. T., Zhu, D., & Le, N. P. (2015). Factors influencing waste separation intention of residential households in a developing country: Evidence from Hanoi, Vietnam. *Habitat International, 48*, 169-176.
- Nixon, H., & Saphores, J. D. M. (2007). Financing electronic waste recycling Californian households' willingness to pay advanced recycling fees. *Journal of Environmental Management*, 84(4), 547-559.
- Noehammer, H. C., & Byer, P. H. (1997). Effect of design variables on participation in residential curbside recycling programs. *Waste Management & Research*, 15(4), 407-427.
- Olsen, S. O. (2001). Consumer involvement in fish as family meals in Norway: An application of the expectance-value approach. *Appetite*, *36*(2), 173-186.

- Philippsen, Y. (2015). *Factors influencing students' intention to recycle* (Master's thesis). School of Management and Governance, University of Twente, Netherlands.
- Poškus, M. S. (2015). Predicting recycling behavior by including moral norms into the theory of planned behavior. *Psychology*, 52, 22-32.
- Ramayah, T., Lee, J. W., & Lim, S. (2012). Sustaining the environment through recycling: An empirical study. *Journal of Environmental Management*, 102, 141-147.
- Ru, X., Wang, S., & Yan, S. (2018). Exploring the effects of normative factors and perceived behavioral control on individual's energy-saving intention: An empirical study in eastern China. *Resources Conservation and Recycling*, 134, 91-99.
- Shi, H., Wang, S., & Zhao, D. (2017). Exploring urban resident's vehicular PM2.5 reduction behavior intention: An application of the extended theory of planned behavior. *Journal of Cleaner Production*, 147, 603-613.
- Tonglet, M., Phillips, P., & Read, A. (2004). Using the theory of planned behaviour to investigate the determinants of recycling behaviour: A case study from Brixworth, UK. *Resources Conservation and Recycling*, 41(3), 191-214.
- Verbeke, W., & Vackier, I. (2005). Individual determinants of fish consumption: Application of the theory of planned behaviour. *Appetite*, 44(1), 67-82.
- Wang, Z., Guo, D., & Wang, X. (2016). Determinants of residents' e-waste recycling behaviour intentions: Evidence from China. *Journal of Cleaner Production*, 137, 850-860.
- Webb, D., Soutar, G., Mazzarol, T., & Saldaris, P. (2013). Self-determination theory and consumer behavioural change: Evidence from a household energy-saving behaviour study. *Journal of Environmental Psychology*, 35, 59-66.
- Yu, L., He, W., Li, G., Huang, J., & Zhu, H. (2014). The development of WEEE management and effects of the fund policy for subsidizing WEEE treating in China. *Waste Management*, 34(9), 1705-1714.
- Zhang, D., Huang, G., Yin, X., & Gong, Q. (2015). Residents' waste separation behaviors at the source: Using SEM with the theory of planned behavior in Guangzhou, China. *International Journal of Environmental Research and Public Health*, 12(8), 9475-9491.