Preliminary Study on Waste Management Behavior of University Students

การศึกษาพฤติกรรมการจัดการขยะของนักศึกษามหาวิทยาลัย

Montalee Sasananan[1*], Methas Mungtularak[1], Thikhakan Suksangwal[1], and Setta Sasananan[2]

[1]Department of Industrial Engineering, Faculty of Engineering, Thammasat University, Klongluang, Pathumthani 12121

[2]Department of Civil and Environmental Engineering, Faculty of Engineering Srinakharinwirot University, Ongkharak, Nakhonnayok, E-mail: smontalee@yahoo.com*

มณฑลี ศาสนนันทน์[1*] เมธัส มุ่งตุลารักษ์[1] ทีฆกานต์ สุขสังวาลย์[1] และ เสฏฐา ศาสนนันทน์[2]

[1]ภาควิชาวิศวกรรมอุตสาหการ คณะวิศวกรรมศาสตร์ มหาวิทยาลัยธรรมศาสตร์ อ.คลองหลวง จ.ปทุมธานี 12121

[2]ภาควิชาวิศวกรรมโยธาและสิ่งแวดล้อม คณะวิศวกรรมศาสตร์ มหาวิทยาลัยศรีนครินทรวิโรฒ อ.องครักษ์ จ.นครนายก E-mail: smontalee@yahoo.com*

Received 2 May 2020; Revised 24 Jun 2020

Accepted 25 Jun 2020; Available online 27 Jun 2020

Abstract

This article presents an overview of waste management behavior and factors affecting waste management behavior of undergraduate students at Thammasat University, Thailand. Data collection was conducted by using questionnaire survey of 265 samples. Statistics used in data analysis were percentage, mean, t-test, one-way analysis of variance, and Least Significant Difference method. The study revealed that most students had good level of understanding in waste management. The respondents engaged in waste sorting, reuse, recycling, rejection of hazardous materials, and repair at moderate level. However, waste reduction behavior was practiced at relatively high level. The hypothesis test showed that there was no significant difference in waste management behavior of male and female except for recycling. Women recycled wastes at notably larger degree than men. Social science students engaged in waste reduction at substantially higher degree than science and technology counterparts. Those in the 5th year or higher practiced waste management at significantly lower degree than students in the other years. The type of residents had substantial effect on waste management behavior. Students living at home engaged in more intensive waste management practice than those living on campus and nearby apartments. Waste management knowledge had no effect on waste segregation, reduction, and recycle. This implies that such behaviors may be induced by relatively short-term approach such as providing waste separation facilities. However, reuse/repair/rejection were significantly influenced by waste management knowledge so educational campaign should be implemented in order to enhance those types of behavior.

Keywords: Waste management behavior, waste reduction, waste segregation, waste recycle

บทคัดย่อ

บทความนี้นำเสนอภาพรวมของพฤติกรรมการจัดการขยะและปัจจัยที่มีผลต่อการจัดการขยะของนักศึกษาระดับปริญญาตรีในมหาวิทยาลัยธรรมศาสตร์ การเก็บข้อมูลกระทำโดยใช้แบบสอบถามจำนวน 265 ตัวอย่าง วิธีการวิเคราะห์ใช้ค่าร้อยละ ค่าเฉลี่ย t-test การวิเคราะห์ความแปรปรวน และวิธี Least Significant Different ผลการศึกษาแสดงให้เห็นว่านักศึกษาส่วนมากมีความรู้ในด้านการจัดการขยะโดยรวมอยู่ในระดับที่ดี เมื่อพิจารณาเฉพาะด้านพบว่าผู้ตอบแบบสอบถามมีการคัดแยกขยะ การนำกลับไปใช้ซ้ำ การรีไซเคิล การหลีกเลี่ยงวัสดุอันตราย และการซ่อมแซม อยู่ในระดับปานกลาง แต่มีพฤติกรรมลดการสร้างขยะอยู่ในระดับค่อนข้างดี จากการทดสอบสมมุติฐานพบว่าพฤติกรรมการจัดการขยะของเพศชายและเพศหญิงไม่มีความแตกต่างกันอย่างมีนัยสำคัญยกเว้นในด้านการรีไซเคิล โดยผู้หญิงมีพฤติกรรมการรีไซเคิลมากกว่าผู้ชาย เมื่อพิจารณาตามสาขาที่เรียนพบว่านักศึกษาในสายสังคมศาสตร์มีพฤติกรรมลดการสร้างขยะมากกว่านักศึกษาในสายวิทยาศาสตร์และเทคโนโลยี นักศึกษาชั้นปีที่ 5 หรือสูงกว่ามีพฤติกรรมการจัดการขยะต่ำกว่ากลุ่มอื่นๆอย่างมีนัยสำคัญ นอกจากนี้ชนิดของที่พักอาศัยยังมีผลต่อพฤติกรรมการจัดการขยะ จากการศึกษาพบว่านักศึกษาที่พักอาศัยที่บ้านมีพฤติกรรมการจัดการขยะมากกว่าผู้ที่อาศัยในหอพักของมหาวิทยาลัยและหอพักใกล้เคียงอย่างชัดเจน ในส่วนของอิทธิพลของความรู้การจัดการขยะที่มีต่อพฤติกรรม พบว่าความรู้ไม่มีผลต่อพฤติกรรมด้านการคัดแยก การลด และการรีไซเคิล ดังนั้นจึงสามารถกล่าวได้ว่าพฤติกรรมเหล่านี้สามารถสร้างขึ้นได้ด้วยวิธีการระยะสั้น เช่น การจัดให้มีถังคัดแยก อย่างไรก็ตามพฤติกรรมที่ได้รับอิทธิพลจากความรู้ในการจัดการขยะ คือ การนำไปใช้ใหม่ การซ่อมแซม และการหลีกเลี่ยงวัสดุอันตราย ดังนั้นพฤติกรรมเหล่านี้จึงควรได้รับการกระตุ้นด้วยการรณรงค์และให้ความรู้เป็นสำคัญ

คำหลัก: พฤติกรรมการจัดการขยะ การลดขยะ การคัดแยกขยะ การรีไซเคิล

1. Introduction

It has been reported that five Asian countries dump more plastics into the oceans than any other countries combined. Thailand is obviously one of them, preceeded by China, Indonesia, and Philippines (1). Such high contribution to waste problems is due to population and economic growth as well as poor waste management. Trading of plastic scraps also plays an important role. According to (2), half of the world's plastic scraps are traded on the international markets, and most of them are exported to countries with poor waste management systems.

In Thailand excessive consumption of plastics is found in all places due to the addiction to comfortable lifestyle. No controls on plastic use have been exerted up until recently. The first attempt became evident when the Minister of Natural Resource and Environment invited major retail stores to stop giving out plastic shopping bags starting from January 2020. Further attempt will be placed on community markets and small retail stores in the future.

To most Thai people, trash bin is perceived as a black hole which you can dump anything into. This coupled with poor waste management practice has created tremendous problems. In order to devise suitable policy on waste management, it is important to understand how wastes are generated and managed at every level of society. Waste management behavior at personal level can have significant impact on waste management at downstream level.

2 .Literature Review

To understand household waste management, it has been suggested that waste management behaviors should be addressed separately and the

predictors for each behavior should be explored in the relevant context. Factors influencing waste management behavior may be categorized into three groups: environmental values, situational variables, and psychological factors (3). Environmental values are the underlying attitudes toward the environment held by individuals. Those who are proenvironmental tend to be altruistic, more open to change, and feel closer to nature (4).

The second group of determinant factors are situational variables which are the variables relating to personal situation, individual characteristics (such as sociodemographics), and individual knowledge and experience. Some demographic variables which have been found to contribute to recycling attitudes and behaviors are education, age, and size of households (5). A study in Korea indicates that attitude about waste management, age, and income appear to be predictors for general waste management behavior (6). Young, female, politically liberal, well-educated with high-income, and single-family dwelling persons tend to be active in waste management activities (7). Single women are more engaged in waste separation than single men (8).

A review of literature indicates that several authors have focused on recycling behavior (9, 10, 11), and that recycle is influenced by certain situational variables. For instance, recycling behavior is influenced by opportunities, mean, and recycling information (12). A study in Vietnam reveals that home composting behavior is affected by knowledge, attitude, and available garden space (13).

The third group of factors impacting waste management behavior are psychological factors which involve personality characteristics and perceptions toward actions undertaken by individuals. From literature review, the factors contributing to waste management behavior are the degree to which waste problem is perceived to be a tangible threat to personal well-being (14, 15, 16), intrinsic motivation to act (i.e. satisfaction on environmental action) (17, 18, 19). A study of waste problem in EU reveals that attitude toward personal waste generation plays significant role in all waste management behaviors, and waste management will be performed to a greater extent if people understand that they personally contribute to waste problems (20).

Because universities tend to have better waste management system than the general communities in Thailand, a case study on waste management behavior of university students is investigated in this study. The objective is to understand the degree of activities practiced by the respondents, and to identify sociodemographic factors impacting waste management behavior. This article presents the findings under the concepts of waste segregation/ reduce/ reuse/ recycle/ reject/ repair. The outcomes may be used in devising strategies that serve to enhance positive waste management behaviors.

3. Methodology

The total population of students at Thammasat University's Rangsit Campus was 23,426. A survey of 265 undergraduate students was conducted and the respondents were divided into two categories: 13 7 students in science and technology, and 12 8 students in social science disciplines. The questionnaire consisted of three parts: general background, knowledge of waste

management, and waste management behavior. For the general background, a series of sociodemographic questions were asked, i.e. age, faculty, year of study, and type of accommodation. Knowledge of waste management was examined by using a series of true/false questions. Waste management behavior was measured in terms of waste segregation, reduction, reuse, repair, recycle, and reject.

Reliability of questionnaire was assessed by using Cronbach's Alpha coefficient. When the questionnaire was tested on 45 people, it was found that Cronbach's Alpha coefficient was 0.813, meaning that the questionnaire was reliable. (Cronbach's Alpha coefficient greater than 0.7). Inferential statistics such as t-test, ANOVA, and least significant difference method were used to identify the influence of various factors on waste management behavior. The research framework is shown in Fig .1.

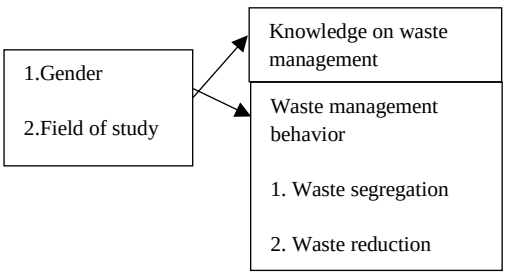

Fig. 1 Research framework

4. Results and discussion

From the survey results, the numbers of male and female respondents were approximately equal (53.2 % female, and 46.8 % female). Respondents were evenly distributed among the different years of study. Based on the types of accommodation, the majority live in off-campus apartments (54.3%), followed by on-campus residences (39.2 %). Only 6.4 % live at home.

4.1 Knowledge of waste management

To evaluate waste management knowledge, 20 close-ended questions were asked with yes/no answers. Each correct answer was given 1 point, and the amount of knowledge was assessed at three levels (0-15 points for low level knowledge, 16-17 points for intermediate level, and 18-20 for high level). The findings revealed that the majority of students had quite good level of knowledge, i.e. 39.2 % were at high level and 44.2% possessed intermediate level of waste management knowledge. More than 50% of the questions were answered correctly. The greatest number of correct answers was for the definition of wastes (99.2 %), followed by the knowledge that wood waste materials could be used as cooking fuel (98.1 %).

The largest number of misunderstandings was found in the definition of dry wastes (46.8 %) and the color of garbage bin for contaminated plastic bags (44.2 %). This shows a lack of education on waste separation which greatly affects waste management in further process. If trashes are not properly disposed of there is very good chance that it will leave the recycle stream and contaminate the environment.

4.2 Waste management behavior

Waste management behavior was ,investigated in the areas of waste segregation waste reduction, waste reuse, waste recycle, rejection of toxic materials, and repair. The questions were related to how often the respondents practiced each activity (never (0), sometimes (1), always (2)). The results are shown in Table 1.

From the table it can be seen that the behavior being practiced at high level was "waste reduction".

This is because recently the university has implemented “no plastic bag” campaign in all convenient stores on campus. Thus the students need to bring their own bags for shopping. Other waste management practices were applied at moderate level.

For waste segregation, the behavior practiced at relatively good level was dumping trash at different types of waste-sorting bins ($\bar{X}$=1.4 3).

very keen on buying refill products in order to reduce wastes ($\bar{X}$=1.29).

Waste reuse adopted most often was the use of waste paper for note making ($\bar{X}$=1.38). Sometimes students buy products in returnable packages ($\bar{X}$=1.03). Sometimes they reuse bottles for drinking water ($\bar{X}$=1.16). Even though the university encourages all students to bring their own water containers to school by giving out free containers to all freshmen, very few students carry them to school. Although free water is available in most buildings on campus, they choose to buy drinking water in single-use plastic bottles rather than fill their own containers with free water. A common problem is that when the thirst is quenched student just discard the whole bottle with remaining water in it. Some of them reuse water bottles bought from the stores during the day.

For waste recycle, it was found that respondents recycled wastes at moderate extent. They would choose to dispose bottles at disposal facility installed in all canteens rather than selling them to scrap buyers. As consumers, they sometimes choose to buy recycled products. Only a small number of them make compost out of wet wastes.

Reject behavior was moderate in all aspects such as avoidance of foam packaging, However, wastes were sorted before disposal at moderate level. This reflects the lack of discipline and comfort-loving attitude that is common among most Thais.

Waste reduction was adopted at high level especially in the choice of long-lasting products ($\bar{X}$=1.46). They would use big plastic bags rather than several small ones ($\bar{X}$=1.44). However they are not

plastic bags, and plastic products. This is because such things are used extensively in public and the alternatives are not readily available to the general consumers. Regulations can be helpful in this case. Toward the end of 2019 the university has announced a regulation on banning single-use packaging on campus. Although this regulation is followed in university canteens, cooperation seems to be quite low within the faculty offices. Single-use plastics are consumed heavily in most events. People are not eager to find more environment-friendly materials because they are more expensive and there is no penalty against violation. Therefore campaigns should be made to instill favorable attitudes towards the reduction of single-use plastic consumption

4.3 Factors affecting waste management behavior

To investigate whether waste management behavior was influenced by gender, the t-test was used at 0.05 level of significance. It was found that male and female students had no different behavior regarding waste segregation, reduce, reject, and repair. However, women recycled waste at a higher degree than men.

Regarding the fields of study, the findings revealed that science/technology students engaged in waste reduction to a significantly smaller extent than social science students. Other activities were

practiced at the same degree.

The years of study had significant influence on waste management behavior at level 0.05. When the Least-significant Difference (LSD) method was applied in multiple comparison, it was found that the first-year students practiced waste management activities at notably higher degree than other years. Year 5 or above engaged in waste management activities at lower degree than the other years. This may be because the first-year students are encouraged to join the university's waste bank as part of their coursework while the students in year 5 or above tend to spend less time at university.

Table 1 Waste management behavior

Waste segregation	Level of practice			$\bar{x}$	SD	Overall level
	Always (2)	Sometimes (1)	Never (0)			
Wastes are sorted before disposal.	51 (25.5%)	139 (69.5%)	10 (5%)	1.21	0.51	Moderate
Wastes are disposed in suitable sorting bins.	95 (47.5%)	100 (50%)	5 (2.5%)	1.43	0.54	High
Waste reduction behavior						
You prefer durable and long-lasting products.	103(51.5%)	92 (46%)	5 (2.5%)	1.46	0.54	High
One large plastic bag is used instead of several small ones.	90 (45%)	110 (55%)	0	1.44	0.50	High
You purchase refill products in order to reduce wastes.	71 (35.5%)	117 (58.5%)	12 (6%)	1.29	0.56	Moderate
Waste reuse behavior						
You choose products whose package must be returned to manufacturers such as drinking bottles	41 (20.5%)	115 (57.5%)	44 (22%)	1.03	0.64	Moderate
You reuse bottles.	53 (26.5%)	131 (65.5%)	16 (8%)	1.16	0.56	Moderate
You reuse paper as scrapbook.	87 (43.5%)	103 (51.5%)	10 (5%)	1.38	0.56	High
Waste recycle behavior						
You collect used bottles for sales to scrap buyers.	44 (22%)	133 (66.5%)	23(11.5%)	1.10	0.56	Moderate
You use recycled products.	67 (33.5%)	107 (53.5%)	26 (13%)	1.17	0.65	Moderate
You make compost out of wet wastes.	19 (9.5%)	54 (27%)	127 (63.5%)	0.46	0.66	Low
Reject behavior						
You avoid foam packaging.	30 (15%)	152 (76%)	18 (9%)	1.06	0.48	Moderate
You avoid plastic bags.	31(15.5%)	146 (73%)	23(11.5%)	1.06	0.50	Moderate
You avoid plastic products in order to reduce environmental problems.	31 (15.5%)	148 (74%)	21 (10.5%)	1.07	0.51	Moderate
Repair behavior						
You fix broken stuff instead of replacing with a new one.	50 (25%)	137 (68.5%)	13 (65%)	1.20	0.53	Moderate
You usually utilize scrap materials for other advantage.	21 (10.5%)	115 (57.5%)	64 (32%)	0.80	0.62	Moderate

The type of accommodation had significant impact on waste management behavior, except for waste reduction. Regardless of where they live, the respondents practiced waste reduction at relatively high level. The other dimensions of waste management behavior are influenced by the type of accommodation. Those living at home practiced waste segregation, reuse, recycle, rejection, and repair at much greater degree than those living on and off-campus. This is unexpected because it was initially assumed that waste management behavior would be better at university due to its established waste management system.

Explanation to this finding may be found in the literature. The number of family members and the length of stay are positively correlated to waste management behavior (21, 22). People living at home tend to have greater sense of ownership, leading to greater sense of responsibility.

However, studies in developed countries have revealed that apartment residents generate the most amount of recycling followed by single houses (23, 24). This conflicting finding may be attributed to the lack of systematic waste management system in developing countries thus indiscriminate disposal is common in apartment buildings in Thailand.

Further investigation was carried out to study the correlation between waste management knowledge and behavior. It was found that waste management knowledge had no effect on waste segregation, waste reduction, and waste recycle at 0.05 level of significance. Thus it would be possible to enforce such behavior through short-term approach such as providing suitable waste management facilities. This is congruent with several studies, i.e. the chance of pro-environmental behaviors being executed increases with the convenience of performing those actions. For instance, installation of sorting equipment in households dramatically increase waste sorting (25, 26, 27). Accessibility of recycle bins has strong impact on recycling behavior (28). However, this does not undermine the importance of awareness-based approach as Sidique et al. (2010) pointed out that raising awareness on recycling through training motivated individuals to adopt recycling behavior (29).

On the other hand, behaviors such as waste reuse, repair, and rejection of hazardous materials were significantly influenced by waste management knowledge and underlying environmental values. Therefore, it is important to focus on knowledge and awareness-based campaign in order to manage these types of behaviors.

5. Conclusion

This study investigated student demographic factors influencing waste management behavior as well as the degree to which waste management was practiced by the respondents. The findings revealed that the respondents engaged in waste management at a moderate degree. Factors influencing waste management behavior were also explored. It was found that different types of behavior were influenced by different factors. Thus various approaches are needed to manage each behavior effectively.

The findings from this study have significant policy implications. It can be helpful in policy planning and implementation involving waste management. Further studies could be done in detail on each particular behavior and on other issues such as the correlation between waste management attitude and actual practice. This could help to ensure more sustainable outcome in the future.

6. References

[1] Hannah L., "Five Asian countries dump more plastic into oceans than anyone else combined: how you can help", Forbes, April 28, 2018

[2] Wheeling K., "The EPA blames six Asian nations that the U.S. exports plastic waste to for ocean pollution", Pacific Standard, July 15, 2019

[3] Barr S., "Factors influencing environmental attitudes and behaviors: A U.K. case study of household waste management", Environment and Behavior, 39, 2007, 435-473

[4] Stern P. C., Dietz T., Guagnano GA., "The new ecological paradigm in social psychological context", Environment and Behavior, 27, 1995, 723-743

[5] Sidique S.F., Lupi F., Joshi S.V., "The effects of behavior and attitudes on drop-off recycling activities", Resource, Conservation and Recycling, 54, 2010, 163-170

[6] Seunghae L., Paik H. S., "Korean household waste management and recycling behavior", Building and Environment, 46 (5), 2019, 1159-1166

[7] Barr S., Gilg A. W., Ford N. J., "Differences between household waste reduction, reuse and recycling behavior: A study of reported behaviours, intentions and explanatory variables", Journal of Environmental and Waste Management, 4, 2001, 1-14

[8] Pettifor H., "Patterns of household practice: An examination into the relationship between housework and waste separation for households in the United Kingdom", ISER Working Paper Series, 2012, 2012-14

[9] Miafodzyeva S., Brandt N., "Recycling behaviour among householders: synthesizing determinants via a meta-analysis", Waste and Biomass Valorization, 4, 2013, 221-235

[10] Schwab N., Harton H. C., Cullum J. G., "The effects of emergent norms and attitudes on recycling behavior", Environment and Behavior, 46, 2014, 403-422

[11] Derksen I., Gartell J., "The social context of recycling", American Sociological Review, 58, 1993, 434-442

[12] Tonglet M., Phillips P.S., Read A.D., "Using the theory of planned behavior to investigate the determinants of recycling behavior: a case study from Brixworth, UK" Resource, Conservation and Recycling, 41, 2004, 191-214

[13] Loan L.T.T., Takahashi Y., Nomura H., Yabe M. "Modeling home composting behavior toward sustainable municipal organic waste management at the source in developing countries", Resources, Conservation and Recycling, 140, 2019, 65-71

[14] Baldassare M., Katz C., "The personal threat of environmental problems as predictor of environmental practices", Environment and Behavior, 24, 1992, 602-616

[15] Steel B.S., "Thinking globally, acting locally? Environmental attitudes, behavior and activism", Journal of Environmental Management, 47, 1996, 27-36

[16] Segun C., Pelletier L.G., Hunsley J., "Toward a model of environmental activism", Environment and Behavior, 30, 1998, 628-652

[17] De Young R., “Some psychological aspects of recycling: the structure of conservation satisfactions”, Environment and Behavior, 18, 1986, 435-449

[18] Gamba R.J., Oskamp S., “Factors influencing community residents’ participation in commingled curbside recycling programs”, Environment and Behavior, 26, 1994, 587-612

[19] McKenzie-Mohr D., Oskamp S. , “Psychology and sustainability: An introduction”, Journal of Social Issues, 51(4), 1995, 1-14

[20] Minelgaitė A. and Liobikienė G., “Waste problem in European Union and its influence on waste management behaviours”, Science of the Total Environment, 667, 2019, 86-93

[21] Suntree J., Study of factors relating to environmental conservation behavior of Pathomasoke villagers, Nakhon Pathom Province [Master’s Thesis]. Mahidol University 1988 (In Thai)

[22] Padilla A.J. and Trujillo J.C., “Waste disposal and households’ heterogeneity. Identifying factors shaping attitudes towards source-separated recycling in Bogotá, Colombia”, Waste Management, 74, 2018, 16-33

[23] Yi G., Lee J, Hong W., “A study on the discharge properties and a unit of municipal solid wastes in residential area types: case study of Taegu City”, Proceedings of Annual Conference of the Architecture Institute of Korea 2000. Seoul, Korea

[24] Park J., Park S., Kwon G., “Generation characteristics of residential wastes according to house types by separated collection of food waste – in case of Kyungju City”, Korean Solid Wastes Engineering Society, 17 (2), 2000, 166-76

[25] Schultz P.W., “Strategies for promoting proenvironmental behavior”, European Psychologist, 19, 2014, 107-117.

[26] Mintz K.K., Henn L, Park J., Kurman J., “What predicts household waste management behaviors? Culture and type of behavior as moderators”, Resources, conservation & recycling, 145, 2019, 11-18

[27] Bernstad A. “Household food waste separation behavior and the importance of convenience”, Waste Management, 34(7), 2014, 1317-1323

[28] Kaiser F.G. and Wilson M., “Assessing People’s General Ecological Behavior: A Cross-Cultural Measure”, Journal of Applied Social Psychology, 30 (5), 2006, 952-978

[29] Sidique S.F., Joshi S.V., Lupi F., “Factors influencing the rate of recycling: an analysis of Minnesota countries”, Resource, conservation and recycling, 54, 2010, 242–249