

Waste Management Behaviors and Waste Management Approaches with Community Participation in Ubon Ratchathani City Municipality, Ubon Ratchathani Province

Piyakanit Chotivanich^{a*}

Irada Phorncharoen^b

Adunyadet Tankaeo^c

Article Info Received 28 August 2021 Revised 30 August 2021 Accepted 31 August 2021 Available online 31 August 2021

^aAssociate Professor, Dr., Doctor of Human Resource Management Innovation

Program, Faculty of Business and Management, Ubon Ratchathani Rajabhat University, E-mail: piyakanit.c@ubru.ac.th

^bAssistant Professor, PhD., Doctor of General Management Program,

Faculty of Business and Management, Ubon Ratchathani Rajabhat University, E-mail: irada.p@ubru.ac.th

^cAssistant Professor, Teacher of Business Data Analysis Program,

Faculty of Business and Management, Ubon Ratchathani Rajabhat University, E-mail: adunyadet.t@ubru.ac.th

Abstract

This research aims to investigate the relationship between people behaviors and waste management approaches with community participations in Ubon Ratchathani municipality, Ubon Ratchathani province, and to create waste management guidelines in which the communities in the municipality could participate. The research samples were 400 people from 106 communities in Ubon Ratchathani City Municipality selected by accidental and convenience sampling. It is a qualitative research design by using a questionnaire and interviewing 12 key informants. The results found that reduction of waste management behavior, reusing and recycling behaviors were at proper management. The centralized waste management system and waste-to-energy system were influenced by reducing and reusing behaviors. The communities in Ubon Ratchathani City Municipality participated in waste management by many aspects, for instance using fabric tote bags rather than plastic bags, sustainable containers instead of polystyrene containers, and minimizing the use of any products that cause global warming. Reusing was used instead of replacing single-use plastic bags with reusable containers, and using both sides of pieces of paper. Recycling use for recycling boxes and bags, fermenting organic waste, and purchasing recyclable products and products made from recycled materials. The proper waste management refers to solid waste disposal by sanitary landfill without creating nuisances or hazards to public health, solidified and stabilized waste disposal properly. The centralized waste management utilized both modern machinery and human labor for waste management system, landfill is restricted to sanitation laws, and odor and water treatments are used to ensure a quality surrounding project environment. Waste-to-energy is converting waste to fuel, and fermentation is used for making biogas. Responsibility and community participation could suggestion waste segregation and recycling activities. Waste-to-energy innovations such as gasification and pyrolysis are energy-intensive processes that attempt to reduce the volume of waste by converting it into synthetic gas or oil and upcycling innovation could extract value from bio-waste which is suitable for Thailand context.

Keywords: Waste Management Behaviors, Waste Management Approaches, Community Participation

Introduction

National Solid Waste Management Master Plan (2016-2021), (from training documents of the course “Fukuoka method, the semi-aerobic landfill technology” by Wijarn Simachaya (2016), director-general of the pollution control department), has explained the objectives of the plan as follows: 1) framework and direction for solving national solid and hazardous waste management problems; 2) concept of integrated solid and hazardous waste management between government agencies, private sectors, and public sectors; and 3) provinces and local government organizations provide an efficient provincial solid waste action plan that is competent for conditioned problem. The concept of the plan has essence of the 3Rs principle: Reduce, Reuse, and Recycle. The goals of proper and centralized waste management, Waste-to-Energy, responsibility and community participation plan are: 1) not less than 75% of 19.6 million tons of community solid waste should be properly managed within 2021; 2) 100% of 30.5 million tons of abandoned solid waste should be properly managed within 2019; 3) 100% of 170 thousand tons of community hazardous waste should be collected and disposed within 2021; 4) 100% of 50 thousand tons of infectious waste would be managed properly within 2020; 5) 100% of 2.06 million tons of hazardous industrial waste must enter a management system within 2020; and 6) 50% of 3,889 local government organizations has sorted and separated waste from the community source within 2021. There are 3 measures: 1) reduction measures in solid and hazardous waste production at its origin by lowering production, sorting, and reusing, producing and consuming environmentally friendly products and services; 2) improve solid waste and hazardous waste management measures by local authorities/provinces collect, transport and dispose waste before providing a total waste disposal center as cluster, provide proper technology to establish locations for community hazardous waste, industrial hazardous waste and infectious waste, and implement the legislation and regulations; and 3) promote waste management measure by initiate a referral program starting from the youth. Provide education about waste treatment and disposal technology in communities. Furthermore, database system should be developed for efficient management and cognizant using economic and social mechanisms should be created. The participation from all sectors includes: 1) local government agencies readiness; 2) laws and regulations for effective operation; 3) Ministry of Public Health enacts the centralized management of infectious waste; 4) Ministry of Industry enacts factories into hazardous industrial waste management system; 5) authorize government allocates fund and private sectors investment; 6) monitor and supervising management according to National Solid Waste Management Master Plan and action plans.

Waste management is a nationwide issue. The Pollution Control Department of the Ministry of Natural Resources and Environments reported about pollution situation in 2020 that Thailand had 27.8 million tons of waste, an average of 1.15 kilograms per person per day, as shown in figure 1 (Kapook.com, 2020):

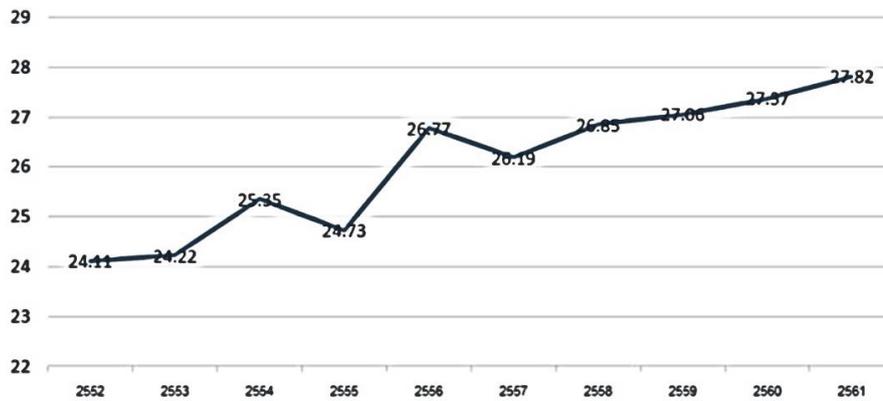


Figure 1: Amount of waste from 2009- 2018
Source: (Kapook.com, 2020)

From figure 1, the waste in Thailand has been increasing since the last decade. Waste has been produced by materials used from daily life that were consumed and expenditures made, for example food scraps, polystyrene boxes, plastic bottles, paper, etc. However, segregation of waste materials can produce fertilizer, feed animals, and even generate electricity. The total amount of waste in 2018 was 27.82 million tons: 10.88 million tons were disposed properly, 9.58 million tons were reused, but 7.36 million tons were treated poorly leading to many complications, for instance infections, soil and water contaminations, pollutions, environmental conditions, odors, dust, and smoke which led to unbearable and unpleasant scenery. The causes for the rapid growth in the quantity of waste were: 1) population growth increased consumption and surplus waste; 2) improper waste disposed from household such as dumping on wasteland, burning outdoor, washed or blown into the ocean, all of which caused more waste and issues; 3) low reuse and recycling have been encouraged by many organizations, but few wastes had been recycled. For example, in 2018, only 9.58 million tons of waste were recycled out of the total amount 27.82 million tons. The top 10 provinces that have the highest amount of waste in the country are shown in the following table.

Table 1: The top 10 provinces that have the highest amount of waste in the country

Ranking	Province	Amount (tons per day)
1	Bangkok	13,240
2	Chonburi	2,591
3	Nakhon Ratchasima	2,480
4	Samut Prakan	2,449
5	KhonKaen	1,847
6	Ubon Ratchathani	1,800
7	Nonthaburi	1,691
8	Pathum Thani	1,690
9	Songkhla	1,656
10	Chiang Mai	1,655

Source: (Kapook.com, 2020)

Table 1 shows that large cities with industrial estates and tourism had produced large amount of the waste. Bangkok produced the highest amount of waste at 13,240 tons per day, the second largest amount from the table was Chonburi at 2,591 tons per day, and the third was Nakorn Ratchasrimea at 2,480 tons per day. Ubon Ratchathatni at sixth with the amount of 1,800 tons per day. Ubon Rattchthani has composed the provincial action plans to assign policies and directions for community solid waste management, called “Changwad Sa-ard” (meaning Clean Province). This “Clean Province” has been targeting indicators and expanding results to be operated at a district, local government organization, village, and community level by organizing knowledge exchanges on solid waste management between local government organizations within the province and with other provinces, alleged Best Practice project. The office of Natural Resources and Environment, Ubon Ratchathani province had managed observation programs as stated in cooperation projects to supervise and monitor the implementation of the solid waste and hazardous waste management plan for Ubon Ratchathani in fiscal year 2018. They expected the project would influence any notions to efficient development (Office of Natural Resources and Environment, Ubon Ratchathani province, 2020). The total area of Ubon Ratchatani is 15,774 square kilometers, divided into 25 districts, 239 local government organizations, containing 1 city municipality, 4 town municipalities, 54 subdistrict municipalities, and 179 subdistrict administrative organizations (SAO). The population of the province in 2018 was 82,718. The total amount of waste was 158.34 tons per day generated in the service area, waste collected for disposal 155 tons per day which was utilized 16.50 tons per day, disposed and landfilled 138.50 tons per day. The most population was in Ubon Ratchathani Municipality for 82,718 people, the second was KhamYai Subdistrict Municipality for 32,683 people, and the third was Warin Chamrap Town Municipality for 28,748 people (Pollution Control Department, 2019). Based on the foregoing statements, researchers undertake a study on the relationship between people behaviors and waste management approach with community participations in Ubon Ratchathani Municipality area to create a guideline for waste management that contains the 3Rs principle (Reduce, Reuse, and Recycle), centralized waste management, Waste-to-Energy, responsibility, and participation from all sectors according to the National Solid Waste Management Master Plan.

The objectives of this research were to investigate the aspects of waste management in Ubon Ratchathani Municipality area: people behaviors, community participation, and relationship between people behaviors and waste management approach, and to create community participation following the waste management guideline.

Research Methodology

The population for this study was 79,978 people of 106 communities in Ubon Ratchathani Municipality, Ubon Ratchathani province (Ubon Ratchathani Municipality Office, 2021). The sample group were 384 people at 95 percent confidential level. Considering the chances of loss of questionnaires, the researcher decided to use 400 people as the samples for the study for greater reliability in evaluation and data analysis. The samples were selected by accidental sampling and convenience sampling from volunteer people to respond to the survey in the municipality. The researcher created, determined, and verified the consistency of the research tool by having three experts to check the questionnaire for content validity and Index of Objective Congruence (IOC). The researcher improved the questionnaire in order to have content consistency and the IOC value should be as close to 1 as possible. The researcher set the corresponding value at 0.6 or higher since this value was sufficient and statistically acceptable (Wuthichat Soonthornsamai, 2009).

As to have a qualitative study, 12 key informants being community leaders and members, municipality representatives, representatives from the Office of Natural Resources and Environment, Ubon Ratchathani province were interviewed using semi-structure for in-dept interview to supplement the information to the study.

The data collected from the questionnaire were analyzed and evaluated its reliability by software application using Alpha-Coefficient method (Boonchom Srisaard, 2002, 99-101).

Research Finding

Quantitative research aspect

An analysis of the behaviors affecting community participation in waste management in Ubon Ratchathani municipality, Ubon Ratchathani province started from testing the preliminary properties of the variables by analyzing the correlation coefficient between the suitable variables, and analyzing the influence of the primary and dependent variables. The results are as follows.

Table 2: Internal correlation coefficient between variables

	A	B	C	D	E	F
A	-	.439**	.434**	.475**	.328**	.321**
B	-	-	.438**	.414**	.255**	.242**
C	-	-	-	.355**	.119*	.150**
D	-	-	-	-	.535**	.479**
E	-	-	-	-	-	.702**
F	-	-	-	-	-	-

As shown in table 2, correlation coefficient between waste management behavior variables (Reduce, Reuse, Recycle) affecting community participation in waste management (appropriate management system, centralized management system, Waste-to-Energy) in Ubon Ratchathani City Municipality has a correlation between the variables from ascending equal to .119 - .702. These values do not exceed .800 which is in an acceptable range. This Multi collinearity is considered exceptional data and could be used for analyzing multiple regression.

Table 3: Multiple regression analysis of behaviors affecting community participation in waste management in Ubon Ratchathani Municipality

Correlation			Unstandardized		Standardi zed	t	p	R ²
			B	S.E.	Beta			
A	⇒	D	.355	.054	.328	6.515***	.000	.391
B	⇒		.213	.049	.219	4.335***	.000	
C	⇒		.113	.048	.117	2.334*	.020	
A	⇒	E	.360	.069	.291	5.227***	.000	.368
B	⇒		.179	.062	.161	2.881**	.004	
C	⇒		-.085	.061	-.077	-1.388	.165	
A	⇒	F	.349	.071	.274	4.892***	.000	.298
B	⇒		.153	.064	.134	2.379*	.017	
C	⇒		-.031	.063	-.028	-.497	.619	

As shown in table 3, a multiple regression analysis of behaviors affecting community participation in waste management in Ubon Ratchathani Municipality showed that 3Rs (Reduce, Reuse, and Recycle) behaviors could predict the community participation in proper management system at 39.1 percent. Reduce and Reuse behaviors affected community participation in appropriated management system by statistically significant at level .000. Recycle behavior determined community participation in a proper management system by statistically significant at level .01.

In term of community participation in centralized waste management, it was affected by 3Rs behaviors at 36.80 percent. Reduce behavior had statistically significant at level .000. Reuse behavior had statistically significant at level .05.

Considering community participation in Waste-to-Energy waste management, it was affected by 3Rs behaviors at 29.80 percent. Reduce behavior had statistically significant at level .000. Reuse behavior had statistically significant at level .05.

The data and correlation of variables could be illustrated multiple regression equations of waste management behaviors affecting community participation in waste management in Ubon Ratchathani Municipality, Ubon Ratchathani province as shown below:

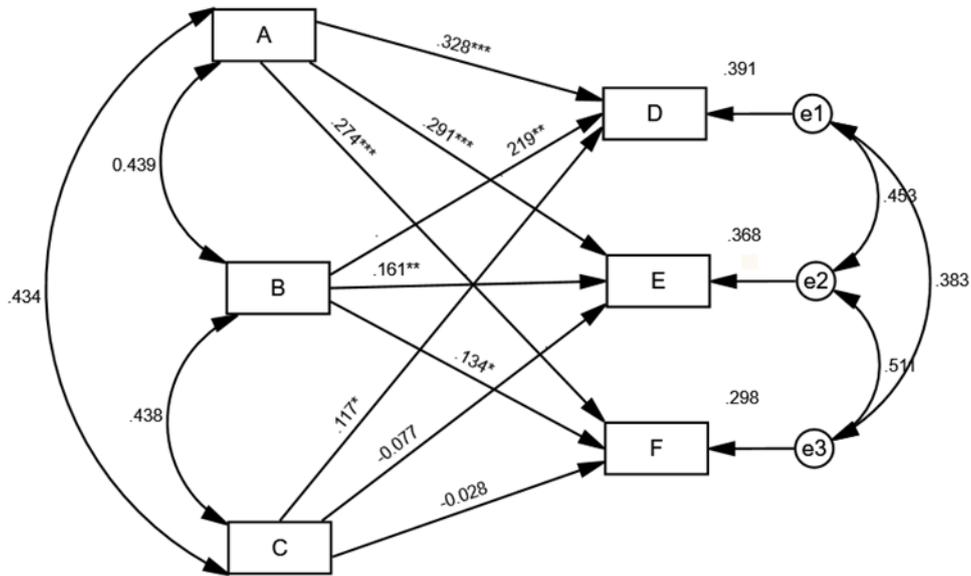


Figure 2: Multiple regression equations of waste management behaviors affecting community participation in waste management in Ubon Ratchathani Municipality, Ubon Ratchathani province

Regression equation in form of standard number

$$Z \text{ (appropriated management system)} = .328(\text{Reduce}) + .219(\text{Reuse}) + .117(\text{Recycle})$$

This equation could be interpreted as per below:

Whenever Reduce behavior is increasing 1 unit, proper management system is increasing .328 unit if other variable values are fixed.

Whenever Reuse behavior is increasing 1 unit, proper management system is increasing .219 unit if other variable values are fixed.

Whenever Recycle behavior is increasing 1 unit, proper management system is increasing .117 unit if other variable values are fixed.

$$Z \text{ (centralized management system)} = .291(\text{Reduce}) + .161(\text{Reuse})$$

This equation could be interpreted as per below:

Whenever Reduce behavior is increasing 1 unit, centralized management system is increasing .291 unit if other variable values are fixed.

Whenever Reuse behavior is increasing 1 unit, centralized management system is increasing .161 unit if other variable values are fixed.

$$Z \text{ (Waste-to-Energy management system)} = .274(\text{Reduce}) + .134(\text{Reuse})$$

This equation could be interpreted as per below:

Whenever Reduce behavior is increasing 1 unit, Waste-to-Energy management system is increasing .274 unit if other variable values are fixed.

Whenever Reuse behavior is increasing 1 unit, Waste-to-Energy management system is increasing .134 unit if other variable values are fixed.

Qualitative research aspect

Key informants showed that the most common reuse behaviors were bringing back any stuffs and using it again; for example, using cleaned glass bottles to refill drinks and lime juice for refrigerator, putting things like pen and nuts in bottles, planting trees in both water and soil cultivation. Using plastic bottles for storages and decorations. Wood materials, for example wooden crates, could be used for storages. Baskets could be used for fruit or replacing handbags, paper boxes for container, worn tires for trees and vegetables planting.

The most common reduce behaviors are cutting down plastic bags and bringing cloth bags when go shopping outside houses. Minimizing the purchase of plastic products or products causing excessive waste. Informing family members to acquire products generating the least amount of waste.

The most common Recycle behaviors are meriting activities such as donating bottles caps, plastics caps, aluminum ring to make prosthetic legs, beds for patients, and desks for little children.

Proper waste management include sorting waste before disposing, separating hazardous waste (fluorescent bulbs, spray paint cans, batteries, infected waste), discussing and exchanging ideas about segregation of waste among neighbors before disposing, arranging community wet garbage bins for making fertilizer.

Suggestions for waste management approaches with community participation in Ubon Ratchathani Municipality, Ubon Ratchathani province are follows:

1. Reduce

- Using cloth bags as a substitute of plastic bags.
- Using sustainable containers instead of polystyrene boxes.
- Minimizing use of products that cause global warming.

2. Reuse

- Fabric tote bags and baskets are better than plastic bags for storing any purchase.
- Paper should be used both sides.
- Reusable containers.
- Reusable plastic bags.

3. Recycle

- Recycling paper to paper boxes and bags.
- Organic waste could be used for producing fertilizer.
- Purchasing recyclable products and products made from recycled materials.
- Plastic drinking cups could be washed and reused.

4. Proper waste management

- Properly landfilling solid and non-hazardous waste according to sanitation laws.
- Hazardous waste is neutralized and landfilled in proper area.
- Disposing waste in correct bins.

5. Centralized waste management
 - Utilizing both modern machinery and human labor for waste management system.
 - Landfill is restricted to sanitation laws.
 - Odor and water treatments utilize to ensure a quality surrounding project environment.
6. Waste-to-Energy
 - Using gasification process to turn waste to fuel gas.
 - Using fermentation to decompose organic compounds (starch, sugar, cellulose, etc.) by bacteria in anaerobic condition.
7. Responsibility and participation from all sectors
 - Suggesting neighbors to sort waste before disposing to reduce the amount of waste.
 - Engaging in community activities about separating reusable waste before disposing.
8. Waste management innovations
 - Turning plastic waste to energy. This could be fascinating innovation to turn abundant of plastic waste into many forms of energies, heat and electricity, for example.
 - Upcycling innovation could be vital part in a plastic recycling process of Thailand. This is suitable for Thailand context and inaugurates value-added.

Discussion/Conclusion

Reduce, reuse, and recycle behaviors of people have been influencing community participation in proper waste management. Reduce and reuse behaviors of people have been influencing community participation in centralized waste management and Waste-to-Energy. The waste management approaches with community participation on reducing is to use fabric bags instead of plastic bags, reusable containers instead of polystyrene boxes, and minimize using products causing global warming. Reusing by using fabric bags or baskets storing goods instead of plastic bags, use both sides of paper, using reusable containers and plastic bags. Recycling is to recycle paper waste, for instance paper boxes and bags, fertilizing organic waste, purchasing recyclable products and products made from recycled materials, washing and reusing plastic drinking cups. Proper waste management is proper landfill, treat solid and non-hazardous waste in accordance with sanitation laws, hazardous waste is neutralized and landfilled in proper area. Centralized waste management is utilizing both modern machinery and human labor for waste management system, odor and water treatments are used to ensure a quality surrounding project environment. Waste-to-Energy is using a gasification process to turn waste to fuel gas, and using fermentation to decompose organic compounds (starch, sugar, cellulose, etc.) by bacteria in anaerobic condition. Responsibility and participation from all sectors are suggesting neighbors to sort waste before disposing to reduce amount of waste and engaging in community activities about separating reusable waste before disposing. Waste management innovations are turning abundant of plastic waste into many forms of energies, upcycling innovation that could be vital part and suitable to Thailand context and inaugurating value-added as stated in the study of Phisak Kalayanamit and Wachirawat Ngamlamom (2018) as shown below:

- 1) The local community waste reusing and sorting should omit or minimize consumption of certain things and reuse various products or resources.
- 2) Waste management problems from local government organizations found that they should lower the amount of solid waste, organize campaign for participation in recycling system, logistics, and mixed disposal system.
- 3) The recommendations are as follows:
 - 3.1) encourage people on reducing amount of waste.
 - 3.2) organize cooperation network between local government organizations.
 - 3.3) stimulate local organizations to prepare for management plans in both short term and long term.
 - 3.4) establish policies and regulations for local waste management.
 - 3.5) construct standard for waste disposal factories.

A study by Teerawan Boontosaeng, et al (2017) was to investigate the knowledge, attitudes and behaviors about waste management in Nanglae-Nai, Nanglae Sub District, Muang district, Chiang Rai province by comparing two groups of villagers, one is villagers living in the lowlands, and the other is Akha and Lahu ethnic villagers living in highlands. Villagers had more knowledge of types of waste and harmful materials than ethnic villagers. On the other hand, they shared the same knowledge about waste management, which is at fair level. Both had the same attitudes about waste problems, waste management, information, obstructions, community waste management, and community waste participation in the same direction. There were some behaviors found more in villagers than ethnic villagers, except that the ethnic villagers had suggestion to reduce waste than villagers. Aside from that recycling waste by selling metal waste, separating wet and dry waste, sorting bulbs and batteries, sorting plastic waste. Lastly, ethnic villagers had more participation in creating community waste disposal methods.

A study by Haroon Mumumadalee (2018) on garbage management model in Bangkok Metropolitan area had shown as follows: 1) current situation and problematic conditions of development of environmental quality case study: waste management in Bangkok metropolitan area applied waste management policy. Accelerated development emphasizes people's participation in the reduction of 3Rs; 2) Factors affecting the development of environmental quality: a case study of solid waste management in Bangkok area. Focus on adding environmental management legal measures to manage solid waste, develop plan involved in waste management, zero waste management to concrete practice; and 3) Suggestions to improve factors affecting environmental quality development in the case study of waste management in Bangkok area. The government should tackle the problem of solid waste based on the guidelines as follows: creating consciousness in waste management, participation in waste management, establishing a waste management learning center, providing a prototype area for waste reduction in Bangkok area and developing an innovation system on trash management.

A study by Patthayapon Aunrod (2021) on good practices in participatory waste management of Wiang Thoeng subdistrict municipality, Thoeng district, Chiang Rai province – Crisis Management Processes that created good practice or success factors include:

- 1) Chief executives of local administration should deliver the importance, support, and cooperate.
- 2) Local officers and municipal clerks working along with executive policies.
- 3) Collaboration in workplace should aim at the same goal: sustainable local waste management.
- 4) Organizing and monitoring projects to encourage waste reduction and segregation from the origin.
- 5) Creating learning resources about waste management.
- 6) Government agencies support network from educational institutions and private sectors.
- 7) Database system that could provide data to communities.
- 8) Legitimate and continue improvement in local policies.

Suggestions

Reduce, reuse, and recycle behaviors of people have influenced community participation in the proper waste management. The reduction and reuse behaviors have influenced community participation in centralized waste management and Waste-to-Energy. The waste management approaches of community participation in Ubon Ratchathani municipality, Ubon Ratchathani province consisted many aspects: reduce, reuse, recycle, proper waste management, centralized waste management, waste-to-energy, responsibility and participation from all sectors. Waste management innovations should focus on collaboration and connection with other networks and agencies to expand the results of proper waste management in both former and new groups. Activities should be organized to promote reduce, reuse, recycle in order to achieve consistent and sustainable results.

References

- Boonchom Srisa-ard. (2002). *Basic Research*, (7th ed.). Bangkok: Suweeriyasan.
- Haroon Mumumadalee. (2018). Garbage Management Model in Bangkok Metropolitan Administration Area. *Rangsit Graduate Studies Journal in Business and Social Sciences*, 4(2), 297-314.
- Kapook.com. (2020). *Garbage, the villain of human hands, reduce simple just well separated before disposal*. Energy Regulatory Commission, Power Development Fund, 2019. Retrieved April 19, 2021, from <https://erc.kapook.com/article01.php>
- Patthayapon Aunrod. (2021). *Good practices in participatory waste management of Wiang Thoeng Sub-District Municipality*. Thoeng District, Chiang Rai Province.
- Phisak Kalayanamit and Wachirawat Ngamlamom. (2018). Development Guidelines of Solid Waste Management in Local Government. *Praewa Kalasin Academic Journal*, 5(1), 172-193.

-
- Pollution Control Department, (2019). Handbook of practices for reducing and separating solid waste in government agencies. Retrieved April 19, 2021, from <http://e-report.pcd.go.th/pcd-erw/web/uploads/content/files/5df70be37e8f1.pdf>
- Teerawan Boontosaeng, et al. (2017). Knowledge, Attitudes and Behaviors about Waste Management in Nanglae-Nai, Nanglae Subdistrict, Muang District, Chiang Rai Province. *Kasalongkham Research Journal Chiang Rai Rajabhat University*, 11(3), 369-378.
- Ubon Ratchathani City Municipality Office. (2021). *Population in Ubon Ratchathani City Municipality, January 31st, 2021*. Retrieved April 1, 2021, from <http://www.cityub.go.th/New2017/index.php/2016-12-14-08-29-54/3081>
- Wijarn Simachaya. (2016). *The National Solid Waste Management Master Plan (2016-2021)*.
- Wuthichat Soonthornsamai. (2009). *Marketing Research and Marketing Information Systems*. Bangkok: Technology Promotion Association (Thailand-Japan).
-