

The Development of Waste Management: The Case Study of Maemok Municipality, Thailand

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Abstract

This research aimed to analyze the factors affecting the development of municipality waste management and the causal relationship of the factors affecting the development of waste management of Maemok Municipality, Thoen District, Lampang Province. Data were collected from 156 households participating in the waste management development project. The independent variables consisted of participatory behavior in waste management, awareness in waste management, technology choices in waste management, government regulations and enforcement, leadership and having responsible organizations. The dependent variable was the development of waste management. The instrument used to collect data was a questionnaire. Data were analyzed by mean, standard deviation and multiple regression analysis. According to the analysis using the stepwise method to analyze six independent variables influencing the development of waste management with the statistically significant level of .05, it was found that all independent variables, including participatory behavior in waste management, awareness in waste management, technology choices in waste management, government regulations and enforcement, leadership and having responsible organizations could explain the variation of waste management development at 57.50% ($R^2 = .331$). The results also showed that there were only two independent variables that had statistically significant influence: awareness in waste management and technology choices in waste management.

Keywords: Waste, Waste Management, Waste Management Development

Introduction

Solid waste is an important issue both at the community and national levels. It is a national agenda that must be solved by the collaboration of all sectors in the country urgently. This problem must be solved completely from the sources of the problem. Based on the current situation of solid waste, the tendency of the amount of solid waste in the country is increasing every year. The solid waste generation rate in the country is also increasing. In 2016, the amount of solid waste generated in Thailand was 27.06 million tons, considered as 1.14 kg / person / day, as shown in Table 1.

Table 1 Amount and rate of solid waste generated in 2008 - 2016²

Years	Amount solid waste (million tons)	Solid waste generation rate (kg / person / day)
2008	23.93	1.03
2009	24.11	1.04
2010	24.22	1.04
2011	25.35	1.08
2012	24.73	1.05
2013	26.77	1.15
2014	26.19	1.11
2015	26.85	1.13
2016	27.06	1.14

Source: Pollution Control Department (2017a)

From the situation in the past, it can be seen that the incidence of solid waste was rising every year. At the same time, the amount of waste that was being disposed of and the rate of waste used were slightly increasing. Crisis of solid waste is one of the environmental problems that must be solved urgently because it is an intensified problem. The amount of waste is increasing and waste disposal facility operated incorrectly still has not been improved. In addition, the urban society is expanding due to increasing population. Economic and social development and technology also result in the increase of consumption which causes the increasing amount of waste in the city. For the effects of waste, in addition to the problems of smell causing a nuisance to the community, organic waste is also the cause of diseases and disease-carrying animals. It also affects the environment and public health (Pollution Control Department, 2017a).

Lampang Province is located in the northern part of Thailand. The area is about 12,533,961 square kilometer. It is the 5th largest province in the North of Thailand after Chiang Mai, Tak, Mae Hong Son and Phetchabun. According to the situation of waste problem in Lampang Province, it is Thailand's 41st leading residual waste crisis with 43,317 tons of residual waste. It was also ranked as Thailand's 47th province with a crisis of solid waste management problem.

Maemok Municipality, Thoen District, Lampang Province consists of 10 villages: Moo 1, Ban Hua Nam; Moo 2, Ban Maemok Klang; Moo 3, Ban Khum Neng Tai; Moo 4, Ban Sapan Hin; Moo 5, Ban San Pa Mon; Moo 6, Ban Maemok Tai; Moo 7, Ban Den Udom; Moo 8, Ban Thung Koh Luang; Moo 9, Ban Hua Nam Pattana and Moo 10, Ban Sapan Hin Pattana. Maemok Municipality is required to carry out proactive projects to promote community participation in waste separation at the sources in order to solve the problem of solid waste management in the community areas, including schools, public and private organizations and shops. Maemok Municipality has to organize campaigns to encourage young people to participate in waste management by separating and sorting waste (organic waste, recyclable waste, hazardous waste, common waste) generated from the sources in their own community and to be the model for other communities. The operation of Maemok Municipality in the past was funded by the Environmental Fund, Office of Natural Resources and Environmental Policy and Planning and Department of Environmental Quality Promotion to carry out the project to promote community participation in waste separation at Maemok sub-district with

² Amount and rate of solid waste generated in 2008-2016. The data from 2008-2012 were obtained from the prediction while the data from 2013-2016 were based on the surveys from local government organizations nationwide conducted by the Regional Environment Offices and Provincial Offices for Natural Resources and Environment.

the focus on having community waste separation processes. The result showed that Moo 7, Ban Den Udom carried out all 7 activities of the project, including training for waste separation, household waste separation, waste bank, fermented water, compost, raising earthworms, creating things from recycled materials and organizing study visit. The percentage of people participating in the activities was 31.93%. Moo 7, Ban Den Udom was a model village in the waste management of Maemok Municipality under the research project: The extension of results for waste management by modeling community: A Case study of Maemok Municipality, Thoen District, Lampang Province which was the research conducted jointly between the research team and Maemok municipality. It expanded the village model of waste management in Village No. 6, Ban Maemok Tai. The results showed that the waste management of Village No. 6, Ban Maemok Tai was improved and it can be a village model for waste management.

However, even the Municipality carried out the project related to waste management, the efficiency in waste management was not good. Therefore, the researchers were interested in finding ways to develop waste management in Maemok Municipality, Thoen District, Lampang Province in order to lead to the expansion of the area operating waste management and find ways to develop waste management.

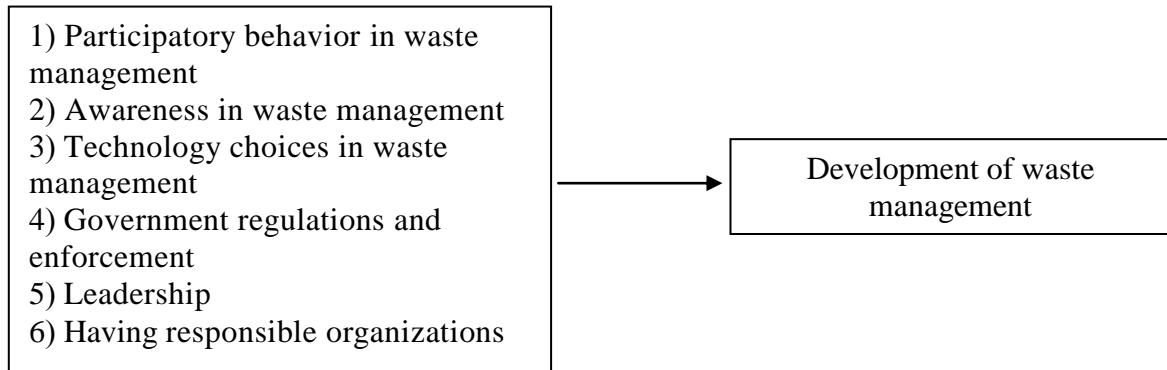
Research Objectives

- 1) To analyze the factors affecting the development of waste management of Maemok Municipality, Thoen District, Lampang Province
- 2) To study the development of waste management of Maemok Municipality, Thoen District, Lampang Province
- 3) To analyze the causal relationship of the factors affecting the development of waste management of Maemok Municipality, Thoen District, Lampang Province

Literature Review

The purpose of this study was to analyze the factors affecting the development of waste management in Maemok Municipality. The research team studied theories and concepts as well as related research studies in order to create the variables used in this study. The focus was on creating the variables covering both personal factors and the factors related to local government, which plays a key role in local administration. Pollution Control Department (2017a) mentioned about the 20-Year Pollution Management Strategy and Pollution Management Plan which set the Environmental Management Plan (B.E. 2560 - 2564). According to this plan, the local waste management guidelines were defined such as cultivating knowledge, understanding and building awareness, creating and transferring knowledge as well as solving community solid waste problem by separating it from the sources in order to be recycled as much as possible. The research team reviewed the literature for considering with the study area leading to the creation of variables for the analysis of the results consistent with the area. In addition, the factors related to local government were obtained from the study conducted by Yuwat Wuttimetee & Suprawan Piromthong (2015) which studied on solid waste management in the communities of Ayutthaya city municipality. It analyzed the factors affecting waste management in relation to local government: government regulations and enforcement, leadership and having responsible organizations. This study was conducted in the area of local government. The research team then created the variables for analyzing results of the study which covered the performance of the local government to obtain varied and holistic waste management approaches.

Conceptual Framework



Hypothesis

The factors, including participatory behavior in waste management, awareness in waste management, technology choices in waste management, government regulations and enforcement, leadership and having responsible organizations are correlated with the development of waste management.

Research Methodology

Quantitative research method was employed in the study. The research methodology can be presented as follows.

Population

The data were collected from 156 households participating in the project of the development of waste management of Maemok Municipality, Thoen District, Lampang Province which was Village No. 6, Ban Maemok Tai that was developed as the village model of waste management. This was the total population of the households used in the research. The research results can be used as a basis for the research conducted in Lampang Province and lead to further national research in the future.

The Tool Used in Data Collection

The instrument used for data collection was a questionnaire. It was a 5-rating scale questionnaire constructed by the researchers from studying theories, concepts and relevant research studies in order to construct the questionnaire meeting the objectives of the study. The questionnaire was reviewed by the experts in public administration and local administration.

Data Analysis

Population mean, standard deviation, multiple regression analysis and content analysis were employed for data analysis. The criteria used to interpret the mean intervals of 0.8 were divided into 5 levels as follows.

Scores	Levels
4.21 - 5.00	the highest
3.41 - 4.20	high
2.61 - 3.40	moderate
1.81 - 2.60	low
1.00 - 1.80	the lowest

Research Results

For the study results in this part, they were obtained from using a questionnaire which was a subjective assessment tool. The respondents were able to assess the level of opinion on the development of waste management which consisted of 6 aspects.

Participatory Behavior in Waste Management: From Table 2, the overall participatory behavior in waste management of households in Maemok Municipality was in the high level. The mean of the population was 3.86 (σ 0.67). It was also found that the households always put all the food left in the food waste bin. They also warned those who did not throw waste in the bin. They always thought before throwing all sorts of waste onto roads, waterways and public places. Using a cloth bag or basket to buy things at the market was the behavior less done by the households.

Table 2 Participatory behavior in waste management

Participatory behavior in waste management	μ	σ	Opinions
(1) I always put all the food left in the food waste bin.	4.60	.52	the highest
(2) I always warn those who do not throw waste in the bin.	3.96	.81	high
(3) I often separate waste for using and selling to earn income	3.83	.65	high
(4) My neighbors and I help to promote waste separation	3.35	.84	moderate
(5) I always think before throwing all sorts of waste onto roads, waterways and public places.	4.17	.55	high
(6) I use a cloth bag or basket to buy things at the market.	3.29	.69	moderate
The Total of Participatory Behavior in Waste Management	3.86	.67	high

Awareness in Waste Management: From Table 3: awareness in waste management, it was found that the households recognized that recycling of some kinds of waste was an effective way to reduce waste and reducing the amount of waste was beneficial for community waste management. These items were rated in the highest level. The separation of waste as the household and individual responsibility was recognized in the high level. These were interesting points in raising public awareness.

Table 3 Awareness in waste management

Awareness in Waste Management	μ	σ	Opinions
(1) Recycling some kinds of waste is an effective way to reduce waste.	4.63	.64	the highest
(2) If everyone reduces the amount of waste, it is a great benefit to community waste management.	4.26	.44	the highest
(3) Having the leaders in waste management keeps the community clean and livable.	3.98	.74	high
(4) Waste management is the direct responsibility of the household.	3.56	.59	high
(5) Waste separation is my responsibility.	3.42	.86	high
(6) Separating waste before disposing is a social responsibility.	3.69	.82	high
(7) Waste separation makes me have higher income.	3.57	.86	high
(8) I am proud to be part of helping reduce waste.	4.07	.68	high
The Total of Awareness in Waste Management	3.89	0.70	high

Technology Choices in Waste Management: From table 4: technology choices in waste management, the households in Maemok Municipality rated the opinion on technology choices in waste management at the highest level. They agreed that wet waste that is food waste can be buried in tanks under the trees for agricultural benefits; and cans and plastic

bottles can be reused in everyday life. For the matters related to the municipality, they thought that the municipality should provide waste management equipment such as crushers for more efficient waste management, and the municipality should organize sharing and learning activities on technology for having more waste management channels. These can be used as policy recommendations for the municipality to effectively manage waste.

Table 4 Technology choices in waste management

Technology Choices in Waste Management	μ	σ	Opinions
(1) Wet waste that is food waste can be buried in tanks under the trees for agricultural benefits.	4.90	.68	the highest
(2) Cans and plastic bottles can be reused in everyday life.	4.51	.29	the highest
(3) The structure of the project must be proper.	4.57	.74	the highest
(4) The municipality should provide waste management equipment such as crushers for more efficient waste management	4.69	.63	the highest
(5) The municipality should organize sharing and learning activities on technology for having more waste management channels.	4.43	.82	the highest
(6) Water treatment ponds for the water used to clean plastic waste and foam before releasing to the drain should be provided.	3.87	.78	the highest
The Total of Technology Choices in Waste Management	4.49	.65	the highest

Government Regulations and Enforcement: According to table 5: the opinions of government regulations and enforcement, it was revealed that having clear guidelines for the operation in waste management, penalties imposed for waste management control to make it more effective for people in the community to recognize waste management, regulations relating to public health in waste matters that can help reduce the amount of waste and manage waste effectively and proper municipal structure for better waste management can help manage waste management effectively.

Table 5 Government regulations and enforcement

Government Regulations and Enforcement	μ	σ	Opinions
(1) The municipality should establish clear guidelines for the operation in waste management.	4.69	.52	the highest
(2) Regulations relating to public health in waste matters can help reduce the amount of waste and manage waste effectively.	4.64	.51	the highest
(3) Penalties should be imposed for waste management control to make it more effective for people in the community to recognize waste management.	4.68	.57	the highest
(4) Supporting government policies is an important part of effective waste management.	4.53	.70	the highest
(5) Staff members involved in waste management of the municipality play a role in community waste management.	3.76	.24	high
(6) Proper municipal structure helps create better waste management.	4.61	.58	the highest
(7) Staff's performance is an important part and has impact on the efficiency of the waste management.	4.57	.57	the highest
The Total of Government Regulations and Enforcement	4.49	.52	the highest

Leadership: From table 6: the opinion on the leadership, it was in the high level. The households thought that government should focus on waste problem and push it as the national agenda, and participation in waste management activities of the leaders of each sector has an important effect on effective waste management. These were rated for the effective waste management at the highest level. The municipality should pay attention to these issues, in particular, defining the policy of waste management, which is a national policy as the policy of the local government. Moreover, the role of the leaders participating in the management of waste will result in more efficient waste management.

Table 6 Leadership

Leadership	μ	σ	Opinions
(1) Government should focus on waste problem and push it as the national agenda.	4.44	.55	the highest
(2) Effective waste management in the community should be well coordinated by the leaders of each sector, including government, central, regional and local sectors.	3.96	.64	high
(3) Community waste management is not about local leaders alone.	3.48	.53	high
(4) Local leaders should push for more policies on the support of waste management.	3.81	.73	high
(5) Participation in waste management activities of the leaders of each sector has an important effect on effective waste management.	4.25	.68	the highest
Total of Leadership	3.98	.62	high

Having Responsible Organizations: From Table 7: having responsible organizations, the opinions of the households were that the municipality should arrange the staff involved in the management of the waste problem to coordinate with the community. This point was rated at the highest level. In addition, effective waste management needs the responsible host and it should be collaborated by many sectors.

Table 7 Having responsible organizations

Having Responsible Organizations	μ	σ	Opinion
(1) The municipality should arrange staff involved in waste management to coordinate with the community.	4.57	.55	the highest
(2) Waste management is not the responsibility of government agencies only.	3.38	.64	high
(3) The government should issue clear instructions to agencies related to problem solving.	3.77	.74	high
(4) Assignment of tasks and authority to local authorities to manage waste is an important part of effective waste management.	3.97	.70	high
(5) For the implementation of the waste problem solving, there should be the main host and it should be collaborated by many sectors.	3.99	.87	high
Total of Having Responsible Organizations	3.93	.70	high

Factors Influencing Success in the Development of Waste Management: From Table 8: factors influencing success in the development of waste management, it found that the use of technology choices in waste management, government regulations and enforcement were rated in the highest level.

Table 8 Factors influencing success in the development of waste management

Factors Influencing Success in the Development of Waste Management	μ	σ	Opinions
Participatory behavior in waste management	3.86	.67	high
Awareness in waste management	3.89	.70	high
Technology choices in waste management	4.49	.65	the highest
Government regulations and enforcement	4.49	.52	the highest high
Leadership	3.98	.62	high
Having responsible organizations	3.93	.70	
Overall	4.10	.64	high

Development of Waste Management: From Table 9: the development of effective waste management, it was found that the municipality should regularly provide proactive public relations to establish a waste separation network and the municipality should have activities that help educate the community regularly. In addition, the municipality should give everyone an opportunity to take part in the comment and propose ways to manage waste.

Table 9 Development of waste management

Development of Waste Management	μ	σ	Opinion
(1) The municipality should regularly provide proactive public relations to establish a waste separation network.	4.90	.57	the highest
(2) The municipality should invite community members to recognize and learn how to decompose garbage every month.	4.35	.62	the highest
(3) The municipality should give everyone an opportunity to participate in the discussion and propose ways to manage waste.	4.47	.57	the highest
(4) The municipality is responsible for providing knowledge related to waste management in the community.	4.41	.53	the highest
(5) The municipality should organize activities that continuously educate the community.	4.75	.51	the highest
Total of Development of Waste Management	4.57	.56	the highest

Analysis of the Relationship of Success Factors in the Development of Waste Management: The analysis of the relationships of success factors in the development of waste management: the case study of Maemok Municipality, Thoen District, Lampang Province was as follows.

- 1) Independent Variables
 - 1.1) Participatory behavior in waste management
 - 1.2) Awareness in waste management
 - 1.3) Technology choices in waste management
 - 1.4) Government regulations and enforcement
 - 1.5) Leadership
 - 1.6) Having responsible organizations

2) Dependent Variable: the development of waste management

Table 10 Summary of regression analysis

Dependent Variable	Independent Variables	R	R ²	R ² Change
develop	.137respon +.291techno	.575	.331	.331

The Equation Forecasting the Factors of the Development of Waste Management

$$\text{DEVELOP} = .137\text{RESPON} + .291\text{TECHNO}$$

The results of the analysis using the stepwise method to analyze 6 six independent variables influencing the development of waste management with the statistically significant level of .05 revealed that all independent variables, including participatory behavior in waste management, awareness in waste management, technology choices in waste management, government regulations and enforcement, leadership and having responsible organizations could explain the variation of waste management development at 57.50% ($R^2 = .331$). The results also showed that there were only two independent variables that had statistically significant influence: awareness in waste management and technology choices in waste management.

Table 11 Regression coefficient used to test the relationship between independent variables and variables

Variables	Y	
	b	β
Constants	11.639	-
Participatory behavior in waste management	-	-
Awareness in waste management	.137	.286
Technology choices in waste management	.291	.562
Government regulations and enforcement	-	-
Leadership	-	-
Having responsible organizations	-	-

Variable Y was the development of waste management

Conclusion and Discussions

This research aimed to analyze the factors affecting the development of municipality waste management and the causal relationship of the factors affecting the development of waste management of Maemok Municipality, Thoen District, Lampang Province. It was a quantitative study. Data were collected from 156 households participating in the waste management development project. The instrument used to collect data was a questionnaire. The data were analyzed by population mean, standard deviation, multiple regression analysis and content analysis. The results revealed that there were 6 factors affecting the development of municipality waste management, including participatory behavior in waste management, awareness in waste management, technology choices in waste management, government regulations and enforcement, leadership and having responsible organizations. In addition, technology choices in waste management, government regulations and enforcement had the highest mean ($\mu = 4.49$). For the development of effective waste management, it was found that the municipality should regularly provide proactive public relations to establish a waste separation network; the municipality should organize activities that continuously educate the community; and the municipality should give everyone an opportunity to participate in the discussion and propose ways to manage waste had the highest level of opinion ($\mu = 4.90$ and $\mu = 4.75$, respectively). The results of this study were obtained from public opinions, so

Maemok Municipality can be used them to develop the projects for waste management in the area to meet the needs and the context of the area. For the analysis of the relationship of success factors in the development of waste management, it was found that the independent variables were participatory behavior in waste management, awareness in waste management, technology choices in waste management, government regulations and enforcement, leadership and having responsible organizations and the dependent variable was the development of waste management. When using the stepwise method to analyze six independent variables influencing the development of waste management with the statistically significant level of .05, only two independent variables had statistically significant influence: awareness in waste management and technology choices in waste management.

For the discussion of research results, this article aimed to analyze the factors affecting the development of waste management of the municipality and the causal relationship of factors affecting the development of waste management of Maemok Municipality, Thoen District, Lampang Province. The study pointed out that the success factors in the development of waste management of Maemok Municipality, Thoen District, Lampang Province were awareness in waste management and technology choices in waste management. When considering together with the substance and the results of the pollution management under the Pollution Control Plan: 2012-2016, the Pollution Control Department (2017b), it pointed out that the problem of waste management on the awareness of the people in waste management was that the system of cultivating and creating environmental awareness is still lacking from kindergarten to higher education. The results of this study also showed that the awareness in waste management was important to the success of waste management in Maemok Municipality. Therefore, supporting the projects related to the awareness of government agencies is an important way to successfully manage community waste. Furthermore, when considered together with related research, the awareness in waste management which was important to the success of waste management in Maemok Municipality was consistent with the study of Wanwisa Khongpirun, Sarunya Thiphom & Wirot Chanthorn (2017) which studied factors associated with waste management behaviors among Pongpa Village, Kaeng Sopha Sub-district, Wang Thong District, Phitsanulok Province, Thailand. The suggestion was that people should be cultivated with the awareness of the importance of waste separation and correct disposal of waste. When considering the sub-issues, it was found that Maemok Municipality focused on recycling some types of waste as a way to reduce the amount of waste efficiently which. It was rated with the highest mean ($\mu = 4.63$). For the context of waste management in Maemok Municipality, trucks for collecting waste were not provided. Therefore, the operation focused on reducing the amount of waste.

The related research on the factors affecting the development of waste management indicated that the factor affecting the development of waste management was public understanding in waste management. For example, Peeraya Vajarodaya (2013) conducted a study on solid waste management of local government organizations: a case study of Muangklang Municipality in Rayong Province and found that Muangklang Municipality operated solid waste management through a policy / plan / project based on public participation. There were many public relations channels to educate people which affected the waste management in the area. Worrapon Phupukdee (2011) also studied the factors affecting the solid waste management in household of people in Bueng Wichai Sub-district Administrative Organization, Mueang District Kalasin Province. The results showed that the variables affecting the management of household waste at Bueng Wichai Sub-district Administrative Organization, Mueang District, Kalasin Province were education and knowledge of people on waste management. Wanwisa Khongpirun, Sarunya Thiphom & Wirot Chanthorn (2017) studied the factors associated with waste management behaviors among Pongpa Village, Kaeng Sopha Sub-district, Wang Thong District, Phitsanulok Province, Thailand, and found

that knowledge and awareness in waste management were associated with waste management behaviors with statistical significance. According to the results of this study, the level of public opinion on the development of solid waste management of Maemok Municipality agreed that the municipality should regularly provide proactive public relations to establish a solid waste separation network, regularly organize activities that help educate the community and give everyone an opportunity to participate in the discussion and propose ways to manage waste was in the high level ($\mu= 4.90$ and $\mu= 4.75$, respectively), which was consistent with the related research studies mentioned above. Therefore, it can be discussed that public understanding of waste management is the factor affecting the success of waste management even in different the areas of study. That is to say, although waste management is done in different areas, the common factor affecting the success of waste management is public understanding in waste management.

In addition, there was a study conducted in the nearby area by Wit Sattakorn, Thanawit Butrudom & Worraya Jatupatrangsee (2018), titled "Waste Management in the Community: A Case Study of Maesook Municipality, Chae Hom District, Lampang Province, Thailand". The results of the study showed that the factors affecting the success of waste management of Maesook Municipality Chae Hom District, Lampang Province were government regulations and enforcement, development of waste management, participation behaviors in waste management and bureaucratic process. When compared with this study, only two independent variables were statistically significant: awareness in waste management and technology choices in waste management. This indicated that in community waste management, the factors related to individuals are important. Support and education must be provided for the public together with collaborate with local government. The results of these two studies pointed out the collaboration of local government, the researchers from educational institutions and people in the community, resulting in successful waste management based on the principles of participatory governance as Patcharee Sivoros (2014) stated that the main goals of participatory governance are collaboration of the government and other relevant sectors and practice working with people. The research team discussed and concluded that to succeed in community waste management; every sector must learn together and local government must support the people in the area to achieve sustainable waste management.

According to the results of the discussion, the factor affecting the success of waste management is the awareness of waste management. So, it must be knowledgeable and cultivated in people since childhood in order to be socially responsible citizens and able to manage their own waste. The key approach is to establish citizenship. Tanet Charoenmuang (2017) stated that citizens are members of the democratic society, or those having political consciousness. They must recognize the importance of public affairs and common interest. The important conditions of citizenship include being educated with various aspects since childhood and participating in the management of the public matters. Consequently, to achieve the awareness in waste management, citizenship must be built by providing insights into the management of waste at an early age and creating participation in the activities or policies that are involved in waste management. These approaches are consistent with the results of the research on the development of solid waste management that the opinions were rated at the high level on the statements that the municipality should regularly organize activities that help educate the community; and the municipality should give everyone an opportunity to participate in the discussion and propose ways to manage waste. This information is an important guideline for public policy development and strategic planning for effective waste management.

Revommendations

Recommendations for the Development of Waste Management

- 1) According to the results of the research on the development of effective waste management, it was agreed that the municipality should regularly provide proactive public relations to establish a solid waste separation network. The municipality should also regularly organize activities that help educate the community and give everyone an opportunity to participate in the discussion and propose ways to manage waste. Therefore, the role of Maemok Municipality should continuously expand the village model to other areas by focusing on the principle of public participation in waste management together with the municipality.
- 2) The results of the research on the relationship of success factors in the development of waste management in Maemok Municipality showed that only two independent variables had statistically significant influence, including awareness in waste management and technology choices in waste management. However, considering the mean level of opinion, it was found that government regulations and enforcement was also at the high level. Therefore, Maemok Municipality should focus on creating clear guidelines for the operation of waste management and waste management control. Penalties should also be imposed to make people in the community recognize waste management more. Community forum may be used in the community to create common practices by the public participation.
- 3) From the discussion, the findings showed that the public perception and understanding of waste management was important for the success of waste management. When considering the relevant research, the policy recommendation for the relevant government agencies was that such issues should be taken into account in order to the create the projects to improve people's understanding of waste management.
- 4) The results of this study were consistent and supported the Pollution Management Strategy, Pollution Control Department in terms of continuously building consciousness. When considered together with the findings and the discussion of relevant research findings, the researchers would like to propose that the awareness building should focus on creating citizenship that engages more people in management such as taking part in policy making as well as using technologies that help manage waste and can be practiced on a daily basis. This can help make a difference in order to increase public participation.

Recommendations for Further Research

- 1) Maemok Municipality consists of 10 villages. The results of the research revealed that the local people focused on creating network. For the research recommendations, additional areas in the villages should be explored in order to analyze the contexts of the areas to expand the village model of waste management in order to promote the research studies affecting the community.
- 2) The researchers and the staff of Maemok Municipality learned together to exchange knowledge and sustainably solve the problem of waste in area. The researchers, therefore, should strengthen the people in the community by working together and making a difference in the area. That is, the roles of the researchers are viewed as supporters; and learning together is organized for the development by focusing on the people in the area. In addition, the staff working in the areas can also develop their own areas for sustainable waste management.

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