

The Promotion of Hazardous Waste Management for Local Government Organizations, Maha Sarakham Province

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ABSTRACT

The purposes of this research were to study and hazardous waste management for Local Government Organizations, Maha Sarakham province, to develop a manual of hazardous waste management for Local Government Organizations, Maha Sarakham province to be efficient and effective, to study and compare knowledge about and hazardous waste management, environmental ethics and environmental volunteers before and after the training. The sample used in this research were 54 officers of the Local Government Organizations, Maha Sarakham province, being obtained by voluntarily sampling. The research tools were manual of hazardous waste management, hazardous waste management data survey questionnaire, knowledge test, environmental ethics test and environmental volunteers test. The statistics used in the research were frequency, percentage, mean, standard deviation and hypothesis testing using Paired t-test. The results of the research showed that: 1) Hazardous waste management of Local Government Organizations in Maha Sarakham province, there are 13 districts, 142 Local Government Organizations. There are total 17,604.71 kg/year hazardous waste. Almost, they take hazardous wastes to disposal with Mahasarakham Provincial Administrative Organization. 2) A manual of hazardous waste management for local government organizations, Maha Sarakham province to be efficient =93.78/89.41 and effective = 0.7889. After the training, the sample had knowledge, environmental ethics and environmental volunteers higher than before the training statistically significance at the .05.

Keywords

Hazardous waste management; Local government organizations; Knowledge; Environmental ethics; Environmental volunteers

Introduction

Environmental problem is another important problem related to people's livelihood. Especially in urban society of various communities will have various environmental problems many took place within the community, due to congestion in the community causing various problems from living conditions, air, wastewater. But one important problem is the solid waste management problem in the community which the amount of solid waste will increase according to the population living in the community, it is a problem that arises in conjunction with the prosperity of the community. Along with the advancement in technology, people have different devices to use that is more modern. When in the daily life of the people have to do activities and consume various appliances the activities and use of those devices create waste products that are no longer used or worn-out product or discontinued product container, they are unwanted waste and must be disposed of properly. The waste generated by the consumption of the people in the community, there are both hazardous waste and non-hazardous waste [1].

Economic expansion and the increase in the population has resulted in changes and effects on the environment. Especially the garbage problem which is part of the community environment that is becoming more severe and widespread both at the urban and national level. From the state of the solid waste problem that arises make the relevant agencies find measures to solve the problem according to the ever-changing situation of the waste problem. But it appears that it cannot be corrected effectively. The cause is due to the continuous economic and social progress. The presence of new technological products used in daily life, resulting in increased consumption values as a result, the amount of solid waste that occurs is a lot. While the efficiency of these waste management has not increased relate to the waste problem that occurs as well, that is the method and place to dispose of most of the solid waste is not yet the proper sanitation. The efficiency of the organization responsible for the collection of waste is low together with the public awareness and awareness of the garbage disposal is not satisfactory. Most people do not see the importance of the problem think of it as the sole duty of the government to manage all solid waste, lack of cooperation from the public or various agencies in the development or rehabilitation of the environment, the department responsible for the management of solid waste always and never end [2].

Due to the problem of hazardous waste is problem that affects the environmental quality and the quality of life of the general public which part of the hazardous waste will be stored and destroyed in accordance with the regulations of the law. But waste resulting from office activities government agency including stores no law has yet been established to regulate. This causes hazardous waste to be improperly disposed of destroyed, contaminating the environment and affects the health of those who are exposed. Which hazardous waste is a type that requires a special disposal method. This is because this type of waste contains hazardous chemicals. If disposed of improperly, it will cause environmental problems and harm to life hazardous waste disposal methods such as chemical-physical destruction, high temperature incineration in hazardous waste incinerators, etc. However, it was found that at present, the community littering will not be sorted before it is disposed. One important reason is that any type of waste is classified as harmless waste and any type of garbage that is dangerous. Which littering together without sorting causes those wastes to be disposed of together as a result, toxic substances from hazardous waste contaminate soil, water and air, causing direct and indirect impacts on people's health and the environment [1].

There are environmental missions stipulated in the act establishing plans and procedures for decentralization to Local Government Organizations, 1999 including section 16. Which states that municipalities and sub-district administrative organizations have the power and duties of environmental management, such as waste disposal, sewage and wastewater management, maintenance management and utilization of forests, land, natural resources and the environment, improving slum resources and housing management and maintaining recreational facilities [3]. As for the duties of the provincial service organization, it is responsible for establishing a public utility system that municipalities and Local Government Organizations cannot do because of lack of budget maintenance of natural resources and the environment including local traditions disaster prevention and mitigation use of land for local interests such as for the preparation of public parks. The actions in the management of hazardous waste from communities of the Local Government Organizations today still have problems such as not separating the hazardous waste from the community from the solid waste, incorrect disposal of hazardous waste from the community, there is no place to dispose of hazardous waste from the community. It is a problem that has accumulated for a long time and this is caused by various factors such as the rapid increase in the amount of hazardous waste from the community. As a result of the increase in the population, local budget and personnel restrictions, this is not enough to invest and improve the management of hazardous waste from the community [4].

Followed by government agencies' hazardous waste management policy, for example, the agency that has established an environmental quality management plan, namely the Ministry of Natural Resources and Environment, has set a strategy that emphasizes the importance of the management of hazardous waste from communities seriously, supporting a complete community hazardous waste management system encourage the private sector to invest in the construction of a community hazardous waste disposal center according to academic principles. In addition, the Pollution Control Department has a policy on the management of community hazardous waste that promotes the establishment of a complete community hazardous waste disposal center within various localities [4].

From the mentioned problems, the researcher is interested in studying waste management and hazardous waste for Local Government Organizations, Maha Sarakham province to contribute to the development efficient management of hazardous waste from communities.

Research objectives

1. To study waste management and hazardous waste for Local Government Organizations, Maha Sarakham province.
2. To develop a manual for hazardous waste management for the Local Government Organizations, Maha Sarakham province to be efficient and effective.
3. To study and compare knowledge about waste and hazardous management, environmental ethics and environmental volunteers before and after the training.

Methodology

1. Research conceptual framework

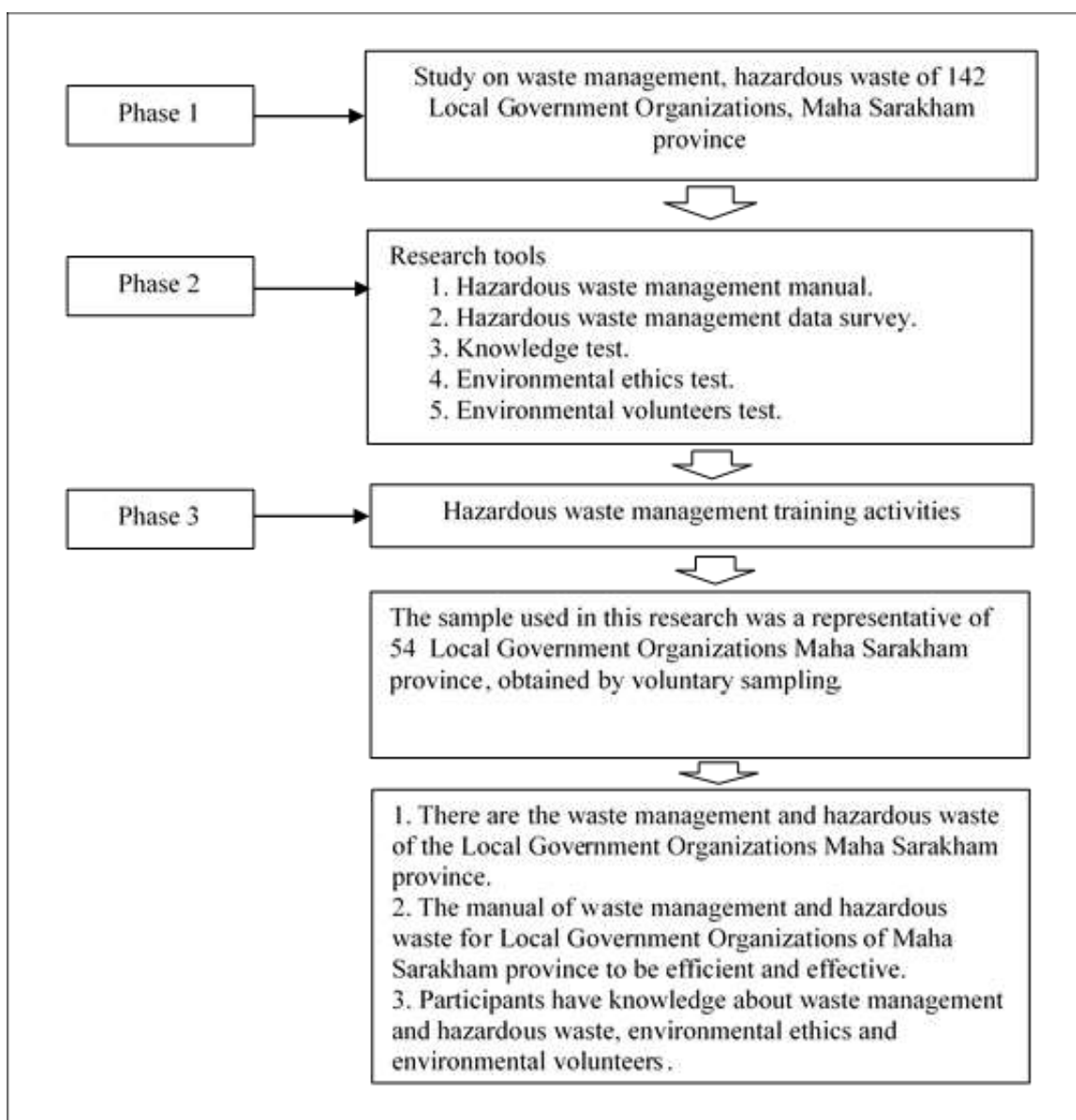


Figure 1. The research Conceptual framework.

2. Population and sample

The population used in this research were 142 Local Government Organizations of Maha Sarakham province. The sample used for data collection about hazardous waste management were 142 representatives of the Local Government Organizations, Maha Sarakham province, obtained by purposive sampling. The sample used in this research were 54 representatives of the Local Government Organizations of Maha Sarakham province, being selected by voluntary sampling to participate in the training on hazardous waste management.

3. Research Design

The promotion of waste management and hazardous waste for Local Government Organizations, Maha Sarakham province is combined research by phase 1; the study of waste management and hazardous waste. It is a survey research and phase 2; developing research manual, it was a quasi-experimental research using one sample group with a one-group pretest-posttest design research plan.

4. Research instruments

1. Questionnaire of waste management and hazardous waste for Local Government Organizations, Maha Sarakham province.
2. The hazardous waste management manual.
3. The knowledge test about hazardous waste management, environmental ethics test and environmental volunteers test.

5. The research tools and quality of tools

5.1) Questionnaire of waste management and hazardous waste for Local Government Organizations, Maha Sarakham province. It is a closed-ended question consisting of 4 parts: part 1 general information, part 2 general solid waste management information, part 3 hazardous waste management information and part 4 comments on the management of general solid waste and hazardous waste. Check questionnaire sent to specialist to check the correctness to collect information.

5.2) There are the processes of creating and finding quality of the hazardous waste management manual as follows:

- 1) Study and research preliminary information related to the development of the hazardous waste management manual by studying concepts, theories, documents and related research in order to plan for the preparation of the manual for efficiency.
- 2) Study knowledge about hazardous waste management from the document books, texts and various media to guide the activities in the development of the manual and focus on the content to be consistent with the objectives of the activity.
- 3) Determine the scope and content of the hazardous waste management manual in accordance with the educational framework to create an hazardous waste management manual with content in the amount of 5 training units.
- 4) Bring an hazardous waste management manual created for 5 experts.
- 5) Adopt hazardous waste management manual from expert assessment to analyse based on the average score of 3.50 or more as a criterion. It was found that there were the suitability of hazardous waste management manual at the mean (\bar{x}) = 4.20 and the standard deviation (S.D.)= 0.22 in the level is very suitable and the consistency value (IOC) = 0.70.
- 6) Adopt an hazardous waste management manual to improve and complete for further data collection with the sample.

5.3) The knowledge test about hazardous waste management, environmental ethics test and environmental volunteers test are details as follows:

- 1) Study basic information from textbooks, relevant research papers to guide the creation of research tools.
- 2) Use data to create tools for measuring and evaluating results, including:
 - 2.1) Knowledge test about hazardous waste management which is a select-and-answer option, there are 4 options, which are: A, B, C and D, 50 items choose only one correct answer. The criteria for a correct answer gave 1 point, the wrong answer gave 0 points, the criteria for interpreting the points are as follows : the average score is 0.00 - 10.00 means that the people are the least level of knowledge, the average score is 10.01 - 20.00 means that the people are a low level of knowledge, the average score of 20.01 - 30.00 means that people are moderate knowledge, the average score of 30.01 - 40.00 means that the people are at a high knowledge level and the average score of 40.01 - 50.00 means that people are at the highest knowledge level.

2.2) Environmental ethics test, there are 4 options, which are: A, B, C and D, 50 items. There are 4 levels set by the ethical rating as follows: the average score is 1.00 - 1.75 for myself, the average score is 1.76 - 2.50 for relatives and friends, the average score is 2.51 - 3.25 for society and the average score is 3.26 - 4.00 for correctness and goodness.

2.3) Environmental volunteers test, there are 5 options, which are: A, B, C, D and E, 50 items with the following scoring criteria : an average score 1.00 - 1.80 means that the people have the least volunteer, an average score of 1.81 - 2.60 means that the people have a low volunteers, average score of 2.61 - 3.40 means that the people have moderate volunteers, average score 3.41 - 4.20 means that the people have a high volunteer and average score of 4.21 - 5.00 means that the people have the highest volunteers.

3) Take the measuring and evaluating tools to 5 experts for considering the consistency of the instruments used for research purposes to find: hazardous waste management knowledge test, the index of item objective congruence was 0.85, Environmental ethics test, the index of item objective congruence was 0.83 and Environmental volunteers test, the index of item objective congruence was 0.83 which is greater than 0.50 indicated that all tests are correct for their content and purpose and can be used for data collection.

4) Take the measuring and evaluating tools to try out with the people that were not a sample to analyse the difficulty index, discrimination and reliability found that:

4.1) All of the knowledge tests about hazardous waste management had an available difficulty index level; the lowest 0.43 and the highest 0.73 using criteria for classifying high and low groups analysis of the discrimination to classify each item with a value of 0.20 and above found that all questions have discrimination at a valid level; 0.32 - 0.64. The reliability of the knowledge test using the α - Cronbach Coefficient method was found that there is a confidence factor of 0.952, indicated that all tests of knowledge comply with an acceptable value of 0.70 or higher, which can be used to collect data.

4.2) All of the environmental ethics tests had available discrimination at a valid level; 0.47 – 0.97. The reliability of the environmental ethics test using the α - Cronbach Coefficient method was found that there is a confidence factor of 0.988, indicated that all tests of environmental ethics comply with an acceptable value of 0.70 or higher, can be used to collect data.

4.3) All of the environmental volunteers tests had available discrimination at a valid level; 0.35 – 0.67. The reliability of the environmental volunteers test using the α - Cronbach Coefficient method was found that there is a confidence factor of 0.951, indicated that all tests of environmental volunteers comply with an acceptable value of 0.70 or higher, can be used to collect data.

5) Revised the tools used for measurement and evaluation and make them complete to collect data with the sample.

6. Data collection

Data collection for the promotion of hazardous waste management for Local Government Organizations, Maha Sarakham province, there are methods for collecting information as follows:

Phase 1; The study of waste management and hazardous waste of the Local Government Organizations, Maha Sarakham province.

1. Create a questionnaire of waste management and hazardous waste, which is a closed-ended question.
2. Take the survey of solid waste management data created for the advisor to consider and improve it according to the recommendations.
3. Take the questionnaire of waste management and hazardous waste to collect information with the representative of the Local Government Organizations, Maha Sarakham province of 142 representatives of the Local Government Organizations, Maha Sarakham province, obtained by purposive sampling.
4. Analyze solid waste management data of the Local Government Organizations, Maha Sarakham province.

Phase 2; Development of research manuals

1. Study basic information from textbooks, relevant research papers to guide the creation of hazardous waste management manual, knowledge test about hazardous waste management, environmental ethics test, environmental volunteers test.
2. Use information to create hazardous waste management manual, knowledge test about hazardous waste management, environmental ethics test, environmental volunteers test.
3. Bring the tools created for the advisor to consider and improve according to the recommendations.

4. Bring hazardous waste management manual evaluated by experts.
5. Take a knowledge test about hazardous waste management, environmental ethics test, environmental volunteers test to the experts to consider the consistency of the research tool to the objectives.
6. Take a knowledge test about hazardous waste management, environmental ethics test, environmental volunteers test to try out with 30 Mahasarakham Provincial Administrative Organizations to find the difficulty value, the power to classify each item and the entire confidence value.
7. Take a knowledge test about hazardous waste management, environmental ethics test, environmental volunteers test to update, revise, make a complete version then offer an advisor for further data collection with the sample.

Phase 3; Hazardous waste management training the sample used in this research were representatives of the Local Government Organizations, Maha Sarakham province.

1. The researcher has prepared documents for training such as hazardous waste management manual, knowledge test about hazardous waste management, environmental ethics test, environmental volunteers test.
2. Take a pre-training test with a knowledge test about hazardous waste management, environmental ethics test, environmental volunteers test.
3. Carry out solid waste and hazardous waste management training activities using narrative techniques, brainstorming problems in solid waste and hazardous waste management of the Local Government Organizations, Maha Sarakham province and management guidelines for solid waste and hazardous waste along with taking quizzes during the chapters of each training unit.
4. Take a post-training test with a knowledge test about hazardous waste management, environmental ethics test, environmental volunteers test, which is the same set as the pre-test.
5. Analyze quizzes after training by statistical methods to test the hypothesis.

7. Research statistics

The statistics used to analyze the data in this research the details are as follows:

- 1) Basic statistics are frequency, percentage, mean and standard deviation.
- 2) Statistics for test performance of the tool are 2.1) The suitability of the hazardous waste management manual. 2.2) Conformity index value. 2.3) Difficulty of the knowledge test about hazardous waste management. 2.4) The power to classify each item of the questionnaire using Item-total correlation. 2.5) The confidence according to Cronbach's alpha coefficient formula. 2.6) Process efficiency factor (E_1) 2.7) Result efficiency factor (E_2) 2.8) Effectiveness Index (E.I.)
- 3) Statistics test results and hypotheses at the .05 level of statistical significance, including Paired t-test.

Results

1. The study on waste management and hazardous waste for Local Government Organizations, Maha Sarakham province found that there are the waste management of 142 Local Government Organizations in Maha Sarakham province, the total amount of hazardous waste was 17,604.71 kg./year. Almost of 123 Local Government Organizations in Maha Sarakham province will take waste and hazardous waste to waste disposal to the Maha Sarakham Provincial Administrative Organization, followed by Local Government Organizations all operate by themselves, total 16 and 3 no hazardous waste management. By weight of waste, hazardous waste obtained from weighing 123, authorities and from the guesswork of 19, there are 10 types of hazardous waste, fluorescent lamps, insecticide, button charcoal, battery, paint cans, car battery, chemical insecticides, spray hair dye, nail polish / nail remover, expired cosmetics. the Almost Local Government Organizations in Maha Sarakham province have common hazardous waste types; fluorescent waste, followed by flashlights and the least common hazardous waste products. There was no problem in the waste processing of 82 hazardous waste sites. And found problems in waste management processes for 60 hazardous waste locations, the most common problem in hazardous waste management is cost, followed by a lack of knowledge personnel, problems encountered in hazardous waste management, the least is the malfunctioning machine. Which has commented on waste management, hazardous waste of hazardous waste management of Local Government Organizations in the 13 districts of Maha Sarakham province, total 142, found that the problems and obstacles in waste management and hazardous waste in the Local Government Organizations, the most common are people oppose the construction of a solid waste disposal system and budget and problems and obstacles in waste management and hazardous waste in the Local Government Organizations. The least is that there

are no problems and obstacles in management. The most comments on waste management practices are to promote public education, the transport operations, correct storage comments on guidelines for hazardous waste management, the least there is no way to manage waste and hazardous waste.

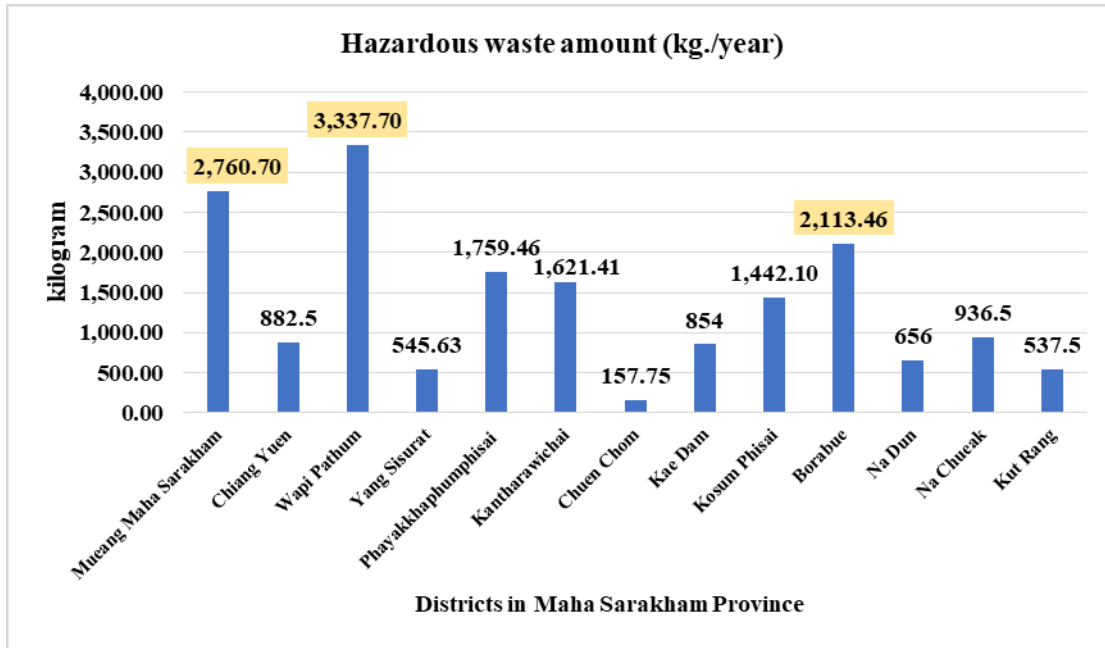


Figure 2. The amount of hazardous waste in the area of Maha Sarakham province.

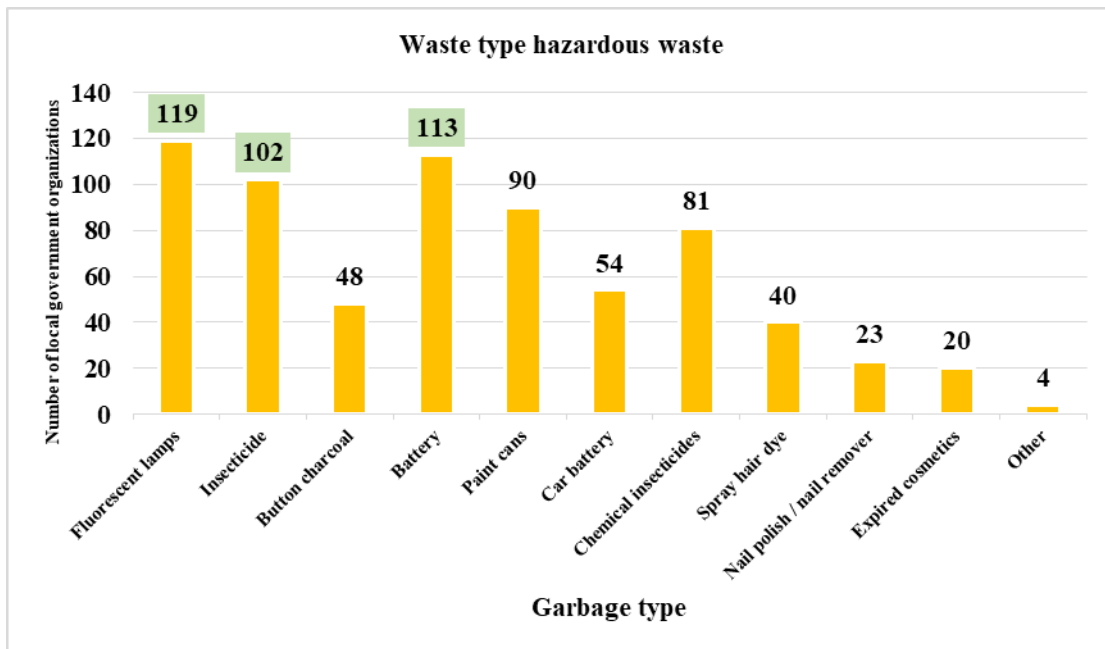


Figure 3. Waste type hazardous waste.

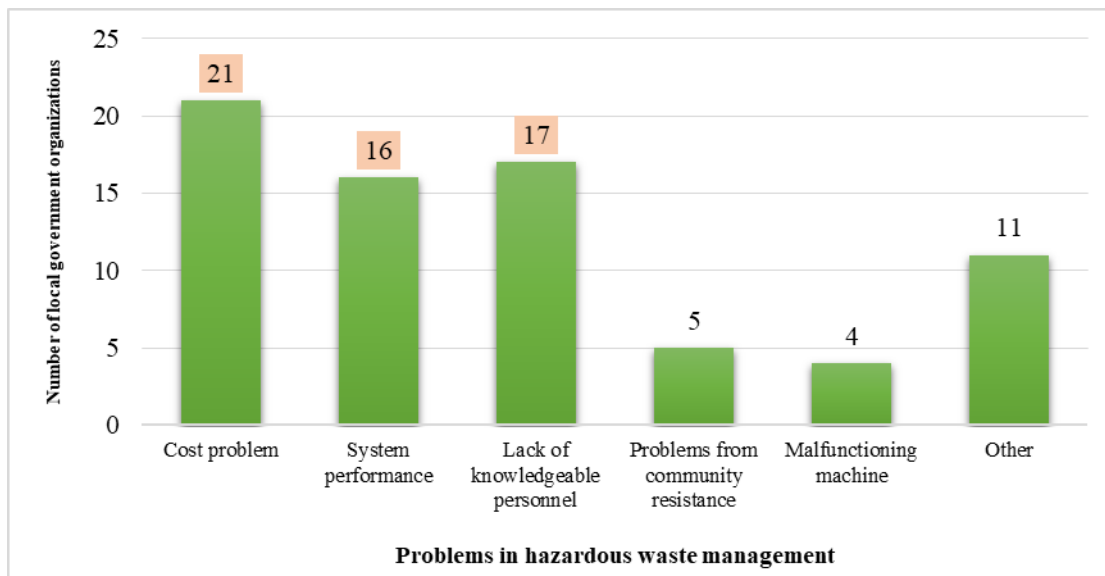


Figure 4. Problems in hazardous waste management.

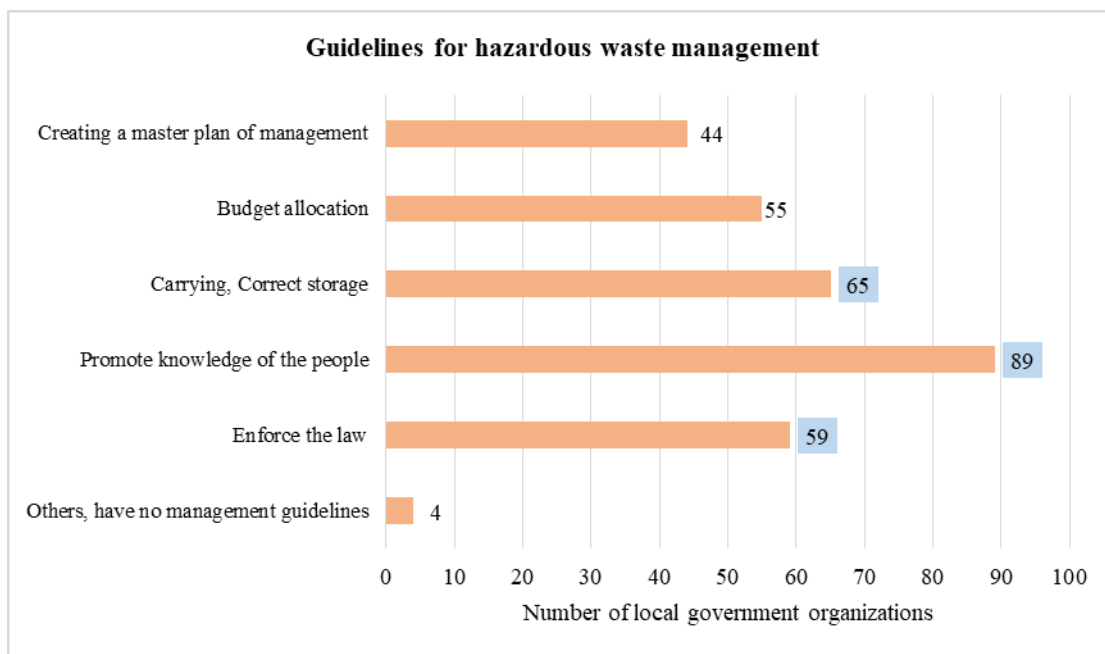


Figure 5. Guidelines for hazardous waste management.

2. The development of hazardous waste management manual for Local Government Organizations, Maha Sarakham province to be effective and efficiency, found that the picture efficiency of the process (E_1) was 93.78% and the efficiency of the outcome (E_2) was 89.41%. Therefore, the hazardous waste management manual for the Local Government Organizations, Maha Sarakham province was efficiency of training manual at 93.78/89.41. The Effectiveness Index (E.I.) of the hazardous waste management manual for Local Government Organizations, Maha Sarakham province was equal to 0.7889, meaning that the participants have increased knowledge and as a result, the participants had a 78.89% increase in learning progress. (As shown in Table 2 – 3.)

Table 2. Results of the Efficiency Criteria of the hazardous waste management manual according to criteria 80/80 (E₁/E₂).

| Hazardous waste management manual | Full score | \bar{x} | S.D. | percent |
|---|------------|-----------|------|---------|
| Process efficiency (E ₁) | 50 | 46.89 | 0.81 | 93.78 |
| Efficiency of results (E ₂) | 50 | 44.70 | 1.14 | 89.41 |

Performance of manual 93.78/89.41

Table 3. Results of the Effectiveness Index (E.I.) study of the hazardous waste management manual.

| Sum of knowledge score before the training | Sum of knowledge score after the training | Number of participants | Full score of knowledge | Effectiveness Index (E.I.) of the manual |
|--|---|------------------------|-------------------------|--|
| 1,345 | 2,414 | 54 | 50 | 0.7889 |

3. The results of the study and comparison of hazardous waste management knowledge, environmental ethics and environmental volunteers before and after the training. (As shown in Table 4.)

3.1 Before the training, they had the average score of hazardous waste management knowledge overall at the moderate level (\bar{x} = 24.91) and after the training, they had the overall knowledge average score at the highest level (\bar{x} =44.70). When comparing the knowledge average score of hazardous waste management before and after the training, found that after training, they had higher knowledge scores more than before the training with statistically significant level .05.

3.2 Before the training, they had an overall environmental ethics average score of environmental ethics which was for relatives and friends level (\bar{x} =2.25) and after the training, they had the overall average score of environmental ethics for correctness and goodness (\bar{x} =3.36). When comparing the environmental ethics mean score before and, found that after the training, they had mean score of environmental ethics higher than before the training with statistically significant level .05.

3.3 Before the training, they had a average score for the overall environmental volunteers at low (\bar{x} =1.95) and after the training, the overall mean score of environmental volunteers at a high level (\bar{x} =3.84). When comparing the mean score of environmental volunteers before and after the training, found that after the training they had mean score of environmental volunteers before the training with statistically significant level .05.

Table 4. Results of comparison of hazardous waste management knowledge, environmental ethics and environmental volunteers using t-test (Paired Samples) (n = 54).

| List | Before training | | Level | After training | | Level | t | df | p |
|----------------------------------|-----------------|------|---------------------------|----------------|------|------------------------------|---------|----|-------|
| | \bar{x} | S.D. | | \bar{x} | S.D. | | | | |
| knowledge (N = 50) | 24.91 | 2.04 | Moderate | 44.70 | 1.14 | Highest | -51.818 | 53 | .000* |
| environmental ethics (N = 4) | 2.25 | 0.38 | For relatives and friends | 3.36 | 0.14 | For correctness and goodness | -20.199 | 53 | .000* |
| Environmental volunteers (N = 5) | 1.95 | 0.28 | Low | 3.84 | 0.25 | High | -35.171 | 53 | .000* |

* Statistically significance .05

Discussions

The promotion of hazardous waste management for Local Government Organizations, Maha Sarakham province was discussed the results of the study as follows:

1. The study of hazardous waste management for Local Government Organizations, Maha Sarakham province found the total amount of hazardous waste is 17,604.71kg./year. Most of the Local Government Organizations in Maha Sarakham province will take the hazardous waste for disposal to the Maha Sarakham Provincial Administrative Organization. The weight of waste hazardous waste can be obtained by weighing and guessing. The most common hazardous waste types are fluorescent waste and flashlights. However, there are problems in the waste management process hazardous waste as cost problem and lack of knowledge personnel. It can be seen that hazardous waste from the community is caused by various activities in the household and various commercial establishments in the community such as garages, gas stations, cleaning shops, dry cleaning, seaports, airports, hospitals, laboratories agricultural area, etc. Most of these hazardous wastes are disposed of together with general solid waste without being treated and disposed of properly according to academic principles. It causes contamination and spread of hazardous substances into the environment into the food chain and affects public health [5]. Including hazardous waste/toxic waste is waste material the deteriorated product or various containers that contain elements or are contaminated with hazardous materials/substances such as batteries, light bulbs, batteries, pesticide cans, expired medicines, cosmetic bottles, cleaning liquid bottles, etc [6]. This is consistent with the research of Somsiri Decharat [7] found that the management of hazardous waste and the participation of the people in Pa Phayom district, Phatthalung province, in general, people will collect general and hazardous waste within the family to collect at the garbage bins that the Local Government Organizations has set up (Mostly the front of each household). After that, the Local Government Organizations will collect general and hazardous waste and forward it to the Phatthalung Provincial Administrative Organization for further disposal. However, overall, it was found that even households had to separate hazardous waste from general waste but when the Local Government Organizations forwarded them to dispose of some of them, there was a mix between general and hazardous waste again. In addition, according to the environmental responsibility of the Local Government Organizations, the hazardous waste collected by households is only a small fraction of the total amount that is actually used in daily life, such as batteries, cell phone batteries, pesticide container, etc. And this is consistent with the research of Pannapat Ritruengdet [8] found that the problem of waste management in Pathum Thani province is at a high level because Pathum Thani province has an industrial estate large wholesale market and has a large number of latent populations in this province. The problem of public participation is people do not participate in projects as they should, such as the construction of a waste power plant, which the people have strongly opposed but the relevant agencies insisted on continuing. And this is consistent with the research of Tasaneewan Nuannu [4] found that the Bang Nam Phueng Subdistrict Administrative Organization no hazardous waste from the community has been managed yet. While the municipality of Mueang Klaeng has a separate collection of hazardous waste from the community but there is still no correct disposal, because small Local Government Organizations lack the readiness and management capability. The medium-sized Local Government Organizations, the Pak Chong Municipality, does not manage the hazardous waste from the community and there is no specific policy on the management of hazardous waste from the community, there is only general waste management. Large Local Government Organizations such as Phuket Municipality and Nonthaburi Provincial Administrative Organization, Phuket Municipality has a comprehensive management of hazardous waste from the community. There are clear and concrete policies and projects in the management of hazardous waste from the community. Nonthaburi Provincial Administrative Organization, there is support for Local Government Organizations within Nonthaburi province, continue to manage hazardous waste from the community. In general, large Local Government Organizations have the most readiness and potential suitable for organizing a complete community hazardous waste management system.

2. The results of the development of hazardous waste management manual for Local Government Organizations, Maha Sarakham province to be effective, found that the picture efficiency of the process (E_1) was 93.78% and the efficiency of the outcome (E_2) was 89.41%. Therefore, the training manual of hazardous waste management was effectiveness of 93.78/89.41. And the Effectiveness Index (EI) of manual of hazardous waste management for Local Government Organizations was 0.7889, meaning that the participants had increased knowledge and resulted in the participants' learning progress after using training manuals 78.89%. This is effecting of the hazardous waste management manual for Local Government Organization, Maha Sarakham province. The environmental education transmission process was used by the technique of lectures integrated with brainstorming activities (ORID). During

the activities, the researcher brought in the recreational activities, playing games, inserted during the lectures to educate. The researcher has studied documents, textbooks and related researches to be used as a guideline for creating a hazardous waste management manual for Local Government Organizations, Maha Sarakham province. The researcher has defined the content of 5 activity units; the definition of general and hazardous waste, hazardous waste collection and transportation, waste and hazardous waste technology and management, laws related to the management of hazardous waste and management of waste and hazardous waste for Local Government Organizations. Which the manual is a book, a textbook, a written guidebook to guide users to study and understand and can be put into operation immediately until achieving the goal in which the standards are as close as possible enabling learners to have similar knowledge, abilities, and skills [9]. Prepared guide to suggest guidelines for readers used in activities this is to facilitate education, research and set objectives. Methods for conducting the measurement activities by the authors are made easy to read and convenient for educators or leaders to organize activities and can follow until achieving success on their own [10]. A good manual should look like this: the characters used should be large, language that is easy to understand, the layout of the book is interesting, the size of the booklet is not too small, not too big, with charts, tables, pictures and examples for practical use, procedures and how to use the manual should be clearly stated. The presentation system should be from easy to difficult or as a matter clearly presenting the content is correct and clear by containing content or details corresponding to the subject studied the content should be appropriate can be referenced or applied and the students have the same understanding can be put into practice after studying the manual [11]. This is consistent with the research of Onanong Phonkhokkong et al. [12] found that manual activity effectively as 81.00/89.43, the effectiveness of manual activity index was 0.8033. And Prayoon Wongchantra et al. [13] it was found that the efficiency of the manual was 80.00/86.86 and the effectiveness index (E.I.) was 0.6989. And Kanitta Nammai and Namthip Khamrae [14] found that the development of a training manual for water resource management in Maha Sarakham province. The efficiency of the training manual 91.33/83.77 had an Effectiveness Index (E.I.) of 0.635. And Pornnipa Toomhome and Prayoon Wongchantra [15] found that the effectiveness of the training manual was 84.53/85.33 while the effectiveness index of the training manual was 0.6343. And Phakeewai. S. and Wongchantra. P. [16] found that the environmental recreation camp activities manual for youth in Roi-Et province had the efficiency of 85.17/83.44 and the effectiveness index was 0.6117. And Pasita Maikami and Prayoon Wongchantra [17] found that the reinforcement manual was as effective as 90.86/87.53. The index is equal to 0.7301 strengthen the effectiveness of your students' progress in learning 73.01%. And Thinkamchoet, J. and Wongchantra, P. [18] found that the ASEAN natural resources and environment conservation manual for youth in Roi-Et province it has an efficiency threshold of 90.04/83.44. The effectiveness index of the manual is 0.6670. Therefore, the promotion of waste management and hazardous waste for the Local Government Organizations, Maha Sarakham province was efficient and effective as a result of the use of environmental transmission processes as a result, the participants had more experience and training progress.

3. The results of the study and comparison of knowledge about hazardous waste management, environmental ethics and environmental volunteers before and after the training.

3.1 The results of the study and comparison of knowledge about hazardous waste management before and after the training, found that after the training, the participants had average scores of knowledge of the hazardous waste management higher than before the training with statistically significant level .05. It is a result of the hazardous waste management manual for Local Government Organizations, Maha Sarakham province that is effective and effective according to the criteria due to the formatting of the manual. Determining the scope of content to be comprehensive, appropriate and consistent with the stated objectives by bringing knowledge about hazardous waste management for Local Government Organizations, Maha Sarakham province emphasis is placed on the process of transferring knowledge in the environment by using lecture techniques combined with brainstorming (ORID) and inserting recreational activities during activities. In order to create fun, enjoy the activities as a result, the knowledge of hazardous waste management after the training was higher than before the training. Which knowledge is the ability to think, understand facts, and apply to solve problems appropriate to the situation at that time, plus previous experiences arising from learning and then making a decision to evaluate is one thing which is clear and quality [19]. It is also a tangible asset, but it is very valuable to an organization. Organizations need to develop knowledge to stand out, which is an important cost of the organization, knowledge that has arisen for a long time or may be called wisdom. It is knowledge that is not only derived from highly educated people, but can also be produced by ordinary people. Nowadays, folk wisdom is regarded as valuable knowledge because the knowledge that is produced does not come from textbooks or research in laboratories rather, it is a result of trial and error experience that has been passed down through generations [20]. This is consistent with the research of Somchok Sriharaksa [21] found that the

village health volunteers who attended the training using the environmental education training set about solid waste in the community knowledge of waste management after training increased from before training. And Kan Nakaphong et al. [22] found that after the training, the average score was higher than before the training in the knowledge and understanding of solid waste management in the community. And Prayoon Wongchantra et al. [13] found that the students had more knowledge about recycling waste management after the training than before the training. And Supanee Siengsan et al. [23] found that the villagers had higher knowledge about the promotion of solid waste solutions in the community after the promotion than before the promotion. And Niran Yingyuad [24] found that the students' knowledge about waste management for students in the department of agriculture and environmental studies through the participation between the university network, schools and communities after the activity was higher than before participating in the activity. And Wiriyapoom Chansuphasen [25] found that the employees had more knowledge about infectious waste management after the training than before the training. And Phra Thep Suree Chankhao and Piyapong Chanmaimoon [26] found that the students had higher knowledge of solid waste management after the activities than before participating in the learning activities. And Dung Mohammed Dauda et al. [27] found that assessing the knowledge and attitude of college students towards solid waste management in Nigeria's North Central Zone, the students had a low level of solid waste management knowledge. Therefore, it shows that hazardous waste management training for Local Government Organizations, Maha Sarakham province, is a process for planning the training and has a process of transferring knowledge through effective training materials as a result, the participants gained more knowledge after the training.

3.2 The results of the study and comparison of environmental ethics before and after the training, it was found that found that after the training, the participants had a mean scores of environmental ethics higher than before the training with statistically significant level .05. This is a result of the introduction of hazardous waste management manual for Local Government Organizations, Maha Sarakham province, which it was used to integrate in the training activities, consisting of 5 activity units, using lecture techniques and brainstorming techniques, which focused on interesting waste management and hazardous waste. There is an example of hazardous waste management in Maha Sarakham province. It reflects the thoughts, behaviors and behaviors of the participants in the training. As a result, the participants had higher ethical environment after the training than before the training, which environmental ethics it is an environmental practice for human beings that takes integrity correctness according to moral principles and kindness that should be treated with the environment. Which will affect life and human beings together the way humans treat the environment consists of fundamental beliefs that differ in morality to the extent that they cause different environmental impacts [28]. Including principles that should behave towards the natural environment to allow the natural environment to exist in accordance with the balance of the natural environment that is harmoniously and sustainably. Environmental ethics is a way of managing the environment that humans have turned to deal with themselves or a return to improve the human management system environmental ethics aims to understand the environment and create an environment-friendly relationship with mutual generosity. Despite the economic development process to use natural resources to meet human needs, but natural resources will not be completely destroyed. People with environmental ethics know how to use natural resources wisely and at the same time know how to develop and conserve natural resources for sustainable existence and that is to know the principles of sustainable development [29]. This is consistent with the research of Pisan Kruarit and Chaiwat Suthirat [30] found that the environmental ethics of Mathayom Suksa 1 students after participating in the activity was higher than before participating in the activity. And Prachumporn Loahprasert [31] found that the effect of ethical interpolation teaching on the development of environmental ethics in undergraduate students the students had average scores on environmental ethics after the experiment was higher than before the experiment. And Uraivan Praimee and Wannasakphijit Boonserm [32] found that the students had higher average scores on environmental ethics regarding waste and waste management after learning than before learning. And Kannika Sookngam Prayoon Wongchantra and Wutthisak Bunnaen [33] found that the students had average scores on environmental ethics regarding soil, water and forest conservation according to the royal science after training higher than before training. Promotion of hazardous waste management for Local Government Organizations, Maha Sarakham province, there is a training process that results in the participants analyzing, brainstorming, reflecting the idea that the participants are ethical in the environment as a result, the environmental ethics after training was higher than before.

3.3 The results of the study and comparison of environmental volunteers before and after the training, it was found that after the training, the participants had mean score of environmental volunteers higher than before the training with statistically significant level .05. This is a result of the process of transferring activities arising from the hazardous waste management manual all 5 activity units have used transfer techniques by emphasizing that the

participants participated in thinking analysis of the current situation of hazardous waste management. In order to stimulate and strengthen the concept for the participants to express their behavior towards the environment and solving problems related to waste management, hazardous waste. As a result, the participants had a higher volunteers environment after the training than before the training by caring and assistance. Those who volunteer to express volunteer behaviors for the common good, such as sacrificing money, things, time, physical exertion, and wisdom to help others and society without expecting a return [34]. Including knowing empathy be engaged and participate in matters of public benefit to the nation have awareness and adherence in the moral system and good ethics ashamed of the wrong focus on neatness economical and balance between man and nature [35]. It is also a sacrifice of time, physical effort, mental strength and wisdom for the benefit of others or society. It is a voluntary act with no expectation of reward and it is an act that is not an obligation to be held accountable [36]. This is consistent with the research of Apinya Chommon, Prayoon Wongchantra, Likhit Junkaew [37] found that the average score of environmental volunteering in relation to the promotion of learning about water resources and aquatic animals in the community before and after the student promotion had a higher mean score of environmental volunteering after the promotion than before the promotion. And Rachineeporn Srikam. et al. [38] found that the mean scores of environmental volunteers before and after training for livestock resource promotion in the students' communities had higher scores of environmental volunteers after training than before training. And Omrudee Wisetwut et al. [39] found that the students had an average score of environmental volunteers in relation to learning about soil resources and land use in the community after the training session than before the training. And Sulukkhana Janchompoo, Prayoon Wongchantra, Uraivan Praimee [40] found that the students had an average score of environmental volunteering towards promoting the reduction, acceptance, giving and use of plastic waste after promotion is higher than before promotion. And Kannika Sookngam Prayoon Wongchantra and Wutthisak Bunnaen [33] found that the students had higher average scores of environmental volunteers in relation to soil, water and forest conservation after the training session than before the training. Therefore, the promotion of hazardous waste management for Local Government Organizations, Maha Sarakham provinc, there is a training process that results in the participants thinking and analyzing so that the participants have a higher volunteering environment after the training than before the training.

Conclusion

The promotion of hazardous waste management for Local Government Organizations, Maha Sarakham province was found that;

- 1) Hazardous waste management of Local Government Organizations in Maha Sarakham province, there are 13 districts, 142 Local Government Organizations. There are total 17,604.71 kg / year hazardous waste. Almost, they take hazardous wastes to disposal with Mahasarakham Provincial Administrative Organization.
- 2) A manual of hazardous waste management for local government organizations, Maha Sarakham province was efficient =93.78/89.41 and effective = 0.7889.
- 3) After the training, the participants had knowledge, environmental ethics and environmental volunteers higher than before the training with statistically significance at the .05.

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