International Journal of Agricultural Technology 2017 Vol. 13(7.2): 1805-1820
Available online http://www.ijat-aatsea.com
ISSN 1686-9141

Initial Environmental Examination Study Report: Project of Effective Waste Management with Production as Renewable Energy of the Mahasarakham Provincial Administrative Organization

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Wongchantra, P., Wongchantra, K., Ongon, S., Junkaew, L., Sookngam, k., Kaeongam, S., Phansiri, C. and Oncharoen, A. (2017). Initial Environmental Examination Study Report: Project of Effective Waste Management with Production as Renewable Energy of the Mahasarakham Provincial Administrative Organization. International Journal of Agricultural Technology 13(7.2): 1805-1820.

In the present, the problem of solid waste in Mahasarakham caused rapid economic and social expansion. Solid waste management is inadequate and with the use of technology is not appropriate. Because most of the waste is collected by disposal method being used to collect solid waste collected from the community on the ground for landfill and letting the natural degradation affect the quality of the environment in various ways. The objective was to study the Initial Environmental Examination : project of effective waste management with production as a renewable energy of the Mahasarakham Provincial Administrative Organization. The results were divided into 4 aspects 1) physical environmental impact : surface water had a BOD value that exceeds the established standards, groundwater values were standard. 2) effects on the biological environment, including the forest and wildlife effect was low. 3) effect on the value of human use, including land use was in low level in residential areas in the industrial areas. And the use of the area livestock, did not have any effect on the project area. 4) impact on economy and society. Project of solid waste management effectively with the production of renewable energy changing from the area of no use was the value added of land use by the impact on the well-being of society or community was very low. The employment of the people in the community and surrounding area led to generate income, flow of money in the economy, help the economy and the income of the community better, quality of life and well-being of helping people in the community better as well as improves the utilities of the community. It is good for the economy and the society of overall space. It also includes measures to prevent, correct and reduce environmental impacts. The project can be implemented with minimal environmental impact and the planning of public participation to implement environmental impact assessment and environmental measures to cover more.

Keywords: Initial Environmental Examination Report, Project of Effective Waste Management with Production as Renewable Energy, Mahasarakham Provincial Administrative Organization

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Introduction

The environment is very important and essential to us. This is something that will benefit humanity. If the necessary environment is lacking, it will inevitably cause human problems. Environmental issues that are closely related to the well-being of people such as solid waste, polluted water, air pollution, noise pollution, etc. If there is no good way to manage or solve the problem, it will affect the quality of life of the people.

At present, the problem of solid waste has intensified and there is a growing trend. Many areas have been allocated budgets for the construction of waste disposal systems. Some of the construction has already been completed and has been completed. But some can not be operated because of resistance from the people in the area. The amount of solid waste is increasing day by day. If no solid waste is disposed of correctly and appropriately, dirt problems caused by solid waste it must happen. Solid waste will cause a lot of problems to the environment. It will also affect human health, both directly and indirectly because solid waste is a food source and a breeding ground for insect pests such as insects, flies, mosquitoes, mice, etc., it can cause bad odors and cause nuisance wasteful waste, the wind blows scattered to the area, make the area dirty and lack of beauty (Saked – Oy, P. 2010).

In addition, the problem of solid waste management is the environmental problems that all parties involved to spot the importance and the need to cooperate you its condition. The problem is that the day will intensify. It is a consequence of the progress the economy and social continuity. The new technology used in daily life and standard of living the higher the material, the more abundant and the amount of waste as more. While most of the methods and facilities for disposal of solid waste have not been sanitized and the efficiency of the agency responsible for collecting solid waste is low.

In addition, awareness and the consciousness of garbage dumping of people in the community is not satisfactory. Impacts on the environment in society, such as contamination of water, leaching of waste to surface water and groundwater, these effects caused annoyance it is harmful to the environment and health of people living nearby (Sainara, P. 2009).

Maha Sarakham province is a province that faced problems of solid waste management, the amount of waste all 379.9 tons/day. The cause of the economy and society quickly which affect the environmental quality in areas such as the water, air and soil pollution, is a problem in public health. The solid waste management of local administrative organizations, mainly is to each household to get rid of it and also the lack of personnel in the solid waste management, take place in garbage disposal is not enough on the amount of

rubbish and the lack of budget for purchasing the trash and garbage collection vehicles, including the use of technologies that are not suitable. Most of the waste is collected by collecting solid waste collected from the community on the ground for landfill and let the natural decomposition removal in this way results in environmental problems (Wongchantra, P. *et al*. 2017).

Consequently, the solid waste management and the amount of waste of local administrative organization in Maha Sarakham province had a IEE study of solid waste management project effectively with the production of renewable energy to analyze and evaluate the impact of the project. It also provides guidelines for correcting and mitigating environmental impacts. This is the basic information to support and promote waste management of Maha Sarakham province effectively with the production of renewable energy.

Objectives : to study the initial environmental examination project of effective waste management with production as a renewable energy of the mahasarakham provincial administrative organization.

Materials and methods

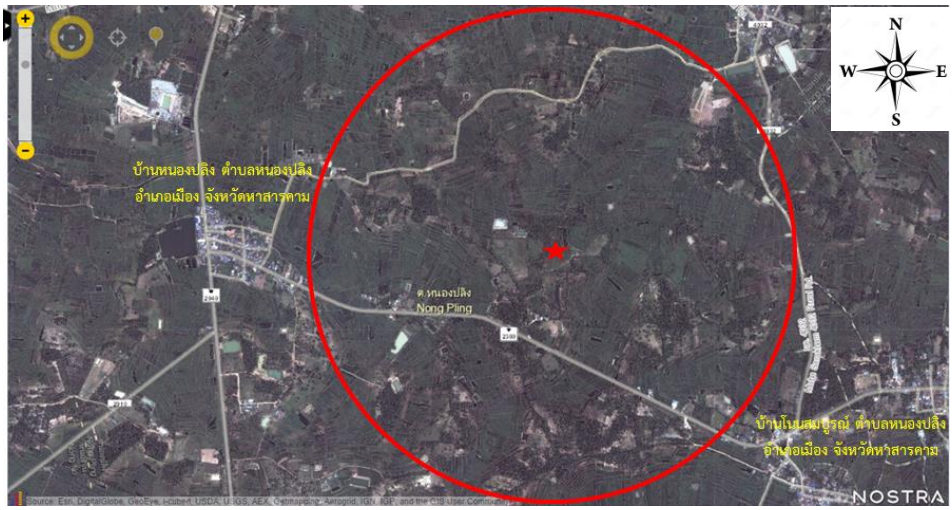

Figure 1. Shows the location of the project site

A study the initial environmental examination was scoped of radius 1.5 kilometers guidelines for the preparation of initial environmental examination. It covers all four aspects physical resource, biological resource, human use value and quality of life value to analyze and evaluate the environmental impact on the project and to propose measures to prevent environmental problems. They also studied the opinions of people in the communities around the project area. The details were as follows:

Study area

There were two levels : Level 1 within the project area and Level 2 in the vicinity of the project and adjacent areas expected to be affected by the project within a radius of 1.5 kilometers from the center of the project.

Steps in the study

There were 7 main steps:

1. Study details of the project : project characteristics, project location, project plan green area, work process, power generation systems, transportation systems, workplace pollution public utility system, occupational health and safety public participation in the area and public relations to make it clear and to see the elements of the environment that may be affected clearly.

Figure 2. Project area

2. Data collection : Study of primary and secondary data of resources and environment currently covers 4 aspects including; physical resource, biological resource, human use value and quality of life value including current problems in the project area and the 1.5 km., study area which may be affected by the development of both short and long term projects to use as a database for environmental impact assessment.

3. Field survey : A survey to collect data in the field of environmental resources comprehensive 4 aspects including survey measuring environmental quality, questionnaires household sample and the study of public participation and public relations.

4. Analysis and initial environmental examination : By studying and analyzing the environmental impact, natural resources that may arise from project development, environmental impact assessment both positive and negative effects direct and indirect effects both in construction and operation.

5. Proposed measures to prevent correct and reduce the environmental impact : By focusing on the negative impacts of significance to complete the project can proceed the minimal environmental impact as far as possible and in accordance with the level of impact by procedure or method is practical in the form of the action plan and the measures of environmental quality monitoring the necessity of environmental surveillance from the later project open operation.

6. Public Participation Plan : By planning the participation of the public education area and plans to engage the public education area. This is a recommendation or concerns about the public participation activities. It will be used for environmental impact assessments and joint environmental measures.

Results

Initial environmental examination study project of effective waste management with production as renewable energy of the Mahasarakham Provincial Administrative Organization to study the effects are expected to occur if the operation of the project, the precautions and fix the impact to make the project can be executed appropriately without destroying the natural resources and environment. The study of environmental impact, which is divided into 2 phase: phase construction phase and project as follows:

Initial environmental examination

Physical resource

- terrain

Construction phase : The project area is a plain and hill plateau which is alternately with the wave. Project development in the initial stage the adjustment of some areas suitable for construction in various parts of the building which is used to dig soil from raw water storage tank and the pond water treatment project. When considering the effect on the terrain of the area, this activity will only change the terrain of the project area. In addition to space adjustments, it will be necessary and appropriate for the use of the space. It is expected that the impact on the terrain will be low. Soil resources it is expected that project development will result in loss of utilization of the soil resources to be a factory. However, Maha Sarakham Province has a large area of land. It is expected that the use of land resources in the wilderness and other unused areas will increase, so the impact on soil resources is expected to be low.

Operational phase : When the open operation, there will be no any activity related or disturb the terrain and soil resources more or affected by

changes in terrain of the area more. So it is expected in the open operation of the project will not cause adverse effects on the terrain and soil resources within the project more.

- Geology and earthquake

Construction phase : the construction of buildings of the project has the characteristics of construction according to normal. The ratings are used by special instruments only activities into the soil, pile driving which does not change the characteristics of the geological structures to affect the bedrock. Considering the project activity, there were no activities, this will cause an earthquake effect in the area. The project is in an area not vulnerable to earthquakes no earthquake events have been found. However, the project has designed a structure that can support the earthquake to a certain extent. It is expected that the construction activities will not affect the geological structure and the seismic conditions in the area.

Operational phase : The project activity is to generate electricity from solid waste. It can not cause an earthquake. The location of the project is not in the earthquake risk zone. Therefore, it is expected that the project will not affect the geological structure and the earthquake in any area.

- Meteorology and air quality

Construction phase : The main pollutants formed during the construction project is the dust, especially during the adjustment of reclamation activities area. Because such activities must be open the face of the earth. The dig area to adjust the plowing soil according to the desired level. In addition, transportation of soil and building materials, it will cause the diffusion effect of dust. However, the project has set out measures to prevent and reduce the impact of air quality at the construction stage. The construction activities of the project will affect the neighboring communities at the lowest level. In addition, construction activities will be temporary and limited to the project area. So the construction activities of the project will cause adverse effects in low level.

Operational phase : The project's duration is from the combustion of solid waste to produce electricity. However, the technology used is environmentally friendly technology. It is expected that the project will not affect the meteorological and air quality in any way.

- Sound

Construction phase : During construction activities. The noise in the area may cause disturbance to the people in the area such as digging and pile driving, heavy machinery, transportation of construction materials. Considering the construction activities, the steps and time of operation are divided into periods of ground clearance, excavation, foundation, structural and finishing. It is expected that the project will not affect the noise level.

Operational phase : As soon as the noise level is activated, the waste is discharged. The project has designed and set up various machines noise exceeding 85 dB(A). The project has adopted measures to prevent and mitigate noise effects such as planting trees in the fence around the plant area. The implementation of the measures this will reduce the noise level. Therefore, the impact on communities in the vicinity of the project area is expected to be low.

- Water and surface water quality

Construction phase : Surface water quality in the vicinity of the project site showed that the project area was flat with no large water sources and natural water sources. It does not affect any surface water. Surface water quality measurements in the vicinity of the waste ponds showed that the BOD exceeded the standard. This has an impact on the area surrounding the waste landfill and the groundwater quality analysis is standard. This indicated that the establishment of this site does not affect the water quality and surface water quality.

Operational phase : From the project activities, no groundwater was used in the production process. Impact on groundwater quality due to waste water from various activities the project will not occur. Due to the contamination of water, it is sent to the wastewater treatment system of the project before reuse it will not be released to the outside anyhow. Therefore, it is expected that the activities of the project will not affect the water source and surface water quality in any way.

Biological resource

- Ecological land : Impact of forest resources is a short-term effect only. During the construction phase there will be a change of area, which consists of logging and customizing areas excavation and backfilling. The impact on wildlife resource in which project area wild small number. Wild animals can adjust or migrated to escape it is expected that the effect is low.

- Ecology water : From the activities in the construction of a water caused by construction activities and the activities of water use, such as the wash water from the wheel, garbage, etc. These wastewater are collected and sent to the sedimentation ponds before reuse. The treated water will be recycled. It will be sent to the raw water storage tank of the project. All wastewater will not be drained to external public water sources. So it is expected the operation of the project will not affect water ecosystem, its external space projects.

Human use value

- Land use

Construction phase: The development of the project is in no way incompatible with the local plan. The construction activity of the project is in the area of 30 rai of Nongping sub-district, Muang district, Maha Sarakham province. Currently, most land use is empty. Therefore, when developing the project will change the use of land for the benefit of its original area of desolation. It is a project for solid waste management more effectively with the production of renewable energy. It is expected to have a low impact on the land use of the project. Since most of the land is unoccupied, it is not expected to affect the use of land surrounding the project area.

Operational phase : The activities of the project the expected benefit of land use in its business and residential community is increasing. The development of the project will affect the development of public utilities and facilities, such as improvement of transportation and electricity including living space the use of industrial space and the use of livestock expected not to affect any to the project area.

- Transportation

Construction phase : The impact that occurs during this construction phase. It comes from the transportation of material caused by demolition, moving to a designated area transportation of construction materials and construction machinery to the project area including travel to the work of construction workers and related engineers. Most of the vehicles used in the route are heavy trucks. The projected impact of low level vehicles is expected to be low.

Operational phase : When the project is open the project is designed to prevent and reduce the impact to a certain extent. But the development of the project may have a significant impact on traffic expected no impact on the project.

- Waste management and waste

Construction phase : Waste from construction workers expected waste from construction workers. The project will be distributed to the garbage collection area. The project requires the contractor to coordinate with the responsible agencies to get rid of the sanitation. Solid waste from construction activities will be collected and adjusted to the area within the project. It is expected that the potential impact of solid waste management during construction will be low.

Operational phase : When operations there is a waste that can not be used in the project. It will be garbage sorting the rest up for sale, such as glass, metal, etc. The waste or ash generated by the project activity will be used to

make bricks and block them into a mixture of cement expected no impact on the project.

Quality of life value

- Economy - Society

Construction phase : The expected economic and social impact of the construction of the project both positive and negative effects. The major positive impacts are increased employment and the distribution of local income and promote business related to construction. Negative impacts are often indirect impacts of air and noise pollution. The construction activities of the project have caused nuisance to people in communities near or adjacent to the project. There may also be conflicts or controversy among project workers.

Operational phase : When the project operation of solid waste management more effectively with the production of renewable energy. It is to enhance the value of land use. By the impact on the well-being of society or community was very low. The employment of the people in the community and surrounding area led to generate income flow of money in the economy better than ever.

- Public health, health, occupational health and safety

Construction phase: Construction activities pose a health threat to workers and people in the neighborhood are dust from construction activities, pollution from burning fuel, machinery and engines noise from construction activities, transport accident and accidents from improper operation.

Operational phase: Activities in the operational phase the health hazards of workers are the separation of solid waste. The project has a standard set of protective equipment in operation. It is expected that there will be no impact on the project.

- Historic sites and antiques : From the project area, there are no historical sites and antiquities registered with the archaeological institute. The Fine Arts Department is expected that there will be no disturbance or disturbance to historical sites and antiquities.

- Travel and Aesthetics : The project construction activities are not expected to directly impact tourism and aesthetics. However, there may be indirect impacts in terms of traffic congestion. But the impact will be low all tourist attractions and aesthetics are located outside the project area.

Measures to prevent and reduce environmental impact

Physical resource

1) Soil adjustment compaction of the soil layer is smooth and uniform to prevent soil erosion, especially during the rainy season.

2) Determining water injection carpet area construction with the spread of dust at least 2 times/day.

3) Prepare equipment to prevent dust for workers adequately especially the workerS are in the area of construction, which may be affected by the dust.

4) The truck building materials had to be concealed or what binds in the truck to prevent dropped its material or the spread of dust.

5) Speed control of the truck does not exceed 30 km/h. during community passage and up to 80 km/h in the passage through the general area.

Biological resource

1) Do not allow hunters or trappers of all kinds (including birds) in the project area and nearby areas by do not hunt.

2) Set up a tree planting area within the project to replace the cut trees.

3) To issue regulations to care staff trees planted in the project area.

4) Plant perennials in green areas and areas with additional landscaping to create a shady.

5) Public relations campaign the importance of conservation of natural resources and the environment.

Human use value

1) Driver training to record discipline in driving and avoid transport during periods of traffic congestion.

2) Weight control truck to truck too to prevent damage of surface traffic it may cause an accident.

3) Preparation of temporary drainage ditch in alignment with the conduit and permanently installed sieve trap waste before paint rainwater from the area project.

4) The fence around the project area sewer system and delay water pond to trap the sediment to flow out to the outside the project.

5) Provide staff responsible for collection of solid waste in the project area.

2.4 Quality of life value

1) Allow the contractor to consider local people in the first place.

2) Comply with the measures to reduce impact on air quality, noise and the strict, especially in the community.

3) Meet community leaders and government officials in the area to listen and exchanges of opinions on the impact and preventive measures.

4) Coordinate with hospitals and local authorities, if you need help in an emergency.

5) Training workers about hygiene and disease prevention and ratings caused annoyed.

Public Participation Plan

The community survey was conducted in two communities: Ban Non Somboon and Ban Nongping, Nongping sub-district, Muang district, Maha Sarakham province. There were 186 households, including members of the subdistrict administrative organization, the village headman, the assistant village headman and the community members. The results of the study indicated that the appropriateness of using waste conversion technology as a renewable energy and generating electricity for most local areas was 161 people (86.60%), not suitable for 16 people (8.60%), and unsure of 9 people (4.80%). Most of the community members agree that 152 people (81.70%), agree with the 24 people (12.90%), disagree the 4 people (2.20%), and disagree strongly the 6 people (3.20%).

Discussion

1. Initial environmental examination mainly secondary data and primary information is needed to be completed within a specified period of time. The analytical approach used a descriptive style to cover the different environments. This may be due to both direct and indirect effects of the project both in the short and long term will impact on resources and environment and values how much to each group and how serious including non-returnable effects. (Suebjakkosi, N. 2003) Including physical resource analysis of physical resources in both construction and operation stages include topography, soil resource meteorology and air quality and noise level, it was found that the impact on the project was at a low level. Geological and earthquake water and surface water quality does not affect the project in any way. This is consistent with the research Plaipol, N. (2014) the study of environmental impacts from Maptaphut Industrial Estate on local communities through the environmental

carrying capacity theory. The objectives of the study were to assess the capacity of water resources supporting industrial activities, and to assess the capacity of water and air assimilating industrial activities, water and air quality, the quality of water resources for industries and communities. It also has increased in air pollutants such as sulfur dioxide, particular, ozone, and volatile organic compounds (VOCs). These could be indicated that there has been exceeding in capacities of both supportive and assimilative contributing the environmental problems in the study area. The biological resources analysis of the impact of ecological land effect was low and the aquatic ecology from the activities of the project will not affect its project. This is consistent with the research Wongchantra, P. *et al.* (2017) the study of environmental health impact assessment of community solid waste management project in Ban Donyom, Thakhonyang sub-district, Kantharawichai, Mahasarakham. The results showed that forest resources implementation of project was less affected to natural forest because the project area was quite far from forest and plants along head of field both in construction and operation phase. Wildlife resources in the project area was not find wildlife from survey. The human use value from the development of the project of land use project area and surrounding the ratings affect the benefit from land surrounding the project area. The transportation. The solid waste management and waste were in low level. This is consistent with the research Baipho, W. (2013) Study the social and environmental impacts on community from integrated waste management middle zone, Pha Thung Noi village, Doisaket district Chiang Mai province. The purpose was to study the process of the project, environmental impact social impact on the community to suggest solutions to problems that may arise from the project to related agencies and to the community. This is consistent with the research the social impacts, the middle zone integrated waste management project created occupations and produced income to the villagers. It brought in macadamized road, village water supply, multi-purpose pavilion, and allocated income to the village. The project process continuously damaged the road and caused smell. These long-unsolved problems led people to lose faith in the leaders; consequently people had bad relationships with their leaders. The suggestions from this study to solve the impacts from integrated waste management middle zone were the project should be controlled, directed, taken care of, and monitored, based on the principles of waste management. There should be environmental quality monitoring. The project should cooperate with the community in order to organize public hearings and to embrace responsibility for the impacts that caused by the project. The faith in community leaders should be increased. The household waste separation should be promoted and the community should be informed about how to prevent dust pollution, smell,

flies, and diseases from garbage. The quality of life value the activities of the project in both the construction phase and operational phase are socio-economic. This will lead to increased employment and the distribution of local income included effective local waste management, health, occupational health and safety the project activities will not affect the project. The source of history, historical sites and artifacts attractions and aesthetics. The ratings were any activity to disturb or impact on the project. And consistent with the research Bawornkiattikul, D. (2002) study social environmental impact assessment, found that the environmental impact assessment was an environmental study that set character of environment by human concerning in 4 resource group: physical resource, biological resource, human use value resource and life quality resource. All of these have to use multi-disciplinary study. Since the life quality resource has the most context of technique that concerns social science that were both different and conspicuous as well as the important factor for project decision now. This social impact assessment would focus on issue that concerns social environment directly such as population, settlement, relationship between human and environment in community, history, religion and etc. All of these issues must use social science method to study, but it still focuses on the social impact from development project that would happen to social condition in community and making measurement to prevent and decrease impact environment. Altogether for the most important objective is to make the acceptance of community for development project that is the most importment factor that get development can implement.

2. Measures to prevent and reduce environmental impact, the initial environmental examination is expected measures to prevent and reduce environmental impact. It covers all four environmental aspects, including physical resource, biological resource, human use value resource and life quality resource both in construction and operation phase. The initial environmental examination report will describe the project's implementation in order to prevent and correct any damage to the environment, resources or values. As assessed and in case of damage can not be avoided and recovered, proposed compensation plan for such significant damage with the possibility and ways to increase the value and the destruction of natural resources. (Intaraphrom, S. 2003) environmental impact assessment was important to establish preventive and corrective measures for the environment (Office of Natural Resources and Environmental Policy and Planning, 2015) and guidelines on how to behave Management Systems Impacts may occur in each aspect according to the nature of the project with standard or benchmarking standards and criteria are used as controls or surveillance when measurement results beyond the specified standard are indicative of potential problems, the

impact or risk of a problem, monitoring of environmental quality in main measures as: emission environmental measurement, environmental quality measurement. This is consistent with the research Boonmuang, S. (2012) study the public participation in environmental and health impact assessment process: a case study of pollution control zone, Rayong province. The results showed that relevant agencies need to promote measures to increase the level of public participation. Researcher should also be conducted to determine the appropriate methods and timelines for the environmental impact assessment process and consistent with the research Wongchantra, P. *et al.* (2017) Study the environmental health impact assessment of community solid waste management project in Ban Donyom, Thakhonyang sub-district, Kantharawichai, Mahasarakham. The results showed that measures to prevent and correct environmental quality monitoring was implementation of measures to prevent and correct environmental impacts and measures to monitor environmental quality in the form of a strict environmental action plan for guidelines for monitoring, monitoring and control of public agencies and organizations involved in air quality, surface hydrology and drainage aquatic ecology, transportation waste management and waste management public health, hygiene, occupational health and safety and public participation.

3. Public participation plan a survey of community members on the appropriateness of using waste conversion technology as alternative energy and to generate electricity for local conditions and the opinions of people in the community to the project. The results of the study were properly prepared. The participation of the people is a group of people or movements undertaken by members of the community in a collaborative manner. To demonstrate coherent interests, there is a need to achieve a coherent socio-economic or political goal or joint action to influence the deputy. Be it direct or indirect or to take action to influence the economy and improve social status in the community. (Wachnasawas, K. 2007) This is consistent with the research Pukjampa, V. (2012) study a development strategy investigative research of the participatory process in the environmental checking and following-up of The Electricity Generating Authority of Thailand (EGAT) Mae Moh operations, Mae Moh sub-district, Lampang province. The results showed that people born in the municipality Mae Moh trust in the environmental performance of EGAT Mae Moh was good. Community agents continuously exchange and receive information as a result, the attitude of people in Mae Moh municipality was positively changed. And every step involved in the process has made the problem solved in the area. EGAT Mae Moh can carry out the prevention, control and monitoring. Measured by the people in the Mae Moh municipality has participated in the monitoring at a good level. It is useful and focuses on the

participation of the people. And consistent with the research Sithisarankul, P. (2014) study the four noble truths of health impact assessment and environmental impact assessment. The results showed that good environmental and health impact assessments include public disclosure before termination. Project consideration increasing personnel who can make environmental and health impact assessments are more interested in and aware of these issues by understanding and communicating in many ways, reconciliation and trust punish business establishments that misuse or destroy environmental quality and reward the establishment to do good or maintain the quality of the environment to develop and implement community health impact assessment, do not forget that projects or establishments that do not conduct environmental and health impact assessment are not environmentally responsible and no good pollution protection system, consider "Healthy" rather than just "health" and in assessing the environmental and health impacts, at least consider the 9 health determinants proposed by the National Health Board.

Acknowledgement

This research has been successfully completed with cooperation from the community and community leaders in Ban Nongping, Nongping sub-district, Muang district, Maha Sarakham province. Thanks to all the Mahasarakham Provincial Administrative Organization and thanks Center of Environmental Education Research and Training, Faculty of Environment and Resource Studies, Mahasarakham University, Mahasarakham, Thailand.

References

Baipho, W. (2013). Social and Environmental Impacts on Community from Integrated Waste Management Middle Zone, Pha Thung Noi Village, Doisaket District Chiang Mai Province. Rajabhat Chiangmai Research Journal, 14(2), April – September, 62-71.

Bawornkiattikul, D. (2002). Social Environmental Impact Assessment. Academic Journal, Faculty Senate Council of Burapha University, 2(1), January-June, 142-157.

Boonmuang, S. (2012). Public Participation in Environmental and Health Impact Assessment Process: A Case Study of Pollution Control Zone, Rayong Province. Journal of Safety and Health, 5(19), June – August, 7-17.

Intaraphrom, S. (2003). Initial Environmental Examination of Traffic and Transport Master Plan for the Metropolitan of Karnjanaburi. Master of Engineering (Environmental Engineering) King Mongkut's University of Technology Thonburi.

Office of Natural Resources and Environmental Policy and Planning. Guidelines for preparation of environmental impact assessment reports. An industrial estate project or project similar to an industrial estate or Industrial Land Allocation Program (1st update). Bangkok: Office of Natural Resources and Environmental Policy and Planning, 2015.

Plaipol, N. (2014). The Study of Environmental Impacts from Maptaphut Industrial Estate on Local Communities through the Environmental Carrying Capacity Theory. Master of Urban and Regional Planning, King Mongkut's Institute of Technology Ladkrabang.

Pukjampa, V. (2012). A Development Strategy Investigative Research of the Participatory Process in the Environmental Checking and Following-up of THE ELECTRICITY GENERATING AUTHORITY OF THAILAND (EGAT) Mae Moh Operations, Mae Moh Sub-district, Lampang Province. Master of Arts (Development Strategy) Lampang Rajabhat University.

Sainara, P. (2009). Participatory Management of Garbage Disposal : a Case Study of Phatath Nongbua Community in Ubon Ratchathani Municipality. Master Degree of Social Sciences for Development, Graduate School, Ubon Ratchathani Rajabhat University.

Saked – Oy, P. (2010). A Guidance For The Development Of Waste Manogement For People In Moo 4 Huay Nam Nak Community, Phoppra Sub-District Phoppra District, Tak Province.

Sithisarankul, P. (2014). The Four Noble Truths of Health impact assessment and Environmental impact assessment. Thammasat Medical Journal, 14(1), January-March, 102-106.

Suebjakkosi, N. (2003). Initial Environmental Examination of Traffic and Transport Master Plan for the Metropolitan of Chanthaburi Province. Master of Engineering (Environmental Engineering) King Mongkut's University of Technology Thonburi.

Wachnasawas, K. (2007). Public Participation in the Implementation of Government Policy on Employment Services. Bangkok : Planning and Information Division, Department Of Employment, Ministry of Labour.

Wongchantra, P. *et al.* (2017). Environmental Health Impact Assessment of Community Solid Waste Management Project in Ban Donyom, Thakhonyang sub-district, Kantharawichai, Mahasarakham. Proceedings The 4th Environment Asia International Conference "Practical Global Policy and Environmental Dynamics" June 21-23, 2017, Bangkok, THAILAND, 536-548.

Wongchantra, P. *et al.* (2017). The Model of Solid Waste Management in Mahasarakham province. Proceedings The 4th Environment Asia International Conference "Practical Global Policy and Environmental Dynamics" June 21-23, 2017, Bangkok, THAILAND, 524-535.

(Received 22 October 2017 ; accepted 25 November2017)