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## **The Project Feasibility Study of Solid Waste Transfer Station of MahaSarakham, Thailand**

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The purpose of this research was to study the project feasibility of solid waste transfer station of Mahasarakham; 13 districts by studying and analyzing the feasibility of the area and the situation of waste in the area, the feasibility of technical transfer station, feasibility in economics and the feasibility of management transfer station from the project by using the information collected and used a qualitative method. The study found that: 1) the feasibility of the project area were divided into 4 stations, including Mueang district station (Mueang Mahasarakham district, Kantharawichai district, Kae Dam district), Borabue stations (Borabue district, Na Chueak district, Kud Rang district), Chiang Yuen station (Chiang Yuen district, Chuan Chom district, Khosompisai district), Wapi Pathum district station (Wapi Pathum district and Na Dun districts) and Phayakkhaphum Phisai station (Phayakkhaphum Phisai district, Yang Sisurat district). They were suitable areas and equipped on the side of the area enough to project construction solid waste transfer station and the surrounding areas was conducive to project construction and project development. 2) the technical feasibility of project solid waste transfer station, it was found that the type of the station handling the solid waste management of Mahasarakham province were designed according to the size and amount of waste space projects happening in the day. 3) the economic feasibility of the solid waste transfer project was a project that will reduce waste management costs and eliminate residues and it is an investment that aimed to benefit the community based on the valuation of construction and technology within the waste disposal station. It was considered a good investment for the long-term investment. 4) The feasibility of internal management station and found that the project was high form of administration and internal management of solid waste transfer station environmental management and the system safety in work and social responsibility of solid waste transfer station, the precautions and fix the initial environmental examination in order to make the management in solid waste transfer station was appropriate and effective. So the solid waste transfer station project of Mahasarakham, there were the

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feasibility of the area and the situation of waste in the area, the feasibility of technical transfer station, the feasibility in economics and the feasibility of management transfer station.

**Keywords:** Project Feasibility Study, solid waste transfer station, Mahasarakham province, the feasibility of the area and the situation of waste in the area, the feasibility of technical transfer station, the feasibility in economics, the feasibility of management transfer station

## **Introduction**

The environmental problems, especially the problem of solid waste a problem and its impact on quality of life of the people. The increasing of population and economic growth of the community, the community has a large amount of waste can not keep up, other pollutants such as air pollution from burning outdoor waste produce smoke and air pollutants cause deterioration of air quality, wastewater from the garbage on the floor. When it rains, the rain will wash away the dirt on the garbage was a waste flows into the water. The garbage collection is not exhausted and the garbage on the floor is smelly and disturbing to the public and the image is not beautiful and aesthetics.

The problem of solid waste management is an environmental issue that all parties concerned recognize and need to work together to resolve. It is a problem in the community at all levels. This problem is compounded by the continuing economic and social development. The new technology use in daily life and higher living standards. There are more waste and more waste as well. While most of the methods and places of disposal of solid waste are not sanitary. In addition, the awareness and consciousness of the waste disposal of the people in the community is not satisfactory (Suttimala, 2013). Include the problem of providing waste disposal facilities, lack of knowledge in effective management cause conflict in the community and environmental problems. Solid waste management will need to be managed appropriately in order to prevent the problem of expansion and even more serious harm to public health and affect the environment.

MahaSarakhm province is a province that faced problems of solid waste management which mahasarakham has all the 13 district, 141 sub-district and a city of education as a result, there is a large number of latent populations causing waste problems, this is due to rapid economic and social expansion. MahaSarakhm province, which is no solution to the problem of solid waste efficient manner. Most of the waste collected from the community is collected on the ground to allow for natural decomposition and occasionally burned. The disposal of solid waste in this way resulted in environmental problems and public health. (Wongchantra *et al.*, 2017)

However, in the area of MahaSarakhm province have the place all 70 disposal. Each waste disposal facility provides solid waste disposal services

from local governance organizations and government agencies and private areas nearby. In addition, the local administrative organizations in MahaSarakham province also face problems and obstacles in solid waste management people in the community lack cooperation in waste management and lack of consciousness in the dumping of waste and there is no place for waste disposal. Including garbage truck damaged and the number of cars is not enough to collect waste. For solving solid waste management problems of local administration organizations have a public relations encourage people to have knowledge of waste separation before disposing of it and recycling of waste. It also promote knowledge about waste disposal sanitarily (Foundation of Environmental Education, 2014).

It is estimated that the amount of solid waste will increase, it is managed to utilize solid waste to produce electricity. The solid waste collection and disposal skip to gather at the center to produce the fuel rods used to generate electricity. It is necessary to have a waste disposal station, it is a place to dispose of waste from garbage trucks in different areas by gathering solid waste from direct disposing of people or from garbage trucks. The collected solid waste will be discharged into the transport system of the station that is highly efficient in the transportation of waste and suitable for the operation of the waste facility located far from its source besides having a garbage dump station also makes it possible to transport garbage out of the area quickly and efficiently reduce waste residue in the area as well as can save the cost of transportation. Therefore, the project feasibility study of solid waste transfer station of MahaSarakham to increase the capacity of efficient collection and disposal of solid waste and can reduce the amount of waste in the area of each district appropriately.

Objectives: To study the project feasibility study of solid waste transfer station of MahaSarakham, Thailand.

## **Materials and methods**

Feasibility study of solid waste transfer station project of MahaSarakham province to analyze the feasibility of the project area, the technical feasibility of project solid waste transfer station, the economic feasibility of the solid waste transfer project and the feasibility of internal management station.

1) Study model: a study of the potential due to the project of waste disposal station the study of appropriateness is important especially the feasibility of the project area, the technical feasibility of project solid waste transfer station, the economic feasibility of the solid waste transfer project and the feasibility of internal management station and found that the project. This

study uses primary data and survey data, the study also analyzes the feasibility of waste disposal stations for efficient waste management.

2) Area of study :the MahaSarakham provincehave to break the space is a transfer station, as well as the 10 district;Borabue district, Na Chueak district, Kud Rang district, Chiang Yuen district, ChuanChom district, Khosoompisai district, WapiPathum district, Na Dun districts, PhayakkhaphumPhisai district and Yang Sisurat district.

3) Data collection:The data collected from the actual area by recording analysis of information from documents, books, media, and other documents related to waste management.The analysis of the feasibility of the project areaand the situation of garbage each district, the technical feasibility of project solid waste transfer station, the economic feasibility of the solid waste transfer project and the feasibility of internal management station and found that the project.

4) Data Analysis :the study of primary and secondary data the analyzed data in the form of analytical description presented by analysis of the relevant issues as follows.

4.1)The feasibility of the project areaand the situation of garbage each district: An assessment of the suitability of the primary site for use as the location of the solid waste transfer station of each zone.Analyze the appropriateness of the amount of solid waste in each area is sufficient to manage and collect information on types, quantities and composition of solid waste in the area.To obtain information that can determine the appropriate size of the waste station and can handle the volume of solid waste adequately in the future.

4.2) The technical feasibility of project solid waste transfer station: The study of technology appropriate to the area to analyze the planning and management within the waste disposal station in terms of the type of waste disposal station appropriate, design of solid waste transfer station, removal of solid waste within the loading and unloading station, waste management system solid waste management system and the transport of waste from the bus station to eliminate the high-efficiency.

4.3) The economic feasibility of the solid waste transfer project:Analyze the feasibility of the waste disposal station, the cost of the project is considered. The cost of waste disposal machinery operating costs, labor costs, depreciation of assets and budget operating expenses etc., as an alternative to decision making. It is used to plan operations and to find ways to improve the changes that will lead to effective operations and the most rewarding in terms of environmental and social.

4.4) The feasibility of internal management station: A study of organizational models internal management of solid waste transfer station working process waste disposal station environmental management including wastewater treatment, odor control system security in practice preventive measures and solutions to environmental impacts to operate efficiently.

## **Results**

### ***The feasibility of the project area and the situation of garbage each district***

1.1 Feasibility of project location : solid waste transfer station project MahaSarakham province it is divided into 4 stations ; Chiang Yuen station, Borabue stations, WapiPathum district station and Phayakkhaphum Phisai station. Each garbage disposal station the information is as follows.

1) Chiang Yuen transfer station include Chiang Yuen district, ChuanChom district and Khosoompisai district. The amount of waste is about 120.8 tons/day. It is found that Khosoompisai district has the highest amount of waste about 59.8 tons/day, followed by Chiang Yuen district about 50.2 tons/day and the ChuanChom district about 10.8 tons/day. The area is suitable for PhonNgamKhosoompisai district, MahaSarakham province. The area of 25 rai, which is suitable for the establishment of waste disposal station and it is a medium-sized garbage transfer station.

2) Borabue transfer station include Borabue district, Na Chueak district and Kud Rang district. The amount of waste is about 103 tons/day. It was found that Borabue district had the highest amount of solid waste about 71.5 tons/day, followed by the Na Chueak district about 21 tons/day and Kud Rang district about 10.5 tons/day. And suitable areas are Borabue sub-district, Borabue district, MahaSarakham province, the largest amount of waste is about 56 tons/day. The area of 13 rai, which is suitable for the establishment of waste disposal station and it is a medium-sized garbage transfer station.

3) WapiPathum transfer station include WapiPathum district and Na Dun districts. The amount of waste is about 40 tons/day. It was found that WapiPathum district had the highest amount of waste about 27 tons / day, followed Na Dun districts about 13 tons/day. And the appropriate area is NongSaeng sub-district, WapiPathum district, MahaSarakham province. The area of 12 rai, which is suitable for the establishment of waste disposal station and it is a medium-sized garbage transfer station.

4) Phayakkhaphum Phisai transfer station include Phayakkhaphum Phisai district and Yang Sisurat district. The amount of waste is about 16.8 tons/day. It was found that Phayakkhaphum Phisai district had the highest amount of solid waste about 11.3 tons/day, followed by Yang Sisurat

district about 5.5 tons/day. And the area is appropriate Palansub-district, PhayakkhaphumPhisai district, MahaSarakham province. The area of 7 rai, which is suitable for the establishment of waste disposal station and a small garbage transfer station.

**Table 1.** Solid waste quantities MahaSarakham province, separated by each district.

Transfer station	Solid waste (tons/day)
Chiang Yuen transfer station	
- Chiang Yuen district	50.2
- ChuanChom district	10.8
- Khosoompisai district	59.8
<b>Sum</b>	<b>120.8</b>
Borabue transfer station	
- Borabue district	71.5
- Na Chueak district	21
- Kud Rang district	10.5
<b>Sum</b>	<b>103</b>
WapiPathum transfer station	
- WapiPathum district	27
- Na Dun districts	13
<b>Sum</b>	<b>40</b>
PhayakkhaphumPhisai transfer station	
- PhayakkhaphumPhisai district	11.3
- Yang Sisurat district	5.5
<b>Sum</b>	<b>16.8</b>
<b>Sum all stations</b>	<b>280.6</b>

**Table 2.** Results of selection of 4 waste disposal stations in MahaSarakham province.

Selection criteria	Have	None
1. Area which has the following characteristics : should not be used as a transfer station from the community.		
- Wetlands of international importance and the national level, as determined by the relevant authorities.		✓
- The area forbidden to build factories under the factory law.		✓
- The area not to building construction according to law on the control of the building.		✓
- The area is obstructed by the flow of water and water flows as the Ministry of Natural Resources and Environment announced.		✓
2. The community solid waste transfer station should be located away from the premises or the following areas not less than 1,000 meters.		
- The land of the archaeological site.		✓
- Watershed Class 1 and 2 by the Cabinet Resolution.		✓
- Conservation area.		✓

### ***The technical feasibility of project solid waste transfer station***

2.1 Feasibility of type garbage transfer station: Based on the analysis of the type of loading station all 4 stations are direct transfer stations. Garbage collected from the garbage can be transported directly to the station's solid waste transporter or to the solid waste compressor before it is packed in the transport vehicle.

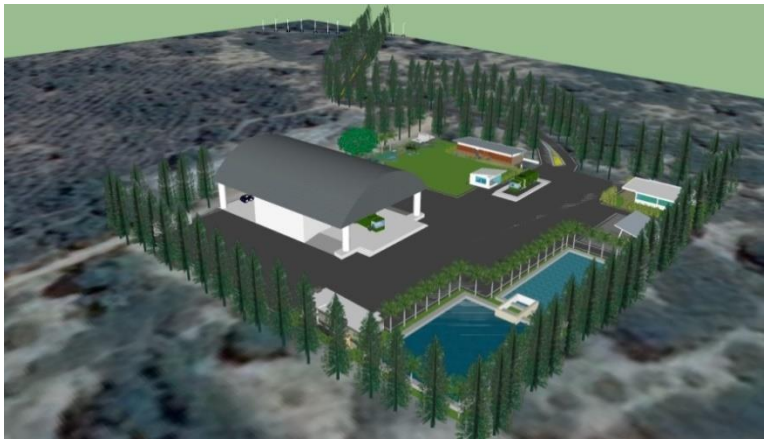
2.2 Feasibility of designing waste disposal station: In the design of the building and the waste transfer station of each station are designed to fit the size of the area of solid waste transfer station each area is divided into the following areas. 1) The area consisting of the solid waste transfer station used in compression systems, building systems, waste containment and transport system for loading and unloading all transport to and from the starting end of the process. 2) The location of the power transmission system of the entire area of the project the electrical system of electrical machinery for the treatment system, office electricity, lighting system and other electrical systems. 3) The area used for wastewater treatment activities it consists of wastewater treatment ponds, water ponds and water supply systems, installed water treatment and standard water treatment system. 4) Areas for maintenance and cleaning of garbage trucks includes parking lot, pressure pump and basic maintenance equipment. 5) Loading area with weighing platform trash trailer and hydraulic lifting. 6) Office space will consist of office and bathroom used in the management of all waste disposal stations. And 7) recreation area includes landscaping or activity patios and bathrooms.

2.3 Feasibility of handling waste, there are ways to remove waste: The solid waste compactor there is a way to introduce solid waste into the compressor, disposal of garbage from the garbage truck to the top of the waste compactor, dispose of garbage from the truck on the floor and then use a tractor to push the waste into the compressor, the use of automated conveyor systems for waste disposal on compressors and installation of compressors in the garbage pit. The pickup truck pours the waste directly into the hole or pours it onto the floor and then the tractor pushes the waste into the hole when the solid waste is full it will compress the waste into the container.

2.4 The feasibility of compressed garbage is compressed horizontally systems, a large quantity of waste management to move further to the centre of with high efficiency. The compaction force are high can produce garbage compression and in the highest price and performance.

2.5 Feasibility of waste management system: The suitability of the waste management system within the waste disposal station. The waste compacting machine is a hydraulic system. The capacity is not less than 90 cubic meters per

hour. The volume of compression is not less than 30 cubic meters per round. Garbage truck, it is suitable for use with waste compressors and tractor hydraulics, truck scales, pumps sludge and sewage pumps, air-filled equipment and clean water pump.



**Figure 1.** Layout design examples Chiang Yuen transfer station.



**Figure 2.** Layout design examples Borabue transfer stations.





**Figure 3.** Layout design examples WapiPathum transfer station.



**Figure 4.** Layout design examples PhayakkhaphumPhisai transfer station.

### *The economic feasibility of the solid waste transfer project*

#### 3.1 The feasibility of economics waste transfer station.

1)Chiang Yuen transfer station the budget for the waste management system in the solid waste transfer station of the solid waste transfer station in Chiang Yuen district, MahaSarakham province it is suitable for the amount of waste.The management system within the transfer station the total cost of investment in the solid waste management system is about 25,524,500 Baht to install a solid waste management system and budget transportation technology of solid waste from the station to the landfill. By

using a 10 wheelhydraulic towing truck (40 ton truck size) is most appropriate. The budget is about 12,518,000 Baht.

2) Borabue transfer station the budget for the waste management system in the solid waste transfer station of the solid waste transfer station in Borabue district, MahaSarakham province it is suitable for the amount of waste. The management system within the transfer station the total cost of investment in the solid waste management system is about 21,273,750 Baht to install a solid waste management system and budget transportation technology of solid waste from the station to the landfill. By using a 10 wheelhydraulic towing truck (40 ton truck size) is most appropriate. The budget is about 10,000,000 Baht.

3) WapiPathum transfer station the budget for the waste management system in the solid waste transfer station of the solid waste transfer station in WapiPathum district, MahaSarakham province it is suitable for the amount of waste. The management system within the transfer station the total cost of investment in the solid waste management system is about 13,273,750 Baht to install a solid waste management system and budget transportation technology of solid waste from the station to the landfill. By using a 10 wheelhydraulic towing truck (40 ton truck size) is most appropriate. The budget is about 10,000,000 Baht.

4) PhayakkhaphumPhisai transfer station the budget for the waste management system in the solid waste transfer station of the solid waste transfer station in PhayakkhaphumPhisai district, MahaSarakham province it is suitable for the amount of waste. The management system within the transfer station the total cost of investment in the solid waste management system is about 8,539,000 Baht to install a solid waste management system and budget transportation technology of solid waste from the station to the landfill. By using a 6 wheelhydraulic towing truck (15 ton truck size) is most appropriate. The budget is about 6,000,000 Baht.

3.2 Feasibility of land and building economics the study of investment budgets in the field of fixed assets consists of land, buildings, furnishings and machinery: The budget is a fixed asset that needs to be advised by a deterioration of the deterioration of the buildings must seize the appropriateness of the size and characteristics of the project area include Chiang Yuen transfer station statements used in the construction of approximately 33,732,000 Baht, Borabue transfer station statements used in the construction of approximately 30,292,000 Baht, WapiPathum transfer station statements used in the construction of approximately 25,512,000 Baht and PhayakkhaphumPhisai transfer station statements used in the construction of approximately 15,652,000 Baht.

3.3 Feasibility of economics management in the field of project management, solid waste transfer station has an estimated cost of personnel to carry out the construction project and assessing personnel costs for the operation of the transfer station include : Chiang Yuen transfer station the project management budget for the construction of the project is 10,000,000 Baht and the operating budget of the waste disposal station is 5,616,000 Baht/year, Borabue transfer station the project management budget for the construction of the project is 5,700,000 Baht and the operating budget of the waste disposal station is 4,350,000 Baht/year, WapiPathum transfer station the project management budget for the construction of the project is 2,352,000 Baht and the operating budget of the waste disposal station is 2,512,000 Baht/year and PhayakkhaphumPhisai transfer station the project management budget for the construction of the project is 1,050,000 Baht and the operating budget of the waste disposal station is 1,596,000 Baht/year.

3.4 The feasibility in economics the calculation of the fuel costs in the garbage collection of each station include : Chiang Yuen transfer station the fuel costs in the amount of waste collected 103 tons, about 2,200 Baht/day, Borabue transfer station the fuel costs in the amount of waste collected 120.8 tons, about 3,304 Baht/day, WapiPathum transfer station the fuel costs in the amount of waste collected 40 tons, about 939 Baht/day and PhayakkhaphumPhisai transfer station the fuel costs in the amount of waste collected 16.8 tons, about 670 Baht/day.

**Table 3.** Cost budget in the overall construction of solid waste transfer station. Of MahaSarakham province.

<b>Solid waste transfer station</b>	<b>Cost budget (Baht)</b>
1. Chiang Yuen transfer station	25,524,500
2. Borabue transfer station	21,273,750
3. WapiPathum transfer station	13,273,750
4. PhayakkhaphumPhisai transfer station	8,539,000
<b>Sum</b>	<b>68,611,000</b>

***The feasibility of internal management station and found that the project***

4.1 Feasibility of organization management and management of solid waste transfer stations MahaSarakham province: The agency is appropriate because each station has the potential to be sufficient and effective and there are health and environmental departments. It is responsible for the management of solid waste and is responsible for maintenance.

4.2 Feasibility of managing the solid waste transfer station, which is operated by providing operational staff in working hours, maintenance include safety measures during the operation, waste control, the smell of garbage and surface water monitoring surface water around the waste disposal station. Which may be affected by the implementation of a solid waste transfer station.

4.3 Feasibility of safety system in operation the regulations for safe operation at the waste disposal station are defined include measures to prevent and correct the initial environmental impact. The water quality is monitored and wastewater management, this is a measure to prevent and correct the environmental impact.

## **Discussion**

1. The feasibility of the project area and the situation of garbage each district, the total amount of waste is 280.6 tons/day. The garbage transfer station of MahaSarakham province is divided into 4 stations including : Chiang Yuen transfer station, Borabue transfer station, WapiPathum transfer station, were a medium-sized garbage transfer station and PhayakkhaphumPhisai transfer station is a small sized garbage transfer station are appropriate criteria for the selection of the design, construction, municipal solid waste transfer station of Pollution Control Department Ministry of Natural Resources and Environment. (2014) the areas selected for use as a solid waste transfer station, this area should not be used as a solid waste transfer station include wetlands of international importance and the national level as determined by the relevant authorities, watershed class 1 and 2 by the cabinet resolution, The area forbidden to build factories under the factory law, areas forbidden to build buildings in accordance with the building control act, the area which obstructs the flow of water and the area is likely to be eroded, landslide risk area and the flow of water and water flows as the Ministry of Natural Resources and Environment announced. The community solid waste transfer station should be located in an uninhabited open air area and away from locations or areas no less than 1,000 meters from the site of the historic site and conservation area. This is consistent with the research Chinpeerasathian, W. (2010 :74) study the feasibility study of the waste separation plant : case study of SaiKaew municipality, Soi Dao district, Chanthaburi province. The study found that to improve and create the waste and garbage disposal system will be able to get rid of garbage in the municipality more efficiently from the original. Because of the location limited original waste no layout of garbage disposal system and no waste garbage can partially to be used again such as plastic, metal can be recycled, organic waste can be fermented to be distributed or distributed to farmers in the area. And consistent with the research

Chiangpuek *et al.* (2015) The state of rural solid waste management in Kokmuang Village, Nonsung Subdistrict, Nongbualumphu province. The study found that the type and amount of solid waste from the shelter that the villagers have smuggled into two areas include : outdoors which is a personal area 2 km. away from the house is open air barbed wire fence easy to throw waste. From the survey, the amount of solid waste was 308 kg. (44.41%), the mountain area the public is 5 km. away from the village, the mountain area is plain he has its mixed tree small tree with its large barbed wire fence surrounded serviced volume solid waste residues were 408.8 kg. (55.59%) and it is also found that the amount of solid waste in the mountain area is quite variable. This may be because public spaces are not owned by the public or should be mutually exclusive. It makes people in the area more popular than private ownership and the owner of the area may condone the illegal dumping of waste.

2. The technical feasibility of project solid waste transfer station: The 4 stations are the direct conveying station that collects solid waste and transports it to the waste disposal station of the station to the efficient waste disposal center. The design of a solid waste transfer station that station it is designed to fit the size of the area. The area is divided solid waste disposal station area, power distribution system area, used for wastewater treatment activities area, area for maintenance and cleaning of garbage trucks, office space and recreation area. This is how the garbage compactor garbage landscape with a proper system of solid waste management in the solid waste transfer station consist of solid waste disposal is a hydraulic system, garbage truck, truck scales, pumps sludge and sewage pumps, air-filled equipment and clean water pump. The technical feasibility of waste disposal station of Maha Sarakham province suitable for project area. This is in accordance with the design guidelines for buildings and systems in the community solid waste transfer station of Pollution Control Department Ministry of Natural Resources and Environment (2014) the design of the community solid waste transfer station is in accordance with the rules and standards used in the country. The standard of construction shall be in accordance with the standards or requirements of the relevant governmental bodies or other acceptable standards include : structural work shall be in accordance with the requirements of the local administration organization, standard of Department of Public Works and Town & Country Planning, road work to meet the standards of the Department of Highways and Department of Public Works and Town & Country Planning, electrical work according to the standards of the Provincial Electricity Authority and Metropolitan Electricity Authority, water supply is in accordance with the standards of the Provincial Waterworks Authority and Metropolitan Waterworks Authority, mechanical work to meet the standards of the Department of Industrial works, safety in

operation is in accordance with the standards of the Department of Industrial works and Department of Labor Protection and Welfare, fire protection is in accordance with local administration organization, Department of Public Works and Town and Country Planning, Department of Industrial works and Department of Disaster Prevention and Mitigation. Internal road system design transportation routes with transport vehicles effective internal traffic control. Roads within the solid waste transfer station should be in asphalt or concrete surface. In case of traffic channel one direction should be not less than the width of the traffic 3.5 meters and in the case of two channel traffic direction there should be no less than the width 6 meters. Design of designated areas for transfer, collection, solid waste disposal may be in a closed building or covered area the dust control system must be installed, smell from waste and waste management system. Road ramp up the garbage disposal slope not more than 10% the various elements of solid waste transfer station designed to meet the needs of applications and the suitability of the space available. It must include basic elements such as road and traffic systems, office building, maintenance area, parking area, truck clearing area, wastewater treatment, entrance door, fence, plumbing, electrical system, communication system and weight scale, system design for rainwater management in municipal solid waste transfer station to effectively, design of wastewater control systems for solid waste disposal and truck clearing to prevent the leakage of leachate water mixed with rain water and control the water quality before draining to the outside it must not exceed the legal water quality standards. This is consistent with the research Theamaka (2013) feasibility on electricity generation from municipal solid waste in Kanchanaburi province. The study found that non-oxygenated degradation technology combined with the production of solid waste fuel it is worthwhile to invest more secondary biogas technology from landfill, community waste gas production technology and incinerator technology each technology is the suitability of each different sides. However, the selection of appropriate technology to be implemented in Kanchanaburi province system complexity must be considered, availability of local personnel and the impact on the environment. And consistent with the research Sawain *et al.* (2014) solid waste management approach for Rajamangala University of Technology Srivijaya, Trang Campus. The study found that factor analysis of the main technical digest is suitable for waste quantity incident and suitable for the characteristics of components of solid waste. Alternative technology choices will be consistent with the requirements of each technology and technology choice with the amount of waste to landfill and minimal include isolation at the source, bank of garbage, a compost pile court system, burning furnace, sanitary landfill. The amount of waste is 0.005 tons/day. The technology used in waste

management minimizes the amount of waste left in the landfill. The technology can make the amount of waste to landfill and minimal is considered to be the appropriate technology.

3. The economic feasibility of the solid waste transfer project: There will be a budget for solid waste management at the solid waste transfer station of the solid waste disposal station by the management system within the transfer station. Installation of solid waste management system and waste transportation technology. The investment budget for fixed assets consists of land, building and machinery. As for the waste management project management, the personnel costs were assessed in the construction project and assessing personnel costs for the operation of the transfer station. Include calculations of fuel costs for garbage collection of each station. The feasibility study on economics and value of investment is cost effective in terms of benefits and satisfaction. This is because the solid waste transfer station project can help reduce one operating cost and can be utilized without wastage. The reduction of pollution to make the country clean, the distance from the location to the source of the waste, as well as reducing the impact on the environment garbage appropriately. According to the concept of Department of Alternative Energy Development and Efficiency (2011) the return on investment analysis is a comparison between income and expenditure. If the income is higher than the cost, the investment is worth it and if the rate of return is higher than the interest rate of the investment to invest otherwise. The Net Present Value (NPV) of a project is the present value of the project's cash flow this can be calculated by taking a net present value discount over the life of the project to its present value. The Internal Rate of Return (IRR) is the interest rate on a loan that causes the NPV to be zero so the project's return rate is the interest rate or  $i$  that makes  $NPV = 0$ . If the current loan rate is higher than the calculated rate of return on the project it is unreasonable to invest in the project. On the contrary, if the current loan interest rate is much lower than the project's calculated rate of return Show is a project that yields more returns respectively. The Benefit-Cost Ratio ( $B / C$ ) is the ratio between the present value of the return current or the value of the project's return relative to the present value of the cost flow or total cost of the project including the power plant cost, land cost, installation cost, operating cost, maintenance cost. If the ratio is greater than 1, it should be decided if the ratio is less than 1 the project is not interested in investing, if it is 1 it shows that the breakeven project. The payback period is the amount of time that the revenue after deduction of operating expenses can be used to pay for the full investment in the development of the project, mostly used for a number of years. Projects with short payback periods are better projects than those with long payback periods. By theory, the payback period must not be longer than the

lifetime of the project. But in practice, the payback period of large projects will be accepted at 7-10 years. This is consistent with the research Saranrom *et al.* (2015) A case study of waste processing plant fuel establishment in Nonthaburi Municipality, Nonthaburi province. The results showed that there are the wastes that can be component of fuel around 174 tons/day in Nonthaburi city area. Plastic, paper and wood waste are selected as raw materials to produce and use lime to be as a emulsifier for briquette to hold tight with a ratio of 38: 4: 1: 1 respectively. Once it processed into waste fuel, it will be able to produce fuel with a capacity of 71.56 tons/day which is equivalent to the heating value 23.79 MJ/KG. There are 7 steps to transform waste into fuel and by economic value analysis founded that the discount rate is 10 percent and net present value equals 118,772,598 baht internal rate of return of 30.91% and a payback period of 4.11 years, 15 year project life. And consistent with the research Kijkuakul (1998) study the feasibility study on the economics of waste disposal in Phuket municipality. The study found that investing in public benefit projects often considers the value of the investment. By comparing the costs and benefits directly with the project. The result is mostly the project is often lost, so it's not as attractive to invest in the private eye. But the study points out that if one can assess the economic benefits. It does not just focus on the direct benefits of the project. It also includes the indirect benefits of projects that may be worth more. It also contributes to the long-term benefits to the population as well the project is a worthwhile investment.

4. The feasibility of internal management station and found that the project. It is possible to form an organization, administration and management of waste disposal stations. MahaSarakham province it is appropriate that each station has sufficient and effective capacity. The internal management garbage transfer station that operated by staging the personnel, maintenance, safety control measures and has established regulations for security operations in solid waste transfer station including measures to prevent and mitigate environmental impacts. The management of waste disposal stations of each station is appropriate for the structure and condition of the area effectively. However, good governance or good governance is required to bring about participation, transparency, accountability, morality and the rule of law. It is a framework and a management approach, with the expectation that the final result will be achieved effective and sustainable. By sharing accurate complete and timely information. Optimize monitoring environmental, quality monitoring and the information is publicly available. Include review and improvement of environmental quality standards periodically. The development of incentive systems to encourage people or organizations to support sustainable management. (Samutvanich *et al.*, 2001) This is consistent with the research



Raktakanit (2015) organic waste management using anaerobic digestion technology in Thailand. The results showed that the impact on the environment application of biotechnology in the removal of organic waste, the energy from waste and eliminate organic waste effectively. The impact of biotechnology is very small this is a closed system. It controls the factors that will affect the environment well, whether it is disturbed and the waste water flowing out. The system is powered by the energy produced from waste those without dependence on energy from other sources produce biofuels for use in projects without having to buy a limited amount of oil and reduce the amount of waste. When the process is over, the waste is really only 10% will be managed to landfill. However, the status of waste left over from the biotechnology process will change to an inert state that does not affect the environment. And consistent with the research Poboorn (2008) study of local administration organization and good environmental management: case study of Phitsanulok Municipality. The results showed that Phitsanulok Municipality has achieved great success in environmental management as well as waste management and other aspects. The waste management is a comprehensive waste management. The factors that affect achievement in environmental management such management has a vision and a clear management approach to environmental management, commitment, sacrifice and to focus on the benefits to the community, the allocation of adequate budget, has defined the responsibilities clearly environmental policy is aimed at building a livable city and human resources development and modern technology help to manage the environment. External factors are important get support from the community from academic departments from abroad and cooperation from related government and private agencies.

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