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# The Development of Saket Island, Thailand

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# Abstract

Our project assisted the Industrial Estate Authority of Thailand (IEAT) in reducing tensions between the Maptaphut Industrial Estate and its surrounding community. By surveying stakeholders and researching case studies, we developed ideas that could enhance nearby Saket Island for the benefit of the local villagers. We analyzed these ideas and the IEAT's previous plan for the island based on cost, feasibility, and the villagers' desires. Finally, we recommended a plan to the IEAT for Saket Island's future development.

# Executive Summary

The rapid increase in Thailand's industrial development has caused industry to spread from the nation's capitol to the nation's countryside. Thailand's industry is localized in its industrial estates which are self-sufficient entities containing living areas, communication facilities, banks, stores, and other amenities. Near these estates are local communities trying to survive using their old way of life. The Maptaphut Industrial Estate, where we conducted our field work, is located two hours southeast of Bangkok and is one of the largest industrial estates in Thailand. It is successful for many reasons including its location on the seaboard, access to an airport, railways and Thailand's major highways.

The Industrial Estate Authority of Thailand (IEAT) works to create and manage industrial estates such as the one in Maptaphut. Based out of Bangkok, the IEAT has offices in each estate. The IEAT is responsible for ensuring that the estates adhere to strict international environmental standards.

Environmental tensions exist between the Maptaphut Industrial Estate and the local community, and the IEAT would like to reduce these tensions. The IEAT has chosen Saket Island which is located 300 meters from the shore of the industrial estate to be the catalyst which will hopefully foster a better relationship between the estate and the locals.

Saket Island is a small island about ten acres in size. There is a small floating dock connected to a walkway which circles the island. There is a beach on one side of the island and a collection of rocks and shells on the other. The interior of the island contains spirit houses, trees, shrubs, and flowers. The island is currently polluted with litter everywhere.

The IEAT would like to make use of the island in order to improve its relationship with the local communities. IEAT had its own ideas for the island's future, but requested that the stakeholders be contacted as well. The stakeholders include the local community and the Maptaphut Municipality, the actual owners of the island. In the end, permission to do anything on the island will have to be granted by the Municipality.

Since one of the stakeholders is the local community, we had to determine their interests for the future of Saket Island. We gathered ideas for the island's future by

interviewing villagers in the five villages near the industrial estate. We conducted the interviews one household at a time as we made our way from the closest village to the most remote village. Once we had surveyed all five villages, we categorized and analyzed their responses.

The major response that we heard from the people is that they wanted Saket Island to remain natural. We also discovered that they visited the island for relaxation and for fishing. The villagers we interviewed were composed largely of fishermen, merchants, restaurant workers, teachers and various other workers. The fishermen in particular did not want to see any development on the island. Some of the merchants, however, were in favor of small construction on the island hoping it would attract tourists. Two-thirds of the villagers interviewed agreed with suggestions for small construction such as a groomed beach, restroom, benches, and an educational program. They felt these ideas would benefit the island. None of the villagers, though, had any original ideas for development on Saket Island. To keep the island natural was their almost unified response. Not one person was in favor of large construction that would require part of the island to be cleared. Many of the villagers wanted to avoid bringing tourists to the island.

We discovered the opinions and ideas of the Maptaphut Municipality during a meeting arranged by the IEAT. We met with the Head of the Department of Public Works and a senior civil engineer. The Municipality showed interest in developing Saket Island as a tourist attraction. They wanted to see an aquarium built and wanted to bring cable car access to the island as well. These ideas fall under the large construction category and would clash with the villagers' wishes to keep the island natural. They would also require a large budget for construction and almost all of the natural areas would be destroyed.

In order to gather further ideas for the possible development of Saket Island we researched case studies of areas of natural land that are located near industrial areas. The major cases we researched were the Boston Harbor Islands and the Gateway National Recreation Area. Both of these natural parks are located near large cities with major ports. People visiting these areas enjoy recreational activities such as hiking, camping, swimming, wildlife observation, and some come to learn about the cultural history of the

areas. Another major reason people visit these parks is for the educational programs they offer, which help school children learn about science. Because of the small size of Saket Island, some of the recreational activities such as hiking are not feasible. Swimming or picnicking, however, would be appropriate. The island has a lack of interesting wildlife to observe as well as no cultural history to speak of. The island would be well-suited for educational programs dealing with marine life or water quality testing. Recreational activities and educational programs are ideas that would not physically harm the island, and they would not go against the villagers' desires. These case studies of natural areas located near industrial areas also provide proof that industry and environment can coexist. The symbiosis of Saket Island and the Maptaphut Industrial Estate reinforce that point.

Next we analyzed the plan the IEAT had proposed for the future of Saket Island. Its plan included a meteorology center, an oceanography research station, a camping area, and a swimming area. We determined that both the meteorology and oceanography centers would fall under the large construction category. They would cause much of the land on Saket Island to be cleared and would be against the wishes of the local residents. We also believe that the villagers would be uninterested in these centers, and therefore they would be a waste of money. It is unlikely that a camping area is necessary. Since the villagers live so close to the island, they could easily travel home after their visit. Creating a groomed beach for a swimming area is a very good idea. The people use the island for relaxation now, and a groomed beach would provide the villagers with a place to relax.

After analyzing all the ideas we found, we developed a plan for the future of Saket Island. We recommended keeping the island natural as the villagers want, while adding a few subtle enhancements to the island. The first step should be cleaning up the trash on the island. This must be done in order to protect the island's natural state. Then the large rocks should be removed from the beach to create a safe swimming area. Once people start visiting on a more frequent basis, they would likely appreciate a bathroom on the island. Placing concrete benches around the island would also be a simple, non-harmful improvement. Once these facilities have been installed on the island, a worker could be hired to check up on the island and to be responsible for removing trash from

the island. The final stage of development on Saket Island should be an educational program for school children, which would entail constructing a small building and training local teachers to lead the educational programs. The programs should teach about marine life or water quality testing. These developments should also take place in stages. If it is taken one step at a time, the total development cost can be spread over time. The total estimated cost of these developments is 240,000 baht ($5,500).

The costs of these developments should be subsidized by the local government. The villagers are too poor to pay to use the island. If the villagers have to pay for anything, tensions between them and the industrial estate would escalate. The two possible sources of funding are the Maptaphut Municipality and the IEAT. The Municipality should be responsible for funding development since they own the island, but because they have nothing to gain, this is unlikely. If they are unwilling to pay, the IEAT should fund development. This act of goodwill would reduce tensions between itself and the local villagers.

We advised the IEAT of our findings with a presentation. We stressed that the real wish of the villagers was to keep the island completely natural. If this is the course of action taken by the IEAT, we explained that it would have to tell the villagers the island is being cleaned and will remain natural for their benefit. If the villagers felt their ideas were actually being considered, tensions over the industrial estate would surely subside.

# Table of Contents

## Table of Figures

# Introduction

Thailand, like most other countries, has an industrial sector. Most of Thailand's industry is contained in its industrial estates, which are collections of related manufacturing plants. Specifically, the Maptaphut Industrial Estate, located two hours southeast of Bangkok, is one of Thailand's largest industrial estates. It is successful because of its location on the seaboard and its proximity to an airport, railway, and major highways.

In the past few decades, the Industrial Estate Authority of Thailand (IEAT) has been able to transform Thailand's industrial sector from individual manufacturing plants into collections of related plants called industrial estates. This has improved efficiency of the plants and reduced environmental damage near the estate.

Saket Island, located off the shore of the Maptaphut Industrial Estate, has benefited from this transition. Its future was once threatened because it is located so close to the estate, but with its safety now preserved, the IEAT would like to do something positive with the island.

One reason the IEAT wants to develop the island is to relieve tensions between itself and the villagers. The villagers believe the industrial estate itself is an eyesore and that it is polluting their air and water. They believe all of this despite continued efforts of the IEAT to improve the estate and to reduce pollution. The IEAT clearly needs to take steps to reduce this tension.

The IEAT chose Saket Island as the catalyst to improve the relationship between itself and the locals. If IEAT creates something positive on the island for the local community, the local residents may recognize this act of good will. The IEAT, however, is taking another step. It would like to know exactly what the villagers would like for the island.

With this in mind, our first objective for this project was to determine what the stakeholders want for the future of Saket Island. The main stakeholders included the local villagers and the Maptaphut Municipality, the actual owners of the island. But since the IEAT had its own set plans for the island, our second objective was to analyze them. We were also asked to find information about similar situations and projects in the world,

making the research of pertinent case studies our third objective. Our final objective was to create a presentation for the IEAT describing our findings.

The discussion that follows provides an in-depth look at industrial development in Thailand, industrial estates, the history and current operations of the Industrial Estate Authority of Thailand, a history of the local villagers, sustainable development, and symbiosis. The methodology of our objectives follows. Finally we collect our results, present our analysis of them, and conclude with our recommendations for the IEAT.

The Industrial Estate Authority of Thailand is committed to demonstrating that industry and environment can coexist. They have chosen Saket Island to be their case in point because of its location near the Maptaphut Industrial Estate. The act of modest improvements on the island will help to relieve tensions between the IEAT and the locals. It is likely that the efforts of the IEAT have saved Saket Island and that the island will remain a beautiful and natural area for years to come.

# 1 BACKGROUND

This chapter contains the background information necessary to understand our project. Sustainable development has made an impression upon today's changing society, shaping the world of tomorrow. Before this concept arose, industrial development in Thailand, as in most developing countries, was disorganized and used resources inefficiently. Thailand is now working to solve these problems through industrial estates. Our project focuses specifically on the Maptaphut Industrial Estate and its surrounding community. The villagers living near the industrial estate are upset because they are convinced the factories emit pollution. It is an ongoing struggle for the IEAT to efficiently manage the industrial estate to create and foster a symbiotic relationship between the local community and the industrial estate. Hopefully the Saket Island project can help reduce tensions between the locals and the industrial estate.

## *1.1 Sustainable Development*

Sustainable development is a concept that enables us to efficiently utilize our energy and resources for future generations. Sustainable development seeks answers to our present-day development problems without compromising the ability of future generations to do the same.[1] The current situation is that industries eat away at resources while polluting the earth with waste. This will either cause permanent resource losses or it will completely destroy a part of the environment, which is to say we are compromising the ability of future generations to solve their development problems. Sustainable development involves planning so that this can be avoided.

Sustainable development is not a new idea. In fact, cultures over the course of human history have recognized the need to harmonize society, economy, and the environment, but now the concept of sustainability is being applied to our current global industrial and informational society. But how do we make the transition to keeping sustainability in mind? This requires changes in the way people think, and these changes have to be put into action at all levels, from local to international.

Sustainable development is an evolving concept. There are many definitions and variations of these definitions, but certain ideas recur. One is that we need to be fair to

[1] http://www.sdgateway.net/

future generations and ourselves. Another is that we think in terms of long-term prevention rather than short-term cures. In other words, the transition to sustainable development means we will have to find actual ways to prevent pollution in order to create sustainability.[2] Currently we have waste treatment plants, which are more short-term cures than prevention.

Sustainability requires us to think in terms of systems. When we think in terms of systems, we see other ways to increase sustainability. We can understand development in terms of inputs and outputs to the system. For example, an industrial estate may appear to be just a collection of factories from similar industries. If we adopt a systems perspective, we might notice that an after-product of one factory is a necessary resource for another factory. Without a systems point-of-view, we could have incorrectly matched factories that do not complement each other. With the systems perspective however, we have reduced the environmental impact enormously and future generations have not been compromised.

Sustainable development is being carried out, as industrial estates, such as the Maptaphut Industrial Estate, are moving towards becoming eco-industrial parks. They are planning how they can reuse their waste products more efficiently. The Maptaphut Industrial Estate has a pipeline system that cycles byproducts from one company to another, reducing the wasted chemicals. By implementing plans like this one, the industrial estate is helping future generations through the conservation of resources and the reduction of waste. By broadening these plans to recycle waste products and cut down on pollution, development of the area can continue to occur with less of an impact on the environment and the future community. The IEAT is working towards attaining sustainable development in their industrial estates. Hopefully through proper planning, the IEAT will be able to improve conditions in the Maptaphut Industrial Estate, thereby improving relations with the local community. Sustainable development is very important, and its integration into future human development is essential for survival on a long-term basis.

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[2] *Ibid*

## *1.2 Industrial Development in Thailand*

The industrial development of Thailand took place very rapidly, without proper planning for the future. This rapid development led to the overcrowding and massive pollution of Bangkok. As an attempt to alleviate these problems, the Eastern Seaboard Development Project was created to encourage industrial development to spread out over the rest of the country. Dispersing industrial development over a broader area has boosted the economy in these areas through the creation of more job opportunities. The spread of industrial development has taken place in the form of industrial estates.

### 1.2.1 Industrial Estates

Industrial estates in Thailand are much more than a couple of companies operating in a certain area. There is a complete infrastructure where all of the factories in the estate share common benefits such as ample electricity, water supply, flood protection, wastewater treatment, and solid waste disposal. These estates have communication facilities, security systems, post offices, and commercial banks. Some have customs offices, schools, hospitals, shopping centers and other facilities needed for investors and workers. With all these facilities at hand, industrial estates resemble the setting of a small town rather than just a place of business.

Industrial estates in Thailand are divided into three main categories: those owned and operated by the Thai government exclusively, those jointly operated by the Thai government and private developers, and those wholly operated by private developers. There are two other classifications that can be applied to industrial estates as well. An estate can be either a General Industrial Zone (GIZ), or an Export Processing Zone (EPZ). The main difference between them is that an estate in an Export Processing Zone only produces exports and contains a customs house for fast clearing of products, while those estates in the General Industrial Zone do not.

### 1.2.2 Maptaphut Industrial Estate

The Maptaphut Industrial Estate in Rayong Province, is being developed into a large-scale petrochemical industry. The Maptaphut Industrial Estate is jointly owned by government and private developers and it can be classified as an Export Processing Zone. This estate has been established close to thirty years and it contains roughly eighty large

factories. The Maptaphut Industrial Estate is the most modernized industrial complex in Thailand. Its main objective is to transform raw materials into usable materials for consumption in order to reduce the need for imported items. The natural gas line running inland from the Gulf of Thailand goes directly to this site, which is why it was chosen to become the prime location of a large chemical industry. Several corporations working with the Thai government singled out this area as being part of the Eastern Seaboard Development Plan. Each company in the industrial estate has a contract on the land for a period of thirty years and can renew the permits for an additional twenty years. This illustrates that the companies are in business for the long term and also benefit in the conservation of the surrounding areas' environment and well being.

## 1.3 Saket Island's Surrounding Community

The country of Thailand is located in Southeast Asia. Thailand is split into 76 provinces, which are grouped into five regions. These regions are designated as the Northern, the Northeastern, the Central, the Eastern, and the Southern regions. Bangkok is located in the central region, while our project is located in the Rayong Province of the Eastern region. This province is located approximately 2 hours (by car) southeast of Bangkok. Besides containing some of Thailand's most productive industrial estates, Rayong is also the home of many tourist areas including well-known beaches and islands, for example Pattaya and Samet Island. Between these well known vacation spots is the Maptaphut Industrial Estate. The companies in this estate deal with the petrochemical, chemical, iron, steel and oil refineries. This is due to the access of large reserves of natural gas coming ashore by the pipeline, which extends far into the waters of the Gulf of Thailand.


**Figure 1: Map of Thailand**

Saket Island is a small-undeveloped island measuring roughly twenty rais in size, which is approximately equivalent to ten acres. It is located approximately 200 meters east of the natural gas pipeline and roughly 300 meters off the coast of the surrounding beach. The island currently has no permanent structures, only a brick walkway circling the island. There is a fair amount of debris both along the beach and in the interior of the island. This along with the existence of fire pits, shows evidence that the locals frequent this island. There is no evidence of wildlife on the island, except for trees and plants.

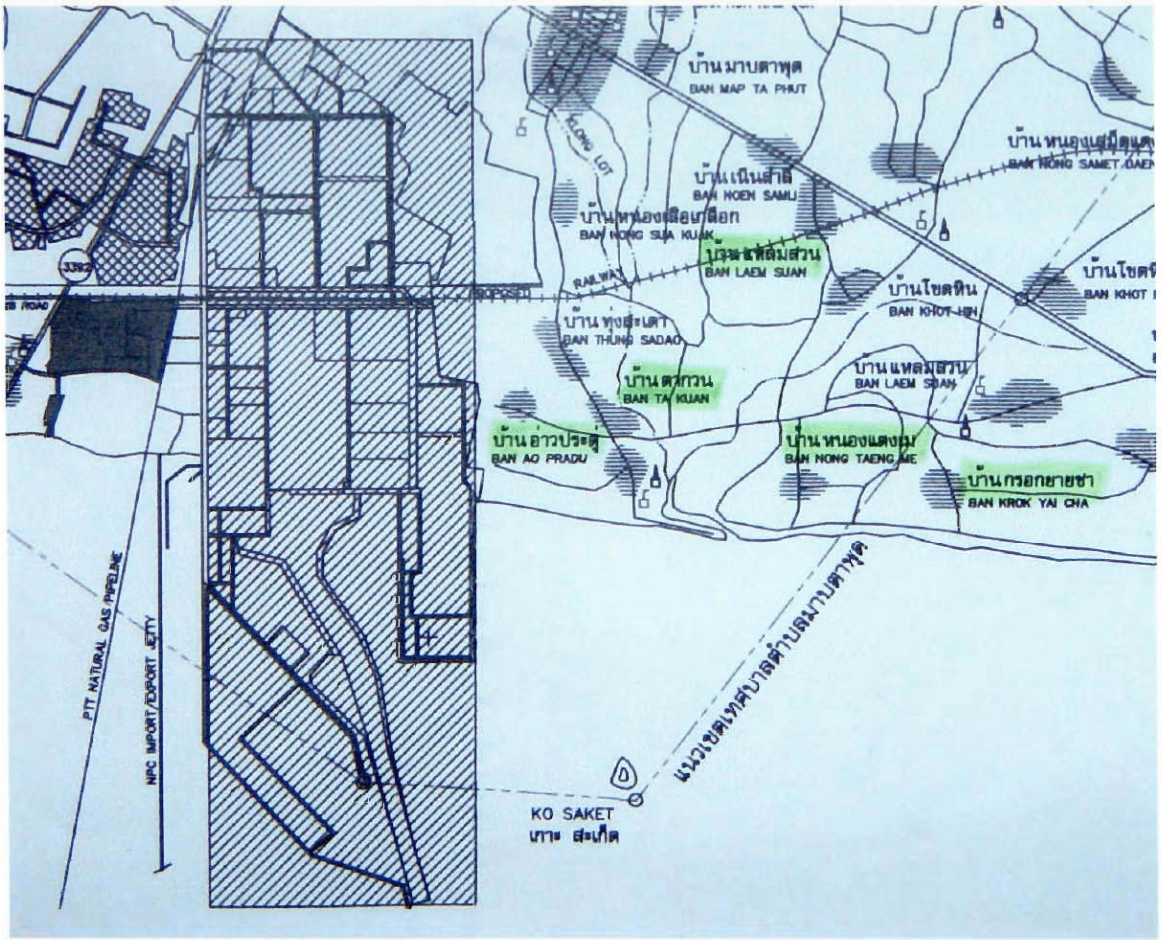


**Figure 2: Maptaphut Industrial Estate and Surrounding Community**

### 1.3.1 Local Community

The people who use the island are mostly the fishermen of the surrounding villages. The villages are scattered along the beach adjacent to the Maptaphut Industrial Estate. These villages, highlighted on the above map, include Ban Au Pradu, Ban Ta

Kuan, Ban Laem Suan, Ban Nong Taeng Me, and Ban Krok Yai Cha. The villages are mainly comprised of bamboo style shelters. The majority of the locals earn their living through fishing the local waters.

Most of these people have lived in the villages their whole life, with very few ever leaving the area for schooling or employment. As for education, the local population commonly obtains only a basic education through the public elementary school located near the villages. At an early age, they begin working with their family and usually live out the same lifestyle as their parents did. Very few of the villagers have knowledge of life outside of the village, let alone the rest of their country. They spend their days repeating the same routines. The fishermen set sail at night and come back to the villages in the morning with their catch. After spending several hours removing the fish from the nets and cleaning them, there is very little time for anything except eating and sleeping before the next fishing trip begins. The rest of the villagers also revolve their lifestyles around the fishermen, since it is their product that the restaurants and merchants rely on. This cycle continues everyday for the local villager.

## 1.4 History of Villagers vs. Industrial Estate

There has been a long history of unrest between the villagers and the Maptaphut Industrial Estate. For years there have been villagers protesting the pollution emitted from the factories. In June of 1998, the villagers held a protest rally because IEAT had failed to enforce two oil refineries to fix their air pollution problem as they had agreed to earlier that year. The villagers complained of terrible noise and smells. The protesters also asked that public hearings be held before deciding to construct more factories.[3] Because the air pollution problem was so bad, many students whose school was near the industrial estate had developed chronic respiratory illnesses. IEAT ordered that the factories responsible for emitting this pollution pay to relocate the Maptaphut Phitthayakan School. The Pollution Control Department of Thailand also demanded that the factories must meet ISO 14000 and 18000 standards.[4] This history of pollution

[3] "Pollution: IEAT angers villagers"

[4] "Environment: Polluters pay for school's relocation"

problems caused by the factories has certainly given the villagers reason to feel negatively about the Maptaphut Industrial Estate.

Even if factories in the Maptaphut Industrial Estate attempt to follow certain regulations, carelessness can lead to dangerous and harmful consequences. In March of 2000, the Thai Polycarbonate Company located in Maptaphut Industrial Estate accidentally leaked carbonyl chloride, a chemical used in their manufacturing process. This chemical is also known as phosgene and it happens to be a chemical warfare gas. Two hundred of the local villagers were poisoned by this gas leak and one died.[5] Accidents that are related to the industrial estate continue to affect the villagers today. In January of 2002, an oil tanker on its way from Bangkok to the Maptaphut industrial port hit a rock, spilling 243,000 liters of crude oil into the ocean. This spill is a threat to the environment including important turtle breeding grounds, coral, and other marine life. It has washed onto the beaches in Rayong, causing a threat to the tourism industry of nearby Ko Samet.[6] This tanker, which was on its way to the industrial estate, has again given the villagers another reason to be angry with the Maptaphut Industrial Estate.

A recent demonstration in December 2001 of the tensions between the villagers and the Maptaphut Industrial Estate was seen when hundreds of fisherman lined up their boats around Saket Island. This demonstration was a protest against the new power plant that is planned to be built in the industrial estate.

The above examples of accidents and protests illustrate the tense history between the local villagers and the Maptaphut Industrial Estate. Accidents have fueled the villagers' tensions and given them reason to be at odds with the industrial estate. Changes must be made to appease the villagers.

## 1.5 Industrial Estate Authority of Thailand

The Industrial Estate Authority of Thailand (IEAT) is a state enterprise under the jurisdiction of the Ministry of Industry, and was founded in 1972. The main purpose of the IEAT is to manage, develop, control, and supervise the industries, seaports, and other related services. The IEAT is also committed to development that considers the 5 E's: economy, equitability, environment, education, and ethics. To carryout its role in

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[5] "Gas leakage"

[6] Saengthongcharoen

managing industrial development, the IEAT tries to balance the 5E's. The IEAT follows this policy of the five E's in order to attain "industrial development in harmony with culture and quality of life."[7]

Economy

The development of industrial estates causes the economy to grow. This growth is a result of the production of goods that can be bought and sold on the market. Industrial estates also supply the country with products that can be exported and sold in other countries, leading to the intake of foreign currency.[8] IEAT is the main driving force of the state in developing the country as well as creating employment and investment opportunities. Presently there are about 1,700 industries under the Industrial Estate Authority that perform effectively and systematically where about 769 billion baht (17.6 billion U.S. dollars) have been invested and 400,000 people employed.

Equitability

The formation of industrial estates also helps to evenly distribute the wealth of the economy by decentralizing development into many different areas.[9] There are currently twenty-nine industrial estates spread over thirteen provinces. The creation of industrial estates leads to new towns. Rather than there being a few over-developed industrial areas with concentrated capital, they are spread throughout the country in multiple areas. This arrangement allows the wealth to be evenly spread out so that there are no dominant sections of industrial development.

Environment

Under IEAT's regulations for their industrial estates, factories must properly treat any waste products and dispose of them in an environmentally friendly manner. Inside the industrial estates, the wastes determine the arrangement of the factories. If possible, one company's waste can be used by another factory during its production process and the waste can be reused. This recycling helps to conserve natural resources.

Education

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[7] http://www.ieat.go.th/t-main2.htm

[8] *Ibid*

[9] *Ibid*

IEAT wants to educate the workers so they are able to produce at a higher and more efficient rate. In order to accomplish the task of educating workers, technological schools have been set up in some industrial estates that improve the skills of workers and allow them to effectively use the resources they have. This education helps to conserve money and energy.

Ethics

IEAT has tried to instill the "Polluters Pay Principle"[10] into the members of the industrial estates. This is an important value to emphasize because damaging the environment is harmful to the entire industrial estate. If someone is willing to risk the health of the industrial estate, they will be punished monetarily. If the idea that pollution is morally wrong is stressed, an ethical community will adhere to it.

### 1.5.1 IEAT Policies on Environmental Issues

The environment is one of the IEAT's biggest concerns. Four policies have been established in order to decrease the effects of industry on environment.

The first policy is "Clean and Green". IEAT defines "Clean" as monitoring and closely controlling all pollutants. Each industry must have the most effective way of disposing of its waste without causing harm to the environment. "Green" defines the desire of IEAT to make each industrial estate area contain at least 10 percent of green zone. Office buildings, industries, paths and roads must be surrounded by shrubbery and grass.

The second policy is Strategic Alliance. IEAT will try to collaborate with organizations, people, and industries from other countries to resolve the environmental problems in factories and industrial estate areas. Establishing a foundation to preserve and revive the environment is also a prevalent goal in this policy.

Advanced Environment Technology is the third policy. IEAT tries to use highly innovative approaches to preserve the environment by using all available technological knowledge. This policy also works to pass on this technology to the industries and educational institutes.

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[10] *Ibid*

The last policy about environmental issue is Waste Minimization and Product Maximization. IEAT tries to inform all industries to minimize the waste they produce and reuse or recycle any waste that is still useable.[11] This recycling will conserve natural resources and help keep the environment clean. Reusing waste products allows industries to get the most value out of a source and it will save the industries money in the end.

Under the control of IEAT, all industries must follow these policies carefully. If the factories abide by the policies set forth by IEAT, both the environment as well as the lives of the people in industrial areas should improve.

### 1.5.2 Environmental Standards

The main focus of the IEAT is on environmentally friendly industrial development. Industry and industrial needs, though, are in natural conflict with the environment. The IEAT tries to adhere to certain standards that help to reduce the environmental impact of industrial development. The IEAT received a certificate of ISO 14001 early in 2001. An ISO certificate is issued by the International Organization of Standardization. This particular ISO certificate contains environmental guidelines and is renewable every two years. The regulations of ISO 14001 are challenging to meet, which illustrates IEAT's serious commitment to environmental concerns.

In ISO 14001, six cyclical components are outlined: a broad environmental policy, specific environmental planning, implementation and operation of that plan, examination and corrective action applied to that plan, upper management review, and continual improvement of the cycle. More specifically, in order to meet ISO 14001, the applying organization must have an environmental policy that outlines the organization's specific environmental planning. These plans are to be implemented and carried out. After the actual events (such as the building of a water treatment facility) have taken place, ISO 14001 specifies that a review of those events take place. Any errors found are to be corrected right away. ISO 14001 also calls for a periodic review of upper management. And finally, ISO 14001 states that this entire process, particular to the applying organization, be refined over time. And as for any ISO certificate, the applying organization must have appropriate paperwork to demonstrate adherence to this process.

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[11] http://www.ieat.go.th/thai/thai%20enviroment.htm

## 1.6 Symbiosis

Sustainable development can allow industry to develop without jeopardizing the environment. This can also be referred to as symbiosis. Symbiosis can be defined as the coexistence of two or more separate entities.[12] The IEAT believes that symbiosis can occur between industry and environment if sustainable development is implemented. The IEAT would like to demonstrate how sustainable development could occur in the Maptaphut Industrial Estate by showing the locals the beauty of the natural environment on nearby Saket Island. Through proper planning, the IEAT is reducing pollution in the area and conserving the island's resources. The IEAT has nicknamed this island as Symbiosis Island. The IEAT hopes that Symbiosis Island will provide a place to illustrate this coexistence. Symbiosis is possible because of sustainable development.

Many people believe that two adverse things such as industry and environment cannot coexist together without harming one another, but this does not have to be the case. The Du Pont Victoria Plant, located in Texas, is a chemical company that wanted to help the environment. In order to do something positive for the environment the company used its treated wastewater to create a wetlands area. Plants that would use the nitrates and chemicals in the soil were planted and the area was flooded with the wastewater. Now the wetlands are a healthy ecosystem with flourishing plants and wildlife. The wetlands contain five species of frogs, dragonflies, bobcats, deer, snakes, turtles, raccoons, and fish.[13] People in the local community visit the plant to learn about the importance of wetlands. As this example shows, with the proper planning and treatment, industry and environment can coexist in harmony.

In order to promote this concept of symbiosis between the industrial estate and the surrounding environment to the local villagers, IEAT would like to develop Saket Island into something positive for the community. Because Saket Island is completely natural and it exists so close to the industrial estate, it shows the balance between industry and environment. This balance is due to sustainable development. Doing something positive for the community will hopefully improve relations between the Maptaphut Industrial Estate and the local villagers.

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[12] http://www.dictionary.com/symbiosis

[13] Du Pont Victoria Plant Wetlands

# 2 METHODOLOGY

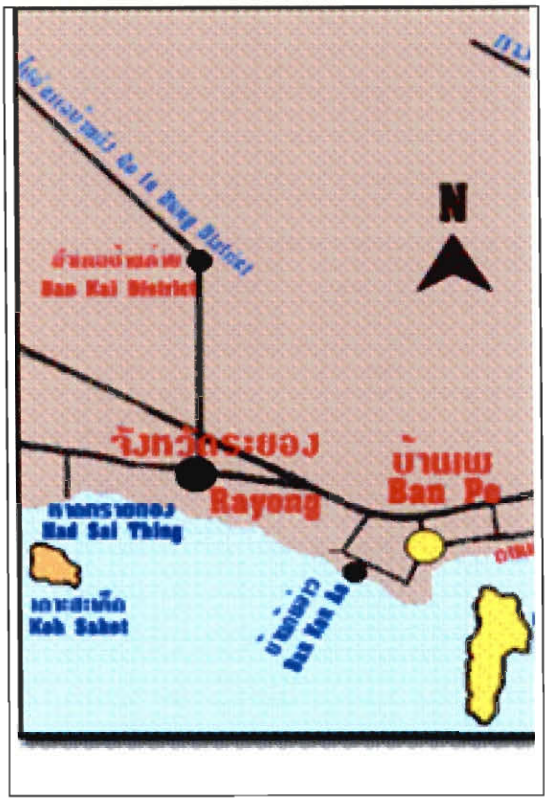
Our fundamental goal for this project was to provide the Industrial Estate Authority of Thailand (IEAT) with suggestions for the future of Saket Island, a small island off the shore of the Maptaphut Industrial Estate. The IEAT wants to solicit the ideas of the local community before they develop a plan for the island. We conducted stakeholder analysis focusing mainly on villagers, to obtain their ideas for the island. We then researched case studies of similar areas of natural land to gather further ideas. Once we obtained these ideas, we compared IEAT's plan for the island with the information that we gathered from the villagers and the case studies, then evaluated the plan accordingly. After analyzing all of the possibilities we formed a recommendation for the future of the island. We presented our results to our sponsors at the IEAT.

We remind the reader of the primary objectives of our project:

1. Obtain ideas for the future of Saket Island
2. Evaluate IEAT's plan for Saket Island
3. Develop a plan for Saket Island
4. Obtain feedback from IEAT

The methods we used to accomplish our objectives are described in the following sections. Section 2.1 briefly describes the geographic area where our study was conducted. Then we discuss the tasks we followed in order to fulfill our objective of obtaining ideas for Saket Island. Section 2.2 describes how we identified the stakeholders of the island. Then we discuss the creation, testing, and administration of our survey. The next section describes how we researched case studies to gather new ideas for the island. Section 2.7 defines how IEAT's current plan for the island was evaluated. Then we discuss the methods used to develop a future plan for Saket Island. Finally, section 2.9 describes how we formulated our presentation to IEAT.

## 2.1 Spatial Domain / Study Area




The area where our project was focused is the Maptaphut Industrial Estate in the Rayong Province which is approximately 2 hours southwest of Bangkok by car. Saket Island, our main area of interest, is located about 300 meters off the shore of Maptaphut Industrial Estate. We conducted our study in five of the local villages that live in close proximity to Saket Island and the industrial estate. These villages are Ban Au Pradu, Ban Ta Kuan, Ban Laem Suan, Ban Nong Taeng Me, and Ban Krok Yai Cha. Section 1.3 of our background can be referred to for further information on these villages.

**Figure 3: Map of Rayong Province**

## 2.2 Obtain Ideas for the Future of Saket Island

Before future development takes place on Saket Island, the decisions of the local stakeholders are to be taken into account before development. In order to determine their wishes for the island, a method must be chosen which gains positive results that can be used for the assessment of the island.

### 2.2.1 Identification of Stakeholders

Before meeting with our liaisons from the IEAT, we speculated that the stakeholders of Saket Island included all of the factory owners and workers in the industrial estate as well as the local community. Through consultation with the IEAT we were told that the opinions of the factory owners and workers were not relevant to us because they did not have any desire to use the island. For the purpose of our study, the

stakeholders of the island included the local communities living in the five villages mentioned above, the Rayong Municipality Department, the Tourism Authority of Thailand, and the IEAT.

### 2.2.2 Creation and Test of Survey

A stakeholder analysis will obtain information from the villagers. The IEAT asked for ideas that the local villagers have for the future of Saket Island. IEAT would like to use Saket Island to show that the environment can coexist with industry. To accomplish this, IEAT would like to develop the island into something that the local community has reason to value. Therefore, IEAT wished to have the input of the local villagers about ways in which Saket Island could be used. We also wanted to obtain the people's opinions on how the industrial estate is affecting their environment as well as their lives in order to gather background information of the relationship between the villagers and the IEAT.

To obtain the necessary information from the stakeholders, we designed a survey to ask questions about these issues. The first step in creating the survey was to create questions. The survey we created inquired about general information (such as name, age, occupation, and village) and specific information about Saket Island and the effects of the industrial estates. The criteria for our survey were that it had to include information such as occupation and village; because a person's occupation or location can directly affect views on potential uses of Saket Island. The survey had to determine key facts, such as whether the individual had ever visited Saket Island. An individual who frequently visits the island has a higher stake in the island than someone who has never been there. Our initial survey can be viewed in Appendix C.

When conducting the surveys we did not want to declare our association with IEAT because we did not want this affiliation to bias their opinions. Instead, we emphasized the fact that we were a group of students from the United States who were exploring the effects of industrial estates on Saket Island and the surrounding environment.

Our first day of interviews was a test day. We needed to administer the survey on some of the local villagers in order to determine if we were asking the correct questions to obtain the information we wanted. We were also curious to see if the villagers

understood our questions. Since the local villagers did not speak English, all of the interviews were conducted in Thai by one member of our team. After testing the survey, we discovered that some questions needed modifications. When interviewing families, we determined all of the family members had the same answers to our questions. Therefore, we began to interview only the head of each family. We determined the number of members above the age of 15 in each family, then the opinions of the family head were multiplied by this number. By conducting interviews in this manner, great amounts of time were saved. We also had to reword some of our questions in order to facilitate answers that would better provide us with the information we needed. Our revised survey can be viewed in Appendix D.

### 2.2.3 Administration of Mass Surveys

Over a period of five days, we administered the survey to the local villagers. These surveys were conducted during the morning and afternoons. The method of distribution was accomplished by driving to each of the five villages and proceeding to walk to the first residence and follow the row of houses until we reached the end. By following this routine, we were able to keep track of the houses already interviewed and the ones that we still needed responses from. If we came to a house where there no was no one home or the members of the household were unwilling to speak to us, we simply moved onto the next house. In the houses that were empty, we came back at a different time to interview them. The purpose of a survey is to get information from a sample population when it is not possible to interview everyone.

When conducting each interview, we would approach the first individual of the household who we saw and asked to speak to the head of the household. We then introduced ourselves as a group of researchers as described earlier. If the household head agreed to speak with us, we proceeded to ask the questions from our survey and recorded the answers manually on the printed forms. If they refused to speak with us, we simply moved on to the next house. After the surveys were conducted, we entered the information into a computer database for better data organization. We then categorized each response and analyzed the results. This information can be viewed in Chapter 3.

### 2.2.4 Interview of other Stakeholders

The IEAT arranged a meeting with the Maptaphut Municipality Department for us. This meeting was an open discussion between the Director of the Public Works Division, the Senior Civil Engineer, and another civil engineer. The majority of the meeting was conducted in Thai and was later translated to us by Chavin. We listened to the discussion and recorded their opinions on who owned Saket Island and what should be built there in the future.

We traveled to the Tourism Authority of Thailand office in the city of Rayong to obtain their ideas for the future of Saket Island. We again introduced ourselves as a team of students who were doing research about industrial estates. We asked to speak with the manager of the office. We inquired if his office had any ideas for the future development of Saket Island. We recorded his response.

### 2.2.5 Research of Case Studies

We conducted independent research in order to generate additional possible uses for Saket Island. We searched the internet for examples of areas of natural land that are located near industrial areas. We determined the types of programs that these parks offered, what made them desirable places to visit, and the criteria that was necessary for the program to be successful. Then we compared these criteria to the resources available on Saket Island to determine if any of these programs were feasible there.

## *2.3 Evaluation of IEAT's Plan for Saket Island*

We obtained a copy of the IEAT's proposed plan for Saket Island from the head of the Maptaphut Industrial Estate. We reviewed the plan by carefully reading the information in the pamphlet given to us and noted the types of buildings that IEAT would like to put on the island. We then estimated how much of the land would need to be developed in order to construct these buildings and compared the estimated amount of development that the IEAT has planned with the responses from our surveys and meetings. We also determined if the programs that the IEAT proposed would be useful and desirable to the local villagers based on our surveying experiences. After making these comparisons, we determined the appropriateness of the IEAT's plan for Saket Island.

## 2.4 Development of a Future Plan for Saket Island

Once all the information from the stakeholders had been analyzed, we generated many possible suggestions for uses of Saket Island. Based on the available resources on the island, we ruled out some of the suggestions that we obtained. When developing our plan for the island we took into consideration the IEAT's goal of using the island as an educational area. We used some ideas from the local villagers as well as ideas generated from our research of case studies.

We determined that the proposed plan for Saket Island should be both desirable and feasible. This meant that the local villagers, the main stakeholders of the island, should want to use anything that is developed on the island. Any development must not take away from their current desire to visit the island. The plan must also be affordable both for the IEAT to maintain the island and for the villagers to use the island. The size of the island and its location near the industrial estate were also considered when determining the feasibility of some plans. After taking into consideration the desirability and feasibility of all the suggested plans and case studies, we decided which ideas should be included in our recommendations by making a list of pros and cons for each idea. Then we voted on whether each idea should be included in our recommended plan for the island.

## 2.5 Creation of Presentation to IEAT

Once all of the realistic uses for the future of Saket Island had been determined, we developed a presentation for the IEAT. In addition to our groups' suggestions, the presentation included success stories of symbiotic living between industry and environment. These success stories demonstrated that coexistence between industry and environment can and does occur.

We proceeded to contact our liaison at the IEAT to set up a time and place for the interview. Then we created an outline of the information our presentation should include and how it should be formatted. We determined which points we needed to illustrate to the IEAT. When we conducted the interviews, we not only asked specific questions about Saket Island, but also questions relating to the surrounding industrial estate to get a feel for the general attitude of the locals toward the IEAT. We decided that the majority of the presentation would discuss the different ideas proposed for the development of

Saket Island since this is the information that the IEAT had asked us to gather. After an outline had been developed, we created slides for our presentation utilizing "Microsoft PowerPoint" software.

The presentation was rehearsed numerous times to prepare for the actual presentation to the IEAT. Some of the slides were revised to make the presentation flow smoothly. After all the necessary corrections were made to the presentation, a small handout was created to allow the audience to have a copy of the results in their hands. This handout can be viewed in Appendix E. At the completion of our presentation, a questionnaire to rate our performance was handed out (Appendix F). The results of the questionnaire were then analyzed to determine if our presentation was helpful to our sponsoring agency. After receiving their feedback we were able to include additional information that was requested into our report, and we were also able to integrate their suggestions into our recommendations.

# 3 RESULTS AND ANALYSIS

This chapter describes the results obtained by following our methodology. We first describe our observations of the current conditions on Saket Island. We then discuss the success of our surveying methods and the villagers' reactions to being surveyed, and we analyze the results obtained from the surveys. Next we discuss the ideas obtained from the IEAT, our interview of the Maptaphut Municipality, and case studies we researched, and we analyze each of them. Finally, we describe the results of our presentation to the IEAT and analyze its usefulness.

## *3.1 Observations of Saket Island*

On January 9, 2002 we visited Saket Island in order to understand the island's condition before trying to generate ideas for its use. The IEAT arranged a boat to bring our team and the head of the Maptaphut Port Authority to the island. The island is located 300 meters from a road constructed by the IEAT extending into the ocean, and approximately 2000 meters from the shore of the local villages. When we arrived on the island, the boat was secured to a temporary dock constructed out of barrels. The dock connected to a brick walkway circling the island. We observed a makeshift shelter on the island as well as remnants of fire pits built by visitors. The trash strewn about the shores and interior of the island indicated a lack of maintenance. The island also contained spirit houses and a monument dedicating it as Symbiosis Island, a name given by the IEAT. The interior of the island was covered with trees, shrubs, and other plants. One side of the island contained a beach with many large rocks embedded in it. The water surrounding the island looked clean and clear.

## *3.2 Results of Surveys*

This section describes the situations our team encountered when conducting our surveys. We then discuss the main responses to our surveys in the five villages. Lastly, we describe the opinions the villagers have towards the industrial estate.

### 3.2.1 Methods of Surveying

Our approach of surveying one household at a time while traveling along the road seemed like it would provide us the response of every villager, but it did not turn out as

expected. Some people were unwilling to speak with us, due to their assumption that we were with some type of agency responsible for the development of the surrounding land. Others were simply not home and were probably out working. Most of the fishermen were difficult to contact because they were out fishing. The fisherman appeared to have very little free time, and the ones we did find were only bringing in their catch. Even though many people were not around, we were still able to survey a large number of people. This gave us an accurate sense of what the local community wanted on Saket Island and how they felt about the industrial estate.

We found that the late morning and early afternoon were the best times to survey the villagers. Due to responses we received from some villagers, which consisted of threats and harsh words, we felt it was unsafe to conduct the surveys after dark.

### 3.2.2 Results of Interviews with Villagers

The first village surveyed was Ban Au Pradu, a small fishing village. Of the five villages, this is the closest to the Maptaphut Industrial Estate. In this particular village, each person responded similarly to our questions. The majority of the villagers did not want to see any type of development on the island for fear that they would only have restricted access to the island or not at all. Some feared that if the island became developed, it would attract tourists who would pay to see the island. And if the tourists had to pay, then so would the villagers they feared. As we asked more families to comment on the ideas for Saket Island, the villagers became resentful towards us. Some felt like we were there trying to brainwash them, even though we asked open ended questions only, hopeful for a creative response. As the day progressed, a large percentage of locals decided not to speak with us while some told us to get off their land.

The next day also brought mixed reviews by the villagers about the series of questions we were asking. Some were very responsive toward these questions and seemed happy to answer them while others refused to speak with us. We believed that this was because the villagers had spoken among themselves the previous night, which led to their increased uneasiness toward these questions the next day. After observing these types of responses we decided to make it optional to give their name. Once we explained that they did not have to give their names and that we only wanted their honest opinions, some villagers felt more comfortable.

The village that we surveyed on that day was Ban Ta Kuan, the next closest village along the water to the industrial estate. A greater percentage of the people in this community were restaurant owners rather than strictly fishermen. They had a positive response to the development of Saket Island. They felt that any development, even small educational programs, would not only be beneficial to the locals using them, but also help the local economy. This would be accomplished by visitors spending their money while in the area, hopefully at the nearby restaurants. Even though the locals realized that larger development attracts more people, they were still in favor of keeping the development small. The most common response as to what they wanted on the island was a groomed beach, or in general, a nice place to relax.

We questioned next the village of Ban Nong Taeng Me, another fishing village slightly farther down the coast from the Maptaphut Industrial Estate. The responses in this village were similar to those of the previous villages. The fishermen did not want to see development, while the local merchants and restaurant owners wanted to see something done to improve the area. However, more fishermen in this village were open to the idea of creating an education program for the local use. They enjoyed the idea that the island would be used in this manner instead of having industrial development occur on the island.

The final village that we interviewed was Ban Krok Yai Cha, the furthest village from the industrial estate. Almost all of the opinions of the villagers were positive towards small development of picnic areas, benches, or a beach on the island. They believed that it would bring the community increased revenue while not damaging the land and the surrounding environment any farther than its current state.

### 3.2.3 Village Opinions of Industrial Estate

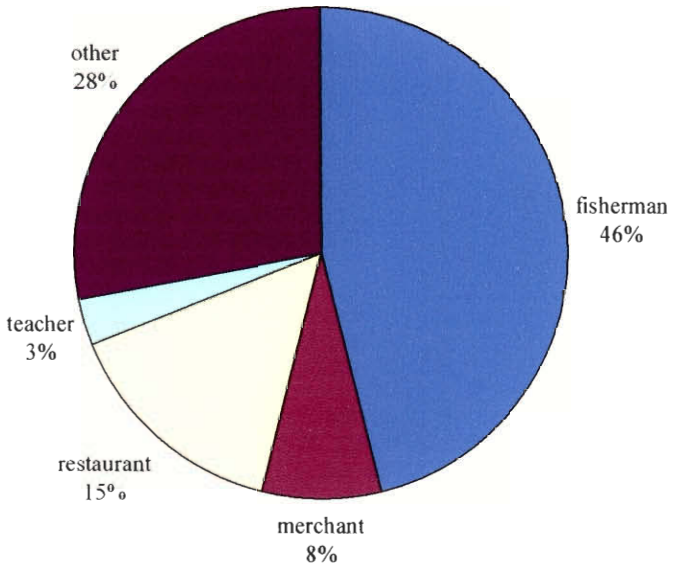
When the villagers were asked how they felt about the surrounding industrial estate, we obtained negative feedback. A few individuals thought that the industrial estate was good because it brought technology to the area. Aside from these few exceptions, many felt the industrial estate was polluting their environment. The negative responses were concentrated within the villages closest to the industrial estate. These villagers complained that both the air and the water smelled bad, and that many of the

fish were no longer good for eating. Although many had these complaints, some felt the conditions were improving.

## 3.3 Analysis of Surveys

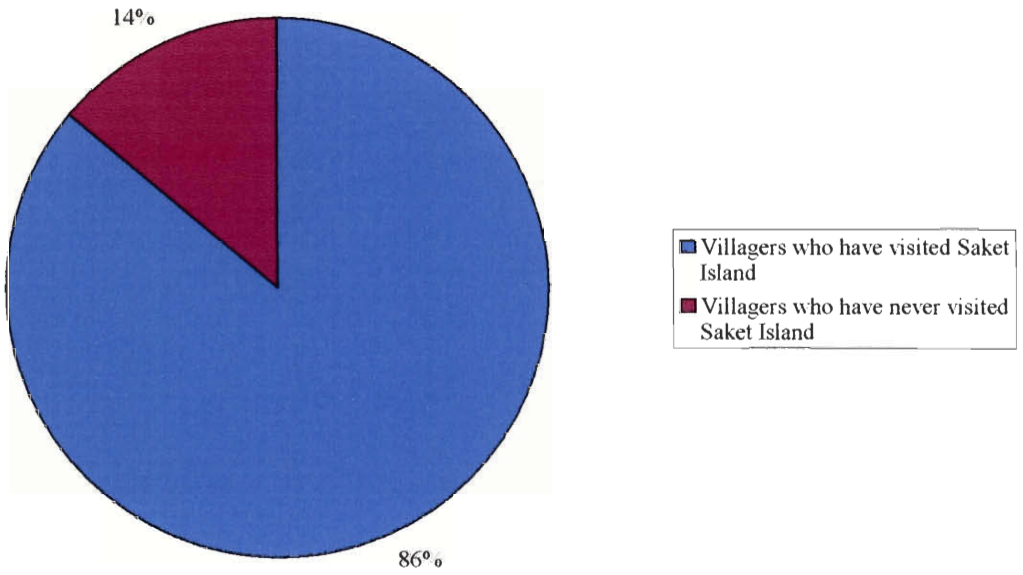
After combining the results from each of the villages, we categorized and analyzed the results from the surveys. Figure 4 shows the villagers that we interviewed were composed of fishermen, merchants, restaurant owners/workers, teachers, and other various workers. Most villagers were fishermen.

**Figure 4: Occupations of Interviewed Villagers**



Since many of the villagers are fisherman, they have direct access to Saket Island because they own a boat. Figure 5 shows that 86 percent those interviewed had visited Saket Island at one point.

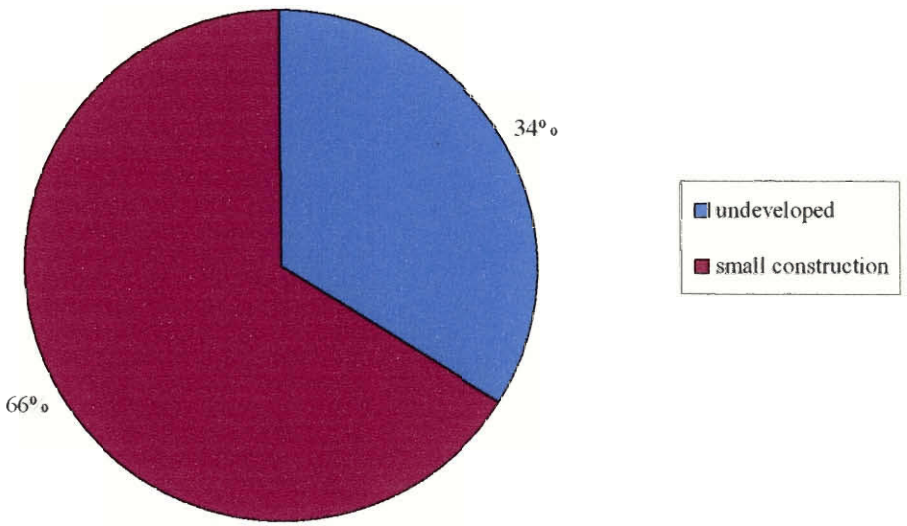
**Figure 5: Visitors of Saket Island**




Since the villagers visit Saket Island, they understand what is at stake on the island. The reasons most visited the island were to relax and to fish. The proposal to keep the island as a spot for relaxation is important to keep in mind. We do not want to overdevelop the island as this would rob the villagers of opportunities for relaxation.

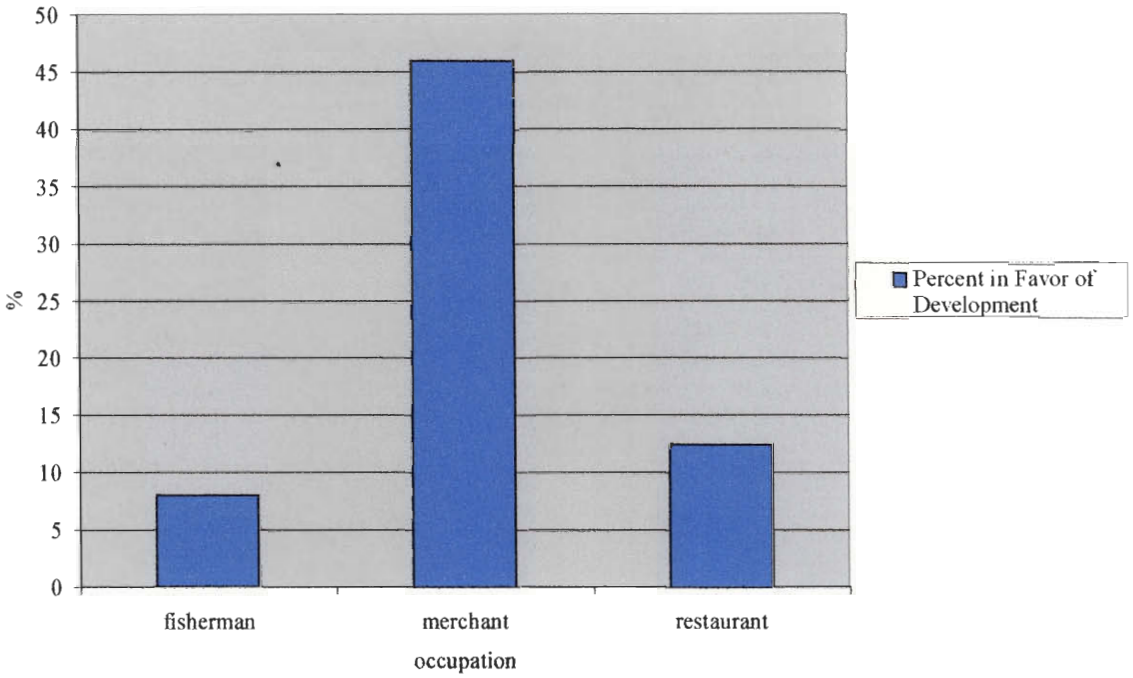
At first, when the villagers were asked for ideas regarding how Saket Island should be developed, none of the villagers offered any ideas for development. Almost invariably, their response was to leave the island alone. In order to find out the villagers' opinions towards the development of Saket Island, we asked their opinion about several options for development on the island. Figure 6 shows that about two-thirds of the villagers supported small construction on Saket Island, while the rest wanted the island to remain completely undeveloped. In the context of this question, we explained that the term small development referred to the construction of a picnic area, beaches, and a small educational program. None of the villagers wanted large scale development, which is anything that would require any clearing of land on the island.

**Figure 6: Percentage of Villagers Who Want to Develop Saket Island**



Of those villagers that were in favor of small construction, the largest group were the merchants. By merchants, we are referring to vendors or anyone who sells clothing, handicrafts, or other goods to the public. Only a small percentage of the fishermen were in favor of development, they would like to keep the island the way it is now. Figure 7 shows how each occupation felt about the development of Saket Island.

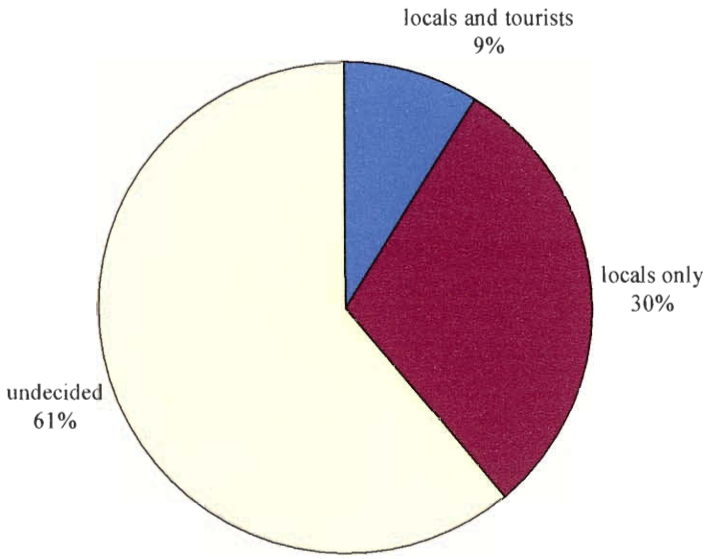
**Figure 7: Percentage of Individual Occupations in Favor of Development**




The fishermen comprise the largest percentage of people, but only eight percent of the fishermen want to see any development on the island. Most of the fishermen would like to continue to use the island freely as they do now. Forty-six percent of the merchants hope to see development, reinforcing the fact that they wish to bring visitors to the area in order to bring in more revenue. The restaurant owners we spoke with were interested in attracting visitors to the area, but many of them were concerned that development would cause more pollution to the area. This accounts for the relatively low percentage of restaurant owners who wanted development.

We also gathered information regarding who should be able to use Saket Island in the future. Many of the fishermen believe that only locals should be able to use the island. This reaction may be caused by the fear that if tourists visit the island, the locals' use of the island may be restricted. Others believed that the island should be for both locals and tourists alike. Those who believed this were mainly merchants and restaurant owners hoping to attract some business. The rest of the interviewees were either undecided or had no opinion about who should be able to use the island.

**Figure 8: Future Users of Saket Island**




Of the thirty-nine percent of interviewees who answered the question regarding who should be able to use the island, thirty percent strongly voiced their opinion that only locals should have access to the island. If the island were developed for tourists, it would probably upset this group of villagers.

The majority of the villagers living near the industrial estate have visited Saket Island, and use it mainly as a relaxation spot. About 66 percent of the villagers are not opposed to developing a recreational area, beach, or educational tour on the island, but

their main desire was to keep the island natural. The majority of those who wish to keep the island completely undeveloped are fishermen. Many of the merchants would like to develop the island to attract tourists. None of the villagers wish to have large scale development on the island. They would like to preserve its natural state.

## 3.4 IEAT's Plan

We obtained IEAT's proposed plan for Saket Island in the form of a pamphlet. Their plan consists of developing four separate areas. Area A would contain a boat port, youth center, resource center, and recreation area. Area B would be a research station for oceanography, geology, and an aquatic plants aquarium. Area C would be a camping area and Area D would be a center for meteorology, solar, and wind. The remaining land would be left undeveloped.[14]

## 3.5 Results of the Maptaphut Municipality Department

At 11:00 a.m. on January 11, we went to the Public Works Division of the Maptaphut Municipality Office. Our team met with Mr. Prapon, Director of the Public Works Division, Mr. Udom, Senior Civil Engineer, and Mr. Pongsan, Civil Engineer.

First, Prapon spoke of the history of Saket. He said that Saket Island was once used as a resort owned by Uncle Pet, a private entrepreneur. This resort had been put out of business by the IEAT because Saket Island is public land and Uncle Pet had no authority to build there. After the resort had been torn down, the IEAT wanted to claim ownership of this island by buying it for 300 million baht. However, to buy this island the IEAT needed permission from the Maptaphut Municipality and Prapon did not grant permission. He believed that the IEAT wanted to use this island as a private island solely for the IEAT. Therefore, the IEAT project to develop this island for its personal properties had been cancelled. Prapon suggested that since the IEAT could not claim ownership of Saket Island, they had devised the Symbiosis Island Project, which the IEAT planned as a celebration for His Majesty the King. Prapon thought the IEAT had made this proposal to claim ownership of the island because no one would disturb a project in honor of the King and IEAT could then develop the island as they wished.[15]

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[14] Symbiosis Island Project Pamphlet

[15] Prapon, the Director of Public Work Division

Since the island is under the jurisdiction of the Maptaphut Municipality, Prapon wants to be the head of the Symbiosis Island Project with the IEAT as a collaborative partner.

After discussing the history of Saket Island, Prapon discussed many disagreements between the IEAT and the Maptaphut Municipality Department. The first issue discussed was the suitability of IEAT's plan for Saket Island. None of the representatives from the municipality department considered it a good plan. Prapon suggested that IEAT's ideas were boring. He believed that if IEAT's plans were put into effect, no one would visit the island. Therefore, Prapon claimed that the IEAT project was not suitable for this island.

All of the representatives from the municipality then went on to discuss how IEAT was damaging the environment. Pongsan mentioned that the IEAT did not regulate the disposal of the waste carefully. He said the local community really had a difficult time living together with the industrial estate because of the smell and pollution to the water that it created. He suggested that instead of thinking about the Saket Island project, IEAT should think of a way to address these environmental issues.

The Director of the Maptaphut Municipality Department suggested that he wanted this island to be a main attraction area for all tourists and foreigners. He developed a new plan for Saket Island. Prapon, Udom, and Pongsan recommended many random ideas such as redecorating an old train and putting it on the island to attract people's interest, using big cargo instead of a building. Aside from these ideas they had two main plans for Saket Island.

The first idea was to build an aquarium. Udom suggested to look at the example of the aquarium in Singapore. He said he wanted to make an aquarium using Singapore's aquarium as a model. One of the main focuses of Singapore's aquarium was the moving walkway that took the visitors on a tour through the big glass-top tunnel under the water.

The second major idea that was suggested by Mr. Prapon, the Director of the Public Works Division, was to use cable cars as a mode of transportation to Saket Island. He believed that since this island would be a main tourist attraction, using boats as transportation would destroy the sea, marine life, and the environment with all the pollution that would be released from the many boat trips. He believed that using cable

cars would reduce the pollution and would therefore be a better mode of transportation to the island.

## 3.6 Results of Case Studies

We researched areas of natural land or parks that are located close to industrial areas. The coexistence of these parks and the industrial areas are examples of symbiosis. Over the years people have realized the importance of preserving the environment. One very effective way to help the environment is to educate people about its beauty as well as how to live in harmony with it. In order to provide an environmental education for the people, ecological centers have been established in natural areas that have a wide variety of programs ranging from the identification of flora and fauna to testing water quality or studying geology. We describe case studies of Boston Harbor Islands, Gateway National Recreation Area, and general educational tours.

### 3.6.1 Boston Harbor Islands

In 1996, the Boston Harbor Islands were established as a national park. The park is composed of 34 islands which total 1,600 acres of land. The islands range in size from less than one acre up to 274 acres and are located close to the large port of Boston. In 1985, Boston Harbor was the most polluted harbor in the United States.[16] This area has been cleaned up over the past decade and the islands are now a nice place to visit to escape from the city and get in touch with nature. By making the islands a national park, the preservation of the environment in this area will be ensured for the future.

The park is rich in both natural and cultural resources. The islands have a historical museum teaching about the Native Americans who used to inhabit the area. It provides a place to learn about their way of life and the war between the English settlers and the Native Americans. Seawalls, forts, bunkers, lighthouses, and cottages from this time period can be visited on the islands. Along with this cultural history, the islands have a rare geological history. The islands were formed by glaciers and they compose the only drumlin swarm (an impressive and rare geological formation) in the U.S. to

[16] www.bostonislands.org

intersect a coastline.[17] The islands continue to be reshaped today by erosion and sedimentation.

The Boston Harbor Islands are full of interesting wildlife. Over 100 different species of birds have been identified along with creatures such as rabbits, raccoons, voles, and snakes. The sea grass beds and salt marshes around the islands also provide critical wetlands areas. The waters surrounding the islands contain marine life such as lobsters, crabs, mussels, jellyfish, several species of fish, and harbor seals.

In order to allow people to enjoy nature, the islands have areas designated for camping, hiking, picnicking, fishing, and swimming. In addition to these recreational nature activities, educational programs have also been established. These programs include informative nature walks, plant identification, bird identification, geology lessons, and water quality testing.[18] These educational programs teach the public to have a respect for the environment and hopefully they will learn the importance of its preservation. These programs are only available on the larger islands in the park. The smaller islands have been kept natural and undeveloped.

### 3.6.2 Gateway National Recreation Area

Another well established educational center is located between New York and New Jersey near New York's harbor. It contains 26,000 acres of beaches, bays, dunes, wooded uplands, and grassy fields.[19] The Gateway Environmental Study Center and Ecology Village specialize in educating people about the area's social and natural history. The area contains military forts, airfields, lighthouses as well as marshlands, beaches, and wildlife. The environmental center specializes as a learning center for social studies, science lessons, and field trips for school children. Some of the programs offered are in marine studies, composting, landfill studies, water quality experiments, beach combing, hiking, bird watching, photography, gardening, and general ecology.[20] In addition to these educational programs there are beaches to enjoy as well as interesting wildlife to observe.

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[17] *Ibid*

[18] *Ibid*

[19] http://members.aol.com/gesc272/web2.htm

[20] http://cpmcnet.columbia.edu/dept/physio/schools/318/gateway.html

### 3.6.3 Educational Tours

Educational tours are an enjoyable and effective way of teaching people about the importance of preserving the environment. Many educational tours are prepared and formulated in a similar fashion. A general outline of how an educational tour is designed is provided here.

The educational tour must be prepared properly for each educational level of people, providing the right information to the correct group of people. Therefore, the tour must be separated into many classes depending on the level of visitors' knowledge and age range. These groupings include:

- Kindergarten level
- 1-6 Grade
- 7-12 Grade
- University Student

As an educational tour is planned for many levels, the program and material will fit perfectly to each group and will provide the most efficient knowledge to all who visits the study site. Some examples of potential programs include the following:

Ground:
Studies of plants, soil, and small creatures, such as ants, mosquitoes, and other insects
Sea:
Studies of sea life, coral, and water testing
Solar System:
Stars, planets, comets

The purpose of an educational tour is to make the visitors understand the importance of nature and all its inhabitants. After completing the tour, visitors will realize the essential link between humans, nature, and animals, and how they all rely on each other. This will create an understanding of the importance of protecting and preserving nature.

One specific educational program that seemed to reoccur in many environmental educational centers was water quality testing. The Camp Bayou Outdoor Learning Center on the Little Manatee River in Florida offers a program in river quality indicators. This program consists of discovering hands on, the biodiversity of the water by running a net through the water to catch any invertebrates. Then the meaning of physical

observations such as water color, smell, temperature, and turbidity are discussed. Finally chemical testing of the water can be done, such as a pH test.[21] A simple program such as this can provide an individual with the ability to determine water quality, giving them a sense of understanding of the world in which they live.

## 3.7 Analysis of Proposed Ideas

This section analyzes the many ideas that have been proposed specifically for Saket Island, as well as ideas that we generated through researching case studies of natural areas of land that are located near industrial areas. We have divided the ideas into those that would require large construction to implement and those that would require only small construction or recreational programs.

### 3.7.1 Large Construction

Some of the proposed ideas would require large construction. These ideas include the research station for oceanography, geology, and an aquatic plants aquarium and the center for meteorology, solar, and wind planned by the IEAT as well as the large marine aquarium and cable car system proposed by the Maptaphut Municipality. We begin by discussing each idea individually and we then analyze them as a whole.

#### *3.7.1.1 Research Facilities*

Both the research station for oceanography and the center of meteorology, suggested by the IEAT, would provide high levels of research and educational opportunities for studying science. These facilities could be of importance in collecting data from the surrounding environment that would help monitor the effects of the industrial estate on the local water quality and marine life. This research helps to intensify building these centers.

In order to operate these research facilities, very expensive laboratory equipment would need to be purchased. Scientists and researchers would also need to be hired to run the labs and conduct experiments. The construction of these centers would require that the materials and equipment be transported to the island. Electrical wires would also have to be installed to connect the island to the mainland, in order to run these research

[21] Camp Bayou Outdoor Learning Center

facilities. All of these expenses would sum up to a very large budget. Large areas of land would also need to be flattened and cleared to provide space to build these research facilities, destroying the natural land.

#### *3.7.1.2 Aquarium*

A large marine aquarium, suggested by the Maptaphut Municipality, would provide a place to observe many different species of fish. The construction of this facility would require a large area of land to be cleared. Large aquatic tanks, many species of fish, and chemicals to clean the tanks are some of the items that would need to be purchased. Using the Singapore Aquarium as an example, we can determine that the price of building such a facility will be quite high.

#### *3.7.1.3 Cable Car*

A cable car system was the last of the large construction ideas that was proposed. In order to set up this cable car system, there would be a high investment cost. The cost for this cable car system is approximately $350,000 for 2200 feet, which allows for two stations, intermediate towers, the cable, and the car.[22] Another important figure for this cable car system is the maintenance cost. During each year, this cost is quite high at about $15,000 per year due to minor defects that emerge over time. This means a thorough inspection and examination of the cable car system must be performed frequently to reduce the risk of unseen defects. Towers in the sea will make the maintenance budget even higher because the sea will damage and erode the towers more quickly than if the towers were on land. In addition, construction of the towers in the sea will create pollution in the sea and will disturb sea life.

Each of these ideas would require large construction on Saket Island. According to the surveys that we conducted, the local villagers are very opposed to large construction on Saket Island. They do not want large areas of land to be cleared, which these facilities would require. The villagers are not interested in going to the island to visit research centers or aquariums. They simply want to visit the island for relaxation.

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[22] Royal Gorge Bridge & Park

The construction of these facilities would not be geared towards the interests of the local villagers. They are targeted more towards tourists.

It is very unlikely that tourists would want to visit Saket Island. Saket Island's location so close to the industrial estate makes it an undesirable place to visit for most tourists, who usually do not like to relax with factories and smoke stacks visible in the skyline. Tourists also have many alternate islands and beaches that they can visit that are located nearby, such as Ko Samet. These other beaches are very beautiful and when given a choice between visiting one of them and visiting Saket Island, it is very unlikely that many people would choose Saket Island. For these reasons we do not consider it feasible to develop Saket Island for tourists.

We spoke with the manager of the local Tourism Authority of Thailand office in Rayong to obtain his opinions of what should be developed on Saket Island. The TAT office had no plans or ideas for the future of Saket Island. They said that it was too small for a resort and that they could not develop the area because it was public land. The manager agreed that tourists would not want to vacation near an industrial estate. The office believed that all tourists visiting Rayong would choose to go to Ko Samet instead. The opinions of the Rayong Tourism Authority reinforce our belief that tourists will not choose to visit Saket Island.

Not only is Saket Island seen as an undesirable place for tourists to visit, but many of the locals resent the idea of tourists visiting the island. As a result of our surveys, we found that seventy-two percent of the villagers said that only locals should be allowed to visit Saket Island. Because of the resentment felt by the local population, and the undesirable location near an industrial estate, the construction of large facilities for tourists should not be implemented.

### 3.7.2 Small Construction and Recreational Activities

This section analyzes ideas that would require only a small amount of construction, if any at all. Some of the ideas that are analyzed are programs or recreational activities that could be offered on the island, rather than the development of a building. Many of the villagers agreed that small construction could enhance the island, but some ideas are better suited for the island than others. Here we discuss each idea for Saket Island.

#### 3.7.2.1 Camping Area

A camping area was both proposed by the IEAT and was found in case studies of the Boston Harbor Islands and the Gateway National Recreation Area. Camping is a desirable recreational activity in these two cases because the parks are located near large cities. People enjoy camping in these parks to get away from the city and enjoy nature. A separate, designated camping area should not be created at Saket Island because most of the local villagers will just go back to their houses at the end of each night, as they currently do. They do not visit the island to get away from the industrial estate as in the case studies. There would be no reason for the villagers to stay overnight at the island because many of them live right on the beach. If they wanted to visit the island, they could easily travel home when they were finished because they live very close to the island. In order to create a camping area, trees and plants would also have to be cut down to make a clearing. This would be destroying the natural state of the island, which is exactly what the villagers want to avoid. However, if villagers want to spend the night on the island, they should be allowed to do so without restriction, but it is unnecessary to have a designated area.

#### 3.7.2.2 Groomed Beach

One of the best ideas that the IEAT has proposed is making the outside perimeter of the island into an attractive beach. This would entail moving the rocks from certain designated areas in order to create a safe place to swim. This would provide the locals with a safe area to relax, which according to the surveys, is basically all that they want to do on the island. Creating the beach front would not require extensive work, and the maintenance would be very low. A beach would enable the locals to enjoy recreational activities such as swimming and fishing. The case studies of Boston Harbor Islands and the Gateway National Recreation Area both show that offering a well maintained beach for these activities is a major attraction to the parks. A beach would encourage the locals to enjoy themselves on the island more often.

#### 3.7.2.3 Educational Programs

Another idea found in the research of our case studies was the creation of educational programs. Many of the educational programs that are offered at these parks are geared towards students. Schools often take field trips to the educational centers to

offer hands on experience and learning to supplement what they are being taught in the classroom. These types of programs for young children can also be successful at Saket Island because there is an elementary school that is located in one of the local villages. The example of teaching water quality testing would apply nicely to Saket Island since it is surrounded by water. Some of the programs are of a higher learning level and are geared towards adults. These programs might not be desirable on the island because the villagers know a lot about the ocean since they have worked on it their whole lives. Many of them have little education and are not interested in learning about how nature works. An educational program would require a small building to house equipment and educational materials, and perhaps a small classroom. An area of land would need to be cleared for this building, but depending on the size of the building, the area could be as small as fifteen square meters. When we surveyed the villagers, many of them agreed that an educational program for the children would be a good idea. There would be expenses involved in the construction of the small building as well as for the educational materials.

Another reason why people visit the Boston Harbor Islands and the Gateway National Recreation Area is to learn about the cultural history of the area. They both contain forts, lighthouses, and other interesting remains of past settlements. Saket Island does not contain any remains of past settlements to visit and learn about and therefore, this could not be offered at Saket Island.

#### *3.7.2.4 Hiking Trails*

Other ideas that have been introduced through our case studies are recreational trails for hiking and nature walks. These activities would not be successful at Saket Island. For example, hiking is an activity that cannot be performed without miles of trails to enjoy. This activity would not be feasible on Saket Island because the island is very small and it would only take a short amount of time to hike around the entire island. Nature walks are successful in both of the case studies because they contain a wide variety of plants and wildlife. There are many different species of plants and trees that can be identified as well as interesting birds and other animals. This variety of natural plants and animals make the nature walks informative and enjoyable to the visitors who do not normally experience these things in their everyday lives. Nature walks would be

less successful on Saket Island because there is not much wildlife to observe on the island. There are different species of plants and trees that could be identified, but it might not interest the locals because they can see the same trees in their own village.

Certain ideas seem to be more appropriate for Saket Island than others. Activities such as camping, hiking, nature walks, and visiting historical monuments are not well suited for Saket Island. However if a docking site, beach, and educational program were created at Saket Island it would certainly make it a more desirable place to visit.

## 3.8 Results of Presentation

On February 12, 2002 our group gave a presentation at the IEAT headquarters in Bangkok. The attendees included the head of the IEAT, the head of the Maptaphut Industrial Estate, and the Saket Island committee.

Our presentation began by outlining the problem of finding ideas for Saket Island. We explained how we gathered ideas through surveying and went on to describe the actual results using graphs and percentages. We then analyzed the results and concluded with our list of recommendations for the island. A copy of the slides used during our presentation can be viewed in Appendix G.

During our presentation and as we finished it, the attendees continued to ask questions. We answered them all and we stressed that the villagers really wanted to keep the island natural. We went on to say that if the IEAT is planning on leaving the island alone, then the IEAT should explain to the villagers that the island will be left alone for their benefit. We explained that it could reduce tensions between the IEAT and the villagers. We finished by thanking the IEAT for their help and cooperation during our stay in Thailand.

## 3.9 Analysis of Presentation

After we had finished our presentation, we asked the attendees to fill out a short form with three questions. The first question allowed them to rate our presentation from one to five. We had nine people fill out these sheets. We earned 39 out of 45 possible points, which gives us a score of 86%. That three people gave us five points (a perfect score) and six people give us four points pleased us very much! The second question

asked if there was anything missing from our presentation. The answers to this question were quite vague, but the two that stood out requested the following: 1) That we should have included pictures of Saket Island, and 2) That we should have included how the stakeholders could participate in the Saket Island project. By using the IEAT's feedback from the presentation, we were able to integrate their ideas into our recommendations. The third question asked what was best about our presentation. Almost unanimously, they wrote that we were very succinct and clear and that we did a "great job". They were very pleased to find out about the case studies we researched.

# 4 RECOMMENDATIONS

After evaluating the many ideas that have been proposed by the stakeholders and gathered through our research, we have developed recommendations for the future of Saket Island. Our recommendations incorporate some of the ideas we analyzed earlier as well as original ideas of our own. We believe, in order to please the local villagers, only small construction should take place on the island. Developments on the island could take place in stages, rather than all at once. This would allow the costs to be spread out over time, as well as not overwhelming the island with construction equipment and materials.

## 4.1.1 Stage I: Trash Removal

Stage one should be the removal of all trash on the island. Labor could be hired to remove the garbage for approximately 168 baht per day.[23] This is the minimum labor salary of an unskilled laborer, who should be sufficient to clean up the island. Based on the amount of trash we observed, this initial cleanup would most likely take about two days. An alternative to hiring labor to clean the island would be to organize a community clean-up of the island. Since the villagers feel so strongly about preserving the island's natural state, they should be willing to help clean the island. Once the island has been cleaned up, trash cans must be placed around the island to allow an alternative method of waste disposal aside from littering. The trash cans should be emptied weekly, or perhaps more often depending on how frequently people visit the island. The trash will have to be transported off of the island by boat and then taken to the local dump. Trash pick-up could be arranged with the local sanitation department once the trash has been taken to the shore. Trash removal should be the first implemented stage because this will help keep the island clean and natural.

## 4.1.2 Stage II: Well-groomed Beach

The next stage should be the removal of rocks that currently clutter the beach to create a sandy shore for the local villagers to enjoy. A swimming area was not only suggested by the IEAT, but it has also been proven very successful at both the Boston

[23] Personal Interview. Ms. Rayrai Aisiri

Harbor Islands and the Gateway National Recreation Area. In order to realize this sandy beach, labor and machinery will have to be hired to remove the rocks and place them further out into the sea. The cost of this is estimated to be 20,000 baht.[24] Having a well groomed beach will enhance the island as a relaxation and recreation area, which will most likely encourage more locals to visit Saket Island.

### 4.1.3 Stage III: Restroom Facility

Once locals start visiting the island on a more regular basis because of the creation of the sandy beach, we believe that many of them would appreciate having a restroom facility installed on the island. The cost of building a restroom on the island varies greatly depending on the construction materials and brand and style of the equipment chosen. The costs including cement for the construction of the building, a roof, sink, and toilet can range anywhere from 2,500 to 10,000 baht.[25] If people are going to be spending the day on the island, a bathroom will be necessary to meet their needs. The construction of a single restroom would not cover a large area of land and therefore would not disturb the natural environment on Saket Island.

### 4.1.4 Stage IV: Benches

The next stage of improvement for Saket Island should be the placement of benches around the island, giving visitors a place to sit and rest. Again the cost and maintenance of the benches vary according to the chosen material. Benches constructed from wood or slate would be cheaper than concrete, but they would deteriorate faster over time and would need replacement or repair. Concrete benches are harder to destroy and require no maintenance. The construction of concrete benches would require materials such as rock, sand, iron platform, etc. to be transported to the island as well as a skilled laborer. The approximate price would be 1,000 baht per bench including labor and materials.[26] Benches involve only small construction and would not pose a threat to the environment on Saket Island.

Once such facilities such as a restroom and benches have been constructed on the island, a park ranger could be hired to watch over and care for the island. He will be able

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[24] *Ibid*
[25] *Ibid*
[26] *Ibid*

to protect anything that has been constructed from vandalism or theft, which has been a problem in the past. However, we feel that this would anger the local villagers. Having a guard on the island would make the villagers feel that restrictions are being placed on their freedom to use the island. This would not only cause tensions to rise, but it would be very costly, approximately 15,000 baht per month. Therefore we suggest hiring a staff member to make a daily trip to the island to check up on the facilities and remove the trash.

### 4.1.5 Stage V: Educational Program

The final stage of development we recommend is an educational program for the local elementary school children. Since the island is surrounded by water, we believe programs could be developed to teach them about the local marine life and water quality testing. Showing the children how to test water quality is important to prove to the villagers that the industrial estate is not negatively impacting Saket Island. As in the case studies we researched, field trips to the island could be taken to reinforce lessons in science, giving the children the opportunity to learn hands on in a natural environment. To implement such an educational program, a small building would need to be constructed to house experimental materials and perhaps a small classroom. Teachers from the local elementary school could be trained to lead the educational programs.

The cost of constructing a small building on the island is difficult to estimate without an exact design and cost varies according to size, material, furnishings, and more. The cost of a bare 100 square meter building is about 200,000 baht. We do not believe that it is necessary to have electricity in the building since field trips would be taken during the day when adequate light is available. Connecting electrical wiring to Saket Island would hinder its natural state. Although some land would have to be cleared for the construction of the small building needed for the educational programs, the majority of the island would remain untouched. Many of the villagers agreed that having educational programs would be a good idea. Prior to the construction of the building, the villagers should be informed that the building is for an educational program and not for IEAT's own use. This information could be conveyed to the villagers through the teachers or the heads of each village. As shown in our case studies, scientific educational programs that are offered in environmental areas prove to be a great learning resource for

children. This should be the final stage of development because it will be the most expensive and it requires the most construction on the island. It will also be helpful to already have the other facilities that have been suggested available to those people who visit the island for the educational programs.

The costs of each stage of development are summarized in the chart below.

| | Baht | Dollars |
|---|---|---|
| Stage I: Trash Removal | 836 | 19 |
| Stage II: Well-groomed Beach | 20,000 | 455 |
| Stage III: Restroom | 2,500-10,000 | 57 |
| Stage IV: Benches | 8,000 | 182 |
| Stage V: Small building for educational program | 200,000 | 4,545 |
| Total One Time Costs | 238,836 | 5,428 |

**Table 1: Costs of Recommendations**

### 4.1.6 Community Involvement

We believe the local community should be involved in Saket Island's future development. There are many different ways this is possible. One idea we have already mentioned is that the local community can take part in cleaning up the island. For example, there could be a competition among the school children to see which class could collect the most trash on the island. This could be a fun and effective method of solving the island's litter problem. Fishermen could also be involved by providing a transportation service to the island. Either the fishermen could be paid by the municipality to provide this service, or the passengers could be charged a fee. This would provide a mode of transportation to the island for those people who do not have access. Merchants could become more involved by selling refreshments to the visitors of the island. Ideas such as these would allow the villagers to become more involved in the development of Saket Island.

### 4.1.7 Implementation of Saket Island Plan

In order for any of these developments to take place on the island, they must first be approved by the Maptaphut Municipality Department because they have jurisdiction over the island. Because the Maptaphut Municipality currently has very different views

from the local villagers and the IEAT as to what should be constructed on Saket Island, a meeting should be held to show the villagers' desires for the island to the municipality. The village heads of each of the five communities located near the industrial estate should be present at the meeting to represent the villagers. The IEAT can present our recommendations to the villagers to determine if they agree with the proposed plan. If the villagers agree with the proposed plan, they can help the IEAT convince the municipality to approve it. If however, the village heads do not approve of our recommended plans, at least they will have the opportunity to voice their opinions to the Maptaphut Municipality. Approval of a plan by the municipality must be the first step.

If the plans for the development of Saket Island were approved, funding for the programs must be established. There are three possible sources of funding including the local villagers, the local government, and the IEAT. Because the local villagers are poor, they cannot afford to pay a fee when visiting the island to cover the costs of any development. If the villagers were forced to pay in the future, they would be outraged because now they can use the island without restriction or cost. Therefore, we believe that any development implemented on Saket Island should be subsidized by the government. The local department of the government responsible for this funding is the Maptaphut Municipality. Because the municipality owns the island, they could allocate part of their budget towards making improvements on Saket Island. Another possible source of funding for any approved developments is the IEAT. Even though the IEAT does not own Saket Island nor have jurisdiction over it, if they were to fund improvements made on Saket Island, it may help to improve the relationship between the local villagers and the IEAT. This act of goodwill would have to be made known to the villagers through information sessions. By enhancing Saket Island and helping the local villagers preserve its natural state, the IEAT would be pleasing the people, which will help reduce tensions and promote coexistence of the communities and the industrial estate.

# Conclusion

Currently, tensions between the Maptaphut Industrial Estate and villagers in surrounding communities have been enflamed by the estate's pollution. The villagers believe the factories are negatively affecting the quality of the air and water around them. Although the industrial estate is not perfect, it is much cleaner and more efficient than it used to be because of its transition to an eco-industrial park. The IEAT would like to show the community that it is possible for them to live in harmony with the industrial estate. Saket Island, located off shore of the industrial estate, has remained unscathed by any industrial waste, demonstrating that symbiosis between industry and environment is possible.

IEAT would like to enhance Saket Island for the benefit of the local villagers as an act of good will in order to improve their relationship. IEAT has shown their concern of the villagers' opinions by asking us to determine the thoughts of the locals on the future development of Saket Island. Through interviewing the villagers, we discovered that they want the island to remain natural so they can continue to visit Saket Island for relaxation. We believe that if the IEAT works to preserve Saket Island's natural state while making slight improvements to it, the villagers may improve their opinions of the IEAT and the Maptaphut Industrial Estate. Considering village opinions before disturbing an island which is part of its community is an important step towards creating a healthier relationship between the IEAT and the Maptaphut villagers. If the IEAT cooperates with the villagers, symbiosis can be realized and tensions reduced.

This project could be used as a model in reducing tensions between industrial estates and their surrounding communities. Tensions in other communities could be reduced by opening up the lines of communication between the industrial estate and its surrounding villages. Other industrial estates could develop community projects that would improve the surrounding areas and help build a better relationship with the villagers.

# Appendix A: Annotated Bibliography

"Aerial Tram." Royal Gorge Bridge & Park. 21 February 2001. http://www.royalgorgebridge.com/attractions/ride_aerialtram.htm (8 February 2002).

This website gives the information about the Royal Gorge Bridge & Park in Colorado, USA. In this park, there is one activity about the cable car that suits our project. Also, this website gives the information about the approximate cost for construct this cable cars.

Boston Harbor Islands. http://www.bostonislands.org (21 January 2002).

This website provides information on the Boston Harbor Islands. It describes the location of the park, its history, and the activities that are offered.

"Camp Bayou Outdoor Learning Center." http://campbayou.org (21 January 2002).

This website describes the educational programs that are offered at this ecological learning center in Florida. It describes in particular, how to perform simple water quality testing.

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This website describes how the chemical factory in Texas used its treated wastewater to create wetlands. It demonstrates symbiosis between industry and environment.

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"Gas leakage." Bangkok Post Week in Review 5-11 March 2000. http://www.fortunecity.com/meltingpot/sanjacinto/1113/week1000.html (4 Feb. 2002).

This newspaper article, which was available online, describes a poisonous gas leakage that occurred from one of the factories in the Maptaphut Industrial Estate and lays the background of the villagers' tensions.

Gateway Environmental Study Center. http://members.aol.com/gesc272/web2.htm (8 Feb. 2002).

This website describes the educational center at the Gateway National Recreation Area. It provides details on the types of educational programs that are offered, as well as teaching materials that can be used.

Gateway National Recreation Area.
http://cpmcnet.columbia.edu/dept/physio/schools/318/gateway.html (8 Feb. 2002).
This website provides information about the park, such as its location, the activities it offers, and the areas history.

"Pollution: IEAT angers villagers." Bangkok Post. 9 June 1998.
www.icsea.or.id/sea-span/0598/IE0168LL.htm (4 February 2002)
This is a newspaper article available online that discusses a protest of 100+ villagers against the IEAT because they failed to crack down on polluting factories.

Saengthongcharoen, Jerdasak. "Oil Spillage poses threat to Rayong." Bangkok Post. January 19, 2002.
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This website gives the information about the Administrative Report from the General Manager of Engineering Services to Vancouver City Council. The purpose of this report is to seek the necessary funding to extend the demonstration street car line to the East side of the city. Also, the report shows the financial implications and funding that Vancouver Council provides for this project.

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This pamphlet describes IEAT's proposed plan for Saket Island and provides a detailed map of the areas they intended to develop. It also provides a timeline for this plan.

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"The Industrial Estate of Thailand." The Industrial Estate Authority of Thailand.
http://www.ieat.go.th/t-main2.htm (12 November 2001).
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Thompson, Joe. The Cable Car Homepage. 1 February 2002.
http://www.geocities.com/CapeCanaveral/Launchpad/3518/html/ccmain.html (8 February 2002).
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Underwater World Singapore. http://www.underwaterworld.com.sg/home.html (6 February 2002).

This website is the official website of the aquarium in Singapore. This "Underwater World" aquarium is the aquarium that Mr. Udom mentioned during the interview.

"Welcome to SD Gateway." SD Gateway. http://www.sdgateway.net (11 December 2001).

This website provides a detailed description of what sustainable development is and it provides information on a conference about sustainable development that was held.

# Appendix B: Sponsor information

**Industrial Estate Authority of Thailand**:

The Industrial Estate Authority of Thailand (IEAT) is a state enterprise under the jurisdiction of the Ministry of Industry. The main purpose of the organization is to manage, develop, control and supervise the industries, seaports, and all services in order to ensure their qualities and performances under the consideration of 5Es: economy, equitability, environment, education and ethics.

The Board of Directors of IEAT is composed of the Chairman: Captain Kajit Habanananda, Vice Chairman: Mr. Praphad Phodhivorakhun, Directors: General Boonsak Kamseangridhirong, Mr. Kampree Kaocharern, Mr. Rapee Asumpinpong, Mr. Banphot Hongthong, Mr. Damri Sukhotanang, Mr. Navee Santikanavin, Police Lieutenant General Suwan Suwanvecho, Mr. Anothai Techamontrikul, and Governor of the Board: Mrs. Anchalee Chavanich.

# Appendix C: Initial Villager Survey

Name: _____

Age: _____ Sex: _____ Occupation: _____

How long have you lived here? _____

Have you ever been to Saket Island? _____

If so, for what? _____

If not, have you ever wanted to see the island? _____

Do you have any ideas for the future of Saket Island? _____

_____

_____

_____

_____

_____

Should transportation to bring the locals to the island be created? _____

How do you feel about the surrounding industrial estate? _____

_____

_____

_____

_____

Is it affecting the environment? How ? _____

_____

_____

_____

_____

# Appedix D: Revised Villager Survey

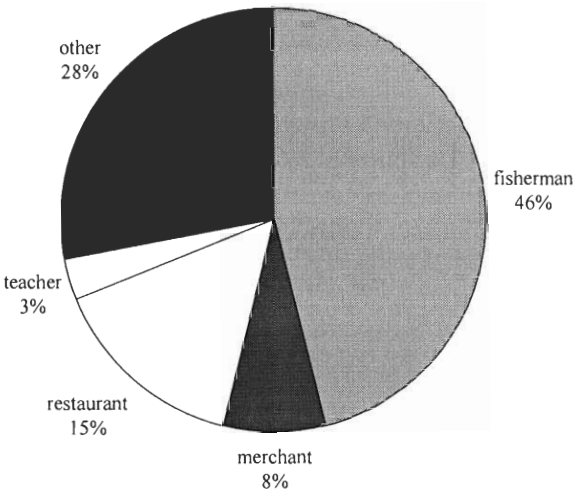
Name: _____ ☐
Family:_____
Age: _____ Sex: _____
Occupation:_____
Village: ☐ Ban Ao Pradu ☐ Ban Ta Kuan ☐ Ban Laem Suan
☐ Ban Nong Taeng Me ☐ Ban Krok Yai Cha

How long have you lived here? _____ Been to Saket Island before? ☐ Yes
☐ No
Why or why
not?_____
_____
If it were your decision, would Saket Island remain completely undeveloped, or are you in favor of future construction?

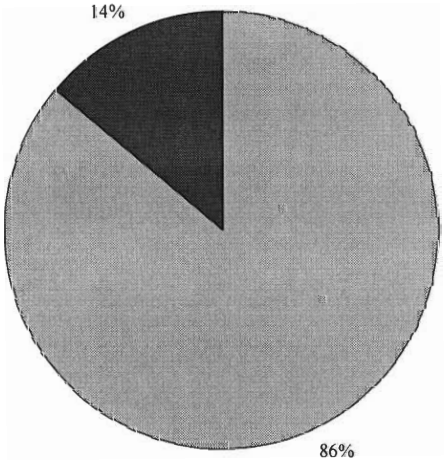
☐ Undeveloped - Would small-scale construction like an educational tour be alright? ☐ Yes ☐ No
☐ Construction - Any ideas for future construction? (i.e. campground, beach, science center)

_____
_____
_____
_____
_____
Is the surrounding industrial estate affecting Saket Island at all? ☐ Yes ☐ No
_____
_____
_____
Is it affecting other areas of the environment (water, air, land )? ☐ Yes ☐ No
_____
_____
_____
_____
Do you feel you are able to live in harmony with the industrial estate? ☐ Yes ☐ No
_____
_____
_____
_____
_____
_____

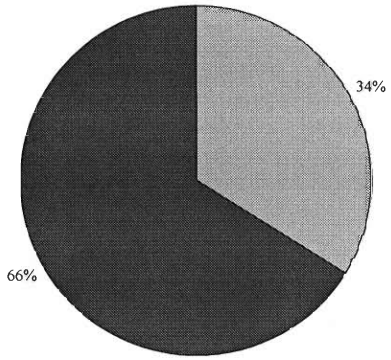
# Appendix E: Presentation Handout



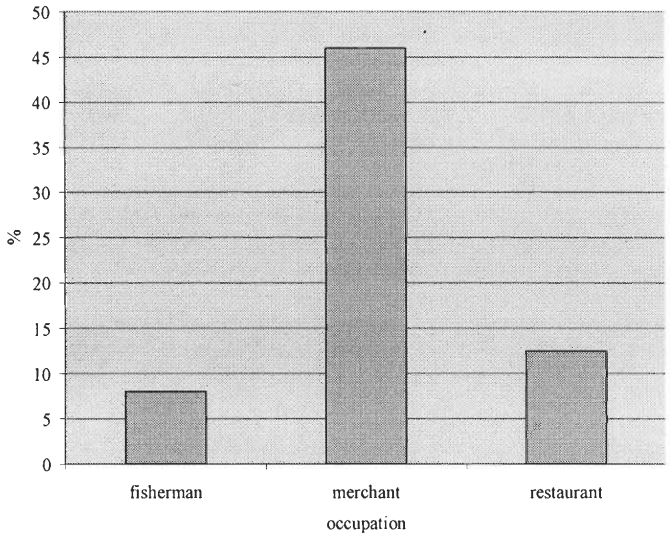

Occupations of Interviewed Villagers




86% of Villagers Had Been to Saket Island




66% of Villagers Accept Small Development




Percentage of Occupations Wanting Small Development

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Final Recommendations:

- Educational Program
- Groomed Beaches
- Restrooms
- Trash Cans
- Benches
- Guard

# Appendix F: Presentation Evaluation Form

Evaluation of WPI Presentation

On a scale from 1-5, how helpful did you find our presentation? (circle one)

| Not helpful | | Average | | Very Helpful |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

What additional information would you like to have been included in our presentation?

_____

_____

_____

_____

What did you like best about our presentation?

_____

_____

_____

_____

# Appendix G: Slides of Presentation

# Development of Saket Island

WPI Project Team
Chavin Boonyaveramuvat
Nicole DeNezzo
Josh Wakefield
Andrew Semmel

## Current Situation

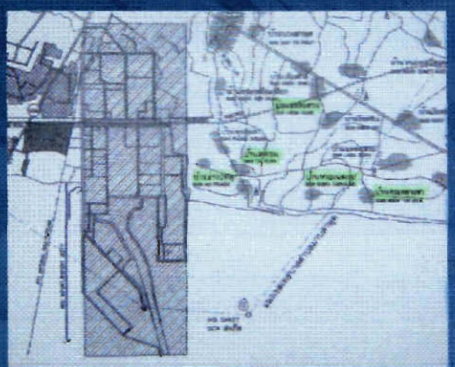
- Saket Island is being considered for future development
- To avoid upsetting stakeholders, IEAT wanted to consider their ideas for the island

## Industrial Development in Thailand

- Rapid industrialization led to overcrowding of Bangkok
- Eastern Seaboard Development Project established to relieve this stress from Bangkok
- Industrial Estates were formed
  - Collections of similar factories working together
  - Also contain living areas, banks, stores, communications, etc

## Maptaphut Industrial Estate

- Located in Rayong Province, southeast of Bangkok
- Contains about 80 petrochemical factories supported by natural gas pipeline
- Shares resources between factories and recycles waste products
- Transitioning to an eco-industrial park



## Maptaphut's Surrounding Community

- Local villages:
  - Ban Au Pradu
  - Ban Ta Kuan
  - Ban Laem Suan
  - Ban Nong Taeng Me
  - Ban Krok Yai Cha
- Saket Island
  - 300 meters from industrial estate
  - Area of 10 acres
  - Currently natural and undeveloped

## Tensions between Industrial Estate and Local Villagers

- History of protests against pollution
  - In 1998, students of the Maptaphut Phitthayakan School developed chronic respiratory illness from air pollution
- Industrial accidents cause destruction
  - Gas leakage kills one villager and poisons 200
  - Oil spill from tanker on its way to Maptaphut Port

## IEAT Attempts to Ease Tensions

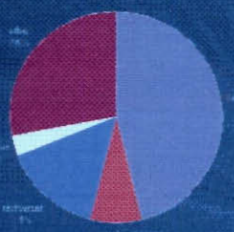
- W

## Project Goals

- To survey the stakeholders to obtain ideas for the development of Saket Island
- To research case studies of similar projects
- To recommend our ideas for the island

## Stakeholders

- Local villagers from:
  - Ban Au Pradu
  - Ban Ta Kuan
  - Ban Laem Suan
  - Ban Nong Taeng Me
  - Ban Krok Yai Cha
- Maptaphut Municipality Department



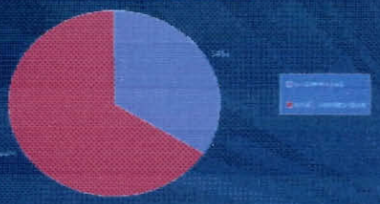
## Concerns of Villagers

- Villagers:
  - Want to continue to use the island for relaxation
  - Do not want to pay to use the island
  - Want to avoid polluting the island

## Results of Interviews

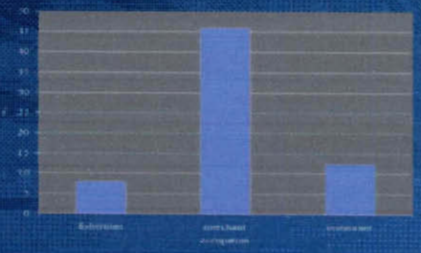
- The villagers proposed no new ideas
- No villagers wanted large-scale construction
- Most would accept small-scale construction

## 66% of Villagers in Favor of Small Construction



- Examples of small scale construction:
  - educational tour, groomed beaches, trash cans, benches, picnic areas, restrooms

## Percentage of Individual Occupations in Favor of Development



## Ideas of Maptaphut Municipality

- Develop island as a tourist attraction
  - –Aquarium
  - –Cable car

## Analysis

- Aquarium
  - Budget
  - Size
  - Location
  - People's desire
- Cable Cars
  - Budget
  - Environmental issue

## Case Studies

- DuPont Factory Wetlands
- Boston Harbor Islands
- Gateway National Recreation Center

- These case studies could be used to prove to the villagers that industry and environment can coexist

## DuPont Factory

- A chemical factory located in Texas

- The factory used its treated waste water to create wetlands
- An example of existing symbiosis

## Boston Harbor Islands

- National park with 30 islands located in Boston Harbor
- The Harbor has a rich natural and cultural history
- Activities offered include nature walks, educational programs, and camping areas

## Gateway National Recreation Center

- Located in New York Harbor
- 26,000 acres of beaches, bays, dunes, wooded uplands, grassy fields, and historical monuments
- GNRC specializes in educational programs for school children

## Analysis of Case Studies

- All cases are located near industrial areas
- Reasons for success
  - Large area of land
  - Contain historical remains
  - Wide variety of plants and wildlife
  - Educational programs desired by city schools

## Recommendations for Saket Island

- Keep it natural
- Educational tour
- Well groomed beach
- Trash cans
- Benches
- Restrooms
- Guard

## Thank You

Any Questions?