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An "ecolodge" in Thailand: a site design based upon the local vernacular village

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**AN "ECOLOGEDGE" IN THAILAND: A SITE DESIGN BASED UPON
THE LOCAL VERNACULAR VILLAGE**

A Thesis

Submitted to the Graduate Faculty of the
Louisiana State University and
Agricultural and Mechanical College
in partial fulfillment of the
requirements for the degree of
Master of Landscape Architecture

In

The School of Landscape Architecture

by
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TABLE OF CONTENTS

ACKNOWLEDGEMENTS.....	ii
ABSTRACT.....	v
CHAPTER 1. INTRODUCTION.....	1
Background.....	1
The Local Government Tourism Policy.....	1
Problem Statement.....	3
Objectives.....	3
CHAPTER 2. THE PLACE.....	4
The Region.....	4
Thailand.....	4
Samut Songkhram Province.....	5
The Village.....	7
Yisan: Historical Richness of the Surrounding Community.....	7
The Site.....	12
Utilities.....	13
Peacefulness of the Site.....	13
Conclusion	14
CHAPTER 3. “ECOLOGDE” FOR THE RETIREES.....	15
Ecotourism.....	15
Definition and Principles.....	15
Ecotourism in Thailand.....	15
“Ecologde”.....	15
“Ecologde” and Sustainable Site Design.....	16
Retirement Community.....	16
Description.....	16
Application.....	17
CHAPTER 4. VERNACULAR ARCHITECTURAL AND DWELLING PATTERNS.....	18
Architecture and Dwelling Patterns.....	18
Lord’s House.....	18
Fishing Village.....	24
Historical Linear Market.....	27
Application.....	28
CHAPTER 5. MANGROVE FOREST.....	29
Vegetation.....	29
Primary Succession of Vegetation.....	29
Secondary Succession.....	31
Mangrove Forest of Yisan.....	31
Wildlife.....	35
CHAPTER 6. SITE INVENTORY, SITE ANALYSIS, PROGRAM, AND STRATIGIES OF ENVIRONMENTAL SUSTAINABILITY.....	37
Site Inventory.....	37

Existing Land Use.....	37
Adjacent Land Use.....	39
Topography.....	41
Climate.....	41
Hydrology.....	41
Mangrove Forests and Canals.....	42
Program.....	42
Program Relationship Diagram.....	46
Site Analysis.....	46
Proposed Land Use.....	46
Diagrammatic Coordination between Program and Site.....	47
Cut and Fill Diagram.....	48
Strategies of Environmental Sustainability.....	49
Graywater Sewage Treatment.....	49
Biodiversity and Habitat.....	51
Dry Composting Toilet.....	51
Application.....	52
CHAPTER 7. MASTER PLAN.....	54
Design Concept.....	54
Master Plan.....	54
REFERENCES.....	61
VITA.....	63

ABSTRACT

This thesis began from my interest in using indigenous architectural and dwelling patterns of fishing villages in coastal Thailand as a model for a new sustainable community.

The provincial government has a policy promoting longstay tourism for affluent retirees from other countries, enabling them to experience the natural, historical, and cultural heritage of the area at an economical cost. To fulfill the local government's policy and my intention to design such a facility, this thesis proposes to design an international "ecolodge" for a site near Yisan Village. The area is very peaceful yet it is not so far from downtown Samut Songkhram City.

This thesis offers the design of a sustainable resort community as a guide to be adapted to other applications on the specific site using local vernacular building and dwelling patterns in a new situation.

CHAPTER 1. INTRODUCTION

Background

This thesis began from my interest in using indigenous architectural and dwelling patterns of fishing villages in coastal Thailand as a model for a new sustainable community. I consulted with two Thai design professors, Ornsiri Panin of Silpakorn University and Chatchai Indrachot of King Mongkut's Institute of Technology Ladkrabang who advised me to select a site near Bangkok; and I went to Samut Songkhram Province where I observed many fishing villages within a short drive of Samut Songkhram City.

The provincial government has a policy promoting longstay tourism¹ for affluent retirees from other countries, enabling them to experience the natural, historical, and cultural heritage of the area at an economical cost. To fulfill the local government's policy and my intention to design such a facility, this thesis proposes to design an international "ecolodge" for a site Yisan Village. Although the primary occupation of villagers is now charcoal-making from the local mangrove forest and not many residents are fishermen, their lives are still very much connected to water. The area is very peaceful yet it is not so far from downtown Samut Songkhram City.

The Local Government Tourism Policy

The Tourism Authority of Thailand recently established a policy promoting longstay *tourism*, and its target group is affluent retired people from other developed countries who spend from two weeks to three years leisure time in Thailand. These visitors would typically join local civic activities, occasionally learn the language, and experience the historical and cultural heritage of the country. Their intent is to have a good quality of life, enjoy services with economical costs, and have the chance to associate with the younger generation in voluntary social events.

¹ Tourism for overseas visitors who come to Thailand to spend their leisure time in the country for over a month

The target group for longstay status are at least 50 years old, healthy and able to take care of themselves. Figure 1, below, shows that the percentage of people at least 60 years old in developed countries is increasing every year compared with the percentage of those under 15 years, which is gradually decreasing. At the same time, the cost of living in the developed countries is high, so some developed countries encourage their citizens to stay in developing countries to maintain a higher quality of life. Thailand has the potential to efficiently handle this new tourist group.

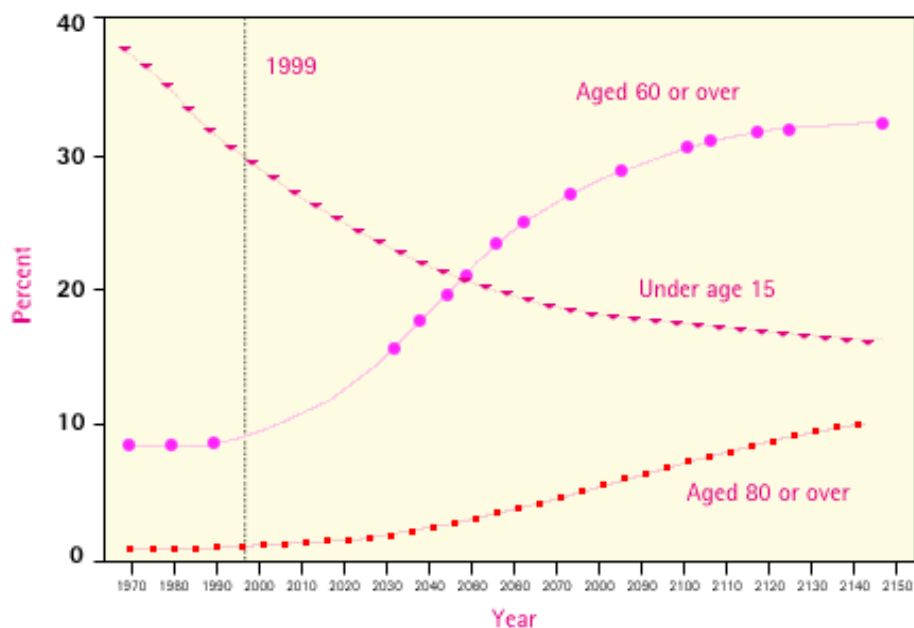


Figure 1. Trend of age of developed countries
(Source: UN population division department of economic and social affairs)

Samut Songkharm Province has appealing attractions for urban dwellers including bird watching in the mangrove forest, experiencing local vernacular dwelling architectural patterns, and riding the long-tail boat on the mudflats with fisherman. These attractions and others, contribute to make this region an attractive place for longstay tourists.

Problem Statement

This thesis will create a site design for an “ecolodge” for retirees based upon the vernacular Thai village, and the natural systems of restored mangrove forest.

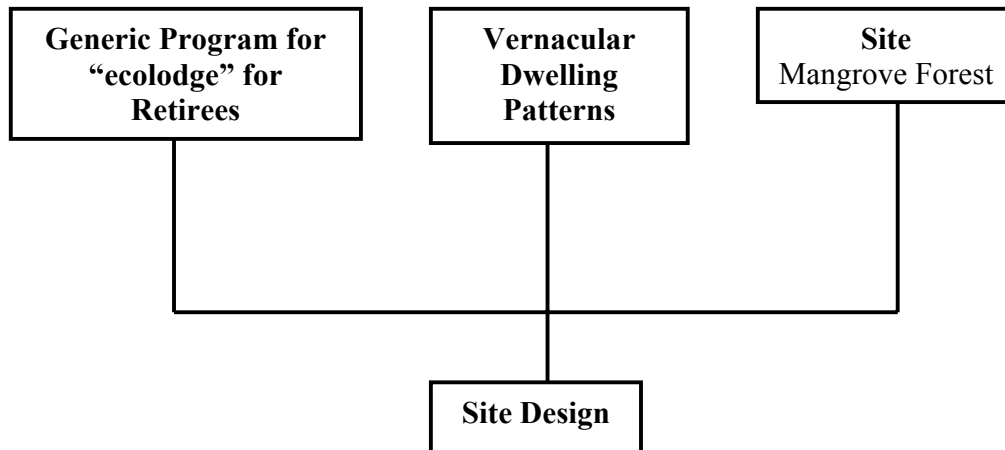


Figure 2. Site design process diagram

Objectives

1. To use vernacular architectural and dwelling patterns as a basis for the design
2. To design an “ecolodge” adapted to the needs of retired visitors.
3. To develop a site plan design that connects to the mangrove forest.
4. To provide an example of how this concept responds to the local government’s policy on ecotourism.
5. To restore monoculture mangrove species to the mangrove forest, resulting in more diversity of wildlife to the site.
6. To promote ecotourism and sense of ecological awareness to the residents, visitors, and local people.
7. To utilize an ecological sustainable design practices.

CHAPTER 2. THE PLACE

Coastal Samut Songkhram Province consists of patches of harvestable mangrove forests, shrimp farms and broad mudflats. The main economic activities in this area include aquaculture, salt production in evaporation ponds, and fisheries. Fish, shellfish and jellyfish are important seafood products from the area. Because of the salinity of the soil, agriculture accounts for only a small proportion of land use and economic activity. The way of life here depends mainly upon tidal flats and waterways. This is conventional Thai culture. There are small villages along canals that lead to the sea. Recently intensive shrimp farming and managing the mangrove forests as a monoculture for charcoal production have deteriorated the local ecosystem of the traditional fishing communities.

The Region

Thailand

Thailand is located in Southeastern Asia, bordering the Andaman Sea and the Gulf of Thailand. Its shape and geography divide into four natural regions: the mountains and forests of the north; the rice fields of the Central Plains; the semi-arid farm lands of the northeast plateau; and the tropical islands and long coastline of the peninsula to the south. Bangkok, the capital city, has its international airport. The country has a well developed infrastructure, a free-enterprise economy, and welcomes foreign investment. The climate is tropical; rainy, warm, cloudy southwest monsoon (mid-May to September); dry, cool northeast monsoon (November to mid-March).



Figure 3. Southeast Asia map



Figure 4. Samut Songkhram and Bangkok map

Samut Songkhram Province

Samut Songkhram City is located 72 km. (45 miles) southwest of Bangkok. It is the smallest province in Thailand and is an ancient province with a long history.



Figure 5. Samut Songkhram map

Local Tourist Attractions

The province has multiple tourist attractions. Here there are three types of waters: fresh, saltwater, and brackish, creating three completely different ecosystems of plant and animal communities.



Figure 6. Mangrove forest



Figure 7. Thai lifestyle and houses along waterways



Figure 8. Thai houses along waterways

The Village

Yisan: Historical Richness of the Surrounding Community

Yisan district consists of 5 villages in an area of 61 sq. km. or about 15050 acres with a population at least 3000 people. The district is surrounded by many canals, mangrove forests, and shrimp farms. The canals link Yisan to other communities, mangrove forests, and also link to the Gulf of Thailand for fishery. The largest and the most important canal is the Yisan canal, a manmade waterway that connects directly to the Gulf of Thailand. All the canals in this area are brackish, and most local people still travel with their own boats.

Men cut mangroves and bring the logs back to the village where they are processed into charcoal. Local women cooperate to establish a gift shop where handmade merchandise, made with mangroves bark dye, is sold.



Figure 12. Gift shop and dyeing cloth from cannonball mangrove's bark



Figure 13. Ditch for parking boats to transport mangrove logs



Figure 14. Charcoal processing



Figure 15. Charcoal

Yisan Temple

Yisan temple is located on the only hill in Samut Songkhram province and serves the nearby five villages. Densely populated, Yisan Village surrounds the foot of the hill.

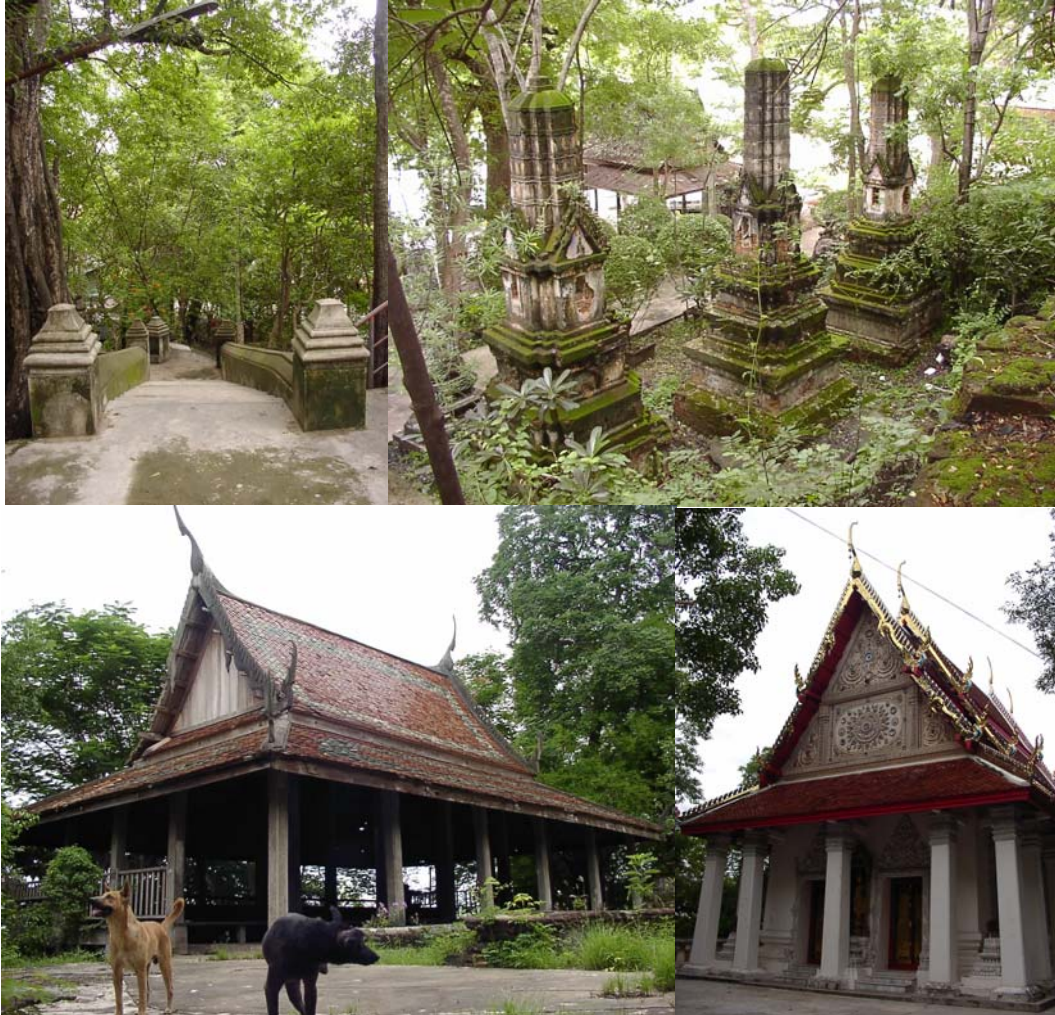


Figure 16. Yisan temple

Market

On Tuesday and Friday of every week, there is a caravan market that comes to sell fresh food, fruits, and daily used goods around Yisan temple. This is an attraction for both local residents and tourists. Other tourist attractions are include the local museum and local restaurant. The local museum has exhibits about the history of the community, antiques, local literature, and occupations in the community.



Figure 17. Local market



Figure 18. Food and dessert from local restaurant



Figure 19. Yisan museum and school nearby

The community has a rich cultural heritage and strong connection to the environment. Citizens live peacefully and in harmony with nature. Because of the historical, cultural, and environmental richness of this area, it has a high potential for building an “ecolodge” here that can be economically successful and become one of the major tourist attractions in Samut Songkhram Province.

The Site

The site for this project is near Yisan village and is located opposite the smaller village called Khlong Bannok and on a harvestable mangrove forest. The site is located 72 km (45 miles) from the Bangkok international Airport and is approximately a two-hour drive along Highway No. 35 and has easy access from a local road (Figure 20 and 21).

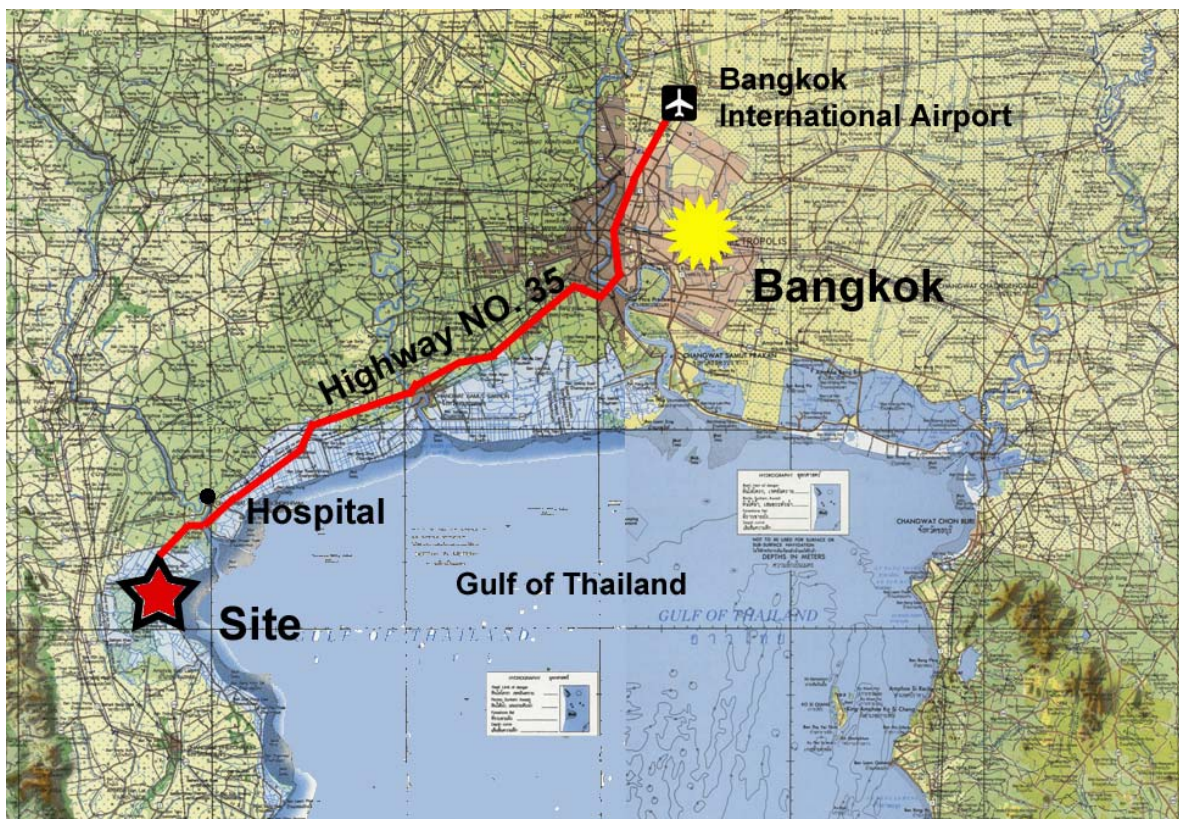


Figure 20. Site accessibility from Bangkok international airport

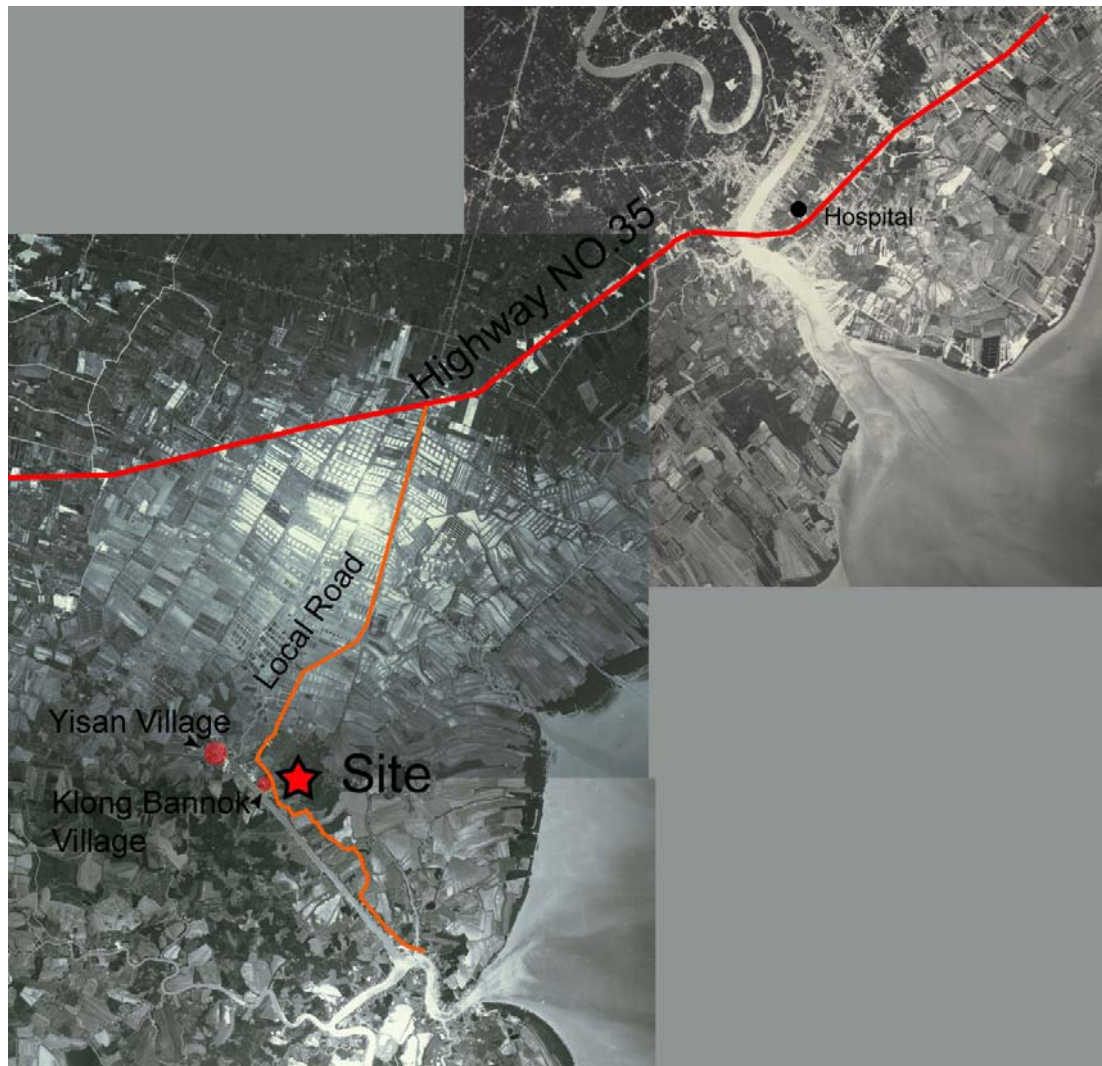


Figure 21. Site accessibility from highway No. 35

Utilities

The site is located opposite the Klong Bannok village, which has municipal electricity and water that can easily be extended to this project.

Peacefulness of Site

The site is located on a local street with very light traffic and is covered with a mangrove forest, giving it a quiet and peaceful atmosphere. The mangrove forest is a wildlife

habitat. In the morning, the birds go out for food and come back to their nest in the evening, thus the resident, will be surrounded by birds and their calls.

Conclusion

The thesis site is located in mangrove forest of Yisan District because of the historical and cultural richness of villages and tourist attractions nearby, special character of place, easy access, adequate utilities, and the peacefulness of the site.

CHAPTER 3. “ECOLOGDE” FOR THE RETIREES

Ecotourism

Definition and Principles

The International Ecotourism Society defines ecotourism as “responsible travel to natural areas that conserves the environment and improves the well-being of local people.”

According to this organization, those who participate in ecotourism activities should follow the following principles:

- minimize environmental and cultural impact;
- build environmental and cultural awareness and respect among tourists;
- provide positive experiences for both visitors and hosts;
- provide direct financial benefits for conservation of natural resources;
- provide financial benefits and empowerment for local people;
- raise sensitivity to the host country’s political, environmental, and social climate;
- support international human rights and labor agreements².

Ecotourism in Thailand

Thailand has approximately 10 million visitors from other countries each year. Its income from tourism industry is more than 3 trillion bahts per year (7.5 billion dollars). The Thai government promotes sustainable tourism in general, and ecotourism in particular. It has a very high potential for increasing its sustainable tourism due to the diversity of tourist destinations, its reliable transportation system, its secure political environment, the stability of its economy, and also the enthusiasm of its native population.

“Ecolodge”

An “ecolodge” is an ecologically-based lodge or resort that conserves energy, benefits its local community, and gives a sense of natural conservation awareness to its guests and

² The International Ecotourism Society, “Definition and Ecotourism Principles”, *What is Ecotourism*, 2004, <http://www.ecotourism.org/index2.php?what-is-ecotourism> (6 July 2005).

visitors. It should also be of a small or medium size for minimal environmental and cultural impact.

“Ecolodge” and Sustainable Site Design

An “ecolodge” facility should be designed with conservation as a major priority by recycling water and waste, conserving energy, and reducing impact on the site. The use of natural and local building materials in an environmentally respectful design will ensure that the “ecolodge” will be in harmony with the landscape and cultural setting of the area. Ideally, it should be locally owned and operated.

“The International ‘ecolodge’ Survey” by David Russell, Chris Bottrill, and Greg Meredith, 1995, identified 28 different “ecolodge” operators from various countries such as Belize, Costa Rica, Peru, Brazil, Ecuador, Alaska, Australia, New Zealand, and Africa. The survey indicated that capacities of these “ecolodges” were generally small, 24-guests capacity, thereby assuring that the sense of connection to the local place was not lost, and human impact on the environment was controlled.

An “ecolodge” should be characterized by a design that integrates with the natural environment and incorporates cultural characteristics, such as vernacular building pattern. Sustainable site design requires ecologically based strategies to create projects that do not alter, and perhaps even restore existing site systems.

Retirement Community

Description

A retirement community is generally a place of residence intended for retirees in relatively good health who may need minimal or moderate care and cannot (or do not want to) be in their own homes. Typically each person or couple in the community has an apartment-style room or suite of rooms, allowing independent living.

Participation in a retirement community can be paid for on a rental basis, like an apartment, or can be bought in perpetuity as a condominium. This system provides a safe, environment that allows for the opportunity to socialize with people the same age, enjoy organized activities, have all meals prepared and housekeeping done by someone else. Additional care is available, if needed, allowing the residents to maintain privacy and independence. Residents have the freedom to choose how much to do for themselves, how much to have done for them, and how and with whom to spend their time. They can usually bring some of their own furniture, and a few facilities even allow small pets. Some people living in retirement communities may still drive their own cars and most are free to leave during the day without supervision. Community activities are an excellent way to make new friends while living an outgoing lifestyle with peace of mind.

Application

This design will apply principles of ecotourism, standard of sustainability, and criteria for retirement communities in designing an “ecolodge” for retirees on the specific site of the mangrove forest on coastal Thailand.

CHAPTER 4. VERNACULAR ARCHITECTURAL AND DWELLING PATTERNS

Architecture and Dwelling Patterns

Lord's House

Local domestic architecture is in the traditional Thai style, and generally can be seen throughout the province. The traditional Thai family is extended and often several houses are built in a group with connecting common outdoor space to eat, sleep, work, play, and also to welcome guests. This pattern of grouping Thai houses has potential as a model for community design for an “ecolodge” for retirees.

Because of the tides, the Thai people construct their houses with living spaces on the second floor and use the ground floor spaces for storage and daytime activities. Domestic architecture in the Thai traditional style responds to an understanding of local climate and flooding seasonal.

The most important element in the house is the chan (Figure 22), an elevated common space that extends from the house and allows more area for cooking and daily life. The chan also connects the otherwise separate houses of the extended family. It is similar to a porch, but is mostly unroofed, and the area is usually larger than the house itself.

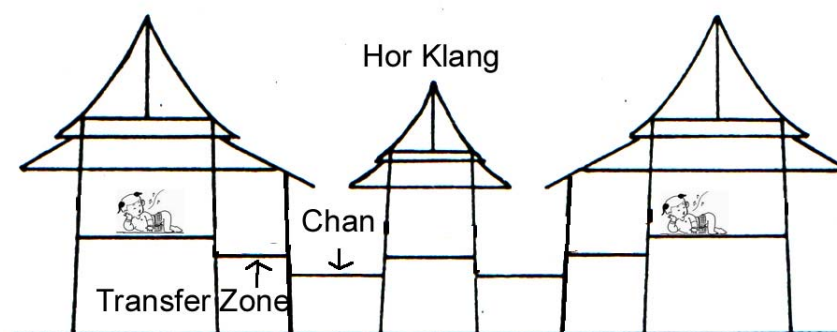


Figure 22. Chan and hor klang

Modified drawing from Nugoon Chompunich, *Traditional Thai House: the Unity of the country*, (Bangkok, Thailand: Audience Store Press, 1987)

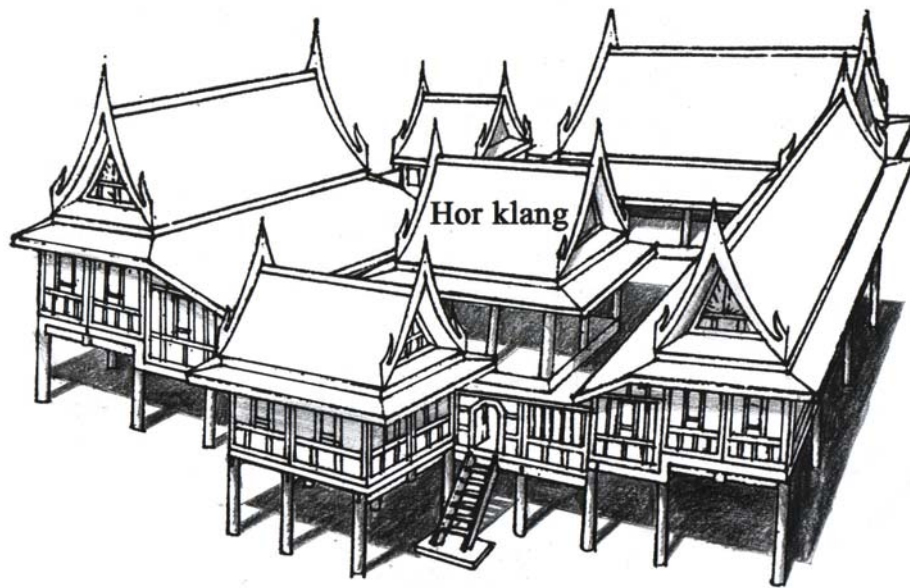


Figure 23. Lord's traditional Thai house
 Reprinted drawing from Nugoon Chompunich, *Traditional Thai House: the Unity of the country*, (Bangkok, Thailand: Audience Store Press, 1987)

Sometime, there is a additional roofed, unwalled structure in the middle of the chan called the hor klang. (Figure 22 and 23) High gable roofs allow rain to run off easily and help ventilate hot air out of the building.

Due to the hot weather, ventilation is an important consideration in traditional housing. Many elements are used to reduce the heat in the house. The “breathing floor” that has a small gap between each board, that allows the wind to flow up and rain to drain down. (Figure 24) There is also a transfer zone, an area between the chan and the sleeping and living areas, that prevents sunlight from hitting the building directly. As a result, the temperature inside the building is lower than outside the roof by 12° F. (Figure 25)

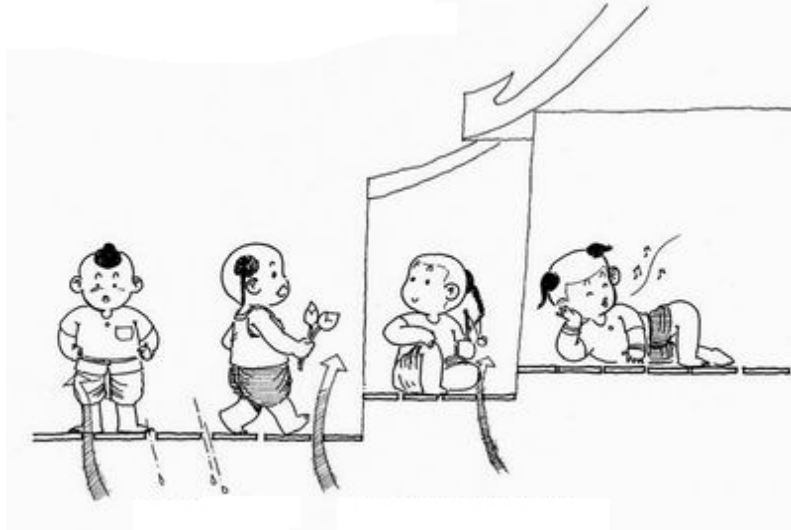


Figure 24. Breathing floor

Drawing: เทพธรรานนท์, ยอดเยี่ยม, “Architect's Answers”, ร้อยพันปัญหาในการก่อสร้าง เล่ม5 ฉบับภูมิปัญญาไทย, 2004, <http://www2.se-ed.net/winyou3/100-1000-05/497.htm> (29 June 2005).

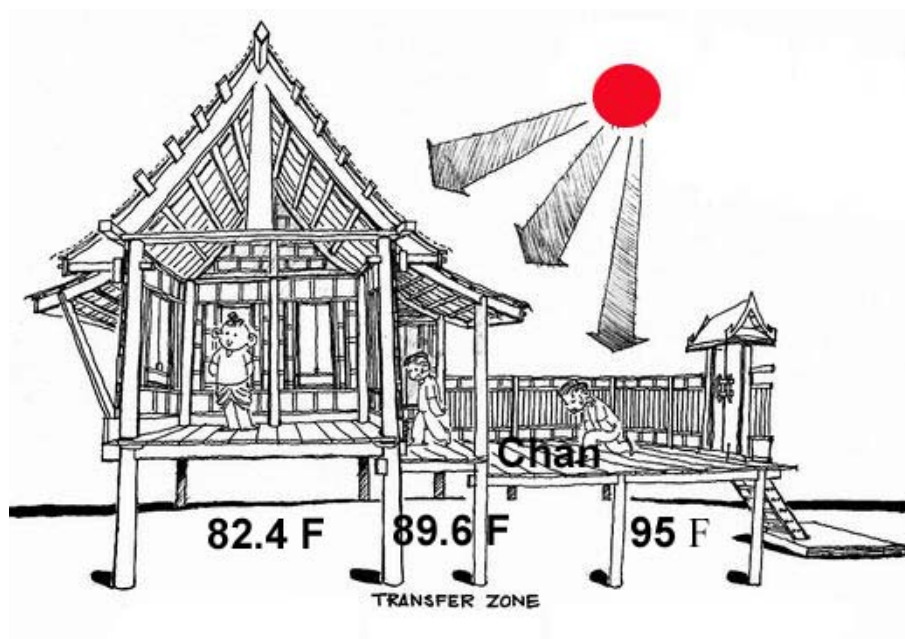


Figure 25. Transfer zone and microclimate

Modified drawing: เทพธรรานนท์, ยอดเยี่ยม, “Architect's Answers”, ร้อยพันปัญหาในการก่อสร้าง เล่ม5 ฉบับภูมิปัญญาไทย, 2004, <http://www2.se-ed.net/winyou3/100-1000-05/509.htm> (29 June 2005).

Columns are tapered and canted inward for rain and wind resistance, allowing to be transferred loads from the walls to columns. It is like a person standing with opened legs, which is more stable than with closed legs (Figure 26).

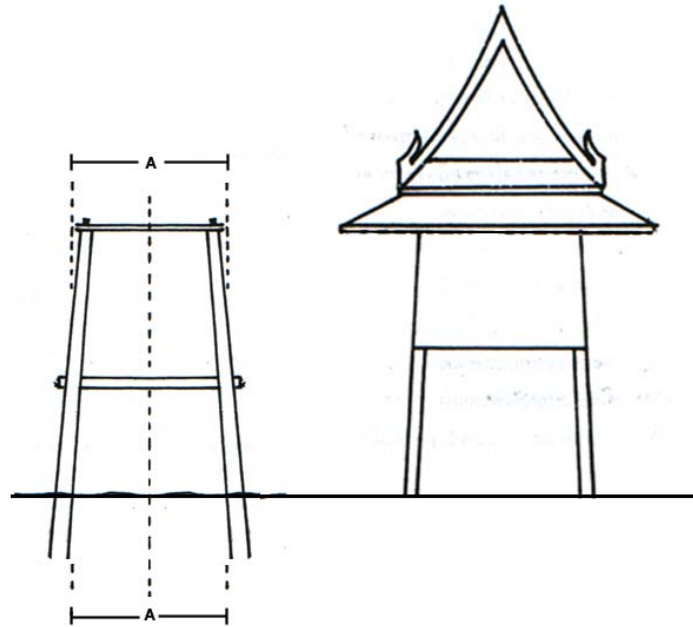


Figure 26. Opened-leg columns
Modified drawing from Nugoon Chompunich, *Traditional Thai House: the Unity of the country*. (Bangkok, Thailand: Audience Store, 1987).

Constructing traditional a Thai house is very easy because it is prefabricated. Every component is prepared off-site and brought in pieces to be assembled. Because the Traditional Thai wood joints are used, construction does not require nails, but employs dowels (Figure 27).

In contrast to the wealthy lord's house, local people generally live in the smaller single family structures. Living area and sleeping area occur in the same area. Normally Thai people sleep on the floor, so it is easy to fold their sleeping materials and keep them in the storage during the day (Figure 28).



Figure 27. Local people's house (under construction)



Figure 28. Traditional Thai house of Yisan Village



Figure 29. Traditional Thai lord's houses



Figure 30. Inner space of group of traditional Thai lord's house with chan³

Fishing Village

Local villages are linear settlements that border the canals (Figure 31).



Figure 31. Aerial photograph of a fishing village showing typical settlement along the canals

³ Source of figure 31-32: Landscape Architecture Department, Chula Longkorn University, “สวนไทยและสถาปัตยกรรม”, อุทยานพระบรมราชานุสรณ์ พระบาทสมเด็จพระพุทธเลิศหล้านภาลัย, 2004, <http://www.land.arch.chula.ac.th/fieldtrip47/group7/01/> (29 June 2005).

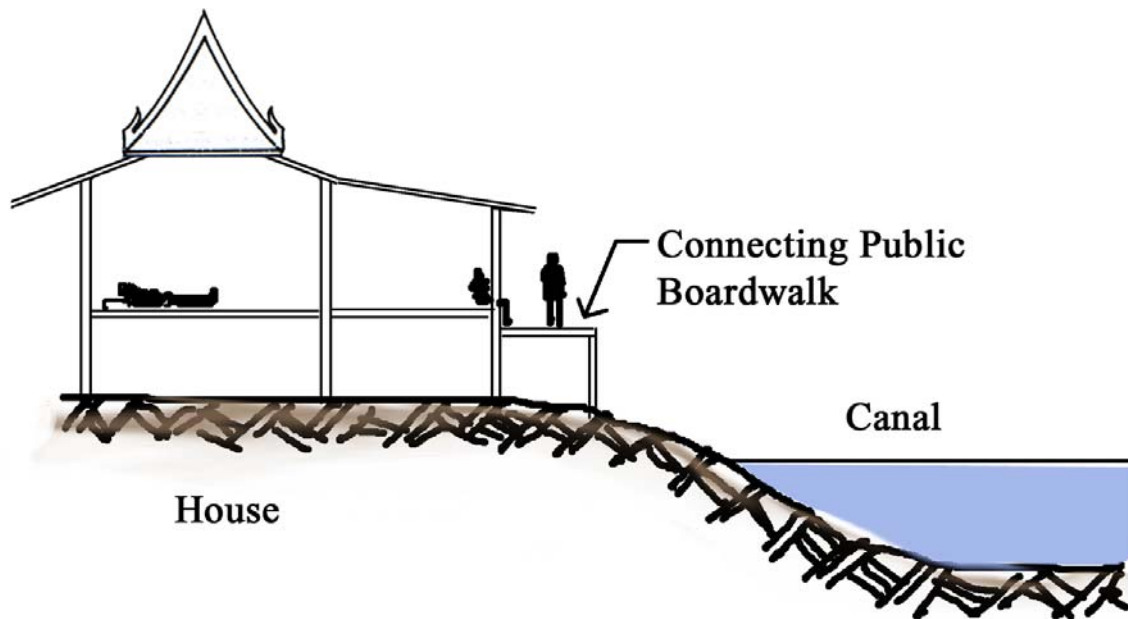


Figure 32. Typical relationship of fishing house, connecting public boardwalk, and canal

The fishermen bring their boats and their fishing gear out along the coast to catch fish, jellyfish, clam, shrimp, shellfish, and crabs, and return to sell them at docks.



Figure 33. Fishing ship and dock

Houses of fishermen are haphazardly constructed, without specific style. Residents depend on available material, tools, and their own creativity. Common materials are bamboo, swamp palm leaves and corrugated iron. These materials are not durable enough for the construction of the “ecolodge”, but the overall pattern and connecting public boardwalk along canals are used in this thesis.



Figure 34. Fisherman's houses with elevated public boardwalks

As with the lord's house and houses in fishing villages are elevated to escape from the tide. Locals use the space under the house to store their boats and large water containers to collect rainwater from the roof. Structures are placed harmoniously with patches of mangrove.

Every house is surrounded by a group of water containers because fishing villages are located in brackish or saltwater areas. Although Yisan Village has a municipal water supply these pots are used for supplemental water storage. These containers are quite large and give the distinct character to the local village (Figure 35).



Figure 35. House in Yisan Village and concrete jars for storing water

Historical Linear Market

In the past, Thai people settled their communities next to the waterways and traveled by boat. In Samut Songkhram City, there is a historical market, an old linear one-story community located along both side of a canal. This market used to be a center of trading food, and merchandise in the province. All buildings are made of wood and connected by an elevated public boardwalk in front of the shops for buying food, local grown vegetable, and merchandise along the canal and from a floating market. Every morning, there is a floating market in this area.



Figure 36. Historical linear market with elevated public boardwalk

Application

The design of this thesis is based upon an interpretation of two patterns:

- The pattern of the lord's house with its central chan and hor klang and
- The pattern of fishing village and historical linear market with their connecting elevated public boardwalks, along canals are used as a basis for the design of this thesis

CHAPTER 5. MANGROVE FOREST

Vegetation

Mangrove forests form a distinct association of diverse plant and animal species. The vegetation composition changes frequently with changes in soil and water conditions. As a result, the succession processes of mangrove forest are more pronounced than those of terrestrial forests. In mangrove areas, the cycle of accretion and erosion of the land by tide and water is essential in determining the distribution of pioneer and successional species.

In addition to natural succession, human activities in mangrove areas can also cause changes in composition and structure of the plant communities. Due to excessive exploitation and cutting of forests, dyke construction for agricultural production or for extensive shrimp farming, the soil in many coastal forest areas becomes degraded; and secondary plant communities, which are quite different from primary forests, eventually develop. Managing the forest for charcoal production encourages a monoculture of one species of mangrove. In areas where the impact is not excessive, succession follows natural rules, but where human interference is extreme, natural or primary succession process will give way to a process of secondary succession.

Primary Succession of Vegetation

The following four stages of mangrove forest the succession can be identified:

- **Pioneer stage:** The seeds of *Avicennia marina* (gray mangrove) are brought from swamps to newly accreted mudflats by tidal water. They then develop both underground roots and aerial roots, with the function of respiration, above the ground. Salt tolerance, due to the presence of salt glands on the leaves and adaptation to conditions of inundation and strong light-intensity, allows this species to rapidly establish itself on the mud flats. A pioneer plant community plays an important role in maintaining the elevated mudflats.



Figure 37. Aerial roots



Figure 38. Support roots

- **Mixed stage:** The mud becomes firm and the loam and clay content increases. As the soil accretes, seedlings of additional mangrove species such as *Rhizophora stylosa* (Spider mangrove), *Bruguiera gymnorrhiza* (Oriental mangrove), and *Kandelia candel* are trapped on the land by the pneumatophores of *Avicennia* and *Aegiceras* (River mangrove). Under suitable conditions and once the substrate is protected by a pioneer species, these new plants grow quickly.

These species gradually surpass the established communities. Most *Avicennia* can no longer compete with later species for light and food. Some individuals of *Aegiceras* can exist for considerable time under the canopy of other species. At this stage, it is difficult to identify the dominant species, which may be either *R. stylosa* or *Kandelia candel*. The land is continuously elevated by alluvium deposits and litter from mangrove trees.

- **Dominant stage:** When a mudflat is elevated and becomes stable, while continuing to be flooded by high tide, the soil composition changes to a firm mixture of loam and sand. The soil is rich in organic detritus and gravel brought by river waters. The growth of species such as *R. stylosa*, *K. candel* and *A. corniculatum* slows down. Young trees of *B. gymnorrhiza*, able

to endure shade, establish themselves and become dominant in the competition for food and light, by surpassing other species, which are shaded by a dense crown of *Bruguiera*. *Rhizophora stylosa* is also a prominent species at this stage.

- **The last stage of succession:** On elevated land, flooded only by spring tide, *B. gymnorhiza* trees survive, although other species die when the mud becomes hard and firm. The soil is rich in pyrite and is oxidised into acid sulphate soil. An associate mangrove community, comprising *Xylocarpus granatum* (Cannonball mangrove), *Hibiscus tiliaceus* (Sea hibiscus), *Excoecaria agallocha* (Milky Mangrove), *Thespesia populnea* (Portia tree), *Cerbera manghas* (Cerbera), *Pongamia glabra* (Indian beech) and some bushes such as *Scaevola tacca* and *Clerodendron inerme* (Seaside clerodendrum), establishes itself.

Secondary Succession

Secondary succession differs depending on the composition structure of the community and human impacts in the area. Even after being cleared, seedlings can regenerate on mudflats, which are periodically flooded. Four main factors affecting the regenerative process are as follows:

- Inundation level
- Characteristics of soil and substrate
- Seed supply
- Level of biotic interference (destruction by crabs, snails, wild boars, monkeys and algae as well as humans)⁴

Mangrove Forest of Yisan

Local soil types on the site are mudflat to firm mud. On some firm and deep mud-flats along creeks and rivers, the community of *Rhizophora apiculata* (Figure 40) -*Bruguiera*

⁴Phan Nguyen Hong and Hoang Thi San, "Succession in Mangrove Communities in Vietnam", *Mangroves of Vietnam*, 1994, <http://www.dec.ctu.edu.vn/sardi/htqt/english/succession.htm>, (29 June, 2005).

parviflora (Small-leaved Orange Mangrove) is dominant. In this community *Xylocarpus granatum* (Figure 39), *Avicennia alba* (Figure 43) or *A. officinalis* (Figure 44) also develop.



Figure 39. Cannonball mangrove
Xylocarpus granatum

The majority of the vegetation in this area is *Rhizophora apiculata* which the local people harvest for charcoal, then replant, thus producing a monoculture and arresting natural succession. *Rhizophora apiculata* and *R. mucronata*, which produce heavy, dense, hard charcoal with a high calorific value that is almost smokeless when burned, are preferred than other mangrove species.



Figure 40. Tall-stilted mangrove
Rhizophora apiculata



Figure 41. Mangrove fern
Acrostichum aureum

Nypa fruticans (Nypa palm) (Figure 42) is frequent in the understory. Further inland, it develops well and in some places forms a community of *Nypa fruticans*-*Cryptocoryne ciliata* (Ciliata). Nypa palm occupies the upper layer and *Cryptocoryne* make up a dense layer under the canopy of Nypa, extending towards the rivers. *Acrostichum aureum* (Figure 41) occupies the degraded area.



Figure 42. Nypa palm
Nypa fruticans



Figure 43. Grey mangrove
Avicennia alba



Figure 44. Grey mangrove
Avicennia officinalis



Figure 45. white-flowered black mangrove
Lumnitzera racemosa



Figure 46. Asiatic mangrove
Rhizophora mucronata

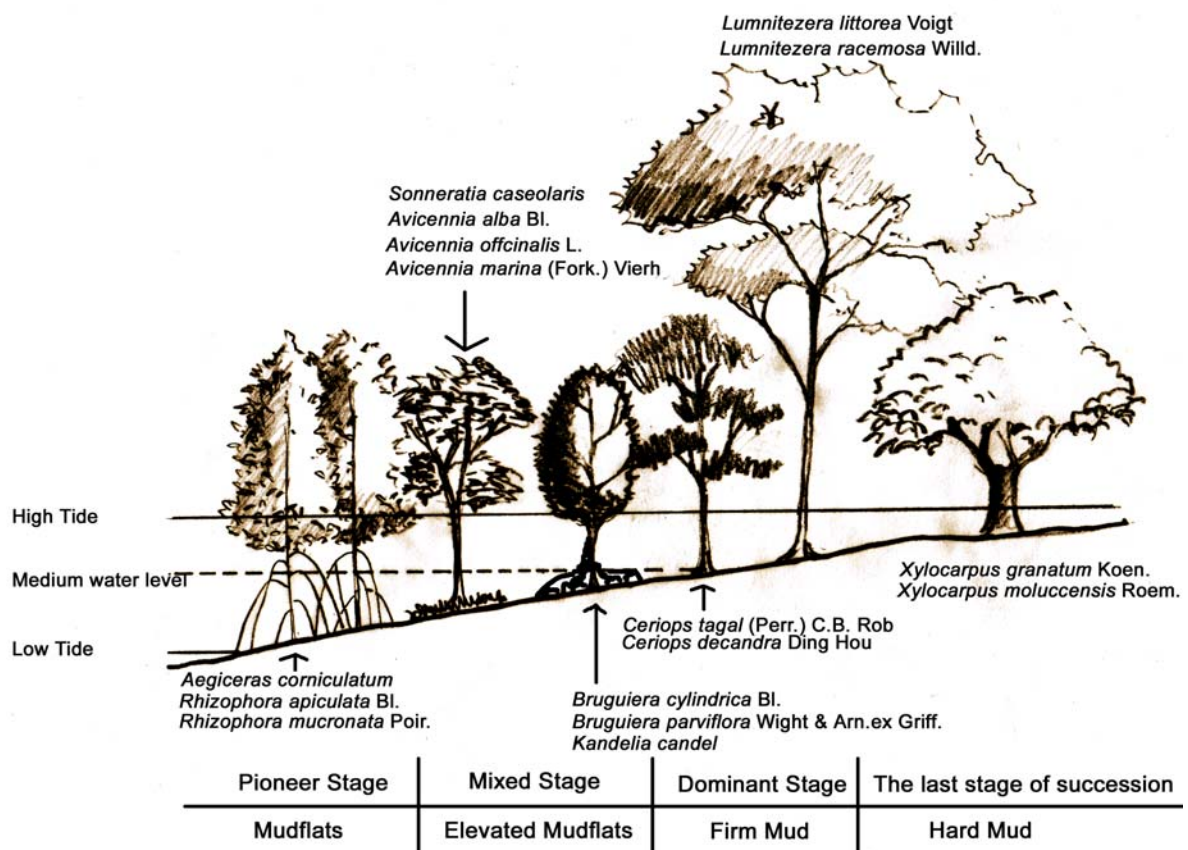


Figure 47. Distribution of mangrove plant species in Yisan area

Wildlife

A variety of animal species such as shrimp, fish, crabs, shellfish, mussels, oysters, lizards, crab-eating Macaques, and resident and migrant shorebirds inhabit the area. In particular, birds can be a main significant attraction for the visitors and residents.



Figure 48. Crab-eating macaque
Macaca fascicularis



Figure 49. Mudskippers
Periophthalmodon schlosseri



Figure 50. Malayan water monitor lizard
Varanus salvator



Figure 51. Birds of mangrove forest

CHAPTER 6. SITE INVENTORY, SITE ANALYSIS, PROGRAM, AND STRATEGIES OF ENVIRONMENTAL SUSTAINABILITY

Site Inventory

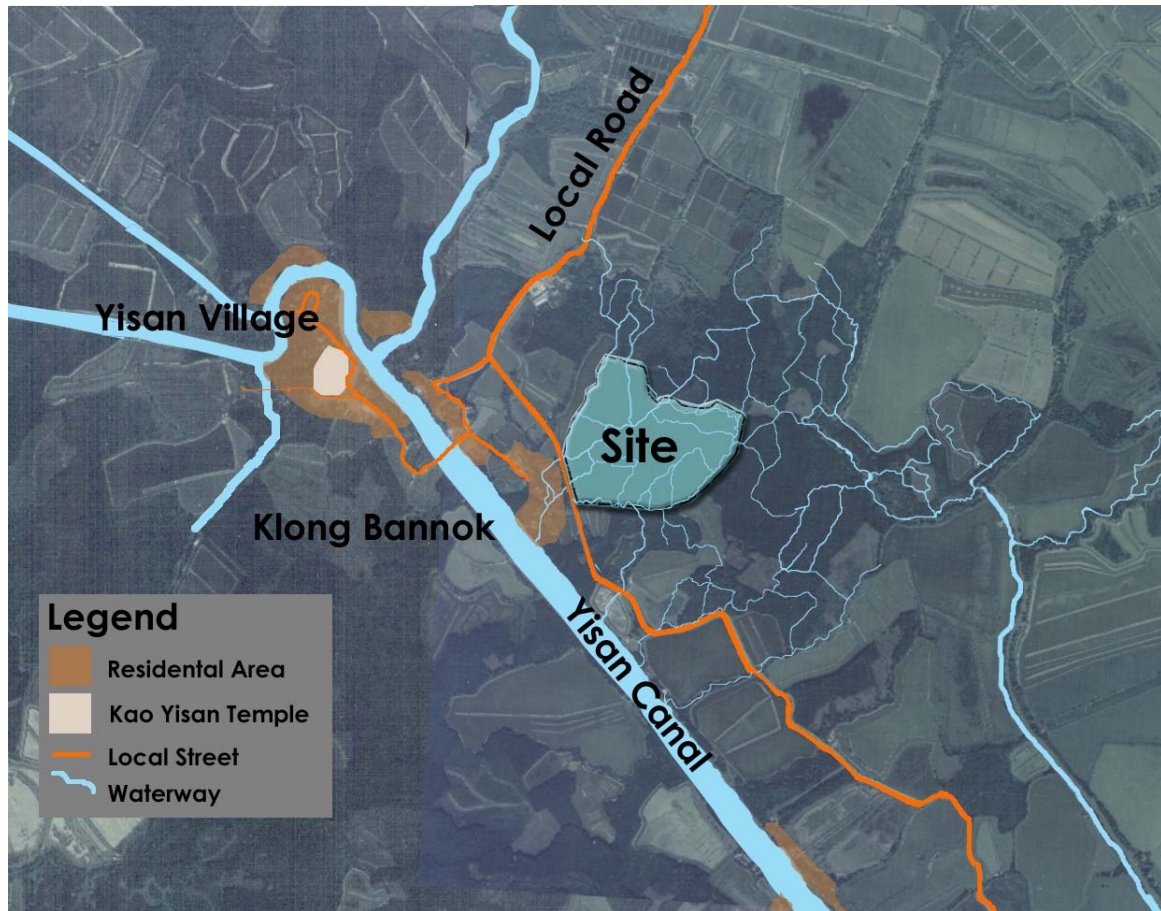


Figure 52. Site location

Existing Land Use

The site is located in a managed mangrove forest that is harvested and replanted as a monoculture every 8-10 years. The local people divide a large area of forest into sections and harvest on rotation to sustain wood-product industries, prevent erosion, and maintain wildlife habitat.



Figure 53. Panoramic view of the site



Figure 54. Canal connecting the site to Klong Bannok Village

Adjacent Land Use

The land uses adjacent to the site are a mixture of harvestable mangrove forests, shrimp farms, and residential areas along the margins of waterways. Shrimp farms are abandoned after approximately three years because the soil loses its fertility and disease breaks out. Due mainly to self-pollution and the deteriorating pond environment, the land becomes useless for other purposes except mangrove forest. Historically, mangrove forests were destroyed to be replaced by shrimp farms and now some of these are returning. The loss of the mangrove forests had great impact on ocean ecosystem and the local coastal fishery as well.

At present, not many shrimp farms still in active production. The remaining shrimp farms use natural methods to raise shrimp, letting water go in and out naturally. Dark slate gray areas in the diagram are primarily mangroves (Figure 55).

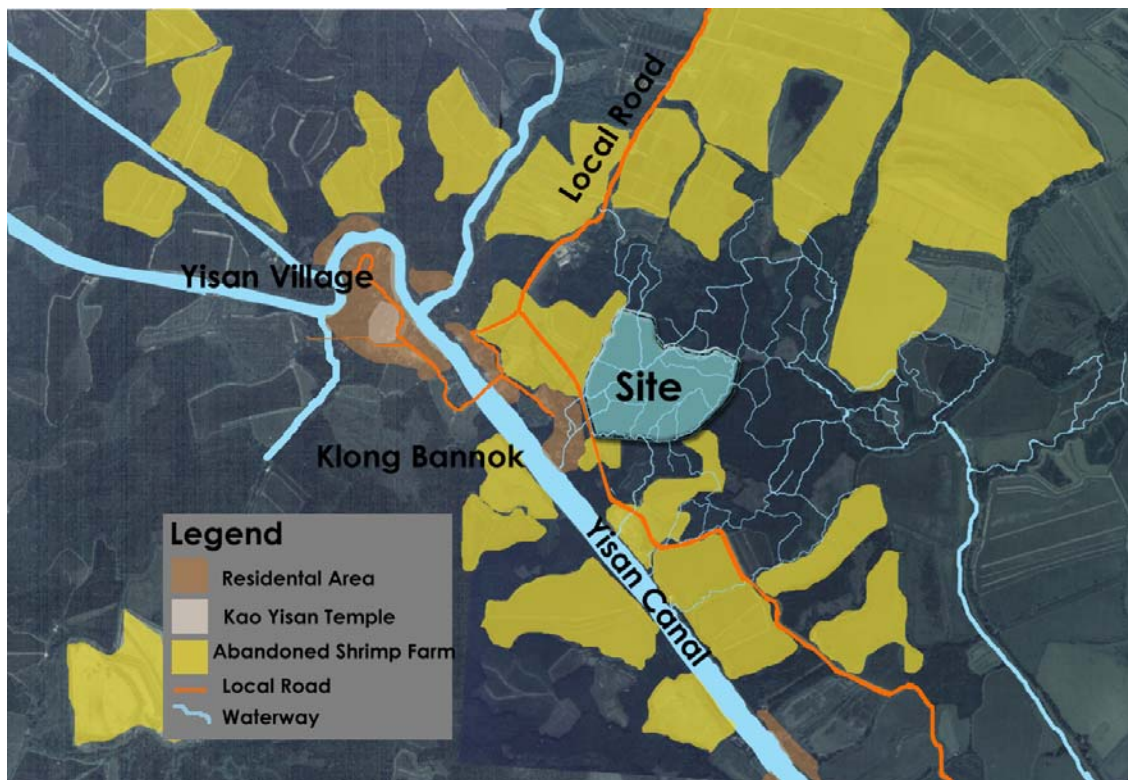


Figure 55. Adjacent land use diagram



Figure 56. Entrance of Klong Bannok Village (Opposite the Site)



Figure 57. Klong Bannok Village (Opposite the Site)



Figure 58. Canal connecting Klong Bann Nok Village to Klong Yisan.



Figure 59. Looking from pier on Klong Yisan back to Klong Bann Nok Village

Topography

The topography in this area is mostly flat. There is the only one hill to the northwest side of the site where the Kao Yisan temple is located.

Climate

The climate of Thailand is under the influence of monsoon winds and may be divided into three seasons as follows:

- Rainy or southwest monsoon season (mid-May to mid-October):

The southwest monsoon prevails over Thailand and abundant rain occurs over the country. The wettest period of the year is August to September.

- Winter or northeast monsoon season (mid-October to mid-February):

This is the mild period of the year with quite cold in December and January, but there is a great amount of rainfall in Northern shore of the Gulf of Thailand including Yisan District, especially during October to November.

- Summer or pre-monsoon season, mid-February to mid-May. This is the transitional period from the northeast to southwest monsoons. The weather becomes warmer, but the temperature does not change much because this area is close to the coast. April is the hottest month.⁵

Hydrology

There are many small natural canals crossing the site and connecting it to the larger canals and then to the Gulf of Thailand. Klong Bannok Canal links the site and Klong Bannok Village and opens up to Klong Yisan. The tide is vital to the life cycle of mangrove stands and animals species.

⁵ The Meteorological Department, "General Climatic Conditions", *Climate of Thailand*, 2002 http://www.tmd.go.th/climate/climate_02.html (6 July 2005).

Mangrove Forests and Canals

Many sub canals cross the site and connect to through Klong Bannok Canal to Yisan Canal.



Figure 60. Mangrove Forests and Canals

Program

Activities of the “ecolodge” imply into four main categories of space: private, semi-public, public, and service.

1. **Private spaces:** 1 lodging unit
 - Sleeping area
 - Living area
2. **Semi-public space**
 - Common area that is shared between 2 lodging units

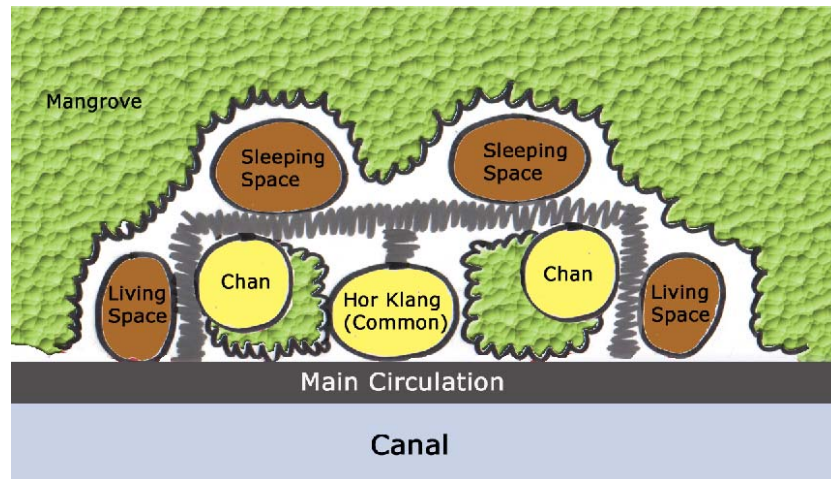


Figure 61. Diagram of relationship between two lodging unit

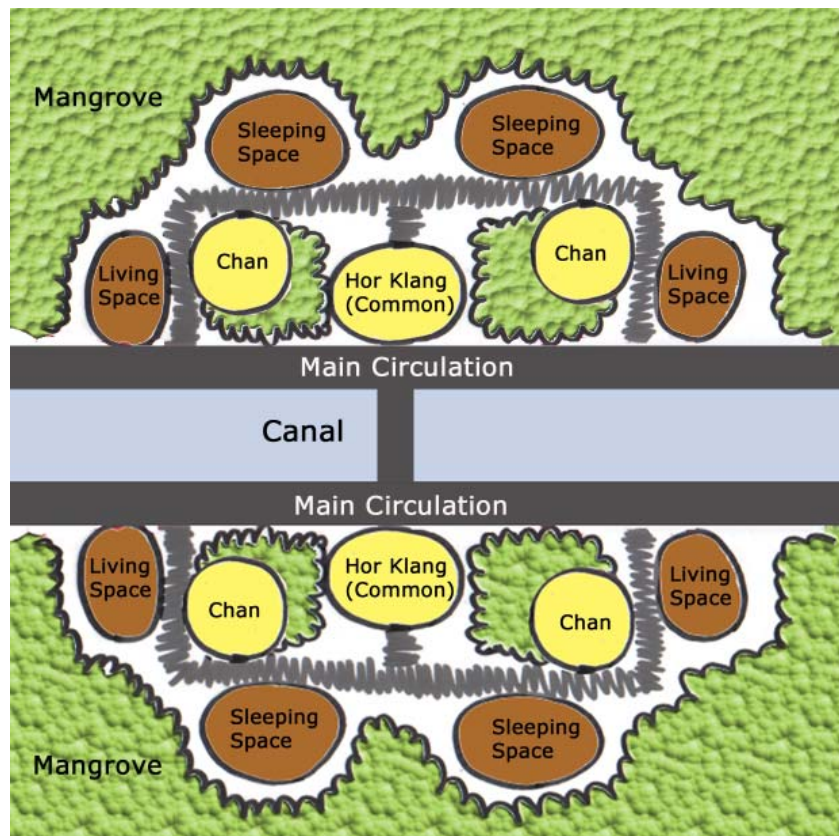


Figure 62. Diagram of connection between each two lodging unit

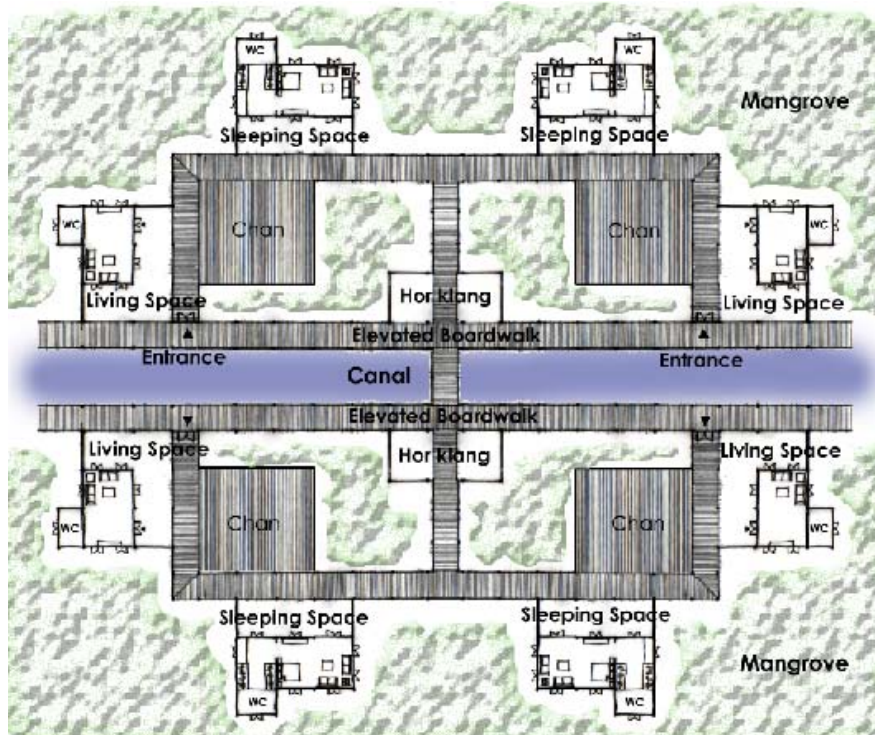


Figure 63. Lodging plan

Each residential unit is comprised of a living and sleeping spaces, that can accommodate an individual or a couple. The two spaces are connected by elevated boardwalks and the chan that are for private use. These private boardwalks then connect to the main public boardwalks that line the canals (Figure 61). In addition, two residential units are also connected together allowing an association between the residents, who will share the hor klang (Figure 62). The Hor klang is placed next to the public boardwalk for an easy access and to relate to another group of two units across the canal (Figure 63).

The arrangement of the elevated boardwalk and buildings do not have to be at right angles; they can be other shapes depending upon site conditions. If they pass interesting spaces such as body of water and a group of mangroves, buildings can be sited so that residents have different experiences (Figure 64). The main circulation is built along the canals similar to patterns formed in local villages.

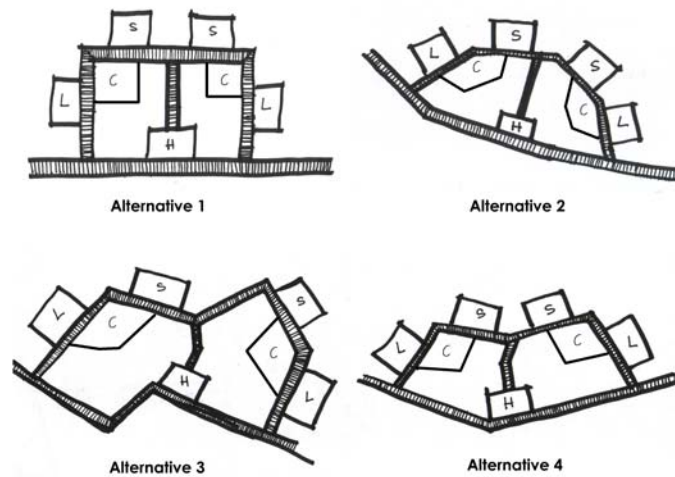


Figure 64. Lodging plan design alternatives

3. Public Spaces

- Parking area
- Meeting room
- Small grocery store and pharmacy
- Clinic
- Beauty salon and barber
- Cafeteria
- Game room and Internet service
- Library, learning resource center, and reading area
- Spa and massage area
- Home theater
- Public restroom
- Outdoor gathering space
- Graywater treatment area / Strolling and learning area

4. Service area

- Reception and office area
- Staff lodging area
- Laundry
- Kitchen

- Garbage area

Program Relationship Diagram

Figure 65 shows relationships among the areas.

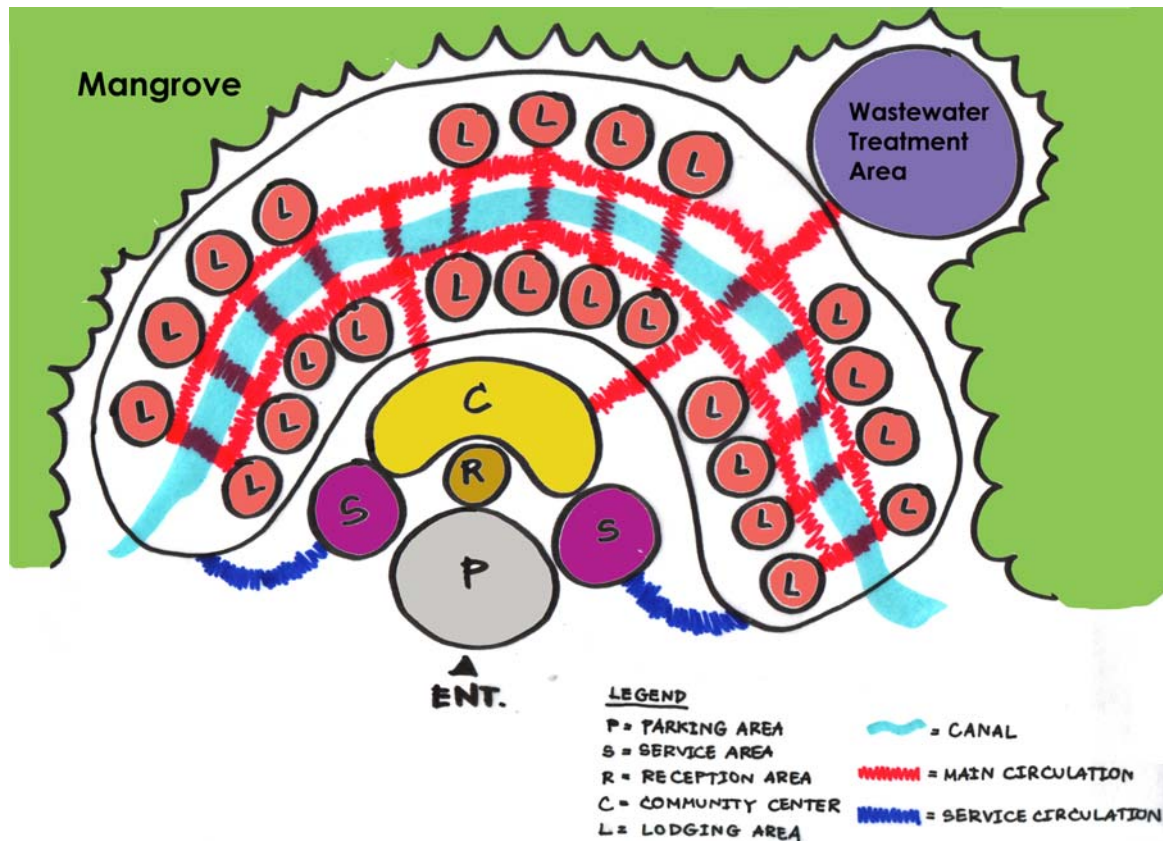


Figure 65. Program relationship diagram

Site Analysis

Proposed Land Use

The total area of the site is approximately 87,500 square meters or 21.6 acres. Areas for buildings and facilities extend along the existing natural waterways. The entrance of the site should connect to the main street. The site is divided into three zones: public, semi-public, and private corresponding to the noise level (Figure 66).

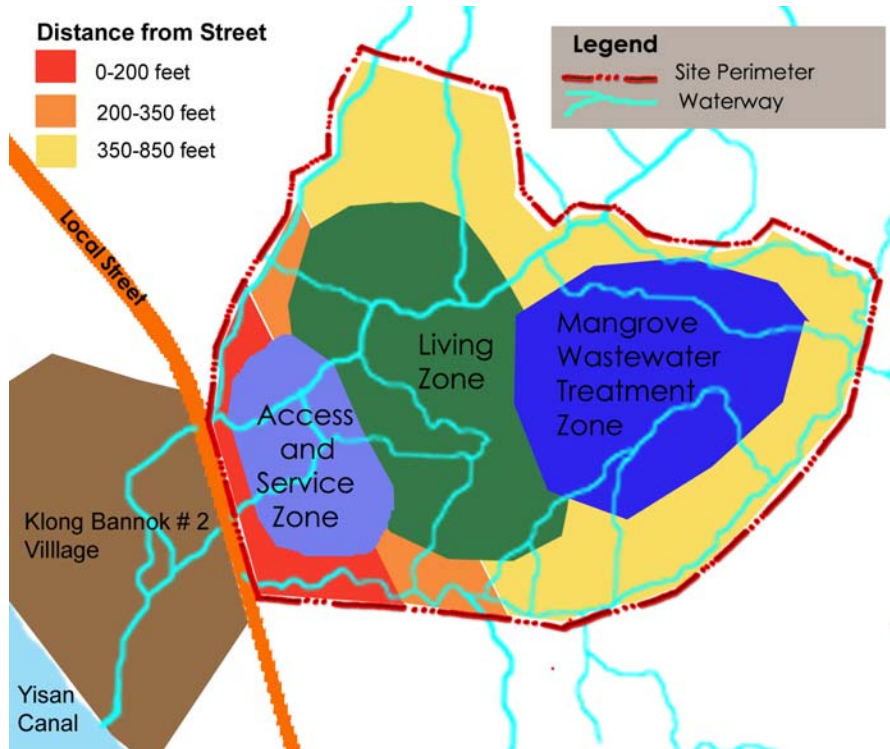


Figure 66. Proximities access from local street

Diagrammatic Coordination between Program and Site

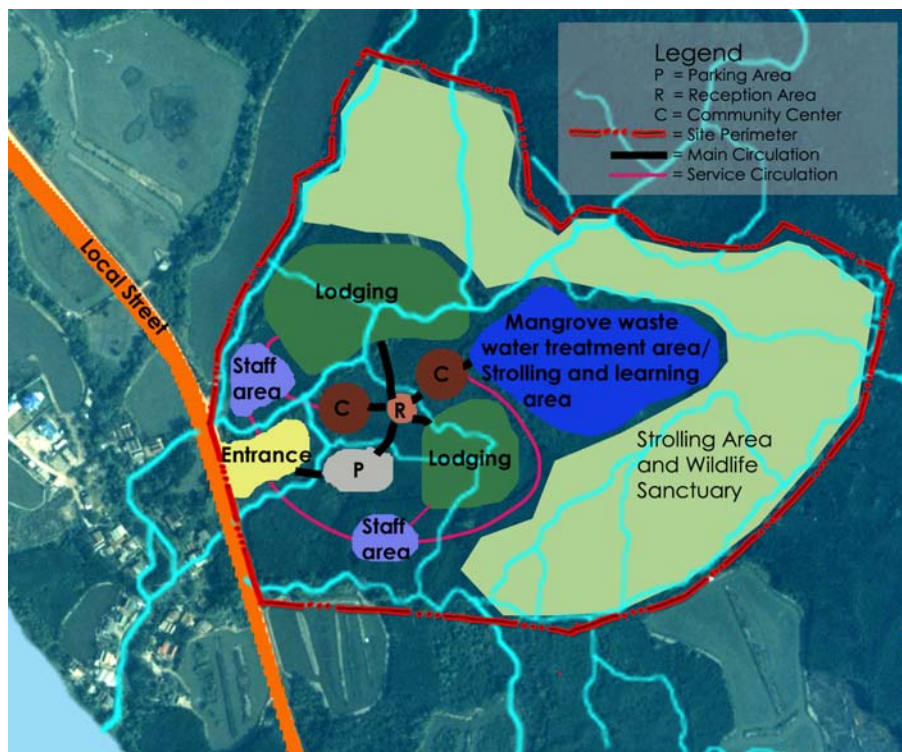


Figure 67. Diagrammatic coordination of program and site

The diagrammatic coordination between program and the site shows land use distribution on the site. There is a clear separation of the main circulation from the service circulation (Figure 67).

Cut and Fill Diagram

In order to restore the mangrove forest, the site will be filled by using mud cut from the retention pond and new canals (in blue). This fill will be about 2 meters higher than present grade (in brown). The fill area, which is in the center of the site, will be used for parking lots, planting upland mangroves, community centers and some residential units, and dikes for the graywater treatment's facilities.



Figure 68. Cut and fill diagram of the site

Strategies of Environmental Sustainability

Graywater Sewage Treatment

Design criteria for a mangrove wastewater filtration system has been published in the Royally-initiated Laem Phak Bia Environmental Study, Research and Development Project. The report stated that this system required a retention pond to store wastewater, a detention pond that has mangrove inside and a 1.5 meter (5 feet) earthen dyke around, a pipe to bring wastewater to the retention pond, and a watergate with control valves. Graywater, the wastewater produced from bathing and showering, is first collected into the retention pond; then a watergate open to collect seawater from the first high tide of the day into the detention pond.

Once the water height is stable, graywater is released to mix with seawater to achieve 20: 80 (graywater: seawater) mixture. Once a precipitation accelerator has been added; the mangrove will absorb nutrition, filter pollutants, and increase oxygen in the graywater. When the second low tide begins, the filtered water is released back to the waterway through the watergate. This system requires very low maintenance.

Two plants that found in mangrove forests are useful in this process because of their tolerance to wastewater are *Rhizophora apiculata* and *Avicennia spp.* and these plants are commonly found in all mangrove forests.⁶

⁶Chaipattana Foundation, "Project to Treat Waste Water from the Community by Natural Methods", http://www.chaipat.or.th/n_stage/activities_e/pakbia/pb1.html#4 (30 June 2005).

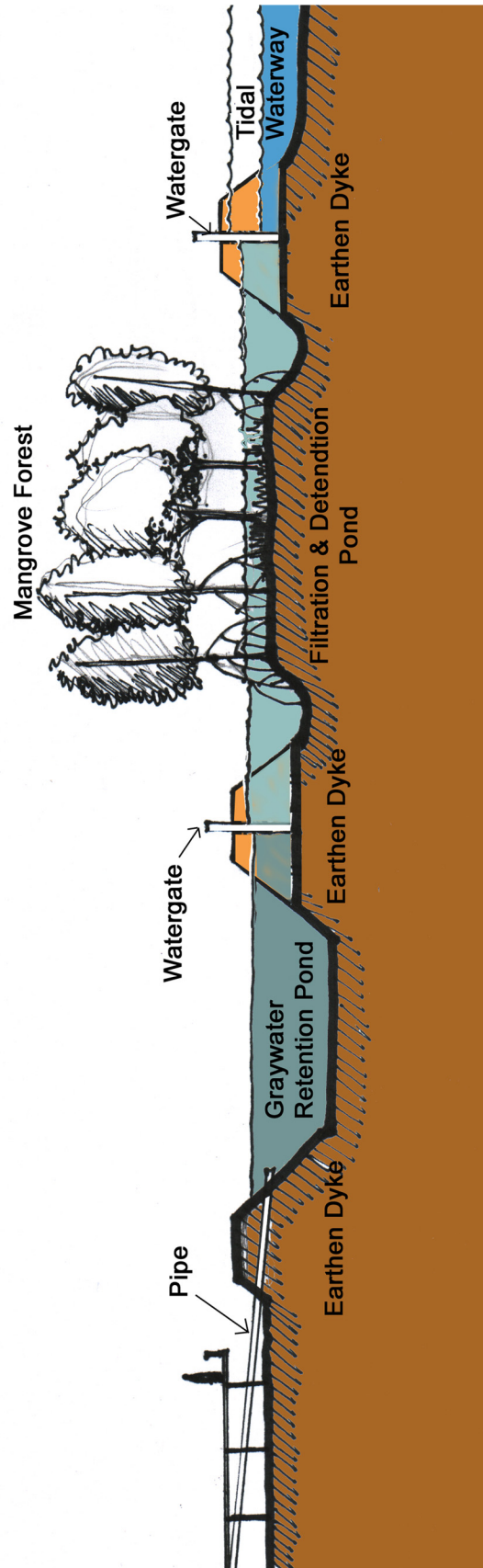


Figure 69. Graywater Filtering System by using Mangrove Forest

Biodiversity and Habitat

This thesis promotes the biodiversity of mangrove species for attracting wildlife, restoring the natural succession and managing waste.

Dry Composting Toilet

Composting toilets are toilet systems, which treat human waste by composting and dehydration to produce a useable end-product that is a valuable soil additive. It is the most efficient way where water is scarce or in areas with low percolation, high water tables. The dry composting toilet promotes water conservation, reduce water pollution, and it is inexpensive and easy to build.⁷

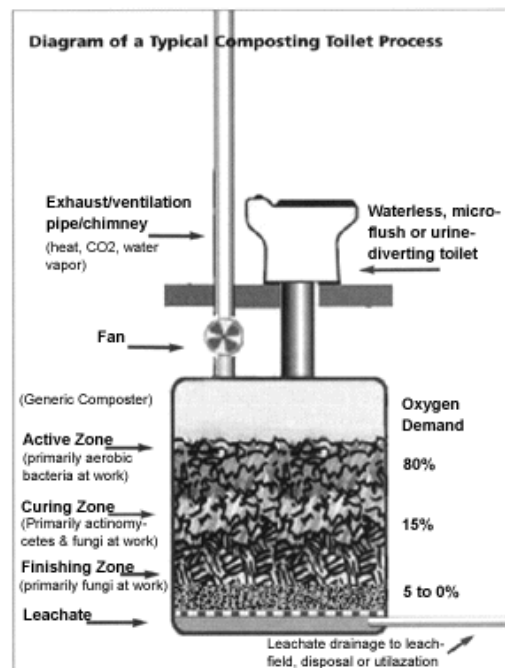


Figure 70. Diagram of typical composting toilet process

Source: "What is a Composting Toilet System?", *What is a Composting Toilet System and How Does it Compost?*, 2005, <http://oikos.com/library/compostingtoilet/> (6 July 2005).

⁷ Al Fritsch, S.J., "Water Report", *ASPI Technical Series TP 58*, 2000, <http://www.a-spi.org/tp/tp58.htm> (30 June 2005)

Application

This thesis will apply this graywater filtration system (Figure 71). Before releasing graywater to the retention pond, it passes through a filtering tank, designed by a local ecologist. The filter tank is easy to construct and materials are commonly found. The height of the tank is about two meters high, and it can fit under the buildings.

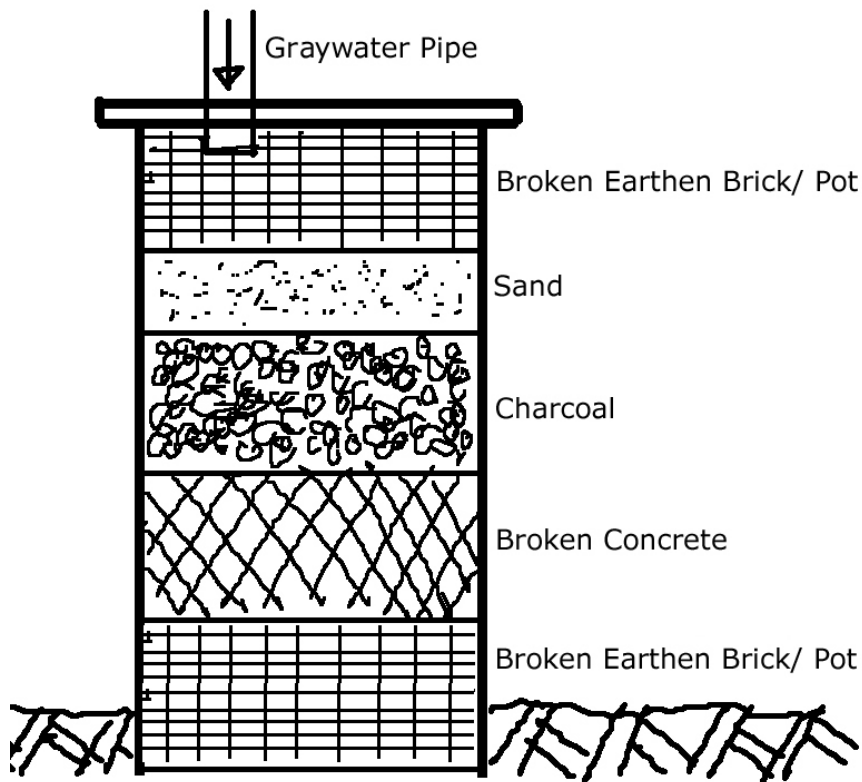


Figure 71. Section of graywater filtering tank

The system also is aerated by a windmill, locally used for driving the traditional Thai water ladder low-lift pump to bring saltwater into salt evaporation farm. This device can be adapted to use for increasing oxygen in the graywater in retention pond. It is a six-sail wind machine currently in use in the salt works around the northern shore of the Gulf of Thailand. The machine is of about 6 meters diameter and use bamboo spars, rope and wire to form a wheel, which carries 6 triangular sails, each woven from rush or split bamboo. This traditional Thai windmills will give more character of the site because they still be used in the salt

evaporation farm. The tourists who visit Samut Songkharm Province will see windmills along the side of the highway No. 35 (Figure 71).

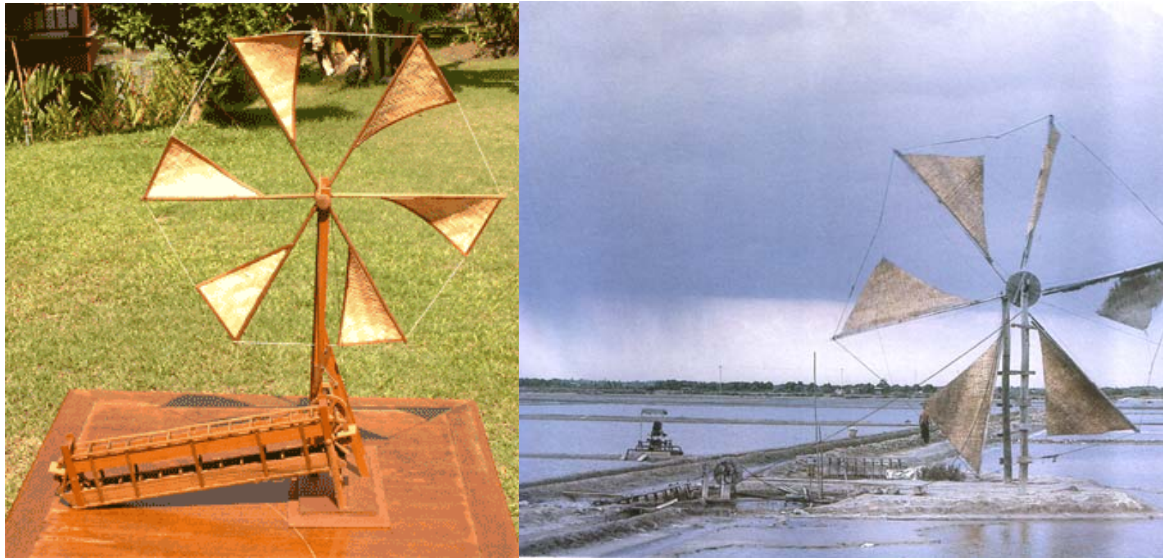


Figure 72. Model of windmill with traditional water ladder low-lift pump in salt evaporation farm, <http://www.sinka4u.com/th/ordersinka.php?id=0002> (30 June 2005)

CHAPTER 7. MASTER PLAN

Design Concept

The design of the site is inspired by the local mangrove forest, the local vernacular architectural and dwelling patterns of nearby villages, and the lord's house.

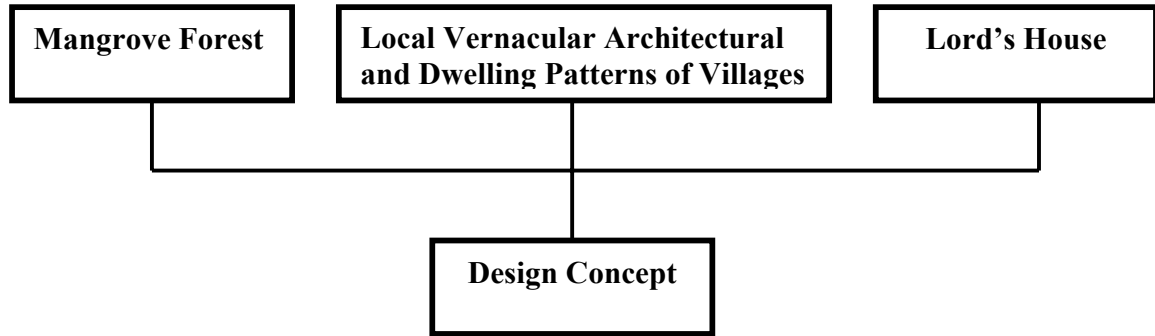


Figure 73. Design concept diagram

Master Plan

Upon entering the site, one first comes to parking lot, which can accommodate two buses and 41 parking spaces for cars. 28-30 staffs are required on site during the daytime. I provided drop off in the front of the community center buildings, and it also can be seen from the entrance area. Service areas and circulations are separated from other areas and circulations.

The design for public areas which are the two community center buildings are derived from the Lord's Traditional Thai House which provides a unique and peaceful atmosphere. The community center is comprised of two buildings connected by a chan. The Lord's Traditional Thai House provides enclosure and secure spaces and yet allows nature to merge with inside the buildings by allowing views to the forest and the sky.

The ground level in the center of the site is raised to promoting diversity of mangrove species, but also the residents and visitors to explore the forest on dry land. There are lodging areas consist of 26 residential units comprised of the chan and shared hor klang. All site

circulation, except in the central area is connected by boardwalks. The graywater sewage treatment facility, also contains an aeration unit driven by the traditional Thai windmill, which can still be seen associated with nearby salt evaporation ponds. The residential units also contain composting toilet to promote water conservation, reduce water pollution. There is an extensive system of boardwalks through the mangrove forest to be used for casual strolling and the observation of nature.

This thesis offers the design of a sustainable resort community as a guide that maybe adapted to other applications on specific site and situation using local vernacular building and dwelling patterns in a new situation.



Figure 74. Master plan



Figure 75. Entrance, community centers, and service areas



Figure 76. Lodging and strolling areas

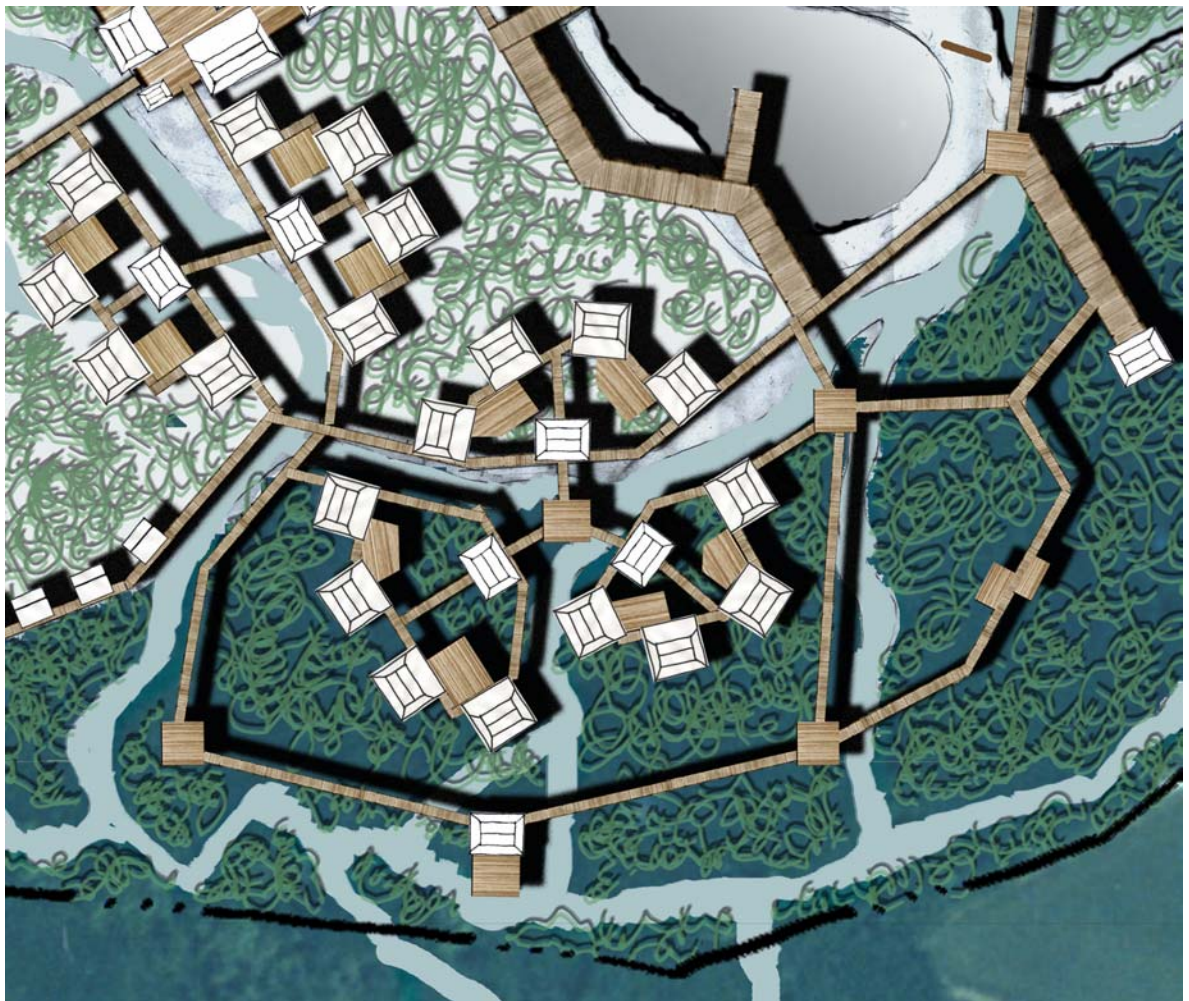


Figure 77. Lodging and strolling areas

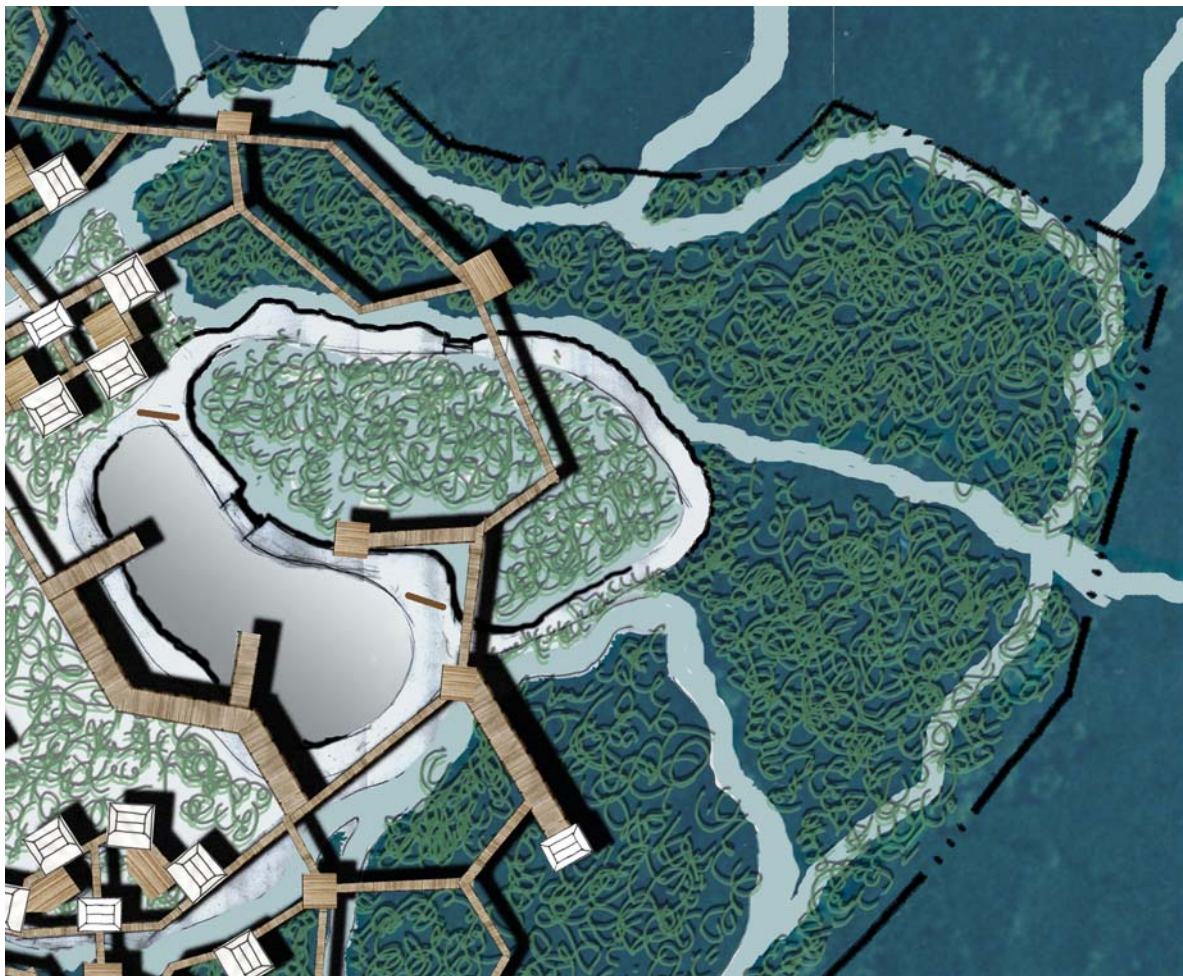


Figure 78. Graywater sewage treatment facility and strolling areas

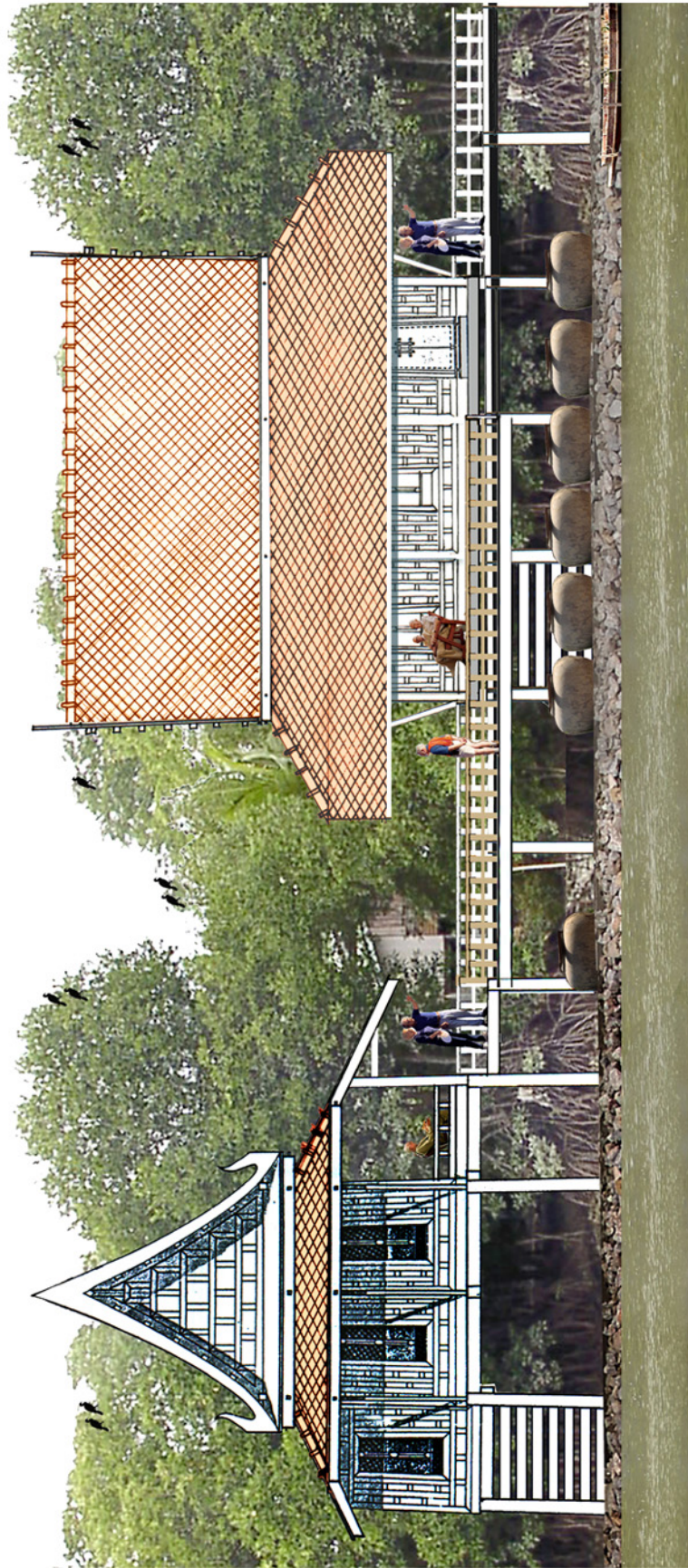


Figure 79. Section of One-Unit Lodging

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