Adaptation of Vernacular Houses to Coastal Basin Environments of Pak Phanang, Nakhon Si Thammarat, Thailand

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Abstract

This article is a study of Vernacular houses that exist in the Pak Phanang River Basin, Nakhon Si Thammarat Province. The area is located on the East coast of Southern Thailand. The purpose is to study the settlement of the community and the architectural styles of Vernacular houses related to the natural environment. By conducing a Vernacular house survey and collecting data in the sample area, this paper examines the lifestyle of villagers in the community and local natural resources in the region. It present the vernacular house characteristics created by the villagers' employing their wisdom to create an architecture for settlement and living with the environment in the coastal basin area appropriately.

The paper uncovers that the houses have to deal with issues such as the landscape surrounding the houses that are flooded in the rainy season. The houses have to be also expanded to accommodate more family members. Notably, it used the terrace area as a multi-purpose area due to the flexible layout and comfortable conditions for various activities. The architectural style of a raised floor house provides space under the house to store appliances for livelihood and prevent flooding. Furthermore, locally sourced plant materials such as "nipa palm" were used to both construct houses, as wall for cladding and roofing.

Keywords: Vernacular House, Settlement, Environment, Coastal basin, Thailand

Introduction

Pak Phanang River Basin is a fertile basin area. Because rivers and canals flow through the location into the Eastern Gulf of Thailand, it is characterized as a coastal plain where the deposition of sediment flows with rivers and canals and converges at the estuary. It is a source of abundant natural resources. People engage in various occupations in the area, such as fishing in the Gulf of Thailand, and in multiple rivers, and canals. Moreover, rice farmers abound because Pak Phanang is considered an essential source of rice bread since the past.

Occupation in nipa palm farming relies on brackish water, shrimp farming, swallow nesting, and other agriculture.

Because of the area's environmental factors, Pak Phanang has settlements of communities and people are scattered in different areas. Traditionally, it is mainly based on waterways and occupation areas. Vernacular Houses were built for living with different styles with characteristics depending on the context of that time, such as waterfront trading communities that need to use waterways for transporting goods or a fishing community that settles on the coast. Moreover, agricultural communities settle on farm land and have waterways for roaming and transporting agricultural goods for sale in the trading community.

The settlement and existence of people have resulted in a living culture passed down as local wisdom to the next generation. It appears as a cultural heritage, both tangible and intangible. A critical representation of that wisdom is dwelling in vernacular architecture or vernacular houses.

The survey found a vernacular house in the area of Khanabnak community that still has an attractive original appearance and is worth studying. It is a vernacular house of villagers who farm in the watershed area. That also shows the wisdom of living and relying on the environment in the area. Natural resources in the area are used for occupation and livelihood. The house shows an adaptation to the changing local environment including lifestyles and various living cultures. It also demonstrate how improvements are made to solve problems to make the vernacular house suitable for living. Over time, it has been prevalent in the area and is passed on to the next generation. The appearance of the Vernacular House are unique in both the architectural style and the space usage. The vernacular houses have become the local wisdom and techniques of construction passed down from the past to the present (Rapaport, 1969), and this is s classic example of this phenomenon.

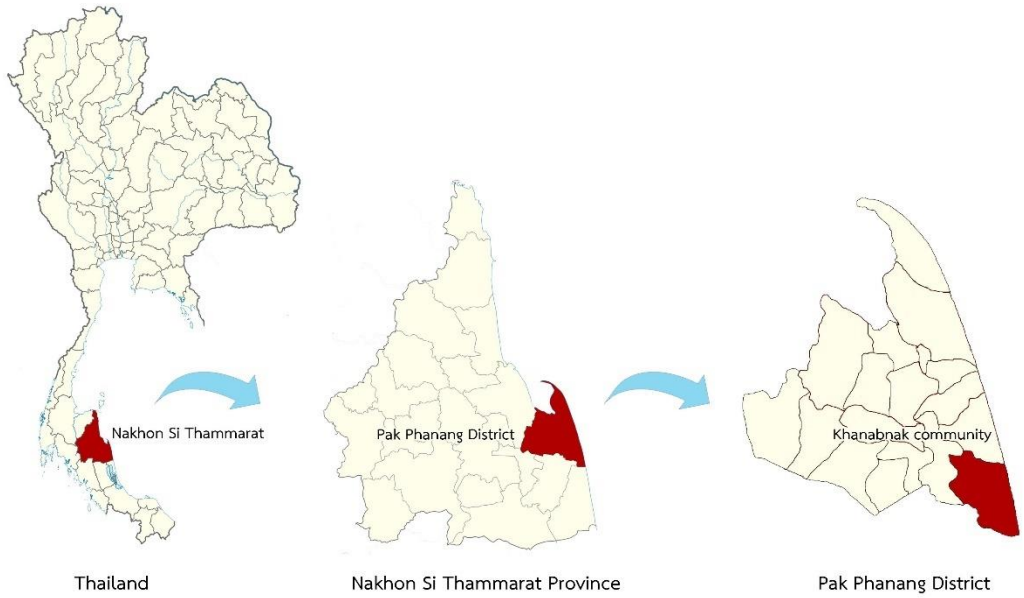

Fig. 1: Khanabnak community, Pak Phanang District, Nakhon Si Thammarat Province, Thailand
Source: Author 2021

Theoretical Background:

Khanabnak Community

Khanabnak Community is located on the coast of the Gulf of Thailand in the Southern part of Pak Phanang District, Nakhon Si Thammarat Province. There are various stories about the origin of the name "Khanabnak," which the villagers have communicated and interpreted to the next generation. These are stories such as the story that the former community area was a deserted forest. Moreover, one family, the head of the family named "Nak," went to build "Khnam" (Hut) to make Nipa palm sugar. When people pass by, they often take breaks. Therefore the origin of the name "Khnum-Nak." After that, it became "Khanabnak" until now.

In the past, other stories related to beliefs and sacred worship of Buddhism had persisted. These are the stories such as the story about "Nak" (Naga), a giant snake in the legend of Buddhism which became the origin of the name "Khanabnak" (Suwannarat, 2016).

Khanabnak community is an essential local rice-growing area in the Nakhon Si Thammarat province. Because Khanabnak community is in the fertile Pak Phanang River basin, it is the main river and has many branch canals. There were settlements near the canals. The main occupation is farming. Moreover, after the rice harvesting season, the villagers engage in a supplementary occupation of making Nipa palm sugar. In fact the Khanabnak community has many Nipa palm fields.

The culture and traditions of the villagers in the Khanabnak community are closely related to Buddhist beliefs. They worship holy spirits believed to protect natural resources used for people's livelihood in the community, such as rice fields or rivers, canals, and seas. The culture was influenced by the Indian culture, in which the villagers respect the water sources and the land they use for their livelihood (Tiwari, et.al,2019).

Vernacular Architecture

The definition or characterization of vernacular architecture has been much discussed. Vernacular architecture includes residential buildings and other types of buildings constructed in response to the environment employing available resources. They are created and owned by the builders or the communities themselves. They use traditional techniques to support specific needs concerning the values, economic, life, and culture of the people who created architecture (Oliver, 1997). Vernacular architecture of a region often has a specific style and is commonly used by people, in specific places, and periods. In other words, no building is vernacular architecture in and of itself without relation to the context of place and time (Mercer, 1975). Vernacular architecture is built on purpose, not temporary with the inspiration of tradition, not the education system to meet the simple daily life of ordinary people on the farm or in the industry. It has a relationship with the community and uses local construction materials. It expresses the culture and philosophy of the people's collective life. Vernacular buildings are designed and built using principle that combines thought and emotion rather than functionality itself (Brunskill, 1981).

Vernacular architecture of Thailand has come into being from the local wisdom of communities in rural regions. The influences of the local builders of each area create their works differently depending on the local environments. Nevertheless, the interest is to create a typical functional building rather than aesthetic (Srisuro, 2000). The house and communities produce an atmosphere of suitable living and cultural conditions that have specific local characteristics (Panin, 1999). Vernacular buildings invariably show the culture of the people, and are the same in each locality. Because it is not a work designed according to the whims and fancies of an architect, it reflects common characteristic of society based on accumulated knowledge, experience, and expertise and pass it on to the next generation (Temiyaphan, 2000).

The shaping elements of the Southern vernacular architecture of Thailand are related to 4 crucial environmental factors: 1) geography, 2) local materials, 3) economic status, 4) fundamental cultural values of society (Pongpaiboon, 1979). Undeniably, the

Southern vernacular architecture is related to climate. Because the south area is influenced by monsoon winds from both the Andaman Sea and the Gulf of Thailand, the construction must consider the strength and build a house to avoid the wind that can blow through the villages (Suwan-Khiri, 1994).

The settlement of Thai South-East coast communities of (Nakhon Si Thammarat, Songkhla, Phatthalung) Traditional houses is wood. The roof is gable and tiled, but it is a small house. There are both single and twin houses, including the kitchen. Most settlements were along the coastal dunes. There are both fishing communities and farmers' communities. The district is not be crowded. The houses are located close to each other but are fenced off. In the area around the house, it is popular to grow fruits and perennials for shade. Later, houses are changed from gable roofs to hipped roofs due to Dutch colonial influences. Galvanized sheets are used for roofing and walls because wood for construction in this area is quite rare (Walliphodom, 2002).

A vernacular house style was studied in the Songkhla Lake Basin area and the Gulf of Thailand coastal in Southern Thailand which is an area that has a context close to this research area. For example,

The study on Vernacular Architecture in Ecological Contexts of the Songkhla Lake Basin (Muadthong, 2014) discusses a vernacular house style that is raised in the floor to escape flooding in the rainy season. Used it for vocational and leisure activities in the daytime. The long side layout of the house is parallel to the East and West lines. To prevent most of the house from facing sunlight and accumulating heat, and the placement of the head to the south at bedtime according to folk beliefs. The elements of the space in the house are the courtyard (veranda), the central hall, the bedroom, the kitchen, the bathroom, and the toilet.

The study on the Development of a Vernacular Dwelling House in Songkhla Lake Basin (Buranaut and Seneevong Na Ayudhaya, 2014) discusses the facing of the house towards the East. Placement of the house to the East-West. Tile roofing material, the roof is popular as a gable shape that is not very steep to reduce the impact of the wind. Later, the Hipped Roof became more popular, which is considered a form. “Regional Architecture” is a cultural heritage prevalent in the peninsula and islands. To solve the problem of highly variable weather conditions. The floors in the house are descending. (The bedroom is on the top floor of the house. Next is the sitting area on the balcony. Below is the floor of the terrace. and the lowest level is the kitchen). The house was built on stilts placed on stone piers. Not buried in the ground, making it possible to lift and move houses.

A study of the identity of a farmer's house in Hua Sai District Nakhon Si Thammarat (Chowkaew and Chuaphram, 2021) discusses the establishment of houses in areas connected to rice fields or gardening and courtyard areas. A house plan that corresponds to the trajectory of the sun and the exposure of sunlight. Low platforms and house layouts to escape floods. The basement is quite low and unused. The space inside the house is lowered to the level of the house for ventilation. There is an open hall in the middle of the house as a multipurpose area. Inside the house, there will be a shelf to pay respects to ancestors and will turn head to the South at bedtime. The addition of the back of the house and next to the house, usually in the kitchen or bathroom. Construction materials use hardwoods from nearby community

forests. The roof slopes low due to weather conditions. The roof in the early days was covered with clay tiles, which is now discontinued. Later it was repaired with modern zinc and tile.

Comparing the style of vernacular houses studied in this area shows the common characteristics of the vernacular house that reflects the wisdom and adaptation to coexist with the environment in the area appropriately, such as house planning. Architectural style building materials that correspond to the topography and climatic conditions occupation, way of life, beliefs, and culture in the area perfectly.

Research Methodology:

This research began by studying history, economy, society, and settlements in the Pak Phanang Basin, the coastal plain of the Gulf of Thailand. Moreover, it studied they geography and natural environment while conducting a surveys to select the sample area for the study.

From the survey, the area of the Khanabnak community was discovered as a unique area of interest. Because it is a coastal basin area with rivers and canals flowing into the sea, the community's proximity to the coast makes it a brackish water area where various plants and natural resources are available for the villagers' occupation, such as nipa palm farming, rice cultivation, fisheries, and animal husbandry. Moreover, it is an area where the environment changes in each season, resulting in villagers having to adjust both their housing and lifestyle to suit the changing environment, such as the rainy season with flooding because it is an area where water flows to enter the sea and the monsoon season with storms or strong winds.

This study explored the Khanabnak community through 10 Vernacular Houses that are similar to the architectural style of Vernacular Houses in southern Thailand according to the criteria studied.

Following methodology was adopted a in studying the Vernacular House located in an area near a canal in the neighborhood.

1. Collect Vernacular House data using surveys and photography. To study the elements and characteristics of the architectural style of the Vernacular House in the area

2. Comparison architectural style to describe the unique common characteristics of the Vernacular House in the coastal basin area.

3. Analyze data on the adaptation and transformation of the Vernacular House's style to suit its environment from past to present.

4. Summarize the results and critique them together with related theories or previous research regarding the relationship of the Khanabnak's Vernacular House and the natural environment, the surrounding of vernacular house, including the living conditions, society and culture "holistic" (Panin, 2551).

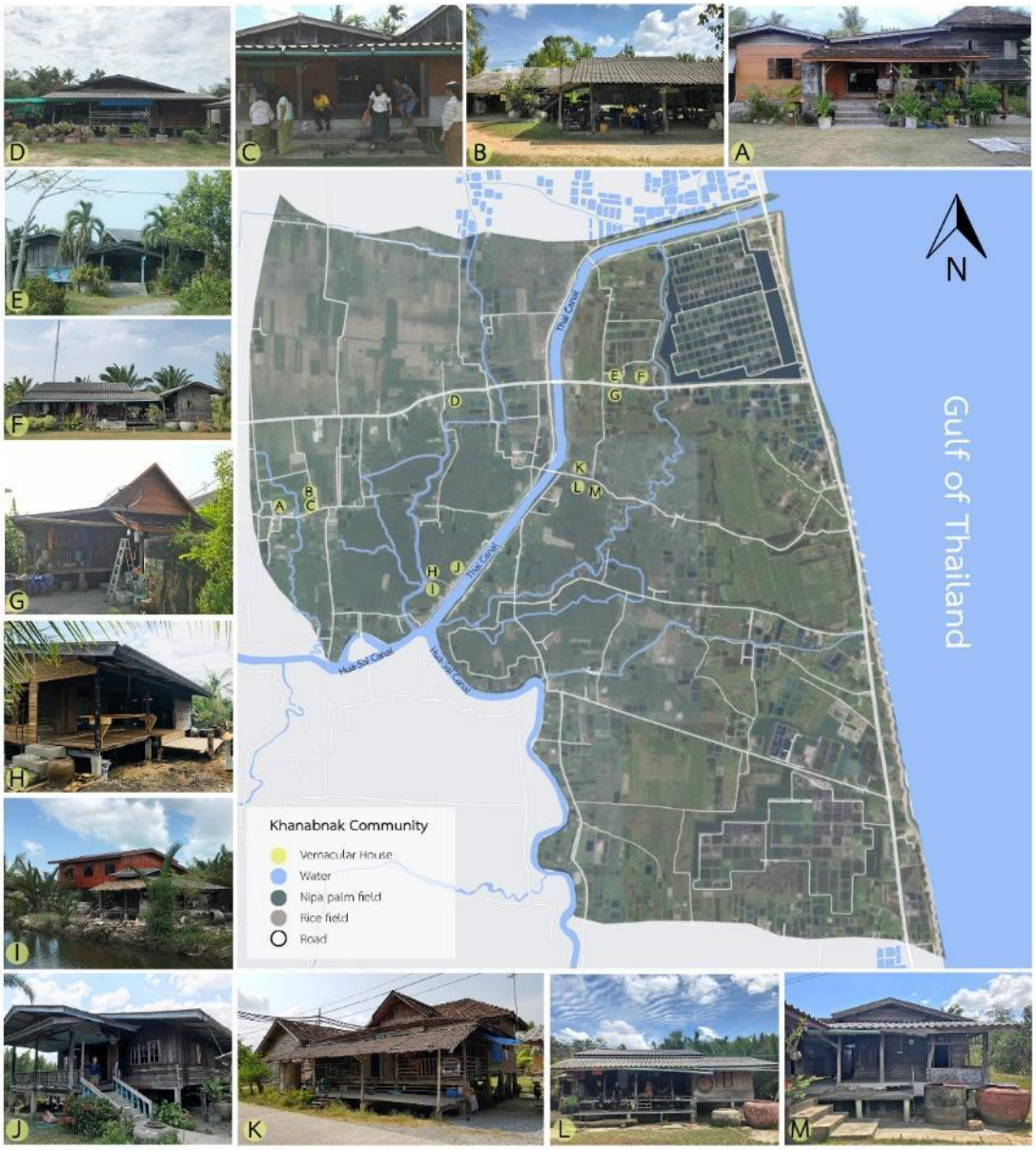

Fig. 2: The boundary of Khanabnak community and the location of 13 sample Vernacular house
Source: author 2020

Finding and Discussion

1. Environment

Khanabnak Community is a coastal basin area. A "Hua-Sai Canal" flows from the Pak Phanang River to connect to the "Thai Canal," a large excavated canal that flows through the Khanabnak community into the Gulf of Thailand. It divides the community area into two sides, and many branch canals flow from the basin area to connect to the "Thai Canal." It results in a vast fertile basin area spreading in the Khanabnak community suitable for agriculture, fishing, and animal husbandry. Most of the area in the Khanabnak community is nipa palm farm and rice fields as well as other communities in the same peninsula basin. (Walliphodom, 2006) This zone has been an important rice growing area since the Ayutthaya period. Originally, it was planted for living. However, later the produce was so large that it had to be sold to surrounding areas in the Malay Peninsula. (Angwittayathorn, 2001) The Khanap Nak community is located in a lowland area continuation from the upper lowland

area of Songkhla Lake. It is between the Laem Talumphuk and Sathing Phra ridge (Kirdsiri, 2014).

The Khanabnak community will have the same climatic characteristics as other areas in Southern Thailand. It is situated in tropical areas near the equator. There are only two seasons in a year, which are summer, during February–April. The rainy season is divided into two periods: during May–October, influenced by the southwest monsoon causing rain. Furthermore, the months of November-January are influenced by the Northeast monsoon causing heavy rainfall and flooding annually. Khanabnak communities are located in coastal areas, making them frequently vulnerable to tropical storms.

From the geographical and climate factors there are three types of water ecology: 1) Fresh water ecosystem 2) Brackish water ecosystem 3) Salt water ecosystem and they, the factors that also provide rich and various natural resources for the diverse ways of living (Suwannarat, 2016).

Fig. 3: Environment of Khanabnak community
Source: author 2020

2. Settlement

The settlement of the Khanabnak community spread to all areas of the rich and plentiful basil. The people's way of life was based on geography and natural resources as their career foundation, such as rice fields and nipa palm farm. The use of freshwater for drinks, cleaning, and transportation, e.g., rivers and canals (Pongpaiboon, 2001). The settlements were not dense but mainly in a self-farming area with fences or tree lines as property indicators. Their houses were nearby as relative villages (Walliphodom, 2006). At first, the houses spread as small groups of houses, exchanging, traveling, and trading among them. Later they exchanged and traded agricultural goods and became the network community (Choowan, 2003). They had traveled by water before they used roads as their primary transportation.

From the studies, the settlements on Indians people were based on basins and flooded areas. The studies also found that their jobs were based on local geography and natural resources (Tiwari, et al, 2019).

3. Vernacular house

Landscape

It was found that most of the houses were surrounded by courtyards. Either a grass yard, clay yard, or a stone yard for use in various activities together, depending on the chance. Some houses are landscaped by planting flowers to create beauty. Some places focus on growing vegetables in the kitchen garden that can be harvested. Moreover, some sites have the surrounding area surrounded by "Nipa Palm" used to gathering produce as a profession. However, the typical character of the landscape for many houses is a flexible area that can adjust the role of the landscape to cope with the rainy season flooding that may damage the house. The landscape of the vernacular house was such that the conditions of geography and climate prevent danger from reptiles or poisonous animals who enter the house in the rainy season, the space around the house also serves as a buffer area to avoid possible fires in the house summer (Kirdsiri, 2014).

Fig. 4: Landscape of vernacular house
Source: Author 2020

Plan and Function

The survey of characteristics of the use of space found that many houses originally had only one prominent place. When a family member gets married, homes will be expanded to increase the usable area inside the house—using the Terrace as a connection area.

The zone of the living space is that there will be a relaxation area or reception area in front of the house. It is easy to see that someone has entered the house area, sometimes in the place. Sometimes it is the front porch. Alternatively, sometimes it is the area under the house.

The organization of the kitchen and the bathroom areas in the back of the house are hard-to-see areas. It is because the items are often cluttered and not arranged in an orderly fashion. Moreover, it may also be connected to a storage area or to corral the animals.

The house is usually a large hall. There may be some part used as the bedroom area. Nevertheless, most of the space is a hall or room in the house for supporting a variety of functional activities, which is a common feature of vernacular dwellings in the humid tropics (Santoso, 2018). Some common areas transformed into a sleeping area when many relatives come to visit simultaneously during various festivals.

Fig. 5: Floor plans and living space in the vernacular house
Source: Author, 2020

Architectural style

Most of the houses are single-story houses with raised platforms to prevent flooding in the rainy season. The foot of the pillar is reinforced concrete, similar to the pillar style of the southern Thai house. Raising the floor also causes good ventilation and creates a basement area for storage, such as equipment or tools for occupation. Raising the floor also protects against beasts and prevents flooding in the rainy season. Nowadays, some houses have transformed the area under the house to become a space for working, relaxing, and receiving guests. (Suttanan, 2018). Because it is a shaded area, not exposed to the sun, often, winds blow through, creating a comfortable state.

The column and girder building with lifted floor style is the identity of South East Asian architecture. The building style is related to the geographical conditions around; Laos, Cambodia and Indonesia, where the floor of houses are lifted over the ground indoor to avoid humidity and insects and support the shapes (Solikhah and Fatimah, 2020).

Fig. 6: Raising the floor for ventilation and storage
Source: author 2020

Characteristics of a house with a raised floor and being suitable for the environment in the area also create the spaces recognized as "veranda" in front of the house. It is another unique feature of the places. It serves to connect different house areas while being used as a reception area. The rest of the house members, use it as a family member's dining area. Some houses have a terrace construction descending from the floor to the ground, suitable for living behavior and activities that occur very well. Most people who live in vernacular houses in tropical areas tend to have a veranda area for various activities. They live outside the home more than indoors during the day (Santoso 2018).

Fig. 7: The veranda of vernacular house
Source: author 2020

Doors and windows, as appropriate help the use of space within the house. The walls of the house are made of wood. The vents are drilled above the doors or windows because they wanted to ventilate hot air inside the homes that rises under the roof. Because of this, it can reduce the heat in the house and maybe a light hole that enters the house. Moreover, they allow the wind to blow through the house to minimize wind resistance, thereby contributing to the house's strength (Suwan-Khiri, 1994).

First, vernacular houses had been with gable roofs but later changed because it got influences from hipped roofs (Walliphodom, 2002) with low sloped ceilings being suitable for resisting strong sea wind, sun, rain, and local climates.

Fig. 8: Vernacular house roof style and roofing material
Source: Author 2020

Materials

The vernacular houses of Khanabnak community were built of wood from the plentiful forest in the West mountain slope in the past. Then the wood would be drifted along a canal to the community consistent with the study of housing in Lake Songkhla basin, Phathalung, and Nakhon Si Thmmasrat (Muadthong, 2014). Small woods like bamboo and nipa palm is strong enough to make floors and roofs of houses. Nipa palms were easily found in local areas. The wisdom of using native wood to build roofs can be found all around Thailand (Boonritthikit, 2014). The wealthy villagers used tiles for their roofs then (Solikhah and Fatimah, 2020). Nows a day, people use industrial tiles but still keep the same wooden structure. However, nip palm roofs can be found with temporary buildings such as nipa palm sugar mills, corrals, and utility pavilions of communities (Kirdsiri, 2014).

The study found that the people in the tropical monsoon climate like Thailand, such as Praigoli Village, West Sumba, Indonesia built their houses of papyrus, wood, rattan grass, and stone found in local areas as the firm foundation of community settlements (Solikhah, and Fatimah, 2020). Native houses on the island of Sumatra were built of wood as the main structure, bark for house walls, leaves for roofs, and local materials, but today, the forest becomes less so; people use cement for house walls and zinc for roofs (Faisal, and Wihardyanto, 2020). The use of local materials with local technology creates sustainability and is friendly to the environment (Dayaratne, 2018).

Fig. 9: Nipa palm leafs roof
Source: Author 2020

Conclusion

Khanabnak Community is a settlement in the Pak Phanang River Basin on the Gulf of Thailand rich with natural resources. This makes the lives of the villagers correlated with geography, water resources, and natural resources for their livelihood (Kirdsiri, 2014); most of the traditions and culture are related to beliefs in Buddhism and Holy Spirit in the area. Most people were living together as a family in the same house or the same neighborhood. The settlement is a community network with travel to the trade and exchange of crops. In the

past, rivers and canals were used as the main transportation. However, at present, it has switched to roaming the streets instead (Choowan, 2003). The reason for it is a river basin and being close to the sea. The Khanabnak community suffers various environmental changes depending on the season, such as in the rainy season, when there are often heavy rains that cause flooding in the area. Strong winds and risk of storms also exist. The high sea level affects the coastal ecosystems and the lives of villagers, such as travel, occupation, and livelihood.

The study of the vernacular houses in the Khanabnak community was consistent with the cultural ecology framework for studying vernacular architecture. It shows that the villagers have adapted to cohabitation between people, environment, and architecture appropriately (Inpuntung, 2020). The findings and conclusions can be summarized as follows:

- The previous settlers usually choose places where close to waters for consumption, transportations, and agriculture. Later, roads have become the main transportation, but water was still needed for consumption and agriculture.

- The courtyard is the bare compacted soil used to dry agricultural products, prevent poisoning animals, buffer zones, and prevent fire during drought seasons. Small rocks are now filled on the top layer as the convenient usage during rainy seasons.

- The wisdom of building houses on the east-west line that moves the narrow side of the house against coastal sea wind and the focus of the south still exists today. The house planning is so flexible for an extension that uses terraces to connect all areas of the house. This method creates spaces between mass effectively air the house. There is no room inside the house, so it is so flexible to air the room, and there is a big veranda connecting the house and the ground. This space supports various activities such as resting and welcoming guests. The tropical monsoon makes people stay outside the houses during the daytime so, people build pavilions from materials they can find to be the place for relaxing and other various activities.

- The lifted floor houses prevent poisonous animals and flooding by using feet can be found in Southern Thai vernacular houses. These houses were less lifted because the water does not flood for a long time due to the short distance to the sea. Under the lifted floors is Taitoon or free space it which can be used for many activities because of its shade and being airy.

- For ventilation, the vernacular houses use batten to air them. The reduction of the area related to dwellers and activities creates the healing space wind to reduce heat and blow out humidity. The old walls are made from wood, weaved bamboo or weave or nipa palm, which resist heat and can be easily found in local areas. However, today people use cement walls because they are more available. There is no space between doors and windows because they need more robust doors and windows to protect the houses against strong winds and rain. Moreover, there are usually voids over windows and doors airing the houses.

- There are gable roofs or hipped roofs with extended eaves, , protecting them from heat and wind. In the past, they used clay tiles and local materials as heat insulation, so there would not be much hot air inside the house, even though the houses are not high. Today, people use all materials from factories instead.

-The use of native natural resources produced by local wisdom such as wood, bamboos, and nipa palms is one of the best ways to preserve Nature and engage in the sustainable use of resources. People may adopt the modern materials, but it is still using old ones which can be passed down from generation to generations.

Now a days, local people can adjust themselves to the changing environment. All knowledge, experiences, and wisdom lead the change to local architecture about houses and the way of life.

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