２０１６年度学位論文

Value Based Conservation and Evaluation of the Traditional Waterfront Community in Chao Phraya River Basin and Related Tributaries

チャオプラヤー川流域とその周辺河川における伝統的な水辺集落の価値に基づく評価と保存に関する研究

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研究概要

「チャオプラヤー川の文化的景観」は、２０１３年タイ政府による世界遺産暫定リスト記載資産の選考対象となったが、その際文化的重要性の評価に上げられた地区は、宮殿や歴史的地区を有するバンコク中心部のみであった。本研究は、バンコク周辺にとどまらず、チャオプラヤー河川全流域を対象にして、水辺集落を成立させている要因である集落と自然環境の関わりを明らかにする視点をもって調査に取り組んだ。この視点は水辺集落の保全のために集落保存に加えて河川環境、周辺の自然環境や人々の生活までに視野を広げて保全　対策を考えるために必要な視野を提供するものである。

本論文は、第 1 章で研究の目的、位置づけ、研究の方法論、論文の構成について説明している。チャオプラヤー川周辺に残る 138 箇所の水辺集落に対して、集落の特徴や水域環境との関連を明らかにするために、統計的分析を行い、伝統的水辺集落の分類を行うこととした。その分析は、二段階に分けて行い、第一に、集落および集落に残る伝統的住宅の建築的特徴などの要素についてクラスター分析を行ない、集落の形式を大まかに捉えることを試みた。また抽出された各クラスターを特徴、性質について主成分分析を行ない、分類された集落の性質を明らかにした。集落データを決定木によって分析し、クラスターによって分けられた条件を考察した。第二に、クラスターによって分けられた集落のグループの形成要因を明らかにするために、伝統的建築物の特徴や集落の生活様式、さらに集落の形成に密接な関係を持つ水域環境の影響などについてフィールドワークを実施した。

第２章では、文化的景観や農業活動が伝統的水辺集落に様々な影響を与えていることを指摘した。さらに、水辺集落は伝統的建造物及びその水域環境の地域的特色によって７種類に分類されることを解明した。その分類した集落の種類は「川港町」(Riverport town)、「水田集落」(Paddy village)、「水上集落」(Raft community)、「運河沿い交易集落」(Canal trading village)、「河口の農村集落」(Estuarine agricultural village)、「果樹園集落」(Orchard village)、「沿岸の漁村」(Coastal Fishing village)である。これらの集落の分類は、水域環境とともに農業や商業といった集落を成立させてきた直接的、間接的な文化的価値によって分類されている。そして集落の分類は、単に集落形態によるものではなく、地域の地理的固有性や農業景観など水域環境とともに成立してきた要素によって形作られたものである。

第３章では、集落に居住する人々の文化的生活様式に着目して 7 つに分類された水辺集落の形態から、典型的な集落を 12 箇所抽出し、それぞれの事例研究を行った。抽出した集落の人々の伝統生活・仕事とその水域環境の関連を考察した結果、水の循環が伝統的な生活に影響を及ぼしていることが明らかになった。水と集落の関係は、「水田集落における洪水」、「果樹園集落における水路の灌漑ネットワーク」、「河口農村集落における汽水の循環」、「沿岸漁村における干潟漁業」、「川港町における南北の河川物流」、「運河交易集落における東西の物流」、「水上集落における水上の暮らし」という要素によってせいりつすることが明らかになった。

第４章では、チャオプラヤー川流域の伝統的集落の中から、①サームチュック集落(Talad Samchuk Community: Riverport town)、②パッカーン集落(Pakkran Community: Paddy village)、③サケークラーン川水上集落(Raunpae Meanam Sakaekrang: Raft community)、④コーンスアン集落(Klongsuan Community: Canal trading village)、⑤

イーサーン集落(Yeesarn Community: Estuarine agricultural village)、⑥アームパワー集落(Amphawa Canalside Community: Orchard village)、⑦レームヤイ集落(Leamyai Community: Coastal fishing village)、の７集落について評価を行った。その結果、チャオプラヤー川および周辺河川の水辺集落は、居住者の生活や産業形態と水利環境によって関係付けられ、農業活動と文化的景観の多様性を有していることが明らかになった。また、水辺集落に残る伝統的高床高式住宅や川沿い木造長屋は、集落が位置する水域環境に適応したものであり、交易や生活環境に適応させた形で発展してきた。これらの建築物は木造で作られており、伝統的様式や構造を受け継いできたことが明らかになった。それらの文化的価値は次のように指摘できる。

- 氾濫原における定住様式と固有資源の利用
- 河川流通組織を基盤にした地方経済に対する異文化の影響
- 地域社会ネットワークの相互接続

第５章では、本論文の各章の結果をまとめて結論を示した。チャオプラヤー川流域に残る水辺集落は大きく 7 つの種類に分類でき、集落の形態や水域環境の関連を基本に、交易や農業・漁業などの生活基盤によって水とともに生きる多様な文化の様相を呈している。そしてチャオプラヤー川水域の水辺集落を人々の生活環境と河川交易の地域経済を形成している多様な文化、そして水域環境に依存している人々のネットワークの維持が必要なことを指摘している。

Abstract

In 2013, Thailand has planned to nominate the new possible “The Cultural Landscape of Chao Phraya River” to the World cultural heritage tentative list. The cultural significant of Chao Phraya River was focused only the areas of central Bangkok where the golden pagodas and the national historic places were located. However, the research provides the fundamental information on the interaction between human settlement and the natural environment along the Chao Phraya River throughout the river basin. This is an important inventory accumulation contributing to waterfront community preservation measure in the future and is expected to be a part of the Chao Phraya River’s World Heritage List nomination.

The research posed systematic overview on the cultural and natural phenomena in motivated mixed method. A total of 138 traditional waterfront communities was selected using the purposive sampling. To classify the waterfront community, the rapid survey of structural remaining in Chao Phraya River basin has been implemented through quantitative methods using hierarchical clustering and decision tree analysis. Then principle component analysis has been employed to grasps complex variations in each cluster. The case study will then unravel from the analysis of the socio-economic and cultural background, through the qualitative survey of the visual and documentary data.

In Chapter 2, the research reveals the diversity of the cultural landscape and agricultural activities exerting influence on the community complex, which could be classified into seven clusters based on common preferences consisting of a Riverport town, paddy village, raft community, Canal trading village, Estuarine agricultural village, Orchard village, and fishing village. These clusters show diversity in the cultural landscape, with agricultural activities exerting influence on the community complex, creating both direct and indirect association, with several significant variables. The results express the identity of regional geography, not merely the physical

structure and agricultural landscape associated with local practices representing evidence of past indigenous water-based settlements.

In Chapter 3 provided significance to the cultural human living pattern. Based on contextual characteristics of the waterfront community complex, it reveals the influence of water-to-landscape through analyzing the relationship between settlement patterns, way of life, and environment. The perspective narrows down to the community level, where the selected twelves case studies were investigated. The result has emphasized how water circulation exerted influence on the traditions of daily life.

Chapter 4 is appraising and synthesizing of heritage value of the properties, which represented the global significance of traditional waterfront communities complex in Cha Phraya River basin and its tributaries. The sites are considered as the outstanding example of human settlement and indigenous resources usage in agricultural landscape, cross-culture influence on economic bustling of the river-based transportation network, and interconnection of community network. They are indispensable for understanding man's adaptation and interaction with their natural environment, using the canal and river system for the historical development of human technology related to agriculture, trading systems and transportation.

This chapter is also explored the existence of traditional structures and building techniques in the waterfront wooden housing of the Chao Phraya River Basin and its vicinity, to identify the current state and condition of traditional structures, processes of change, and the effect on its overall integrity. The results indicated that patterns of traditional building techniques remain in community typology. The remaining techniques represent the preservation of local cultural and natural resources, which modernity has become an integral part of life and the community has chosen to adapt rather than be eliminated. The result is also expected to be a common ground for proposing conservation measure of the properties.

The result led to discussion of value and possible measure and program to maintain the Chao Phraya River and its associated traditional waterfront community complex, drawing from appraising and synthesizing of cultural value. The community complex is an outstanding example of man's adaptation and interaction with his natural environment, using the canal and river system for the historical development of human technology related to agriculture, trading systems and transportation. The understanding of their natural environment and its efficient adaptation to their way of life reflects in the architectural and built heritage, in the intangible cultural heritage, which is considered a genuine and an outstanding model for sustainable way of life.

To described the waterfront community complex as a part of “The Cultural Landscape of Chao Phraya River” to the World cultural heritage list nomination, it must be confident that the property will be effectively protected and managed. For landscapes of high sensitivity to change, an overlay control is the most appropriate approach which developed into an approach to spatial planning and conservation. However, there are number of options for managing landscape significance through the application of layer model. An overlay approach run as a guideline to ensure that the values of the site is preserved and those future developments are made within the framework of sustainable development. Number of issues must be considered in relation to community groups and cultural landscape management *in-situ* which considered in three outstanding significance approaches; 1. human settlement and indigenous resources usage of the flood plain, 2. cross-culture influence on local economy of the river network, and 3. interconnection of community network

Besides, it is indispensable to encouraged to prepare Tentative Lists with the participation of a wide variety of stakeholders, including site managers, local and regional governments, local communities, NGOs and other interested parties and partners. However, the description of important legal mechanism mentioned that local government is a key contributor to progress towards the further management plan.

Preamble

The rich waterfront communities with its living culture are largely remaining in Southeast Asian countries. However, this important amphibious lifestyle has been gradually changed caused by rapid economic growth along the roadside, leaving riverside housings and heritages are being at threatened to disappear. This study aims at giving systematic overview on the Chao Phraya River Basin of Thailand, one of the major river systems in the Indochina continent, to valuing and encoding the existing condition, formation pattern, distribution pattern, remaining condition, and living pattern. The result will provide the common reference for Thai government to save the traditional waterfront community and its living culture.

To understanding the remaining waterfront communities in Chao Phraya River Basin, the study is carried out an in-depth field survey investigation of representative samples in seven major clusters derived from cluster analysis, which was employed to group the similar communities based on physical appearance and living pattern from archiving 138 traditional waterfront communities. The analysis will be reveal characteristic and settlement pattern of each cluster, geographical features, agriculture and fishing production activity, and lifestyle changes according to modernization. Then, methodology for preserving community with high cultural value will be examined.

Research outcome provides the fundamental information to preserve waterfront cultural heritage remaining in Chao Phraya River Basin. This is an important inventory accumulation contributing to waterfront community preservation measure in the future. This project is expected to be an example of a well preserved riverside space and river environment which to be considered as a part of World Heritage List nomination.

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Chapter 1
introduction, research background, and objectives

The rich waterfront communities with its living culture largely remain in Southeast Asian countries. The settlements have constantly adapted to environmental and social transition from past to present cultures. The traditional waterfront community with its diverse vernacular features was formed by the rich amphibious culture of an aquatic environment. It is regarded as a unique housing standard, reflecting the surrounding environment and living behavior of everyday life. However, the intensity and speed of such changes are challenging the complex urban environments in contemporary society. This important amphibious lifestyle has been gradually changed caused by rapid economic growth along the roadside, leaving riverside housing and heritage is being at threatened to disappear.

A complex set of transnational problems have been brought about by global environmental issues. Several communities are being threatened by serious physical structural alterations and inappropriate development controls. New socio-economic activities caused communities are in danger of losing their authenticity. As a consequence, the communities with cultural values seem to have collapsed. Thus, it is indispensable provide a study to be a point of reference for monitoring and safeguarding of the waterfront communities to ensure a long-term sustainability and the ongoing uses of heritage in their communities.

1.1 Research background

Traditional waterfront community complex along Choa Phraya River and its tributaries is located in a vast and extensive flat land that experiences cyclic flooding. The Chao Phraya River basin is found in the center of the central region of Thailand. The river, Chao Phraya, is formed by four major tributaries in the mountainous area of the northern part of the country, Ping, Wang, Yom

and Nan Rivers which flow southwards to meet at Nakhon Sawan province. The river flows southwards through a large alluvial plain passing through the major population centers. The river basin length approximately over 600 kilometers upstream and 360 kilometers downstream covers the catchment area of 159,283 square kilometers while the Mae Klong basin is on the west and the Bang Pa Kong basin on the east.

Figure 1 The major river in Chao Phraya River basin

The Chao Phraya River and its tributaries is one of the major river systems in the Indochina continent, as its basin defines the regions of Central and Northern Thailand, primarily demonstrating the central flood plains (fig.1). Its cultural landscape has been shaped by regional geo-body and topographical features. The upper basin is monopolized by paddy fields and forest, while the lower Chao Phraya River delta sprawls over an urban agricultural market landscape dominated by fruit orchards to the west, rice fields to the east, shrimp farms along the coast, and fish farms in the lowlands (Thaitakoo & McGrath, 2008). The geo-body of the Chao Phraya River Basin has affected architecture and settlement planning since the natural setting influences and dictates design.

1.1.1 "The Cultural Landscape of Chao Phraya River" as a world heritage

Thailand's Fine Arts Department (FAD) had notified the Bangkok Metropolitan Administration (BMA) to responsible for the new possible World cultural heritage tentative list "The Cultural Landscape of Chao Phraya River" in 2013. However, the initial plan was formulated and details prepared in 2012 by FAD on the grounds that the riverside area featured examples of outstanding architecture that were of high historical value, according to Archaeology Office director (Kongsai, 2013).

The river banks are key areas of cultural significance, adding the possibility of registering 11 riverside areas of outstanding value as World Heritage sites. Over 200 places of cultural value along the river are included, such as old communities, religious sites and public and private properties (Wancharoen, 2015). Both side of the river, *Thon buri* and *Phra nakorn*, were proposed to be an important zone which cluster several national important temple and historic structure such as Wat Prayurawongsawat, *Wat Arun*, *Bangkok Noi* Railway Station, the *Rachini* School's *Sununta* Building, *Wat Pho*, *Bawon Sathan Mongkhon* Palace, *Phra Sumen* Fort, and so on (fig.2). the importance of the Chao Phraya will propose that the stretch of river flowing through the capital become a national and world heritage site.

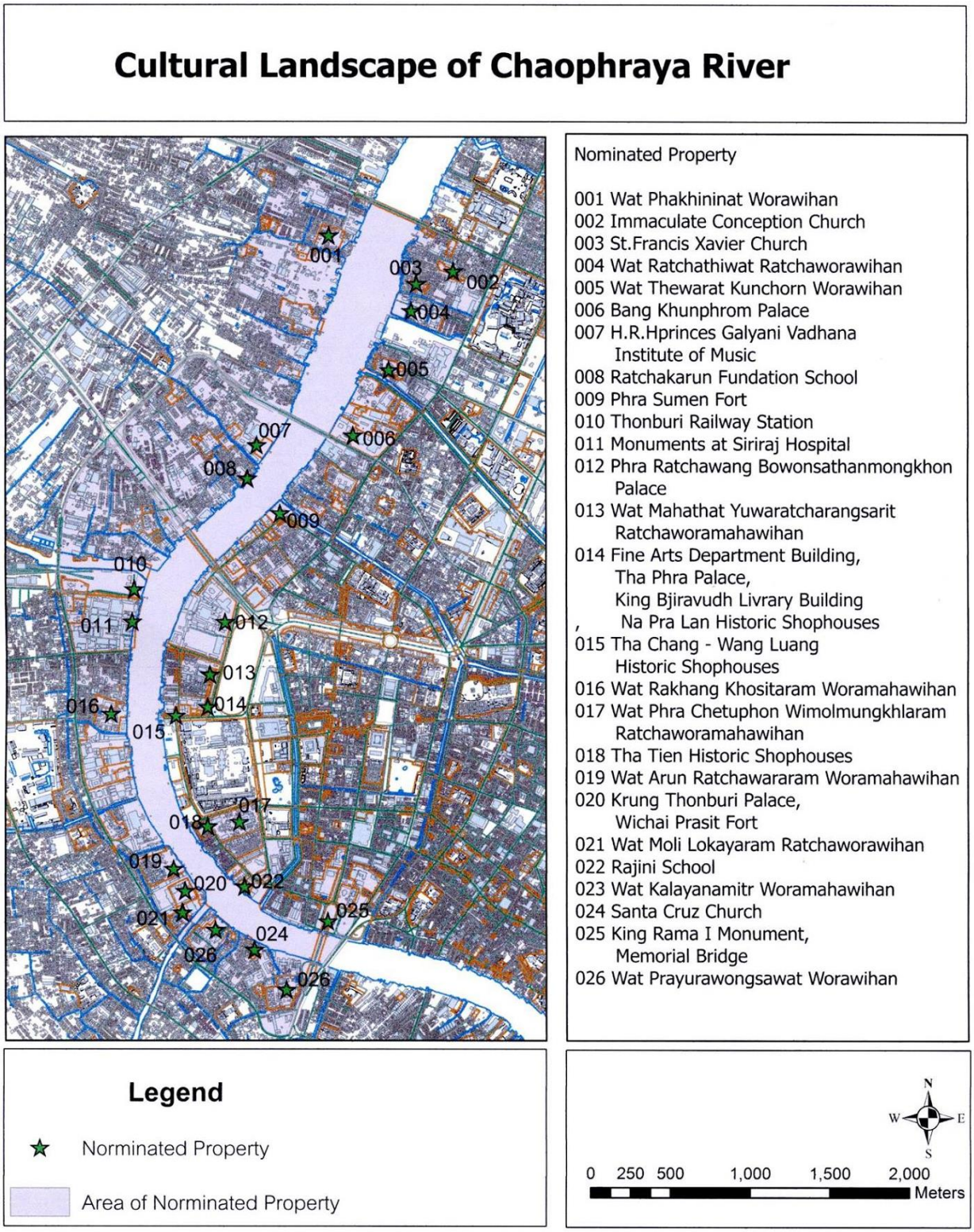


Figure 2 Purposed area of "The Cultural Landscape of Chao Phraya River" to

World Heritage Tentative List was taken into consideration

(Source: ICOMOS Thailand Association. (2015, June 10). In Facebook [Fan page].

Retrieve from https://www.facebook.com/ICOMOSTHAILAND)

However, the cultural significant of Chao Phraya River was beyond the golden pagodas and the national historic places. Life along the river, including local people who make the river home, modest irrigation works for agriculture, indigenous fishing traps, and different use of water in the lower delta, represented the diversity and changing of cultural landscapes along the river channel overtime. The Cultural Landscape of Chao Phraya River and all its attributes must be protected as a whole, so as to fulfill authentic, integral and permanent preservation of the property. To this end, considering the characteristics of the Chao Phraya River, including its life along the river, traditional community with its harmonious relationship featuring an amphibian environment shall be nominated as a part of the river by more systematic, scientific, classified, and prioritized processes. This will be enhanced fully and sustainably the social and cultural benefits of the local community whose heritage belongs to.

1.1.2 Traditional waterfront community: the definition

A community is considered as a social unit (a group of three or more people) who share something in common, such as norms, values, identity, and often a sense of place in a given geographical area (e.g., a village, town, or neighborhood). Community is a small relative to personal social ties at micro-level, and can be classified into two main types: interest communities and geographic communities. Interest communities do not usually have a spatial base but are connected through a common interest. Examples include the sporting and academic communities. A geographic community is one defined over a geographical space. Some kind of social interaction or common tie is usually included in this type of definition as well (Poplin, 1979).

This dissertation on the traditional waterfront community mainly focuses on a geographical community where people share common spaces and social interaction. Thus, it is essential to define "community" before posing questions on its cultural environment and setting.

In defining community, the Blackwell Encyclopedia of Sociology (2007) refers to people having something in common by sharing a geographical area (typically a neighborhood). However,

a community has been defined by a common history rather than space. Communities have been formed through affiliations with religious and other community organizations over time (Bailey, 2007). Although community is also a name that usually implies a specific group of people, this is not always the case (Poland and Mare, 2005). Community features include:

- Geography i.e., a riverfront or mountain community
- Ethnicity i.e., a Chinese or Thai community
- Religious i.e., a Muslim or Christian community
- Livelihood i.e., a fishing or farming community

However, a larger related community at regional or national level of a group of people involved in persistent social interaction, is called a society. Thailand's traditional community conservation handbook issued by the ONEP (2013) defines a traditional community as a specific geographical area exhibiting a traditional settlement expression through an immediate environmental context, both rural and urban, and/or testifies development over a span of time on both physical and social interaction in a man-made or natural environment context. Within this definition, a traditional community is classified into six categories;

(a) Waterfront community

A waterfront community is an area bordering the river and/or water, where people settle into a community which might consist of market places and residential units. Architectural features are derived from waterfront settings and its function, including the river ecosystem, vegetation, and production.

(b) Railroad community

A railroad community is an area where a railroad has been developed and people settle. Basically, a large railroad community is a commercial district situated near a railroad junction, with architectural features usually related to the train industry.

(c) Commercial/market community

This is a community where commerce is the main activity, characterized by a market area of a city or neighborhood. Architectural features consist of fresh markets and row houses.

(d) Village community

Communities in rural areas are characterized by a group of housing that reflects its local identity. Architectural and community features reflect the interrelationship between local livelihoods and the natural environment, containing high dynamism and adaptability.

(e) Agricultural/fishing community

This represents a community associated with livelihoods which might be located far away from the actual community, and includes post-product transit and space for processing.

(f) Ethnic community

This is an area where people settle into a community by reference to nationalities or ethnic minorities, etc. Most are immigrants from neighboring countries, accompanied by cultural baggage. However, this community has outstanding intangible features which retain their original identities to some degree, even though their physical and social structures have been changed.

In defining community classification, the terms “community”, “village”, and “town” are used to specify their characteristics. The term “community” is used to define a general group of people living together which is, sometimes, very difficult to form a precise definition of “village or “town” (Chaudhary, 2015). “Village” (Thai: *Muban*; literally means group of homes) is used to define a community containing a sense of rural habitation, where people live their lives by substantial agricultural activities as a product of traditional cultural interaction, practice, kinship, and social interaction (The Office of the Royal Society of Thailand, 1982). As of 2014, there were 74,965 administrative villages and having, on average, 144 households or 746 residents, as of the 1990 census (DOPA, 2014). whilst the census survey results in 2010 revealed that the average size of

population of a village was having 143 households or 492 residents (National Statistical Office Thailand, 2010).

Meanwhile a “town” (Thai: *Muang*) contains a sense of urban habitation, but on a smaller scale than a “City” (Thai: *Nakhon*), and is considered to be primarily an urban area. Town was also considered as a place where people live and work, containing many houses, shops, places of work, places of entertainment, and so on. As in the Municipal Act (2546 B.E.), a town is defined as having over 7,000 residents and a population density of 1,500 per sq.km. As of 2014, the population living in the municipal area (town and above) was over 44.2 percent of the country (11,940 residents on average), which increased nearly half from 29.4 percent (7,000 residents on average) according to the census survey in 1990 (National Statistical Office Thailand, 2010). Thus, these are the terms applied to define the concept used in this dissertation for description and discussion.

1.1.3 Historical and development overview of the River basin

The Upper basin consisted of mountainous region lying down the mountainous area and the central flood plain above the confluences near *Nakhon Sawan* province. The plains comprise sedimentary deposits which was mainly an alluvial plain formed by the river system (Vongvisessomjai, 2006). The Lower Chao Phraya basin, downstream from the confluence was a flat, low area with an average of two meters above sea level, while the Further north elevation is over 20 meters. the river basin was well-watered plain continuously refreshed with soil and sediment brought down by the rivers. The lower plain area at about 8,000-7,000 years before presents, was a shallow sea known as Ayutthaya Paleo-gulf (fig.3). After that the shoreline regressed south leaving a river delta plain as seen today. The lower central plain gradually developed by the time containing a long history of human settlements from prehistoric to historic periods, the first record of historic human activity in the area, *Dvaravati* (6th-13th centuries) (Songtham et al, 2015). The great variety of the ethnic groups found in the Chao Phaya River plains. Migrations and population changes further helped to extend and enlarge this variety (Suchitta, 1981).

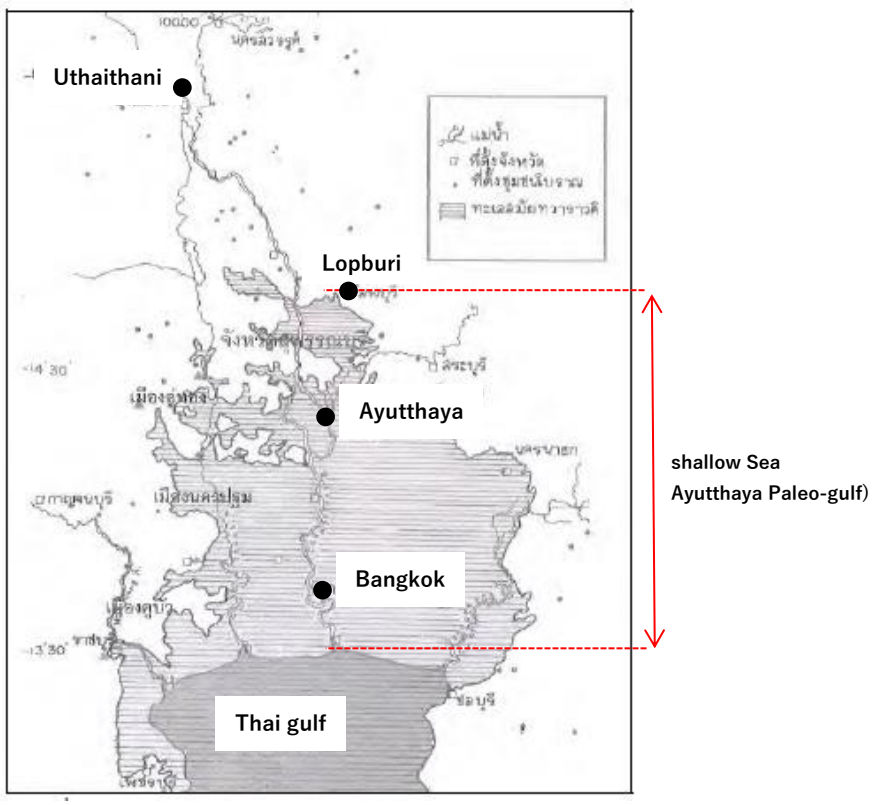


Figure 3 Coastal line in Dvaravati period (6-13 Century)
Source: Bhramaboon, S. (2009) A study of local history in the Chorakhe Samphan river valley area. Pathumthani: Rangsit University.

However, during *Sukhothai* period (1238-1351) Chao Phraya River was partly used, due to the water surface obstacle elements such as islet, sandbank, dune, and etc. Thus, land roads and cart tracks were the dominant mode of transportation (Suphachaturas, 2013). Even the *Sukhothai* Kingdom was settled over 10 kilometers far from the river and there were no any evidences mentioned about waterfront market and community during this period. In Ayutthaya period (1351–1767), the waterfront markets, raft houses, and boat houses were first mentioned in historical evidence. Several islets were blasted to clear the way for ships navigating up-down the river and to the sea. This period was marked the departure in water-based settlement.

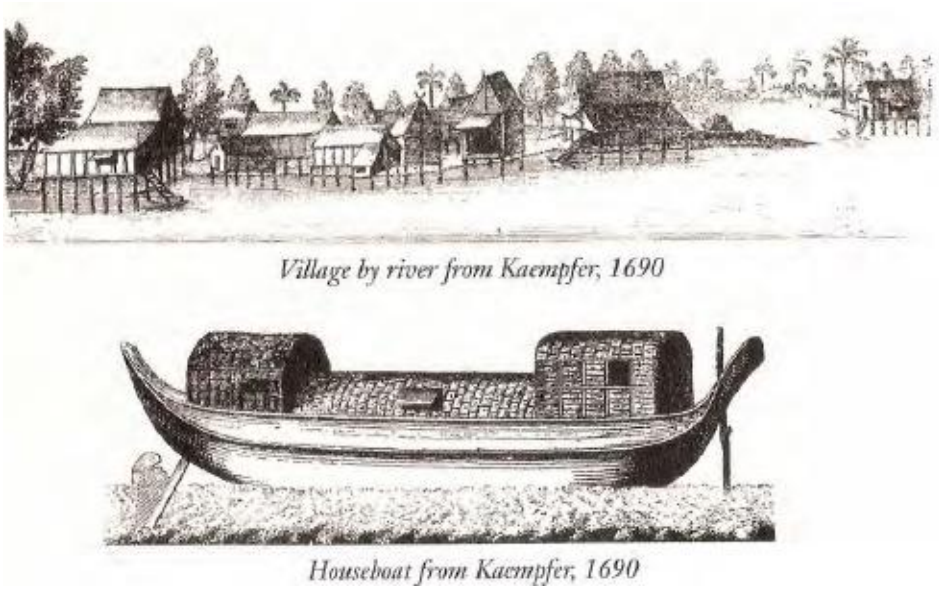


Figure 4 Waterfront housings and boat houses were mentioned in foreign travelers
(Source: Lemgo, K.M. (1690). Engelbert Kämpfer (1651-1716) erforscht das seltsame Asien. Second edition of Meier-Lemgo's biography of Kaempfer. Hamburg.)

Since agriculture dominated most parts of the river basin, agricultural communities were scattered, often connected to the irrigation network system. Wichiencharoen (1993) mentioned the traditional livelihoods of Thai water-related activities in "The Environment and Culture of Thailand":

> *... The Thais lived on fertile land, and the country in the good old days was under populated. The climate was genial. The village was a social system, with at least one Buddhist monastery—a self-contained community capable of satisfying its own economic, social, and spiritual needs. The requirements for supporting life were simple and easily obtained. Rice, fish, and vegetables were plentiful. People lived amicably together. They worked and helped one another in times of need. There was plenty of time left after work for the people to enjoy their leisure life together. The village monastery was the community center for social gatherings, festivities, and ceremonial functions all year round…*

This scene depicted ideal Thai life and a cultural pattern assimilated with nature. The waterfront community along the river contains a significant influence of tradition in the daily lives of an amphibious culture. However, the diversity of a waterfront community complex goes beyond this point to something more complicated but interconnected.

A wide variety of topographical features associated with the cultural landscape exerted influence on the indigenous day-to-day living behavior. The mountainous region of the upper basin was covered by forest. A river runs through a small and narrow floodplain surrounded by mountain forest where the indigenous population made a living in the past. Following modernization, intensive forestry and remote trading has become very popular, replacing the indigenous livelihood over the past few decades.

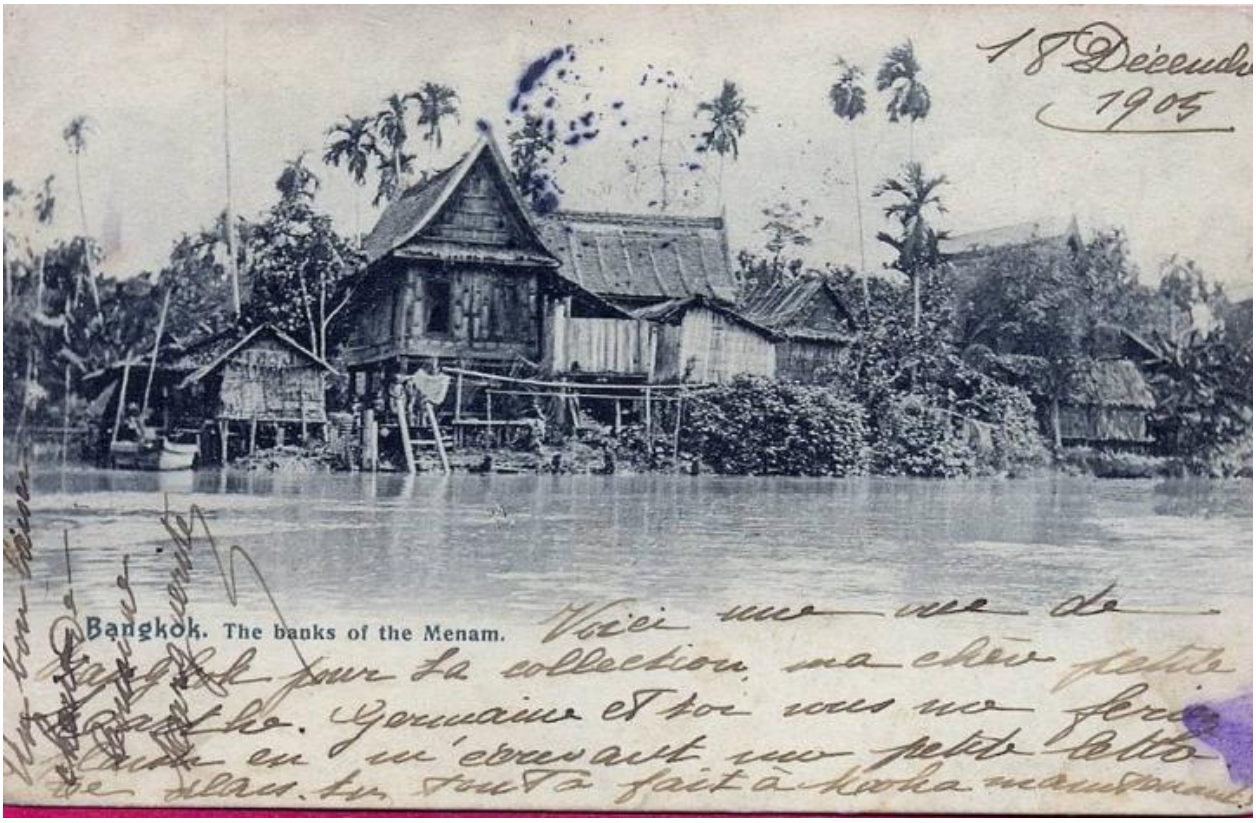


Figure 5 Traditional house along Choa Phraya River in Bangkok. In the past, living quarters were raised in order to prevent and respond to flooding and high tide.
(Source: The National Archives of Thailand)

The central plains upstream and the upper delta were dominated by the paddy field landscape. Rice cultivation and its community suited the soil fertility and natural irrigation systems. Houses

and housing adapted physically and culturally with contemporary agricultural conditions over time. Associations between rice field, village, and waterbodies demonstrated how local people lived with nature and climatic transformation. However, in the lower delta region, diverse socio-economic activities were intensively clustered. The large variety of plantations, vegetation, fishing, and farming were a result of plentiful water circulation and ecosystems. Communities with traditional livelihoods were being well maintained by their living culture and remained functional.

Figure 6 (Left) Boat houses in front of Sena market, Ayutthaya (Source: The National Archives of Thailand)

Figure 7 (Right) Raft houses clustered along the waterfront, especially in commercial community (Source: The National Archives of Thailand)

The Siamese ‘good old days’ were recalled in “The Environment and Culture of Thailand” (Wichiencharoen, 1993) which depicts an identical cultural pattern of Thai life assimilated with nature. The waterfront community is greatly significant in understanding the role and influence of tradition in the daily life of an amphibious culture. Communities were primarily clustered close to the river; the living quarters were then raised in order to prevent and respond to annual flooding and high tides (Panin, 1999). In the commercial community, raft and boat houses were employed as shophouses to coincide with dwelling units for easy travel and trade along the river. This practice has continued since the Rattanakosin period. Unfortunately, these utopian scenes of Thai culture have now disappeared .

In Ayutthaya, the Venice of the East, only bricks and ruins remain, while Bangkok is facing modernization, contributing to greater economic expansion and unlimited urban growth. The urban heritage of water-based settlements is fragile and has lost its identity as a result of uncontrolled urbanization and rapid economic growth.

Rural areas have been greatly impacted by agricultural reformation since the Bowring Treaty (1855) with significant large-scale expansion of the canal system to form an agricultural frontier. Housing and land development along the new waterway transportation facility (Boonnak, Noppakhun, & Thadaniti, 1982) then boomed and turned into a commercial hub connecting the agricultural network to the capital.

Following modernization and industrialization, the socio-economic pattern changed. Thailand turned into a new developing country, dependent on the export of agricultural products. Land transportation became more crucial, as a result of improvements in safety standards and accessibility. New urban areas have grown along the modern communication axis. The old riverside centers were gradually abandoned and left unfunctionable.

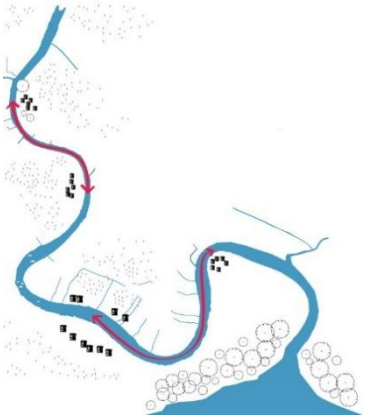
Yet another threat to the traditional waterfront community concerns the change of stream flow. Since 1900, several large dams have been constructed on the main tributaries of the Chao Phraya River, upstream from the Chao Phraya Barrage. These dams have the multi-purpose function of flood control, electricity production, and providing water supplies for agricultural, domestic, and industrial purposes in the Chao Phraya River Basin. As a result, in the late 1960s, floods became less frequent in the eastern part of the delta, causing problems with acidity in the soil; due to fewer floods, the soil eventually becomes acidic. As a consequence, agricultural lands were then abandoned. A significant outcome of the construction of roads and dams to produce electricity concerns the proliferation of many new industries and modern factories along a section of the Phaholyothin Road. (Jarupongsakul & Kaida, 2000). At the same time, the western part of the delta is supplied by the Mae Klong River. Agriculture is nevertheless in competition with the hydropower

sector since when water is released for electricity generation sufficient consideration is not always given to inter-seasonal regulation, which has resulted in occasional shortages in the past (Molle, 2005). As a consequence of rapid economic development and uncontrolled urban expansion, the traditional social structure seems to have collapsed. The adult population tends to move to the city for economic reasons. Houses and the associated agricultural landscape were left behind and threatened by decay as time passes. It has proved difficulty to maintain the riverside heritage since it is costly and labor-intensive, which may be the reason for its loss of authenticity. Reminiscences of the past have started to disappear.

Since 2009, the boom in nostalgia-motivated tourism has revived the economy of the bustling of waterfront community once again (Suntikul, 2013). New tourism provides economic opportunities for local residents after several decades of economic stagnation. With the development of tourism, waterfront communities have once again become fascinating, drawing the working population back home. However, there has been a clash between modern requirements and traditional available resources, evoking the need to satisfy contemporary socio-economic activities.

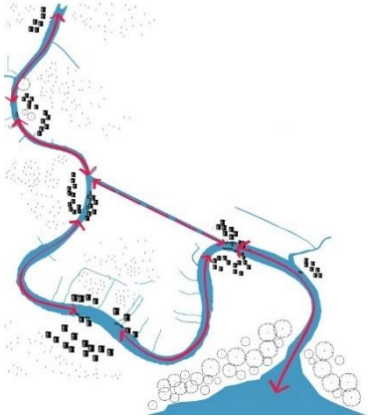
However, several communities are being threatened by the nature of contemporary society. New socio-economic activities affect communities which are seemingly prone to losing their authenticity. As well as the encroachment on public watercourses and physical structures, such environments remain ruinous and turn into slums.

Historic urban heritage conservation was first initiated in the 1970s by the Fourth and Fifth National Economic and Social Development Plans (1977 to 1984). Several mega projects for the conservation of historic urban heritage were first initiated by focusing on national historic monuments and important structures in ancient towns and historic core areas. Several royal palaces, Buddhist monasteries, forts, and national historic structures have been conserved during this period. Unfortunately, the way of life for local dwellers and minority heritage issues have been overlooked (Issarathumnoon, 2004).



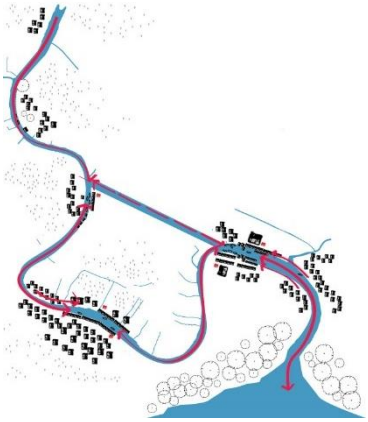
Sukhothai p. (1238-1351)

- Roads were the dominant mode of transportation. River was partly used, due to river's water surface obstacle (ie, islet, sandbank, dune etc.).
- Sukhothia K. was settled 10 km far from river. No evidence about waterfront market (most were on-land market).



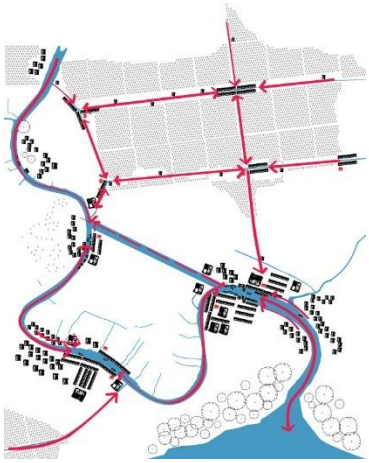
Ayutthaya **p. (1351–1767)**

- Blasting of the islets, to clear the way for ships navigating up-down the river and to the sea.
- Waterfront markets, raft houses, and boat houses were first mentioned in historical evidence



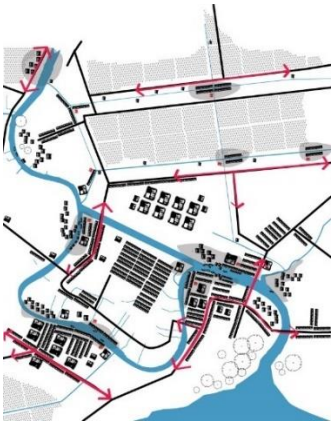
Early Rattanakosin **(1782-1840s)**

- Chinese immigrants engaged trading activities
- Markets and shrine
- Row house were initiated for rental purpose
- Booming of waterfront market and river transportation



Agricultural revolution (1850s)

- Great expansion of dug canal
- Demand of economic corps in global market
- Flourish of stream-powered rice mill and sawmill
- Market expansion

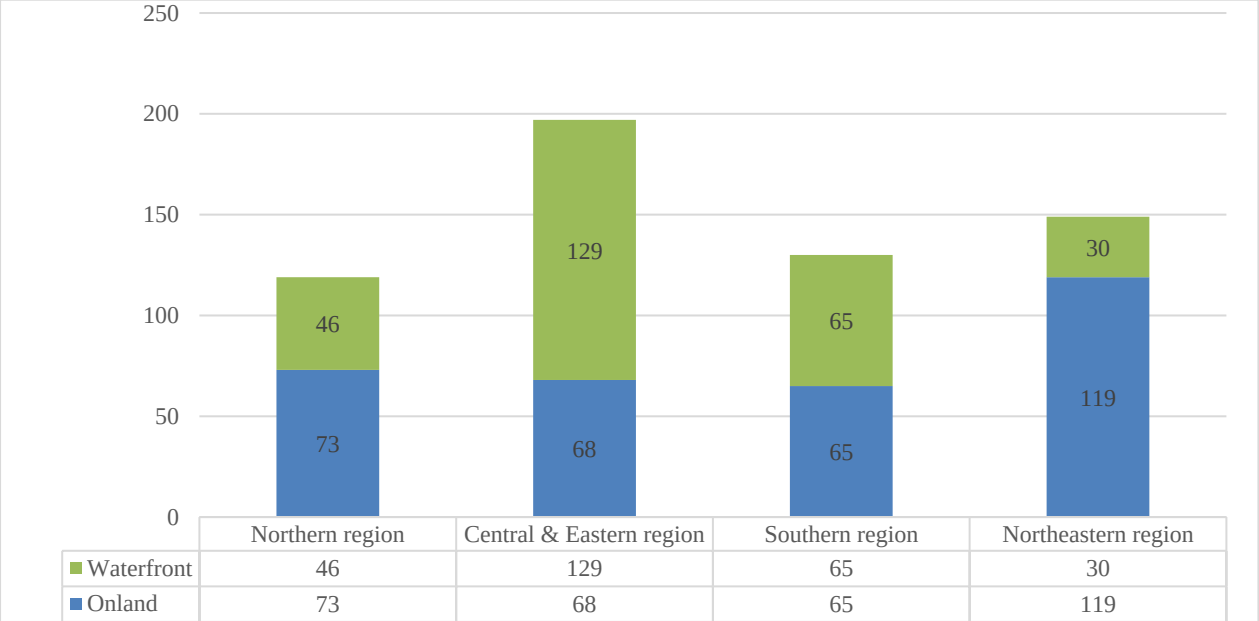


Modernization (1950s onwards)

- Road
- Monoculture
- Urbanization
- New market compound along road axis

Figure 8 Summary of chronological events of historical development overview along the Chao Phraya River

Public awareness of Thailand's national heritage has been concomitant with the dramatic transformation of both physical and social structures. As in western countries, the heritage industry is fueled by collective nostalgia of the not too distant rural past, as a result of the emergence of a new middle class engendered by rapid economic growth during the 1980s (Peleggi, 2002). The heritage of the common people was not recognized until the late 1990s when the first local heritage conservation project was initiated by the local community with the support of the academic sector. Since then, the momentum of historic district conservation in Thailand has turned towards the local community whose heritage it belongs to (Yodsurang, 2013).



	Northern region	Central & Eastern region	Southern region	Northeastern region
Waterfront	46	129	65	30
Onland	73	68	65	119

Figure 9 Traditional communities classified by region

The number of authentic traditional communities and historic towns with cultural value are seriously decreasing, and therefore the remaining historic communities have received more recognition. Two national agencies began primary surveys for the registration of historic communities as follows: In 2010, the National Housing Authority (NHA) commissioned the Faculty of Architecture and Planning, Thammasat University (APTU) to investigate traditional communities in order to maintain their identity and values in a report entitled "Housing and Communities Standard". Throughout the country, 140 historic communities were archived in the report (APTU, 2010). Two years later, 455 historic communities in the "Cultural Environment

Standard Project for the Historic Community" by the Office of Natural Resources and Environmental Policy (ONEP) were tentatively added to the list for Historic Community Registration (ONEP, 2012). From 595 communities listed, 138 riverside communities in the Chao Phraya River Basin were archived.

1.1.4 Outline of traditional community and historic district conservation in Thailand

In the past, traditional settlements along the main rivers and scattered throughout the floodplains of Thailand were very popular. Houses were clustered beside the river, which was home to agriculture, trading, and transportation systems. The natural environment and its efficient adaptation to the traditional way of life is reflected in the architecture of the buildings, and intangible cultural heritage, which is considered a genuine, outstanding model of sustainability. However, since modern society continues to change at a dizzying speed, the traditional way of life and village fabric is becoming increasingly fragile, and risks damage and loss in the coming decades.

To date, there are no auxiliary legal measures to promulgate or directly control this specific type of living heritage in Thailand, including the traditional community and cultural landscape. A serious conflict between the conservation and development of historic districts in Thailand has arisen in the past decade. The conservation of cultural resources in traditional communities face numerous problems, and these lead to the growth of socio-economic inequality. A series of community mismanagement scandals appear in the newspapers almost every day. New and modern facilities have been added to historic structures in order to improve contemporary socio-economic livelihoods, with urban patterns and buildings changed without proper controls. These were probably carried out in a hurried manner, without attention to detail, as a result of rapid economic growth and uncontrolled urbanization, which exposed a lack of appropriate protective measures for a place of cultural identity.

During the 1960s, Thailand's autocratic government took its first step toward economic and infrastructure development, concentrating particularly on the industrial sector (Kuebler, 1965). Basic facilities like water supply and electricity were expanded to reach the rural and agricultural regions. Road networks and transportation systems were connected from Bangkok to the countryside and from one area to another (Darling, 1960). Together with its patriotism policy, the state successfully connected the Thai people and united them in mental space. This era created a very important momentum for change in Thailand's environment, social relations, social value, and ideology (Potjanalawan, 2009). As a result of unanticipated economic bustling and globalization local communities became more public, and were no longer indigenous. This phenomenon gradually developed over time.

The strong connection between cultural heritage and nationalism has been assimilated, which was one of the essential ingredients for building a nation in the 1960s. As a consequence of constructing a patriotic identity, nationness has powerfully manifested itself into modern society (Kasetsiri, 2014). The perception of cultural heritage is undoubtedly placed at the center of national pride with the golden temple and royal palace representing the country's civilization (Khoksanthia, 1987). Cultural heritage is national property which is being an untouchable with a cleaned version of disordered living culture. It is not surprising that indigenous living cultures have been excluded in the process of building the nation. The value of indigenous heritage has been overlooked and ignored.

Another threat to life along the river was the eviction of communities living in it. Since the 1960s, raft and waterfront housing have been considered as pollutants and going against water management policy and a healthy city. The dwellers of the river, importantly raft communities, were offered resettlement onto land (Prakard kong kanapratiwat chabub tee 44, 1959). Since then, most of the raft communities have been relocated away from the river.

Thailand's first historic district conservation movement began with Bangkok's Rattanakosin core area in 1976 by the national authority who established the Committee of Conservation in Building with Historical, Archaeological, Arts and Architectural Value in Bangkok (Yongthanit 2013), and subsequently "The Committee of Conservation Improvement and Restoration of Historic Monuments in the Rattanakosin" in 1979. A decade of temptation became reality; in order to celebrate the 200th year of Rattanakosin in 1982, the Master Plan for Conservation and Development of Krung Rattanakosin was enacted, consisting of several action plans to conserve the National Monument. Unfortunately, the master plan led to negative consequences for the way of life of local residents to a certain degree (Wimonrat, 2006). The conservation plan focused mainly on maintaining and protecting historic monuments, important buildings, and vistas, including the control and limitation of physical growth in the historic core area, rather than involving public participation in the plan (Sujchaya, 2009).

The paradigm of the historic district conservation approach shifted significantly in the 1990s. It was the first local community initiative to protect the cultural environment under the support of the academic sector. Talang Road, a group of Chino-Portuguese historic buildings in Phuket old town, was a pilot project for the conservation historical districts, initiated by the local community and its muncipal authority (Yongthanit, 2013). Consequently, in 2003, this effort at conservation became successful when the area was pronounced a Cultural Environment Protected Area. One of the positive aspects was that the local community and municipality were empowered by the conservation effort and enforced regulation in the vicinity. Since then, the momentum of historic district conservation in Thailand has turned toward the local community to whom this heritage belongs.

Following the decentralization and devolution of political and economic power by the Decentralization Act promulgated in 1999, the management of local resources has consequently

been transferred from central government agencies to local government. The local heritage practice in many historic communities in Thailand has been widely awakened, and local organizations have begun to play an important role in managing their own cultural resources.

1.1.4.1 Protective measure

As a layering control, the primary legal mechanism for consideration as a software instrument for the traditional waterfront community is associated with at least six traditional district and historic community acts plus one waterfront related Act:

(a) Ancient Monuments, Antiques, Objects of Art and National Museums Act;

(b) The Enhancement and Conservation of the National Environmental Quality Act;

(c) Regulations of the Office of the Prime Minister on Development and Conservation of the Rattanakosin and Old Town;

(d) Town Planning Act;

(e) Building Control Act;

(f) Local Ordinance; and

(g) The Act on Navigation in Thai Waters.

a) Ancient Monuments, Antiques, Objects of Art and National Museums Act

The Ancient Monuments, Antiques, Objects of Art and National Museums Act (aka Ancient Monument Act) gives police power to the Fine Arts Department (FAD) to manage and control ancient monuments with national value and its area by registration, cancellation, and modification on behalf of the Director-General by means of notification in the Government Gazette. As a responsible government agency, FAD is the most powerful with the availability of its intellectual staff, expertise, and experience in archaeological and architectural conservation in Thailand.

According to Thailand's ancient monument statistical update on July 2017 (FAD, n.d.), the numbers reveal that over 9,615 sites were listed as historic monuments, and only 3,131 were registered. Among those, 84% were religious structures and 14% were royal palaces and government buildings. The rest were residential units with high national value, with no traditional districts and historic communities on the list. Considering the numbers, seemingly FAD is not involved in traditional districts and historic communities, even though they play a significant role in living culture.

Many scholars criticized FAD for focusing solely on national monuments and overlooking people's heritage. However, the Ancient Monument Act, was not designed for living culture, since permission has to be obtained for the construction or alteration of registered properties, otherwise the building in whole or in part has to be removed or demolished. With a natural and markedly dynamic living heritage (Lenzerini, 2011), when applying the Ancient Monument Act to the traditional districts and historic communities, an adversely consequential scene may be created by limiting the dynamism of life and living culture. Most physical structures in the communities are not able to be registered as historic monuments (and are consequently not protected by Historic Monument Law) due to alterations in their historic structure. This has typically limited the power of FAD.

b) The Enhancement and Conservation of the National Environmental Quality Act

Another wide range of recommendations in relation to historic communities is provided by the Office of Natural Resources and Environmental Policy and Planning (ONEP), and Ministry of Natural Resources and Environment (MoNRE) under the Enhancement and Conservation of the National Environmental Quality Act (aka the Environment Act). This Act is considered to be one of the most comprehensive laws for the environment, involving both natural, physical, and biological conditions surrounding man and anything man-made (Global Environmental Forum,

1999). Thus, culture, tradition, religion, politics, and law are implied to be man-made and traditional districts and historic communities fall under this category as cultural environments.

The government agency mainly responsible for implementation of this Act is ONEP, which deals with a wide range of natural and cultural environment issues with a large number of local units for the Conservation of Natural and Cultural Environment (LUCNCE) in 77 provinces throughout the country.

Technically, with the advice of the National Environment Board, MoNRE can issue ministerial regulations to designated Cultural Environment Protected Areas, in order to control and limit improper development in the area according to the ONEP propositions. Following the designation of the areas, the ONEP issued a management specific recommendation to the relevant local government agencies for proper and suitable development conditions for the area. However, the ONEP does not have any police power under this Act; it can only issue recommendations.

c) Regulations of the Office of the Prime Minister on Development and Conservation of the Rattanakosin and Old Town

The Regulations of the Office of the Prime Minister on Development and Conservation of the Rattanakosin and Old Town (aka Old Town Regulations) were developed and adopted from the significant achievement of the Master Plan for Conservation and Development of Krung Rattanakosin. The regulations were enacted to ensure effective protection measures and the implementation and monitoring of the management plan for the old town. It was meant to establish the organizational structure and legal framework for the conservation of the old town by defining its boundary and establishing subcommittees at both national and local level.

The regulations covered three priority levels defined by physical structure and archaeological significance, bearing a unique cultural tradition and/or an exceptional testimony to

ancient civilizations with longevity and archaeological evidence. Ten historic core areas in major cities and the Bangkok old town of Rattanakosin were designated as the first tier containing high cultural value at national level, while the second tier consisted of 26 minor cities of secondary importance, and the third tier contained 39 towns where relatively little archaeological and historical evidence remained.

Overall, it was a completely top-down regulatory scheme rather than bottom-up approach. An ad hoc Board for Development and Conservation of the Rattanakosin and Old Town was established and chaired by the Deputy Prime Minister, comprising both central and local government actors. The ONEP was also served as Secretary of the Board, and took charge of coordination and cooperation with relevant local agencies. The board also assigned academic expertise as the advisory body to provide advice and recommendations by academic opinion. However, the obstruction to these regulations and Environmental Act was the same; a lack of an incentive mechanism, to stimulate collaborative interaction between local stakeholders government-to-government, local-to-government and local-to-local. However, several national organizations and legal instruments have been adopted and continue to protect the areas as part of their crucial mission.

d) Town Planning Act

The Town Planning Act was implemented by the Department of Public Works and Town & Country Planning (DPT). This was another spatial regulation to manage the development of land-use planning through zoning regulations at national, regional, sub-regional, provincial, town, and specific area levels (Sakkayarojkul, 2013). However, this Act was principally to keep the thriving areas healthy and function on a broader scale, and not limited merely to conservation.

Town planning as described in the Town Planning Act consists of a General Plan and Specific Plan. The General Plan has been used as a general guideline for development and

maintenance on a broader scale, while the Specific Plan is used for specific areas. In general, zoning or a land-use plan in town planning has been classified into categories to provide a specific land-use pattern for each area and to determine building size using the Floor-Area Ratio (FAR) and Open Space Ratio (OSR) regulations. Land-use types for conservation could be designated into four categories: the preservation of existing rural and agricultural areas; open spaces for recreation and conservation of the environment; a conservation area for the protection and promotion of cultural heritage; and a national park area.

The General Plan was prepared by the DPT from a national perspective enforceable by a Ministerial Regulation. Areas or boundaries notified as ancient monuments under the Ancient Monument Act and/or archaeological sites containing high cultural value at national level are designated as a conservation area for the protection and promotion of cultural heritage. However, from a local perspective, the Specific Plan for conservation and development for a specific purpose in a specific area could be made by local government and enacted (DPT, 2009). This Specific Plan was used as an implemental tool to give local government more power to decide on a planning scheme for specific matters.

e) Building Control Act

Conservation is not merely limited to historic structures and new buildings adjoining the existing historic urban landscape but must be distinguishable and compatible with the conservation principle. In controlling the construction of new buildings in a historic area, each local government might establish a by-law under the Building Control Act relating to building control and urban management that should be compatible with the historical context. In designated Cultural Environment Protected Areas, local governments can issue a by-law with design guidelines under supervision of the ONEP upon request.

Design guidelines regarding building typology, characteristics, patterns, size or level of the building, and prohibited adaptation of construction and demolition, removal, or change of any kind on any type of building in local designated historic areas, in cooperation with Specific Planning, is part of local ordinance concerning the conservation of vernacular heritage. The achievement involved a collaborative effort between local initiative stakeholders to address conservation at community level.

f) Local ordinance

Since the 1990s, legal measures and the local approach to historic district conservation have been reformed, largely due to the initiatives of local communities involved in the process. Provincial regulation can be made under the authority within their legislative power to control specific activities in historic areas.

In the bottom-up approach, local dwellers with initiative can propose local ordinance according to the Local Initiative Act, the *Tambon* Council and *Tambom* Administrative Organization Act. These reiterative measures were aimed at blocking direct intervention in Local Administrative Authority management from national agencies, and importantly, encouraging local dwellers to participate in local government (Fumio, Mektrairat and Tsuruyo, 2008). However, there were certain obstacles to the granting of rights to the enlistment procedure: the number of people wishing to enlist was inappropriately large for the size of the local administrative organization, local dwellers collected signatures on their own, there was no time limit for the process, no right to participate in any stage of the local assembly session, and an absence of criteria for amendment and revocation (Prasopsub, 2012).

g) The Act on Navigation in Thai Waters

The traditional waterfront community, where 60% of listed traditional communities have settled and are connected to each other by water, is an important element in generating the water-based culture in Thailand (Yodsurang, Miki, and Uekita, 2016). Raft and riverfront housing has been organized and controlled by the Act on Navigation in Thai Waters under the supervision of the Marine Department. Yet, this law principally deals with the navigation and regulation of water traffic, and prohibits any actions that might create obstacles or threats to waterways.

Basically, no structures or any part thereof are allowed to encroach over, in or under any public waterways unless permission is obtained from the Director-General of the Marine Department. However, a floating house (aka a raft house), which seemingly encroaches on the public waterway, represents permissible encroachment and is considered as an intrusion according to the opinion delivered by the Council of State on raft house dwellings. The Act on Navigation in Thai Waters came into force in 1913 when local people throughout the country preferred to live on rafts. Thus, the raft dwelling house demonstrated the cultural and social context in shaping legal ideas, and it was considered right and proper that this was the case (Sumnukngan Krisdika, 1994). However, the Marine Department have the power to control a raft which is not safe, in poor condition, or may cause danger to the public or navigation, including causing pollution or waste into river, but not encroachment (Maritime Department, n.d.).

New raft houses require permission, but in practice, licensing is no longer prescribed. In particular, after Thailand's environmental law was enacted in 1992, raft house clusters were deemed undesirable. Governmental sectors considered the existence of the raft house cluster a pollutant and going against the policy of a "healthy city". Remaining traditional raft houses before the enactment of the law acquired permission and were able to be registered by local government. However, most of the raft house dwellers have been offered resettlement on land (Meesiri, 2000).

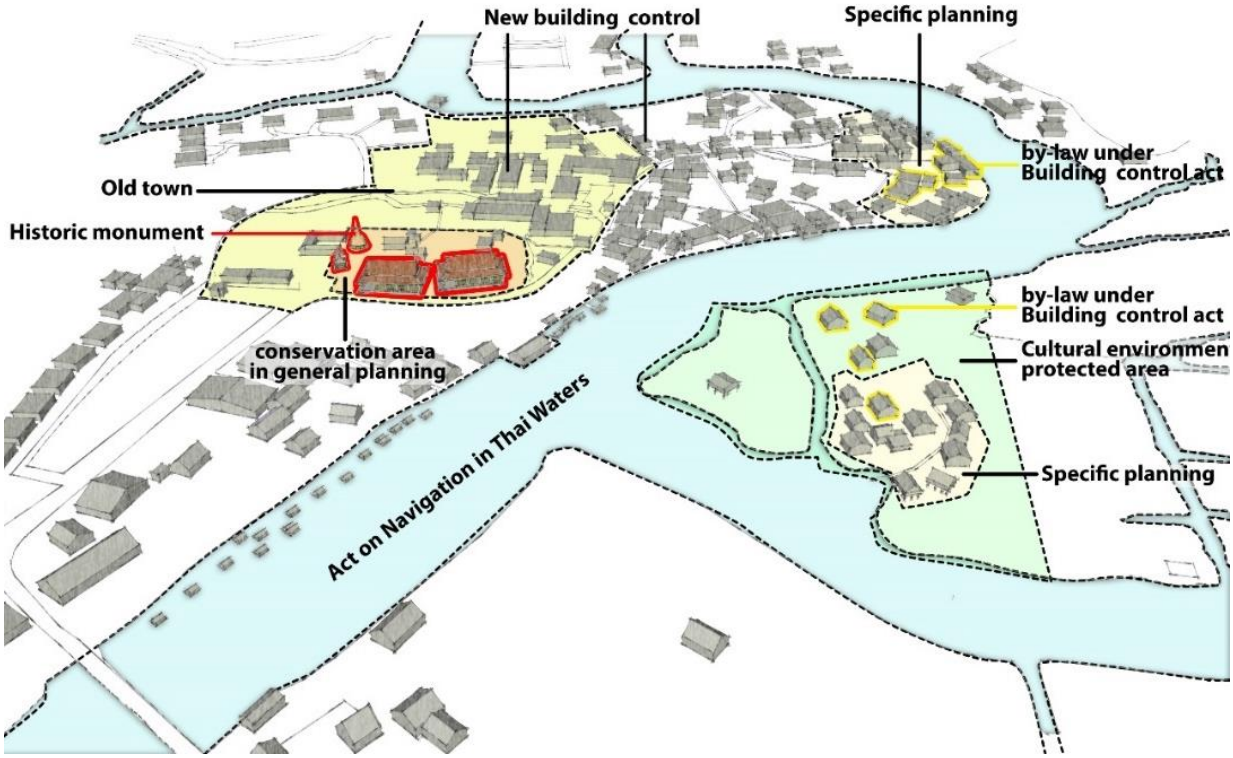


Figure 10 Summary targeted implementation of legal protection measure

Table 1 Summary targeted implementation and responsible bodies of legal protection measure

Regulation measures	*Targeted implementation*	*Responsible bodies*
Ancient monument act	National importance historical monument	FAD
Environmental act	Designated environment protected area	MONRE
Old town regulations	Historic core area in 55 provinces	Board for Old Town
Town planning act		
- General planning	Zoning specific activities in a broader area	DPT
- Specific planning	Designated area for specific purpose	Local government
Building control act	General regulation for new building for safety and hygienic standard	MOI
Local ordinance		
- by-law under Building control act	Specific regulation for new building in specific area	Local government
- Local declaration	Managing specific activities in historic area	Local government
Act on Navigation in Thai Waters	All water ways and water surfaces	MD

Since there have been no direct legal measures, either promulgated or directly controlled on specific living heritage in traditional communities and historic districts in Thailand, complex legal measures have been layered in conservation. The comprehensive centralized legal system in paragraphs 3.1, 3.2, and 3.3 of this study is too national, too broad and too short, seems unable to cope and sometimes turns out to be an obstruction to protect the local traditional community. Therefore, local governments are essential for conserving their local heritage involving the legal instruments set out in paragraphs 3.4, 3.5, and 3.6 and have the power to do so. In order to do that, the specific planning contained in the Town Planning Act and the local ordinance on building control are important software instruments to maintain environmental quality, historic urban landscape and traditional architecture with, importantly, local participation. As a consequence, local government is seemingly the key player in good conservation practice.

Despite this, building controls have not covered regulations for raft dwelling house structures, referred to in paragraph 3.7 concerning the Act on Navigation in Thai Waters, which was aimed at controlling navigation and waterways, provided some guidelines for safety and hygienic standards for surface water livelihoods, not intended to achieve the conservation objective.

The practice of self-management in local communities is a long way off, and that includes the paradigm that conservation is a matter of national heritage. The gap between central-local government and the community is significantly increasing and cultural resources allocation has become a serious problem. Several scandalized cases have underlined the lack and/or possibility of communication among stakeholders. While the existing laws and regulations are not suited for a contemporary living heritage, particularly in a historic district, the legal framework and its overlaying control can help in the protection of cultural resources. Unfortunately, in many areas with protected legislation, there are still problems in terms of implementation.

Although a complex set of laws regarding historic district conservation have been enacted to maintain the public interest and attain conservation efforts, regulatory and policy actions for living-local heritage in particular seem to have been lost in the mists of time. However, in the decentralization of police power and the right to manage local resources, a comprehensive and up-to-date conservation law must be enacted and integrated with other incentive measures. However, it is noted that the model for managing cultural resources in Thailand involves almost no cooperation between stakeholders who have their own paradigms and perspectives on specific problems and site potential. With the human resources capacity of the local authority, it may be necessary to have a reliable third-party through independent bodies in charge of cooperation of the various dimensions in a cultural setting to empower the stakeholders.

1.1.4.2 Local hardware instrument

Since the wide spread of decentralization ideology and local government had been reformed in the last two decades, civic participatory processes play an important role in coordinating, planning, managing and monitoring of cultural resources allocation. Various sources may be considered when starting a small-scale heritage management for local communities. One distinctive hardware instrument for historic district conservation is a collection of institution/organization that accommodates the conservation mechanism.

In fact, an enthusiastic local authority is able to pass local ordinance to control the physical impact of the historic urban landscape transformation. However, it is widely accepted that most of the local council perceive themselves hamstrung by limited funding and technical capacity (Friesen, 2013). Under the municipal authority, all stages of planning, implementation and management of both old and new physical structures are mainly responsible by *'Kong Chang* (Technical Bureau)'. Unfortunately, the numbers of project request are not balanced to the number of technicians, because small and medium municipalities have very few technical officers. The local government seems unable to bear the burden of heritage conservation which is not the primary task of the Bureau.

Together with the limitation of human resources capacity, it is indispensable to share its responsibility with the stakeholders. Thus it is important to let the local people take a part which is able to share benefits through both improving the socio-economic quality and increasing employment opportunities from the existing cultural resources (Khanjanusathiti, 2009).

1.2 Research aims and objective

This study aims at giving systematic overview on the Chao Phraya River Basin of Thailand, to reveal the existing condition, formation pattern, remaining condition, and living pattern. The purpose of this study is to provide the common reference for Thai government to considered the traditional waterfront community and its living-culture as a part of "The Cultural Landscape of Chao Phraya River" to a world heritage nomination.

. Therefore, the objective of the research is based on three key issues:

- Understanding contextual characteristic of the waterfront community complex through physical structures, way of life, and its environment.
- Evaluating values through analyzing the complexity of the urban organism with its dual nature of place, containing cultural associations of the surrounding natural element and revealing threats to values of the site.
- Discussing the approach to conservation and management *in-situ.*

1.3 Study framework

The scope and content of this dissertation were within the following frameworks.

1.3.1 Physical framework

Physical framework included the Chao Phraya River basin which has an area of 20,125 square kilometers together with its tributaries is, approximately, 157,924 square kilometers (35% of the nation's land). Research Participants (Subject) were carried out from two national important

reports on traditional communities, the Housing and Communities Standard (APTU, 2010) and Cultural Environment Standard Project for the Historic Community (ONEP, 2012). The traditional waterfront communities in the Chao Phraya River Basin and its neighbors the Bang Pakong and Mae Klong River Basins, were selected to be investigated by purposive sample for completeness.

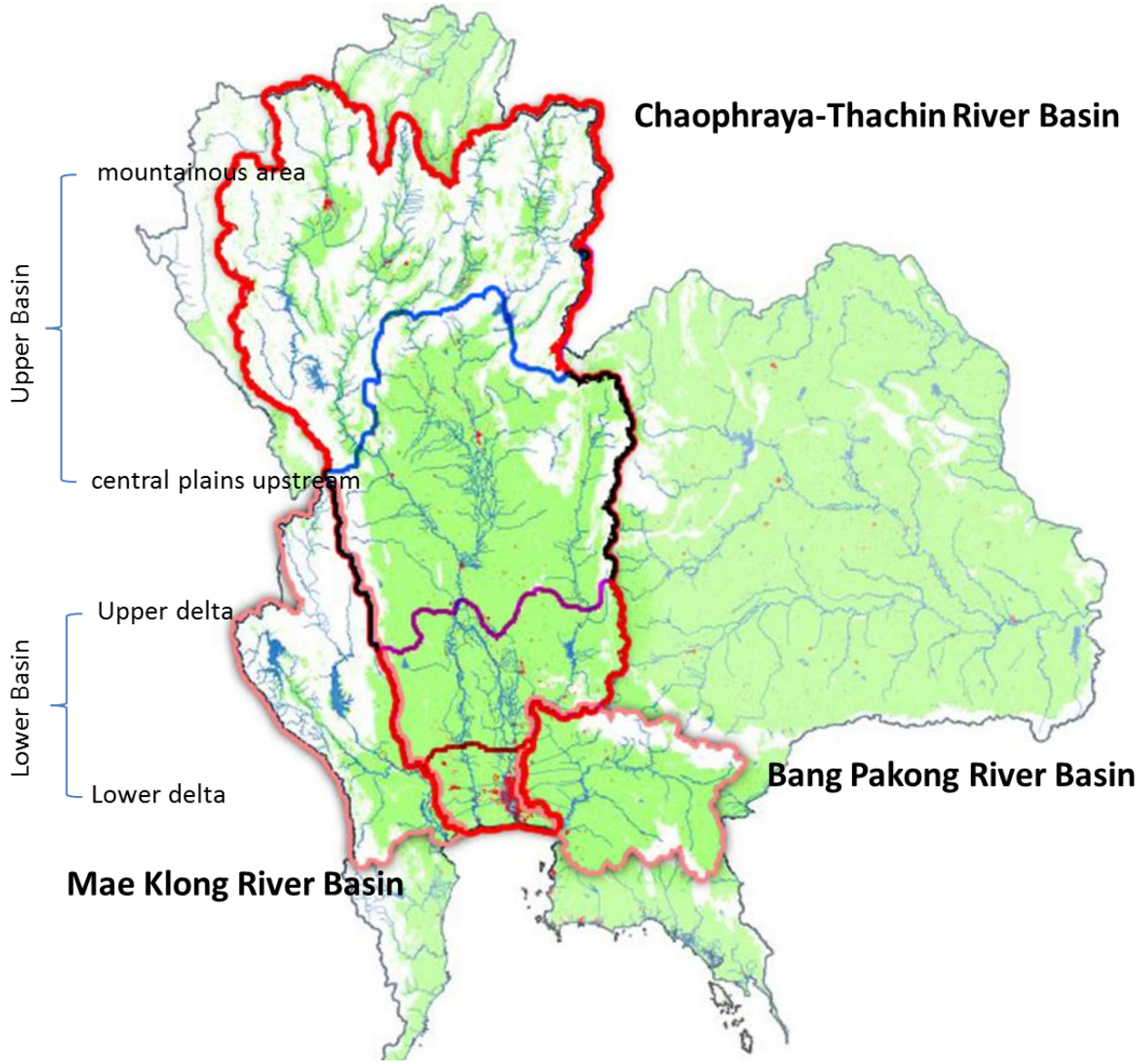


Figure 11 Study area

(Source: Elements for a political ecology of river basins development:

The case of the Chao Phraya river basin, François Molle)

1.3.2 Theoretical framework

A review of literature relevant to cultural ecology, assessing the values of cultural heritage, historic urban landscape, and cultural landscape management established the theoretical framework to situate this thesis in the study of traditional water front community.

All studies and assessments of nature and culture and efforts to acknowledge the role of cultural heritage are vital contributions to the maintenance of the ecological character and sustainable use of the aquatic-terrestrial ecosystems collectively referred to as wetlands. Many living things are connected to each other through water. Many wetland functions are extremely useful to human societies but the cultural components associated with them, sometimes called “intangible heritage”, are also significant (Tolentino, 2013). The association between built environment and natural environment was created cultural landscape and the sense of place, which was complex and dynamic ways to ascribe value and significance of cultural place (Milholland, 2008).

However, cultural ecology of the flood plain is the main factor of influence to the people for generations. “Lebensraum” or Geographical Living-Space is the Habitat for people to dwell and created such a special settlement which fit to the environment (Shigeharu, 1977). The literature review on a study by Kwansuwan (2014) which mentions the spatial configuration of a typical traditional village, revealing the association between agricultural area, village, and waterbody, was the key significant in finding authentic traditional community. Under the specific flood plain phenomenon, many of traditional villages kept the amphibious characteristic throughout the process and degree of changed which is the key importance in surviving in modern era. The fixed-flood and dry amphibious context provides familiarity and experience to the local people to dwell and make place attachment which is actually an integral part of the whole geo-cultural ecosystem which enhance the existence of traditional living spaces. (fig.12)

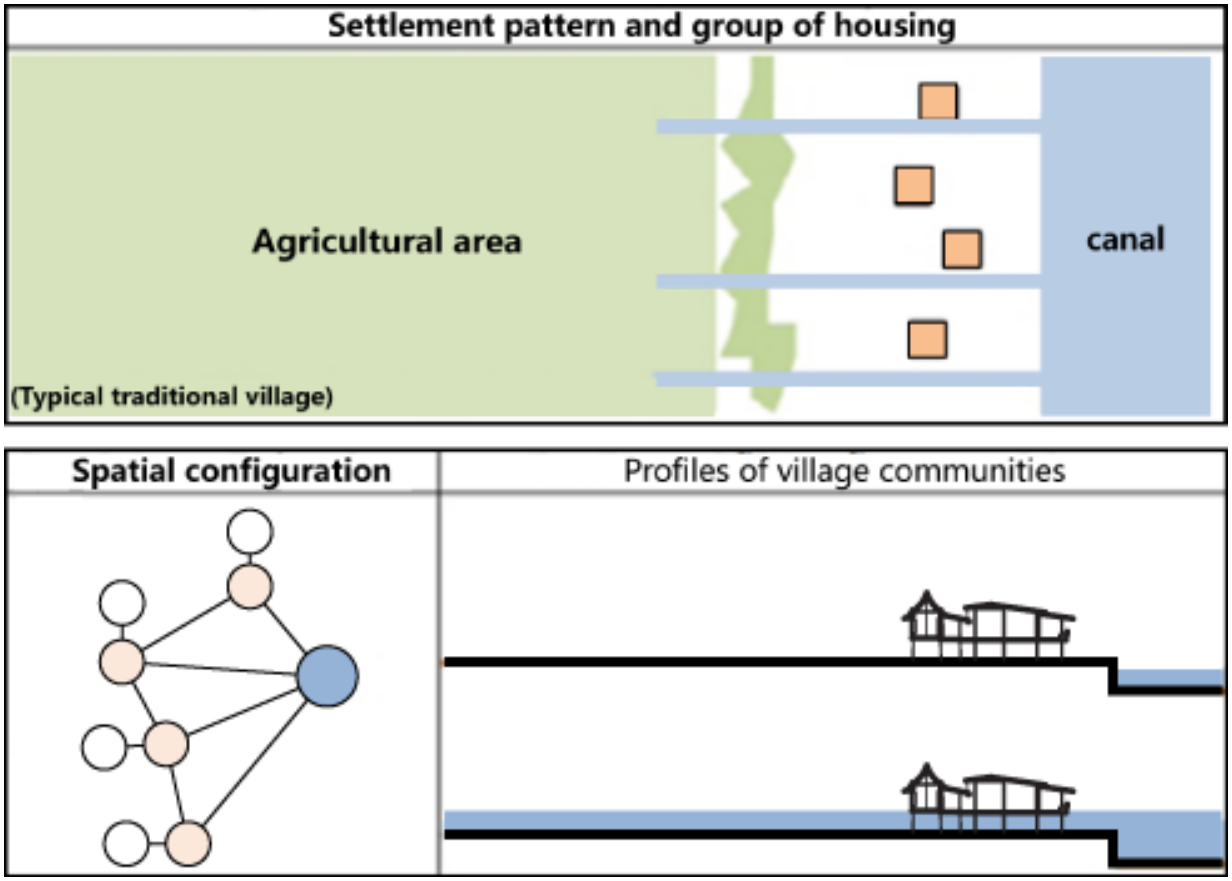


Figure 12 Configuration patterns of rice field, village area, and waterbody (Kwansuwan, 2014)

However, traditional and modern livelihoods were co-existed. The amphibious context implies a sense of spatial resilience not only to flood and dry situations but also to the force of modernity. Therefore, in order to analyzing of the data and the issues arising from survey, spatial adaptability and socio-economic transformation was primarily concerned.

1.3.3 Thesis structure framework

Document collection of secondary data of history, legislation, researches and criticism will be used to design the criteria for field survey investigation which intended to explore the existence, transformation and association between physical structure, traditional way of life, and aquatic environment. The derived data were conducted by a critical analysis. All research procedure involved four phases. Each phase adopted a different strategy in order to observe and analyze evaluation and conservation methodology as following.

1. Macro scale analysis (river basin study)
2. Micro scale analysis (community and surrounding study)

   The outstanding traditional waterfront communities will be selected to be a case study for assessing cultural value with its transformation and transmission capacity.

3. Apprising cultural value
4. Discussion and finding conservation proposal

Figure 13 shows of the structural frameworks model. More detail on methodology procedures will be described in each chapter.

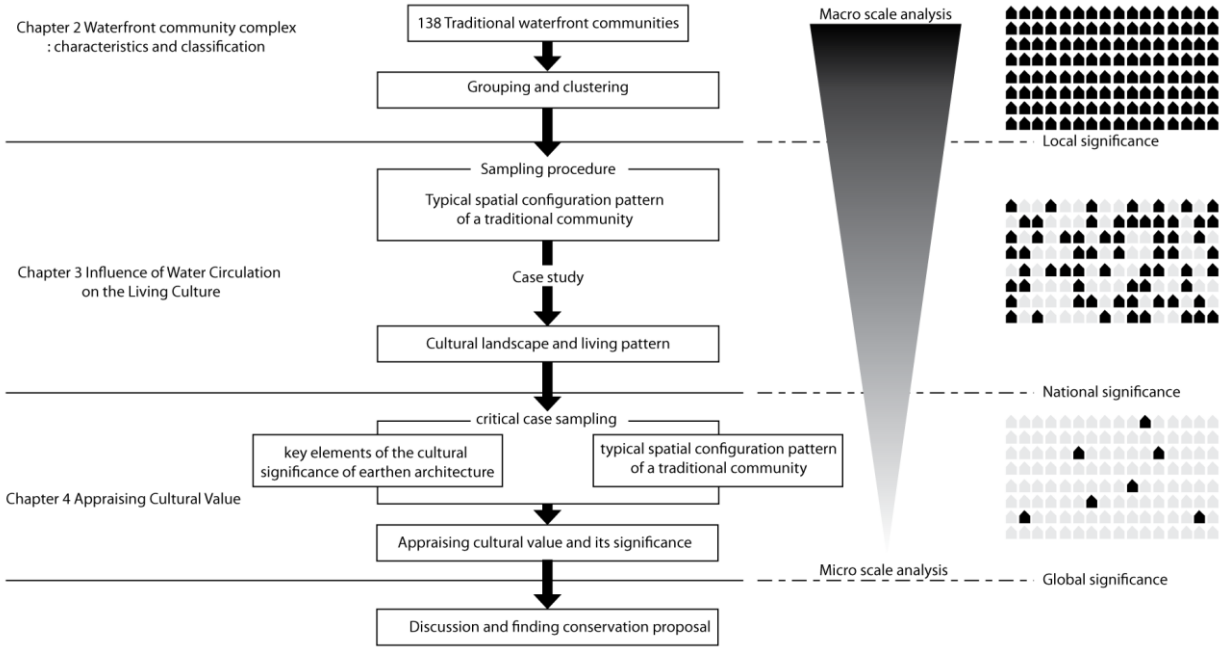


Figure 13 Thesis structure frameworks

1.4 Research methodology

The study is carried out an in-depth field survey investigation of the representative samples from archiving 138 traditional waterfront communities. The analysis is to reveal a contextual characteristic and settlement pattern of each cluster, geographical features, agriculture and fishing production activity, and lifestyle changes according to modernization. Then, methodology for preserving community with high cultural value will be examined.

The research intends to provide the appropriate and latest methods and techniques for investigation, analysis, preservation, restoration and management of the waterfront community with its living-culture. Multidisciplinary approach has been employed through primary and secondary documentation analysis in order to address the structural problem in conservation of living heritage and its environment.

The collection and evaluation criteria to reveal complexity of the urban organism will be based on Historic Urban Landscape principle to include the broader urban context and its geographical setting of waterfront community. Research method is comprised of;

- Qualitative survey of outstanding community to be investigated in order to finding a common ground of the community complex.
- Interviewing & observation involved bodies will be required to find out the opinions and utilized conditions of vernacular heritage and to finding trends and latest method in conservation of historic wooden structure and vernacular heritage through its living culture.
- Quantitative assessment will be employed by using statistical testing to finding any significance association among the key domains. Statistical analysis will be used to support the argument for qualitative analysis.

1.5 Research significant

Research outcome provides the fundamental information to preserve waterfront cultural heritage remaining in Chao Phraya River Basin. This is an important inventory accumulation contributing to waterfront community preservation measure in the future. This project is expected to be an example of a well preserved riverside space and river environment which to be considered as a part of World Heritage List nomination. However, the research characteristics and uniqueness of the research are follows;

- Combination of physical structure and cultural landscape associated with local practicing has been investigated through various aspect of multidisciplinary documentation analysis to address the current social phenomena and the reasons that led the cluster to this moment.
- Macro scale analysis of the community of vernacular architecture throughout the river basin has been employed to encode the association of socioeconomic activities, environmental features and physical structure.
- A survey has the largest and up-to-date database of the water-along cluster so far.

1.6 Research ethics

The field survey of the traditional water-along cluster and its environment in this research is conducted by recording housing features and interviewing method which is employed with personal information. Therefore, the protection of the human rights of research collaborators recognize as an extremely important issue. All investigations procedure will be created under the University of Tsukuba research ethics provisions guidelines. Personal information obtained from the survey will be handling with care, and save the document in a locked vault. However, the fundamental procedure for investigation will be considered as follows:

- Explaining the study to the potential subject/owner by providing pertinent information and allow the potential subject/owner ample opportunity to ask questions.
- Obtaining written consent from the subject/owner to participate in a study prior to interviewing and recording. Informed consent involves providing a purpose of the study, research procedure, management method of data and right to reserve.

- To usage of data in the report, academic paper, classroom, conference presentations, and public presentation, getting written consent regarding to a specific usage of data is required.
- In all cases, using a hand drawing, sketching, and illustrator instead of image by applying the anonymous as possible and avoid unnecessary privacy exposure.

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Chapter 2
Waterfront community complex: characteristics and classification

This chapter was published in Yodsurang, P., Miki, H., and Uekita, Y. (2015) A Traditional Community in the Chao Phraya River Basin: Classification and Characteristics of a Waterfront Community Complex. Asian Culture and History, 8(1), 57-68., http://dx.doi.org/10.5539/ach.v8n1p57

2.1 Introduction

Human settlements have constantly adapted to climatic and environmental changes. However, the intensity and speed of such changes are challenging for complex urban environments (UNESCO, 2011). The traditional waterfront community with its diverse vernacular features was formed by the rich amphibious culture of an aquatic environment. It is regarded as a unique housing standard, reflecting the surrounding environment and living behavior of everyday life (Kwansuwan, 2014). This association between socio-environmental activities and physical structure carries a milestone of social transition from past to present cultures.

A complex set of transnational problems have been brought about by global environmental issues. Several communities are being threatened by serious physical structural alterations and inappropriate development controls. Rapid urban growth poses crucial cultural questions for modern society. Urban development has grown, leaving the remaining riverside ruinous, neglected, and abandoned. This similar tendency has occurred from place to place. New socio-economic activities mean that communities are seemingly prone to losing their authenticity. As a consequence, the cultural values of communities are gradually disappearing.

Despite the fact that the study of a traditional settlement in its natural environment offers an outstanding example of human adaptability to the contemporary environment, there is limited previous research on the monitoring and management of the waterfront community in the Chao Phraya River Basin to provide an overall picture.

This study aims at giving a systematic overview of the traditional waterfront community complex in the Chao Phraya River Basin, to identify the phenomenology and salient features that characterize it, on the basis of historical literature and field survey investigation. Macro scale analysis was used to focus on the bigger picture of community complexity and vernacular architecture throughout the river basin to encode the association of socio-economic activities, environmental features, and physical structure. Contextual characteristics, including specific features and components, also provide practical ways to monitor and safeguard the traditional community and related cultural activities *in-situ*.

2.2 Research methodology

The sample selection procedure was carried out using the Housing and Communities Standard (APTU, 2010) and Cultural Environment Standard Project for the Historic Community (ONEP, 2012). 138 traditional waterfront communities (fig.14) in the Chao Phraya River Basin and its neighbors the Bang Pakong and Mae Klong River Basins, were selected for survey and analysis by the purposive selection method. The sample represents all archived traditional communities authorized by the government. Thus, there are no sampling errors due to the small sample size.

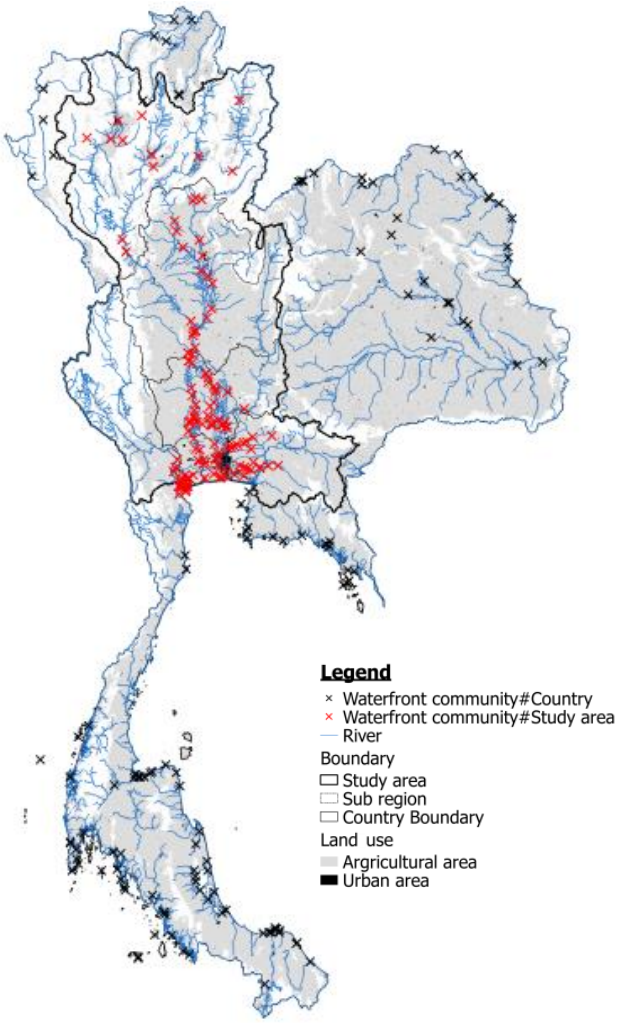

Figure 14 Map showing location of traditional waterfront communities

The quantitative data collection was conducted using field investigation based on empirical data during October, 2014 to March, 2015. The survey was designed to collect and evaluate the validity of properties using binary measurements (yes/no) in actual contions to avoid any bias caused by inequality. The evaluation criteria covered four domains, 13 categories, and 51 measurements to reveal the complexity of urban organisms (Bandarin & Van Oers, 2012), including the broader urban context in the setting of its geographical waterfront community.

1. Waterbody and geographical features
    - Water features (dug canal/natural canal/river)
    - River basin (three major river basins)
    - Region (mountainous area/central plains upstream/ upper delta/lower delta)
2. Cultural landscape and agricultural activities
    - Orchard/paddy field/salt-paddy/forest/fishing agricultural landscape/estuary and coastal landscape
3. Urban components
    - Functional settings (raft/commercial/residential)
    - Settlement pattern (linear/dispersed/nucleated)
    - Important urban feature components (wooden bridge/elevated walkway/urban pier/water front corridor/fishing and agricultural structure/central market/flea market/shrine/temple)
4. Architectural features
    - Building typology (row house/traditional Thai house/vernacular house/raft house)
    - Construction material (bamboo mixed/hardwood)
    - Durability (temporary/permanent)
    - Flooring (single floor on high stilts/single floor on ground/double floor on ground)
    - Basement structure (on land/amphibious structure/raft structure)

- Important architectural features (waterfront pavilion/fully open front facade / enclosed walkways/movability/granary, barn, and storage structure/processing plant/pier)

The study was performed using two steps of analysis.

2.2.1 Hierarchical Clustering and Decision Tree Analysis

Hierarchical clustering was the main tool used to group similar communities as a starting point towards understanding the complexity of the traditional waterfront community in a specific geographical area. These conceptually meaningful groups of the community share common characteristics, which play an important role in how the community is described and analyzed (Pang-Ning, Michael, & Vipin, 2005).

Based on the clustering results, decision tree analysis is used to interpret characteristic of cluster membership and to specify influential classification factors. The decision tree consists of nodes and branches representing sequential decisions. The first node is divided in accordance with the most influential factor. Besides, the decision tree model is applicable to predict the target cluster for further archived communities based on input variables.

2.2.2 Principal Component Analysis (PCA)

The analysis extracted observed the data of 51 binary-variables (from observed data) with seven cluster binary-variables (from clustering results) to examine the correlation of actual variables measured. Since the data consists of a large number of variables, it might be unstable for proper interpretation. It is therefore essential to reduce the number of variables into a linear combination which corresponds to a principal component.

At this stage, the PCA coefficient was complemented to describe the correlated variables of each PCA, which was then interpreted and labelled according to outstanding characteristics and preferences. However, a larger correlation was considered with strong importance on each

component. This is necessary for identification of the hidden structure and pattern in the data set. In addition, qualitative assessment of secondary document collection, legislation, previous and present public policies, research, and criticisms were used to support the argument for statistical analysis.

2.3 Result

The result reported qualitative components through quantitatively based surveys. Each domain contained several detailed empirical evaluations to explore the validity of the traditional waterfront community complex.

2.3.1 Hierarchical Clustering and Decision Tree Analysis

Hierarchical clustering was employed by the survey data set to identify similarities in data distribution patterns among communities. Clustering was implemented using the complete linkage method in order to find similar clusters. To determine the number of cluster, the results complement qualitative assessment of each cluster inspected. As a consequence, seven major clusters (Clusters A to G) were identified based on their distinguishing features in the data set.

The set of clusters were used as target variables in generating the decision tree (fig.15). The result consisted of 14 nodes and 9 terminal nodes in three layer depths. As in the first node, the cultural landscape and agricultural activities were the most influential factors in classification. Subsequently, functional settings, sub-region, and settlement patterns were assigned into the leaf node, and water features were added at the end. This information is considered to be a significant key point for labelling the clusters in the next section.

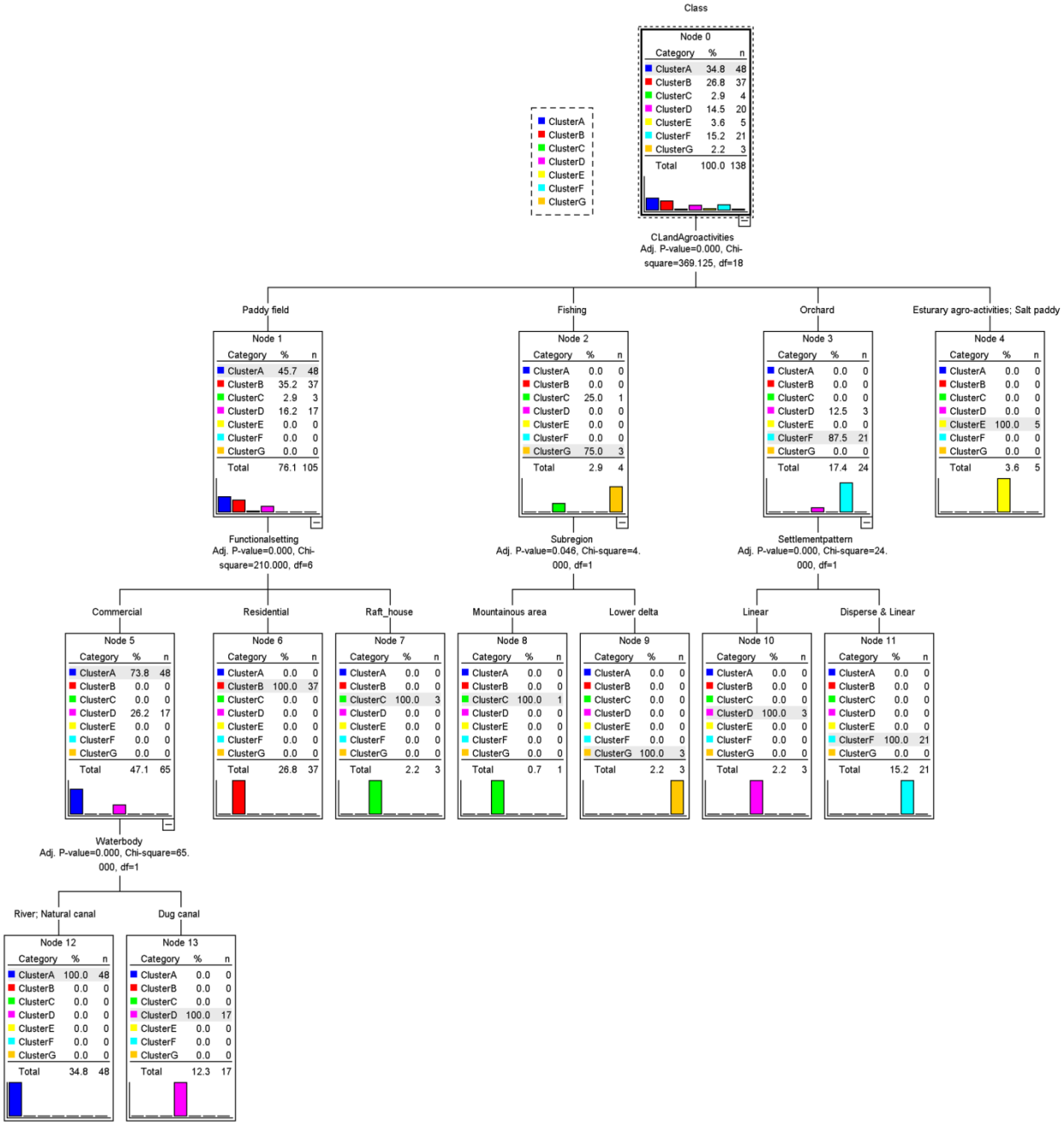

Figure 15 Tree diagram using the CHAID growing method

2.3.2 Principal component analysis

PCA grasps complex variations in the traditional waterfront community. The result revealed the emergence of 6 set components of 7 clusters. Scree plot was used in principal components analysis to visually assess which components explain most of the variability in the data. Scree plot shows that 6 of those components explain most of the variability

The p-value was used to determine the correlation value which has significant importance for data sets. A factor analysis was conducted on 56 different characteristics of waterfront community. Thresholds for factor loading cut-offs at 0.5 for about 120 samples (Hair et al, 1998). A factor loading value above 0.5 (p-value ≤ 0.05) is deemed important to give tangible meaning to association. The remaining factors explain a very small proportion of the variability and are likely unimportant.

The principal component index (PCI) is reported in Table 2. Variables were arrayed, and correlated within their components. PCA emphasis the validity of characteristics commonly found in each cluster. PCA1 considers as many of the variables as possible in the data set, and the other components (PCA2 to PCA6) explain the remaining variables. However, it is necessary to exercise caution on these points since on the basis of a correlation coefficient alone, no matter how large, it cannot be said that one variable creates another. In order to do that, logic, additional evidence, and/or analysis must be applied as the measure states the degree of relationship and nothing more (Deutschmann & McNelly, 1964). Interpretation of the PCI with respect to the values is described in the next section.

2.4 Characteristics and classification

To label clusters, PCA and qualitative assessment were used to extract the main characteristics of the traditional waterfront community comprised in each cluster, and these were then described according to their cluster preferences (Table 3). The combination of clusters depicts the richness of data in the process of ongoing transformation for the waterfront community. This is characterized by the wave of transformation caused by socio-economic requirements through the years. These forces reflect the ‘spirit of place’ and are crucial to the understanding of contemporary society, together with the scenic environmental surroundings of the waterfront community.

Table 2 Principal Component Index

* (correlation value above 0.5 was considered significant)

** Red emphasized distinguishing feature in each PCA, and not repeat.

PCA1	*r*	PCA2	*r*	PCA3	*r*
Commercial	**0.91**	**Cluster C**	**0.99**	**Cluster F**	**0.92**
Fully open front facade	**0.90**	**Movable**	**0.99**	**Orchard**	**0.90**
Shrine	**0.90**	**Raft**	**0.99**	**Waterfront pavilion**	**0.89**
Central market	**0.87**	**Temporary**	**0.99**	**Disperse**	**0.88**
Row house	**0.85**	**Raft house**	**0.99**	**Processing plant**	**0.79**
Double floors on ground	**0.82**	**Raft structure**	**0.99**	**Mae Klong River Basin**	**0.73**
Cluster A	**0.80**	**Elevated walkways**	**0.69**	Lower delta	0.59
Urban pier	**0.67**	**Wooden bridge**	**0.69**	**Pier**	**0.54**
Nucleated	0.48	Single floor on ground	0.41	Flea market	0.48
Enclosed walkways	0.43	Central plains upstream	0.31	Urban pier	0.44
River	0.24	Pier	0.22	Waterfront corridor	0.44
Paddy field	0.23	Fishing	0.21	Residential	0.27
Central plains upstream	0.23	Shrine	-0.17	Granary and storage structure	0.27
Pier	0.22	Granary and storage structure	-0.18	Amphibious	0.26
Cluster D	0.21	Commercial	-0.18	Fishing and argricultural structure	0.23
Amphibious	0.19	Fully open front facade	-0.18	Temple	0.22
On land	-0.17	Temple	-0.18	Single floor on ground	0.22
Mountainous area	-0.20	Urban pier	-0.21	Dug canal	0.21
Cluster F	-0.21	Single floor on high stilts	-0.23	Row house	0.21
Processing plant	-0.23	On land	-0.33	Bamboo	0.19
Waterfront pavilion	-0.24	Permanent	-0.99	Linear	0.17
Disperse	-0.24			Enclosed walkways	-0.17
Natural canal	-0.41			Nucleated	-0.18
Linear	-0.46			Cluster A	-0.18
Vernacular house	-0.48			Double floors on ground	-0.20
Traditional Thai house	**-0.61**			Mountainous area	-0.21
Temple	**-0.61**			Commercial	-0.23
Single floor on high stilts	**-0.66**			On land	-0.24
Cluster B	**-0.77**			River	-0.25
Fishing and argricultural structure	**-0.87**			Shrine	-0.25
Granary and storage structure	**-0.88**			Upper delta	-0.41
Residential	**-0.91**			Cluster B	-0.48
				Chao Phraya-Thachin River Basin	-0.60
				Paddy field	-0.84

PCA4	*r*	PCA5	*r*	PCA6	*r*
Cluster D	**0.88**	**Cluster E**	**0.88**	**Cluster G**	**0.87**
Dug canal	**0.77**	**Salt paddy**	**0.67**	**Fishing**	**0.83**
Amphibious	**0.69**	**Estuarine and coastal landscape**	**0.56**	Vernacular house	0.41
Enclosed walkways	**0.66**	**Nucleated**	**0.50**	Amphibious	0.36
Single floor on ground	**0.64**	Wooden bridge	0.39	Waterfront corridor	0.36
Waterfront corridor	**0.57**	Elevated walkways	0.39	Mae Klong River Basin	0.20
Lower delta	0.56	Natural canal	0.35	Processing plant	0.18
Bang Pakong River Basin	0.35	Lower delta	0.25	Cluster F	-0.17
Pier	0.35	Traditional Thai house	0.18	Paddy field	-0.18
Linear	0.31	Disperse	0.18	Chao Phraya-Thachin River Basin	-0.18
Fully open front facade	0.21	Processing plant	0.17	Waterfront pavilion	-0.20
Shrine	0.18	Cluster B	-0.18	Linear	-0.24
Urban pier	0.18	Row house	-0.21	Urban pier	-0.27
Granary and storage structure	-0.17	Paddy field	-0.28	Traditional Thai house	-0.32
Mountainous area	-0.18	River	-0.34	On land	-0.36
Temple	-0.24	**Linear**	**-0.51**	**Hardwood**	**-0.62**
Upper delta	-0.24				
Chao Phraya-Thachin River Basin	-0.27				
Single floor on high stilts	-0.29				
Nucleated	-0.31				
Central plains upstream	-0.32				
Double floors on ground	-0.41				
Cluster A	-0.48				
On land	**-0.66**				
River	**-0.66**				

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 6 iterations.

Table 3 Description of clusters

Cluster	*PCI*	*n*	*Description*
Cluster A	PCI 1	48	Riverport town
Cluster B	PCI 1 (negative)	37	Paddy village
Cluster C	PCI 2	4	Raft community
Cluster D	PCI 4	20	Canal trading village
Cluster E	PCI 5	5	Estuarine agricultural village
Cluster F	PCI 3	21	Orchard village
Cluster G	PCI 6	3	Coastal fishing village

Since paddy fields dominate a large part of the basin, *rice cultivation clusters* represented the majority of the cluster population, commonly located in the central plains. Wide varieties of indigenous architectural detail and material have been invented to suit endemic economic and environmental conditions. The *Riverport town (Cluster A, PCA1 positive, fig.16)* is characterized by traditional double-floor wooden row houses with a central market where the public pier is located at the waterfront. The cluster is settled in single-centric (nucleated) plan surrounded by agricultural areas of paddy fields and post-agricultural products (rice mills) and the center for trading along the main river. The settlements are along the main transportation route running through the north-south corridor of the Chao Phraya River and influenced by activities for economies of scale. Market clusters have been associated with Chinese immigrants since the early Rattanakosin period, who made a significant contribution to the development of the Canal trading villages and agricultural product distribution network (Tachakitkachorn & Shigemura, 2005). Thus, there is a Chinese shrine in the center of the commercial community. A combination of Thai-Chinese culture has created unique architecture to coincide with the cultural landscape.

Riverport town
Commercial
Fully open front facade
Shrine
Central market
Row house
Double floors on ground
Cluster A
Urban pier

Figure 16 Riverport town of Sriprajan community

These market communities are bonded in the *paddy village (Cluster B, PCA1 negative, fig.17)* of the central plains to the corridor. Granary stores, barns, and other agricultural related structures (including fish trapping) are the main features of the community cluster. The agricultural activities associated with housing and the environment were built using vernacular and/or a traditional Thai house structure, on land with a raised floor on high stilts. The houses were clustered around the community space which contained a Buddhist temple.

Paddy village
Residential
Granary & storage structure
Fishing & argricultural structure
Cluster B
Single floor on high stilts
Temple
Traditional Thai house

Figure 17 Paddy village of Bangbaan community

The *raft community (Cluster C, PCA2, fig.18)* was very popular, especially during the Ayutthaya and early Rattanakosin periods. Raft houses were very practical for the flooding conditions of the central flood plain (Panin, 1999). As the only on-water-surface structure it can be easily transportable up and down the river. Due to the temporary nature of the raft house, it can easily be destroyed. Since 1945 the raft house clusters in Bangkok have disappeared (Denpaiboon, Tohiguchi, Matsuda, & Hashimoto, 2000). Only four authentic raft house clusters were accepted as traditional settlements under threat. As a consequence of socio-economic transformation, the raft house was not suitable for the safety and hygienic standards of modern urbanization. This therefore presents a predicament for the continuation of a raft culture. Raft house clusters intrude on the public waterways and offer extremely poor housing and environmental conditions. After Thailand's environmental law was enacted in 1992, raft house clusters were deemed as undesirable. Governmental sectors considered the existence of the raft house cluster as a pollutant and going against the policy of a 'healthy city'. The raft house dwellers were offered resettlement on land.

Raft community

Cluster C

Movable

Raft

Temporary

Raft house

Raft structure

Elevated walkways

Wooden bridge

Permanent (Negative)

Figure 18 Raft house of Sakeakrang River

The expansion of dug canals along the east-west corridor from Bangkok to the peri-urban agricultural frontier was initiated in the 1860s and new watersides were claimed for agriculture and housing development. Soon after, during the new canal construction, trading began, turning the

canal network into a commercial hub for agricultural and agro-industrial products. Agricultural land was connected to the network system by *the Canal trading village (Cluster D, PCA3, fig.19).* Typical single-floor wooden row houses were clustered on the east-west corridor of the lower basin. The houses were positioned along one-side or both-sides of the waterways of the commercial hub. The cluster was built adjacent to the canal, with the walkway running in-between. This corridor served as a common/shared veranda, one of the smallest public spaces, and connected to the row houses. Functionally, the housing combined a shophouse and residential unit, connected to the agricultural landscape and product suppliers at the rear.

Canal trading village
Cluster D
Dug canal
Amphibious
Enclosed walkways
Single floor on ground
Waterfront corridor
Lower delta
On land (Negative)
River (Negative)

Figure 19 Canal trading village of Raheang canal

In the lower delta, the diversity of the cultural landscape has influenced agricultural activities. The wide varieties of agricultural activities were caused by the nature of estuarine water circulation. In general, the area has been influenced by the tides and seawater covering most of the lower delta. The estuarine-agricultural activities and associated structures, including shrimp farm shelters, coconut farms and processing plants, nipa shingles, mangrove wood charcoal plants, and salt paddy plants, were important features of the *Estuarine agricultural village (Cluster E, PCA4,*

fig.20). The community of single-centric wooden houses were built on land and clustered around a Buddhist temple, surrounded by agriculture.

Estuary agricultural village

Cluster E

Salt paddy

Estuarine and coastal landscape

Nucleated

Linear (Negative)

Figure 20 Estuarine agricultural village of Bangkeaw salt paddy

The *Orchard village (Cluster F, PCA5, fig.21)* combined orchards, shophouses, row houses, and a market. The clusters subsisted on the agricultural activities of the orchard landscape complex which exerted influence on material cultural design. Dispersed settlements were associated with the orchardist agricultural landscape and salt paddy agricultural areas. Land use and area consumption based on function illustrated a long distance association between agricultural areas, processing plant, community, and market. Agro-processing activities incorporated local-made machinery and factories, such as mills, stoves for stewing coconut sugar, traditional sweets, etc., and were scattered throughout the canal network. The agro-products were usually self-marketed within the market cluster in the collection/distribution hub of the tributaries.

Orchardist village
Cluster F
Orchard
Waterfront pavilion
Disperse
Processing plant
Mae Klong River Basin
Lower delta
Pier
Chao Phraya-Thachin River Basin (Negative)
Paddy field (Negative)

Figure 21 Pradoo canal Orchard village

Fishing village
Cluster G
Fishing
Hardwood (Negative)

Figure 22 Leam yai fishing village

The amphibious vernacular community housed on high stilts in the *fishing village (Cluster G, PCA6, fig.22)* demonstrated outstanding fishing activity in the lower delta and related estuary areas. Fishing and fish processing related structures were a result of important activities related to the wetland culture. It was primarily used for wetland resources vulnerable to conversion for global environmental reasons. A series of wooden houses with an attached pier were aligned along the canal network, connected to offshore fisheries and '*Krateng*'. The '*Krateng*' architecture involves a wooden shelter for local fisheries built on high stilts to monitor the cockle farms.

However, most of the remote and isolated '*Krateng'* are currently used by tourists as an exotic destination.

The community-based agricultural clusters were culturally landscape oriented, where the clusters and associated structure ensembles took a different form depending on specific agricultural activity. The cluster accommodated a variety of agriculture and storage structures characterized by the diverse cultural landscape, especially in the lower basin. Diversity of the cultural landscape and agricultural activities exerted influence on the settlement pattern and architectural design. Remaining traditional villages and communities were settled in the agro-rural area associated with the immediate agricultural landscape, as shown in Figure 23.

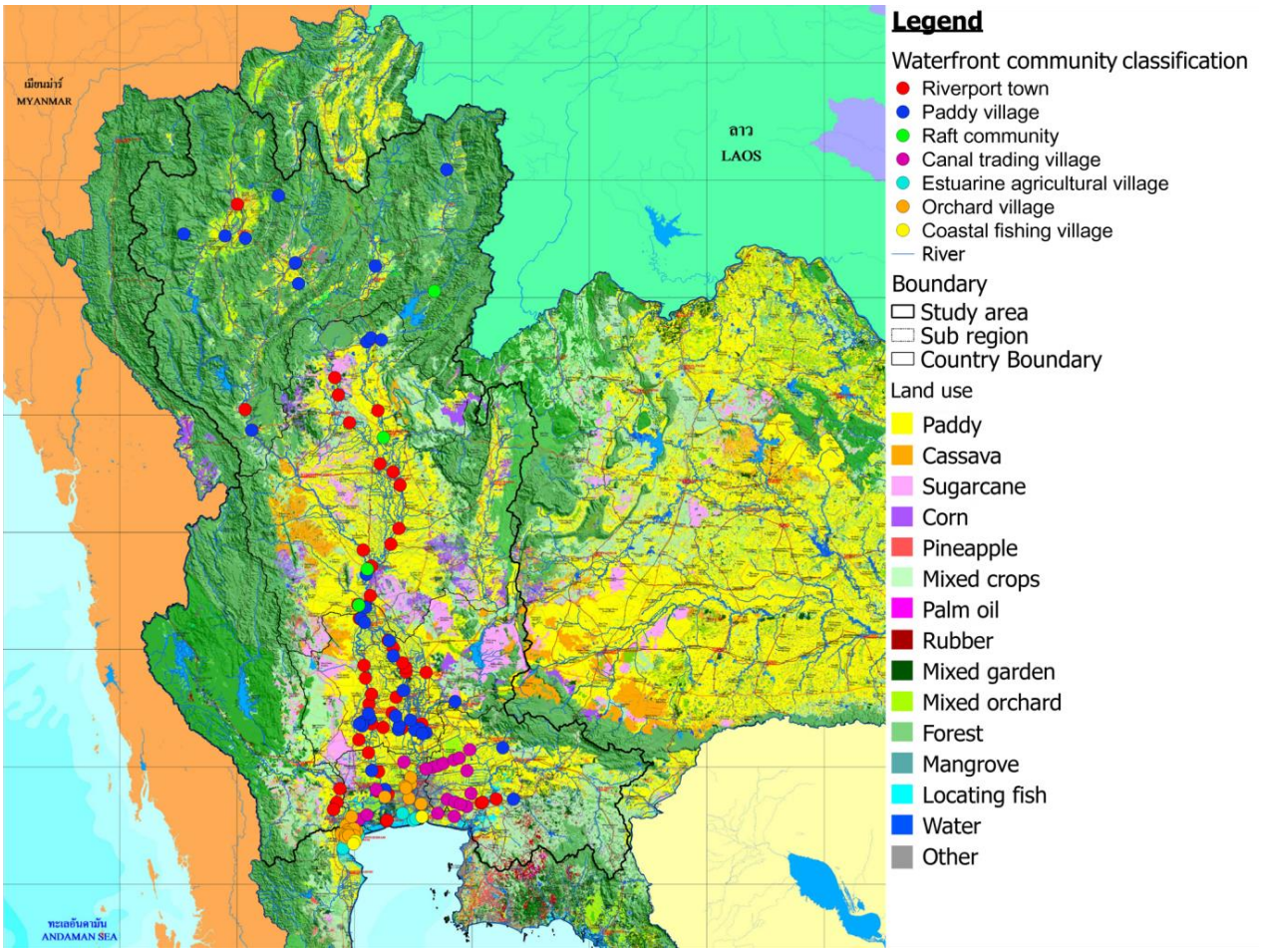

Figure 23 Land use map showing location of traditional waterfront cluster
(Basemap: Land use from sattelite Lansat 5 in 2005, Source: Ministry of Agriculture and Cooperatives)

2.5 Chapter synopsis

The traditional waterfront community in the Chao Phraya River Basin was classified into seven clusters based on common preferences consisting of a Riverport town, paddy village, raft community, Canal trading village, Estuarine agricultural village, Orchard village, and fishing village. These clusters show the diversity of the cultural landscape and agricultural activities exerting influence on the community complex.

Since the rice paddy dominated most of the agricultural land in the river basin, the majority of the cluster population contained a rice cultivation community. The center for rice trading along the north-south corridor was a Riverport town where the rice-cultivated residential community of the paddy village was bonded to the corridor. Along the line, raft communities were able to travel up and down the river; however, since the 1950s these unique housing communities have gradually disappeared as a consequent of modernization. Cluster typology diversity was assembled in the lower delta. The trading center along the east-west corridor was characterized by the wooden row houses of the Canal trading village at the collection/distribution hub of the tributaries supplying the agricultural landscape oriented vernacular community of the Estuarine agricultural village, Orchard village, and fishing village.

The results express the identity of regional geography, not merely the physical structure and agricultural landscape associated with local practices representing evidence of past indigenous water-based settlements in Ayutthaya and Bangkok. The remaining physical structures share the common appearance of regional vernacular architecture. This reflects the mixture of influences, creating a unique architecture, culture, and townscape. The clusters share common features but maintain their uniqueness. Each cluster is associated and considered a counterpart, representing an ensemble of the cultural diversity of man, architecture, urban development, and environment.

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Chapter 3
Influence of Water Circulation on the Living Culture

This chapter was published in Yodsurang, P., and Uekita, Y. (2015) A Traditional Community in the Chao Phraya River Basin II: Influence of Water Circulation on the Traditional Living Culture according to the Settlement Pattern. Asian Culture and History, 8(1), 112-125., http://dx.doi.org/10.5539/ach.v8n1p112

3.1 Introduction

Water is life, and culture is the essence of life. It has supported rich biodiversity and provided cultural services to communities. The water-based communities are considered as cultural manifestations of water importance (Papayannis and Pritchard, 2008). The waterfront settlements, with their living culture, largely remain in Southeast Asian countries. The settlements have constantly adapted to environmental and social transition from past to present cultures (UNESCO, 2011). Community vernacular architecture is always changing to suit the current socio-economic environment. New functions respond to modern activities, expressing the ability of man to take charge of shaping his environment by his great capacity for adaptation, appropriation, and creativity (Guillaud, 2014).

People have gradually adapted their living spaces to meet the needs of life and way of living. This has indeed affected original spaces, but the identity of a place still maintains (Kwansuwan, 2014). Thus, the cultural embodiment of vernacular architecture involves the requirement of users at the time of building and how these may have been adapted to suit changing needs (Oliver, 1987).

In the Chao Phraya River Basin, diversity of the agricultural landscape and cultural activities reveal the complexity of traditional waterfront communities. Everyday life in the traditional community complex is about being in harmony with all other aspects of the system to which it belongs. The deep traditional living pattern provides some useful reference, while looking towards the sustainable development of society as a whole in paying attention to its ancestors. The remaining

community demonstrates human adaptability to modern conditions. However, the intensity and speed of such changes are challenging complex urban environments in contemporary society. With high dynamicity, this important amphibious lifestyle is gradually changing due to rapid economic growth.

This study aims to provide significance to the cultural human living pattern in the Chao Phraya River Basin settlement. Based on contextual characteristics of the waterfront community complex, this study reveals the living patterns, influence, and declination through analyzing the relationship between settlement patterns, way of life, and environment.

3.2 Research methodology

The methodology is based on a qualitative approach, in order to examine the general pattern of amphibious livelihoods from past to present, including changes and processes of adaptability/declination. The analysis is intended to reveal contextual characteristics and cultural patterns of the waterfront community, geographical features, agriculture and fishing production activity, and lifestyle changes as a result of modernization. The research procedure uses two investigative steps:

a. Reviewing historical documents, past and present legal measures, previous research studies, and criticisms in order to find a common ground for the existence of the waterfront community complex.
b. Interviewing and observation of methods of living in balance with surrounding environment and have allowed the sustained development of the continuing culture, as well as the ideas of the construction of historic wooden structures and vernacular heritage

Traditional waterfront communities in the Chao Phraya River Basin were selected for the case study to grasp the complexity of the indigenous daily lives of an amphibious culture. From the archives of 138 traditional waterfront communities, the traditional waterfront community in the Chao Phraya River Basin was classified into seven types of cluster based on common preferences. These consist of a paddy village, orchard village, estuarine agricultural village, coastal fishing village, riverport town, canal trading village, and raft community (Yodsurang et al., 2015). These clusters are representative of human settlements in the river basin which have been influenced by diversity of the cultural landscape and agricultural activities.

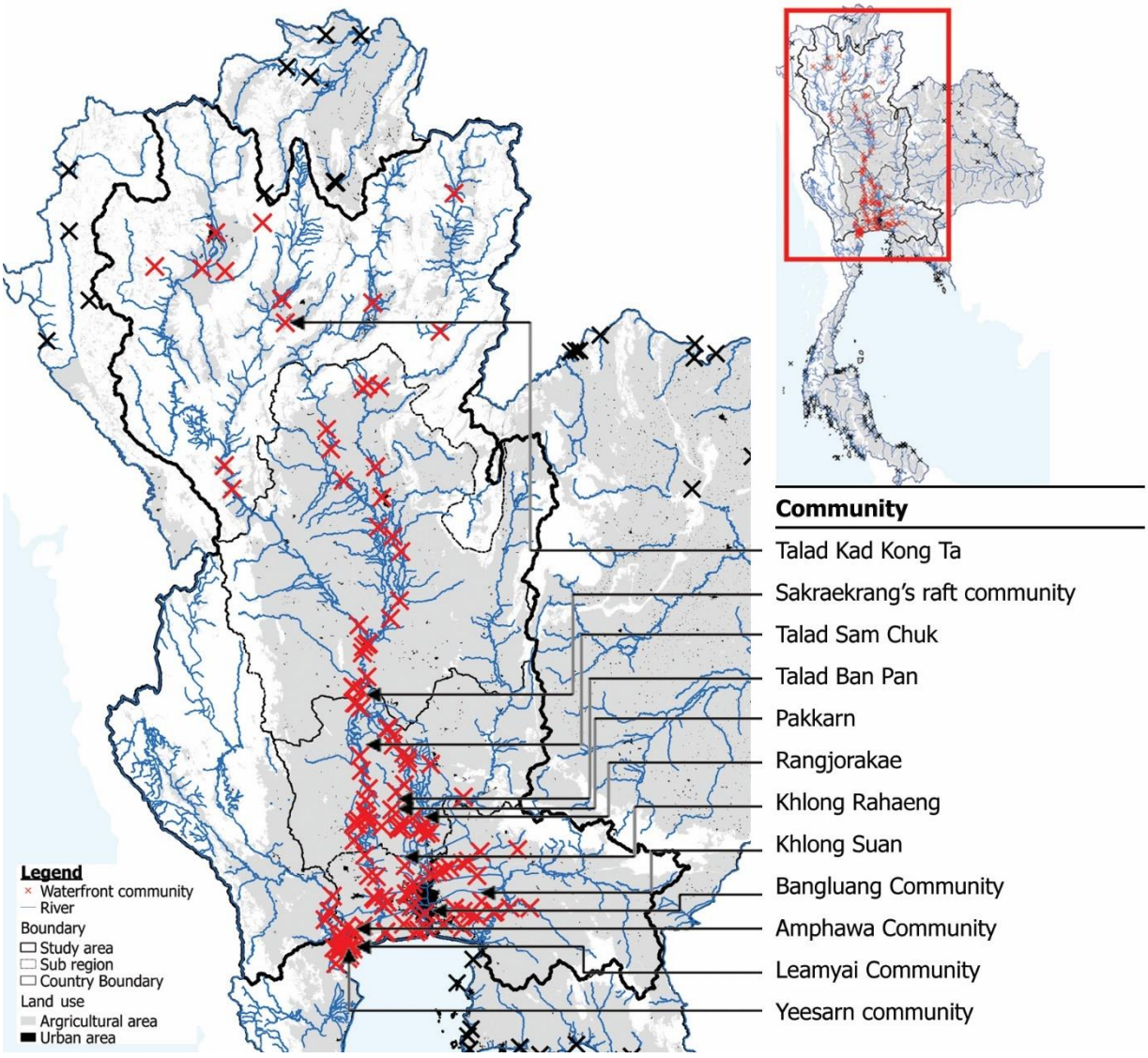

Figure 24 Location of selected case study

An in-depth field investigation survey was carried out using seven sample clusters throughout the river basin. The critical case sampling method was used for the case study selection procedure since it was likely to provide the most informative and illustrative sample. The matching case selection was based on a study by Kwansuwan (2014) which mentions the spatial configuration of a typical traditional village, revealing the association between agricultural area, village, and waterbody. The sampling selection was screened for either an actual or probable match in the traditional conditions, and twelve communities were included as a result (fig.24, Table 4).

Table 4 Selected case studies

	Cluster type	***Selected community***	***Function***
1	Riverport town	YaanKarnkha Talad Kongta	Wood log trading port
			shopping street, weekend market, residential, tourist attraction
2		Talad Baanpan Community	Rice trading port
			Urban market
3		Talad Samchuk Community	Cotton trading =>Rice trading port
			Local market, weekend market, tourist attraction
4	Paddy village	Pakkran Community	Rice and other corps producing community
5		RaangJorakae Community	Rice and other corps producing community
6	Raft community	Raunpae Meanam Sakraekrang	Market-fronted floating shophouses
			Residential unit
7	Canal trading village	Klongsuan Community	Local trading hub
			Weekend market, tourist attraction
8		Klong Raheang	Local trading hub
			Weekend market, tourist attraction
9	Estuarine agricultural village	Khaoyeesarn Community	Estuarine food and mangrove product producing community Residential area, tourist attraction
10	Orchard village	Amphawa Canalside Community	Orchard farming and market mixed community
			Weekend market, tourist attraction, agricultural community
11		Chumchon Klong Bangluang	Orchard farming and market mixed community
			High dense residential area, tourist attraction
12	Fishing village	Leamyai Community	Off-shore food and mangrove product producing community

3.3 Result: Traditional environment and livelihoods

3.3.1 Agricultural villages

Those cultural landscapes associated with agricultural activities were represented by agricultural villages, as testimony to the human and structural adaptation of the surrounding environment of the Chao Phraya River Basin. A unique cultural pattern illustrates the settlement characteristics.

A) Paddy village

The indigenous people of the Chao Phraya River Basin were predominantly reliant on rice cultivation, covering over half of the total land use. However, the village and associated structures were represented by modest cultural practices related to their agricultural activities. The surrounding environment exerted influence over settlements and livelihoods, not religions or beliefs (Muadthong, 2005).

Figure 25 Group of housing in Rangjorakae community

Figure 26 Traditional house in *Pakkarn* community

The remote *Pakkarn* (fig.25) and Rangjorakae communities (fig.26) in Ayutthaya Province provide an outstanding example of the living practices of paddy people. Communities were located on floodplains which were seasonally under water. This phenomenon created a unique characteristic where both tangible and intangible structures responded to flooding conditions. The flooding season from September to November with water depths of between 80–120 centimeters assists traditional rice growing (Sunsuwan, 2013). Water overflowed from the river through to the space underneath the house, spreading across the field. People were living in a world almost entirely submerged by water. Over these three months, life relied more on boats and fishing. The activities of daily life moved to the upper floor which was raised above the highest water level.

Harvesting started in early December after the water level had decreased and the rice burst forth into kernels. Post-harvested grain might contain a lot of moisture and dirt courts were used to dry it off. This created a large open space in between a group of houses and the rice field, and was

one of the most important features of the paddy village, representing a plentiful, locally grown, healthy and lively community culture. Rice products were collected by boat and then transported and processed at market communities.

In the 1860s, agricultural reformation created a significant impact on the frontier. The Bowring Treaty forced the country to lift all barriers on rice trade, emphasizing the potential for export. The rapidly rising volume of exports was turning the traditional rice culture into a commercial production system (RRAFA, 2007). Rice became the major export crop while expanding the land for growing rice in accordance with canal development.

A monoculture-type export structure began in the 1960s (Urrutia and Yukawa, 1988). Since the new road system has reached rural villages, the demand and supply of rice crops have significantly increased. Villages producing rice crops evolved towards intensive farming, using mostly wage labor for cultivation. Traditional methods have been replaced by new machinery and technology. However, an environmental problem caused by modern agricultural waste has gradually occurred. Pesticide and fertilizer waste enters the surface water, and rivers then become polluted, turning into undesirable areas.

Meanwhile, water requirements have increased due to rice production requirements, and new irrigation systems have been provided. Dam and water gates were constructed on existing canals/rivers to control water flow in the dry season. As a result, water was unable to flow naturally. This has created a consequent impact on fishing potential as migratory fish cannot or have difficulty in getting across the water gate; fishing folk have since found it harder to survive.

However, agriculture has been in serious trouble since the 1980s (Siamwalla, 1996). It has been demoted from an engine of growth due to the lack of labor supply which has shifted concentration towards the industrial and service sectors (Suwannarat, 2011). Massive migration has led to the abandonment of agricultural areas. The working generation moved away, leaving older people and children behind. Indeed, traditional and old vernacular houses lay in ruins since the

durability of materials reached its limit due to lack of continuous care. It seems easier to build new houses than to repair broken ones which need more money and time spent on them, especially with the shortage of labor. Traditional communities have lost their adaptability towards modern requirements and threaten to disappear.

Cluster	*n*	*Community*	*Found*	*Current use*
Paddy village	37	Pakkran	Ayutthaya p. (over 250 years)	Rice and other crop-producing community
		Raang Jorakae	Ayutthaya p. (over 250 years)	Rice and other crop-producing community

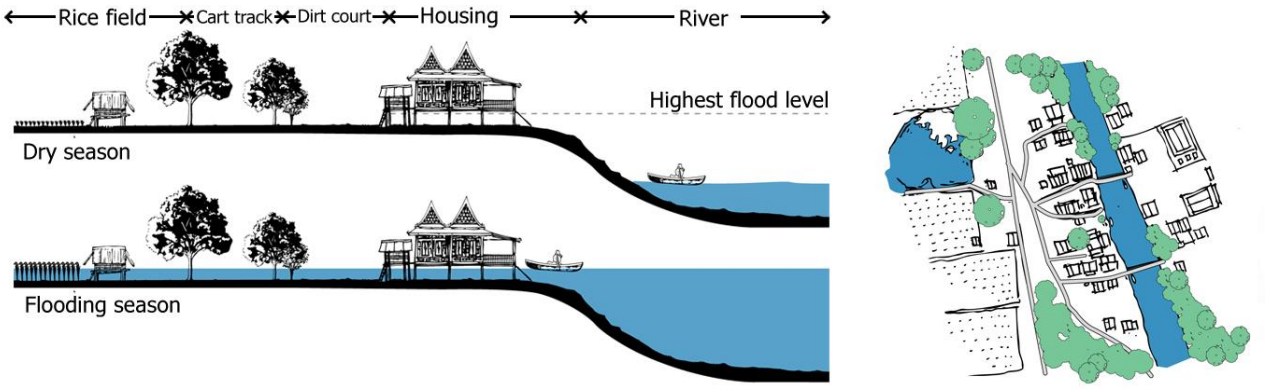

Figure 27 Typical features of traditional waterfront paddy village

B) Orchard village

The unique socio-economic activities in the orchard village complex, consisting of the isolated orchard with the local-made processing plant, marketplace, floating market, and traditional housing, were completed within a canal system. Agricultural and post-processed agricultural products were usually self-marketed. The orchard villages were scattered in the lower delta, located in brackish water territory. Agriculture and water management relied extensively on natural water circulation.

An outstanding irrigation network system connected the orchard ditches to canals and the larger river system. A branching network of ditches provided the main water supply to the inner land (Palopakorn, 2010). Individual orchard ditches joined parts together. Water was able to flow into the orchard ditches using high tide and low tide water circulation. As water ebbs and flows

twice a day, brackish water merges with fresh water, and therefore people managed to collect fresh water for their household and brackish water for agricultural purposes (Silapacharanan, 2007).

Figure 28 Processing plant in the orchard of Amphawa

Figure 29 Remaining market of the orchard village of Bangkok, Bangluang community

The Amphawa community (fig.28) in Samut Songkhram Province retained its integrity, even though some people were faced with abandonment and uncontrolled urbanization problems. Traditional settlements and waterfront livelihoods accommodating brackish water circulation were commonly seen. Processing plants, including those for coconut and palm sugar, still play an important role in the local economy, even though they have subsequently turned into nostalgic tourist destinations.

The only example remaining in the city of Bangkok is the Bangluang community (fig.29). It was a unique community along the old Chao Phraya River before the shortcut was created. The settlement represented a waterfront livelihood within the associated natural environment. Housing was aligned along the river strip, alternated by orchards, green spaces, and religious structures. However, since the change in socio-economic activities as a result of rapid economic growth and city expansion, orchards and green spaces have gradually decreased and turned into new development projects. The canal network system may still be seen but has been left unfunctionable. However, evidence of Bangkok's past still remains in tangible structures. The relationship between social spaces, pedestrians, vistas, social activities, and water-based environments created the fundamental city structure, making it unique (Wongtimarat, 2003).

Land transformation has consequently impacted on the water flow changes in the orchard farm land. The water distribution network used in orchards was hierarchical, resulting in the failure of a whole distribution system if any system member withdraws. While urban development gradually continued, most of the orchards and agricultural lands were replaced by road, housing estates, resorts, and even parking spaces. As a result, this increase in the impermeable water area has led to difficulty for the network of ditches flowing into the inner land. Slow or stagnant water flow has created pollution and flooding. Irrigation systems have been allowed to deteriorate, leading to subsequent abandonment.

Cluster	*n*	*Community*	*Found*	*Current use*
Orchard village	21	Amphawa community	Early Rattanakosin period (Approx 200 years)	Weekend market, tourist attraction, agricultural community
		Bangluang community	Early Rattanakosin period (Approx 200 years)	High density residential area, tourist attraction

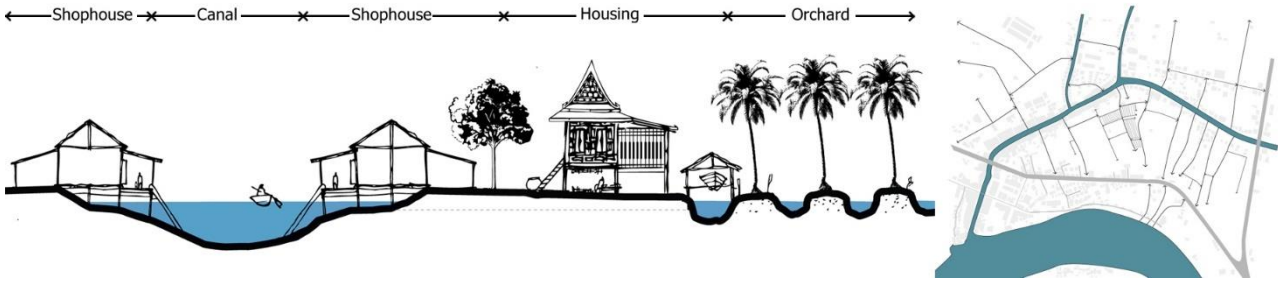

Figure 30Typical features of traditional waterfront orchard village community

C) Estuarine agricultural villages

Estuarine agricultural villages along the coastal region were influenced by seawater interpenetration, covering larger areas along the Gulf of Thailand coastline. The associated coastal vegetation of the settlement, such as mangrove forest, and Nypa palm, was extremely important to the indigenous environment. Mangrove forest remains important since it has an indirect impact on local livelihoods. Mangrove forest products were traditionally used for construction frameworks, while Nypa palm was commonly used for roof thatching and wall partitioning. In addition, mangrove charcoal and firewood remain an important source of fuel in the lower delta. The Yeesarn community (fig.31) in Samut Songkhram Province maintains a relationship between kinship, living conditions, and the settlement (Tragoonram, 2009). The single-centric community has been built on the uplands of coastal wetlands and mangrove swamps. The settlement is clustered around the Buddhist temple, surrounded by agricultural land and mangrove forest. The areas connected communities to remote farms and forest by natural canals (fig.32).

Figure 31 Yeesarn community

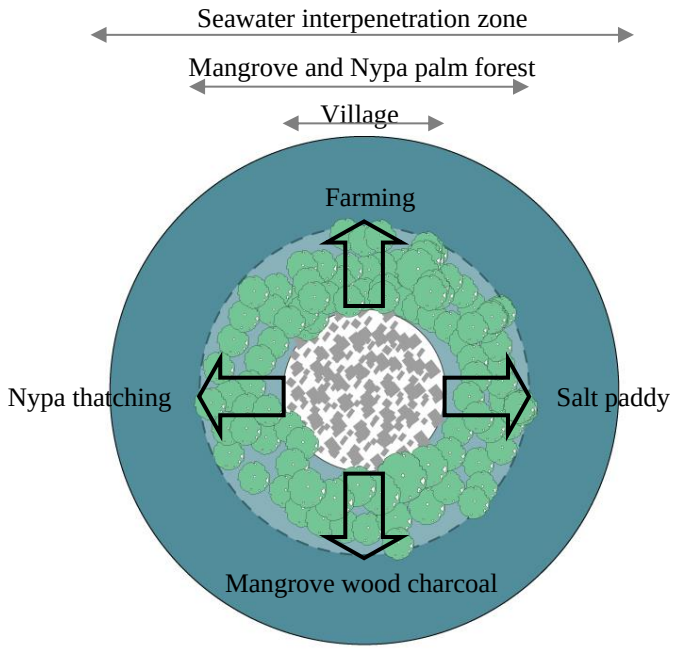

Figure 32 Conceptual diagram showing association between village, agricultural land and forest in the estuarine agricultural village

The brackish water agricultural activities including shrimp, fish, and coconut farms, as well as salt paddy, played an important role in supporting the local economy. However, intensive farming has produced both direct and indirect impacts on mangrove and other coastal ecosystems. In many cases, mangrove forests have been destroyed in exchange for pond spaces (Plathong and Plathong, 2004). The remaining residents were the older generation and the community faced depopulation issues. Older people were reliant on traditional fishing and vegetation at a moderate level with sufficient capital and labor. Besides, most of the old houses were left abandoned and remained in a ruinous condition due to lack of maintenance.

Cluster	*n*	*Community*	*Found*	*Current use*
Estuarine agricultural village	5	Yeesarn community	1703	Estuarine food and mangrove product-producing community, residential area, tourist attraction

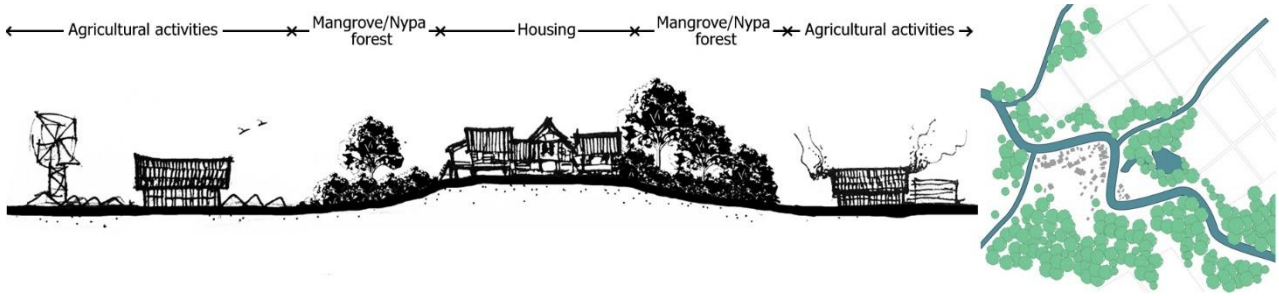

Figure 33 Typical features of traditional waterfront estuarine agricultural villages

D) Coastal fishing village

The coastal fishing village demonstrated an outstanding culture-based fishery in the related offshore area. The village, with its offshore fishing shelter (fig.34) was a prominent tangible structure representing a plentiful sea resource. Indigenous people relied on fishing and fish processing, which were important cultural modes of living in the wetlands. Since wetland resources are very sensitive to changes in the global environment, the lifestyles of the indigenous people were under threat and vulnerable to fluctuations in traditional socio-economic activities.

The Leamyai community (fig.35) in Samut Songkhram Province was a small fishing village located on the estuarine of the Mae Klong River. Vernacular architecture and its associated environment was a result of interaction between man and nature. Natural resources from mangrove products were commonly used as building construction materials. Mangrove wood was used as a construction framework, covered by Nypa shingles for roofing and partitioning. Offshore fishing was the traditional and primary economic resource of the local dweller, while coconut farming and other brackish water farming provided supplementary living. However, as with the other villages, the working generation moved towards the industrial sector for economic reasons. However, the socio-cultural conditions of the Leamyai community did not change that much, and ecological, social, and cultural resources still remain in good condition (Usupharat, 2013).

Figure 34 Krateng, offshore fishing shelter

Figure 35 Leamyai community

In the waterfront and water-related communities, fishing for a living was mandatory. Traditional methods and instruments are still being used today. However, overfishing and illegal

fishing practices using modern lighted nets and fishing traps has caused indiscriminate trapping of non-targeted fish and young animals. Since the EU issued a "yellow card" warning on Thailand's illegal fishing activities, the Thai junta has promulgated article 44 of the interim charter, which legalized the junta's hard order, to deal with illegal fishing (Ganjanakhundee, 2015). However, rigid law enforcement on the fishing industry opposes traditional fishing methods and faces a predicament because traditional fishing traps (subsistence fishing) are also prohibited. The banned traditional fishing traps are the "Ai Ngo" trap, "Sai Nang" trap, and "Pong Pang" stow nets because of their use of the lighted net trap and overfishing which creates an environmental hazard ("Knowing Pong Pang", 2015).

Cluster	*n*	*Community*	*Found*	*Current use*
Coastal fishing village	3	Leamyai community	80–100 years	Offshore food and mangrove product-producing community

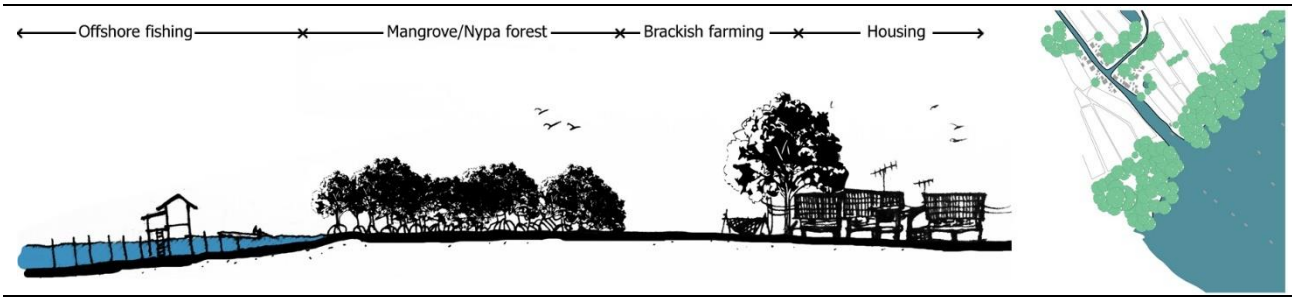

Figure 36 Typical features of traditional waterfront coastal fishing villages

3.3.2 The market communities

Chinese immigrants have contributed much to the development of market communities, since the indigenous people were not proficient in trading and traveling up and down the river. The market communities helped to connect agricultural villages to the river network system by their economic activities. Traditional market communities emerged on the transportation route junction; both on land to water and water to water trading routes.

The Canal trading village and water trading were first mentioned in the Ayutthaya period (Pongsripean, 2007) and became popular in the early Rattanakosin (Jiwakul, 1982) until reaching their peak after 1855 during agricultural transformation, particularly in the Central Region (Natsupa,

2002). They contributed much to the promotion and distribution of agricultural products from the Chao Phraya River Basin, such as rice, forestry products, tropical fruits, spices, etc.

However, there is a classic threat to the historical area from new urban areas which have grown along the modern communication axis. In commercial communities, the new towns, along with their infrastructure and modern facilities, have attracted new activities to the historical area. A number of roadside communities have formed to provide somewhere for people to shop. Roadside markets and convenience stores have been established, coming into direct competition with the old riverfront markets. The riverfront centers soon became obsolete due to their distance from the roadside markets (Sriwichien, Keeratiboorana, and Soungsaweng, 2015) and have been gradually abandoned and remain unfunctionable.

As a consequence of economic center shifting, declination has led to the closure of shops and people have had to look for work elsewhere. Besides, the problems of poor housing conditions and inadequate infrastructure made the communities uncompetitive in local markets. The units were fundamentally rental shophouses, thus it was not easy to be able to customize, remodel, or even change the layout. Accordingly, the existing structures and open spaces were difficult to adapt to the modern trade and market activities.

E) Riverport town

The riverport town was an urban commercial distribution/collection center for the agricultural products of the neighboring village. The settlement was scattered along the main river running north-south of the basin, commonly found at the point of convergence where the traditional cart track meets the river. Thus, there were both land and Canal trading villages.

Figure 37 Kongta community

The historical Kad Kong Ta community (fig.37) in the Northern Region of the Lampang Province was located in the middle of the Lampang Basin, surrounded by mountain forest. Kad Kong Ta (aka Chinese market) literally means river road market, and was one of the most important port towns of the Northern Region. In the past, cargo from Bangkok and the Central Region was unloaded here before being shipped to the neighboring and mountainous areas. Besides, during the nineteenth century Kad Kong Ta was very well-known as a teakwood trading center, which made a substantial contribution to Lampang's economic development, and attracted people from near and far, including Burmese, Tai Yai, Chinese, and British. As a result, the settlement turned into a multicultural community (Buranaart, 2014) with its remaining structures being represented by their ethnic origin, prosperity, and creativity. However, the age of declination started during World War II, particularly in the commercial market. Besides local market stagnation, the war affected immigrants who had previously contributed to commercial development. This is especially true in Kad Kong Ta, where the enemy residents, including British, American, and Dutch were forced to

evacuate and their concessions in properties such as forestry businesses were cancelled and taken over by the government for a short period during the war. However, the Chinese and Burmese were not treated as enemies, and thus they were able to stay and operate their businesses as usual (Uthongsap, 2012). The consequences of the war have brought about several changes to society. Subsequently, even though previous enemy properties were returned to private ownership, they were not attractive enough to bring the business back. However, in these unrivalled conditions, Chinese businesses flourished and were more active and vibrant than before.

The Ban Pan Market (fig.38) in Ayutthaya Province sat on the plentiful rice cultivation area of the Chao Phraya River Basin. The community was surrounded by numerous paddy villages, making it an important rice trading center for the Central Region. Rice and saw mills were the key to economic growth and drew people to the area. The earlier Ban Pan Market was located at a mooring dock for Chinese trading raft. Until its peak, the river was crowded with raft and boat houses, resulting in more people relocating onto land and permanently settling in shophouses. As a consequence, the market complex of shophouses was clustered close to the river, gradually expanding outwards. However, with the advent of modern trade and transportation, characteristic of raft houses, shophouses, and way of life changed. On the other hand, the architecture and transformation of the community were reflected in a consistent adjustment of the way of life (Klaichom and Pinijworasin, 2013).

Sam Chuk Market (fig.39) in the Suphan Buri Province was a wooden shophouse market cluster, and was previously the trading center on the bank of the Tha Chin River. The settlement evolved over time, from a local market into an important, more dynamic, commercial community (Jampanil, 2007). The settlement emerged as a local market and hawker center as it formed the junction between land trading routes to the Tha Chin River. In the beginning, Chinese people helped the community to achieve urbanization. Rental shophouses were built in response to the growth in trading activities of the newcomer population. The community reached its peak during

Figure 38 Banpan market

Figure 39 Samchuck market

modernization in the 1960s. The arrival of modern rice and sugar mills generated local trading/financing activities and created a local bursting economy. This made Sam Chuk Market a prosperous and successful community in the Central Region.

However, during the great urban expansion and development of infrastructure in the 1980s, roads became a crucial mode of transportation and watersides were left unused. The local economy was dominated by modern trade and culture. New town centers moved to the road axis. Traditional shophouses and market places were left abandoned and unfunctionable. As a result, this period created stagnation in the Sam Chuk Market and minor changes to socio-livelihoods. However, the market has since regained its popularity due to the boom in nostalgia tourism after the 2000s. Historic shophouses, local products, and traditional livelihoods fulfilled the requirements for a new tourism approach. Thus, the local economy is bursting once again, while retaining its traditional structure.

Cluster	*n*	*Community*	*Found*	*Current use*
Riverport town	48	Talad Kad Kong Ta	1877	shopping street, weekend market, residential, tourist attraction
		Talad Ban Pan	before 1876	Urban market
		Talad Sam Chuk	before 1896	Local market, weekend market, tourist attraction

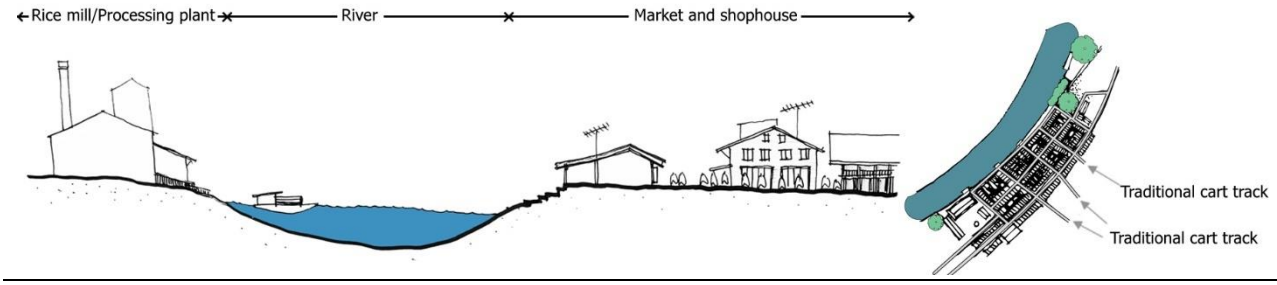

Figure 40 Typical features of traditional waterfront riverport town

F) Canal trading village

The canal trading village was a smaller trading center in the peri-urban area on the east-west canal network of the lower delta. During and after agricultural reformation as a result of the Bowring Treaty, the man-made canals developed substantially and expanded towards the agricultural frontier from Bangkok to neighboring regions. New canals reached remote areas, providing off season

farming possibilities. As a result, new developed land, particularly rice fields, became prosperous as the new breadbasket of the Central Region, creating an easier connection to Bangkok and other urban areas. The trading center settlement was located at the point where several canals crossed. New water transportation and irrigation systems have helped much in achieving global development.

Figure 41 Klongsuan market

Klong Suan Market (fig.41) was located in the Samut Prakan and Chachoengsao Provinces, along a man-made canal on the east canal network, where there was a strategic canal during the Thai-Vietnam war in the 1840s. The canal was extended once again to the Bang Pakong River in the 1880s and the Chinese coolie was employed as the main labor force. The new waterside was claimed for agriculture and housing development by aristocrats. Soon after and during the new canal construction, Thai, Chinese, Muslim, Mon, and Khmer people settled along the way and made a living (Preecha, 2008). Thus, they began trading and turning the area into a commercial hub for the agricultural and agro-industrial products of the canal network. A combination of Thai-Chinese culture created a unique architecture, coinciding with the cultural landscape.

Figure 42 Raheang market

Another important canal trading village located on the west canal network was Rahaeng Market (fig.42) in the Nakhon Pathom Province. The Chinese settlement was built as wooden shophouses along both sides of the canal. Both water and rail transportation contributed to Rahaeng's prosperous past. During this period, the canal network provided the mode of transportation, while rail travel attracted a mass of people to Rahaeng as the last stop on the Bangkok-Bangbuathong line (Visitthakul and Hawchareon, 2013). However, following the development of new urbanizations, road transportation has increased accordingly, and water and rail have become less important. The market has been depressed since 1952, when the railway service permanently ceased.

Cluster	*n*	*Community*	*Found*	*Current use*
Canal trading village	20	Klong Suan	1868–1910	Weekend market, tourist attraction
		Klong Rahaeng	1868–1910	Weekend market, tourist attraction

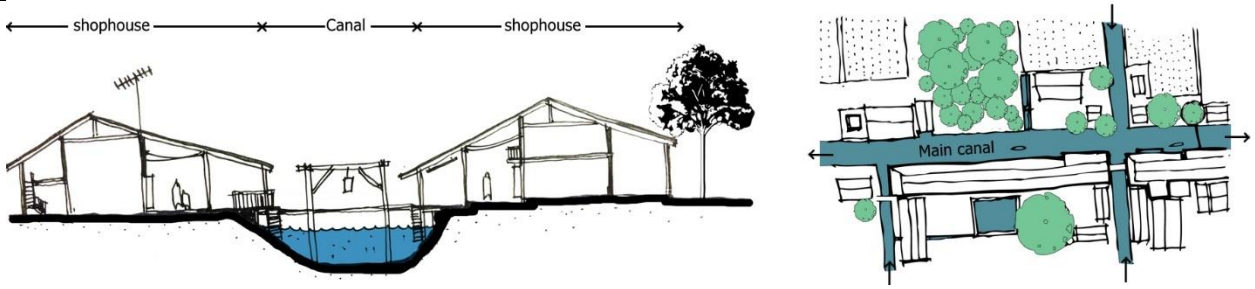

Figure 43 Typical features of traditional waterfront canal trading village

3.3.3 Raft community

Due to their practical adaptability to seasonal flooding and tidal waves, raft and boat houses were very popular in the early settlements and could essentially respond to water-based trading and land-free housing units for multiracial immigrants (Jansuebsri, 2009). Raft and boat houses could also be efficiently transported throughout the river and were able to settle wherever the seasonal trade and economic activities shifted to. The raft community usually clustered together with the riverport town, which was actively supported and stimulated as a front market.

G) Raft community

The unique and still existing Sakaekrang River raft community (fig.44) in Uthai Thani Province is an outstanding raft community of the basin. Over three generations of raft people have settled here and made their living by mixing trading, agriculture, and fishery (Kritsanapan, 2012). Traditional skills relating to water and water circulation have continually passed from generation to generation. Floating farms and net cage fishing attached to the raft house were a result of that. Yet, most of the inhabitants have adapted modern equipment and machinery to traditional living methods in response to market capitalization.

Figure 44 Sakeakrang River's raft community (left) and its traditional floating argricultural activities (right)

However, due to the temporary nature of raft houses, both tangible and intangible structures have simply changed over time. Traditional socio-economic activities were replaced by modern lifestyles. The free interior spaces responded to day-to-day living behavior and represent the flexibility and adaptability of raft culture. New functions and materials have been added to raft structures to meet convenience and hygienic standard requirements without any incompatibility or substantial changes to their cultural practices.

Daily life activities of the raft community such as agriculture, fishing, washing, and transportation are closely related to water and, importantly, the people still work in the agricultural sector. Thus, they treat the water and environmental resources carefully (Denpaiboon, Tohiguchi, Matsuda, and Hashimoto, 2000). Daily life was threatened by the eviction of communities along the river. Since the 1960s, raft and waterfront housing have been considered as pollutants, going against the water management policy for a healthy city. The dwellers on the river, importantly raft communities, were offered resettlement onto land (Prakard kong kanapratiwat chabub tee 44, 1959). Since then, most of the raft communities have been relocated away from the river. However, only four authentic raft communities still remain in the Chao Phraya River Basin, faced with impending threatening conditions.

Cluster	*n*	*Community*	*Found*	*Current use*
Raft community	4	Raunpae Meanam Sakraekrang	before 1605 (over 400 years)	Residential unit

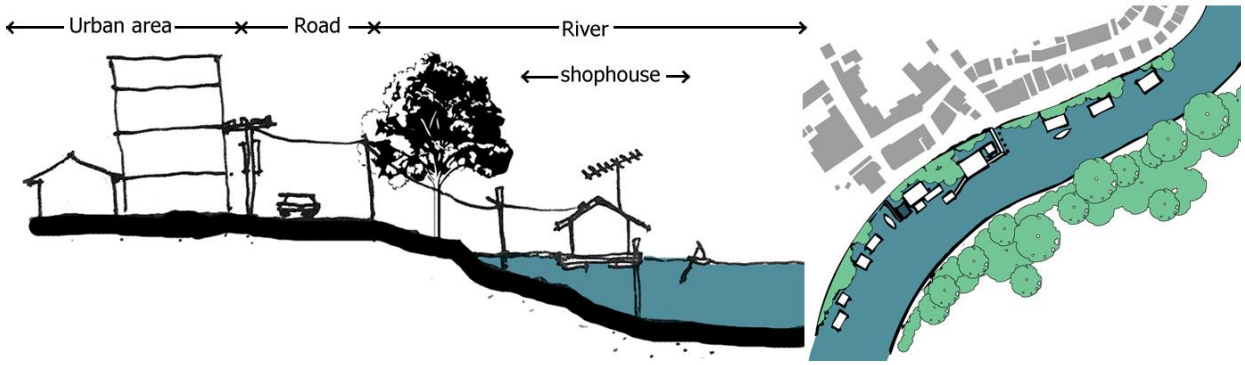

Figure 45 Typical features of traditional raft community

3.4 Chapter synopsis

The remaining culture of traditional livelihoods proves that the cultural landscape associated with agricultural activities is lively and living well in contemporary conditions, even though there is some threat of disappearance. The diversity of the waterfront community complex illustrates that water circulation patterns exert influence on the traditions of daily life: river overflows in the paddy village, irrigation network of ditches in the orchard village, brackish water circulation in the estuarine agricultural village, wetland fishery in the coastal fishing village, north-south corridor river trading in the riverport town, east-west canal network trading in the canal trading village, and surface water livelihoods in the raft community.

However, change and adaptability are part of the phenomenon of the living culture in traditional communities. Since the waterfront communities were first mentioned in the Ayutthaya period, they have continually developed to respond to the requirements of particular periods in time. When water transportation became critically important, waterfront communities grew substantially and reached their peak during the nineteenth century. However, it is fascinating how the vernacular culture has come to terms with the fact that modernity is now an integral part of life and chose to adapt rather than be eliminated.

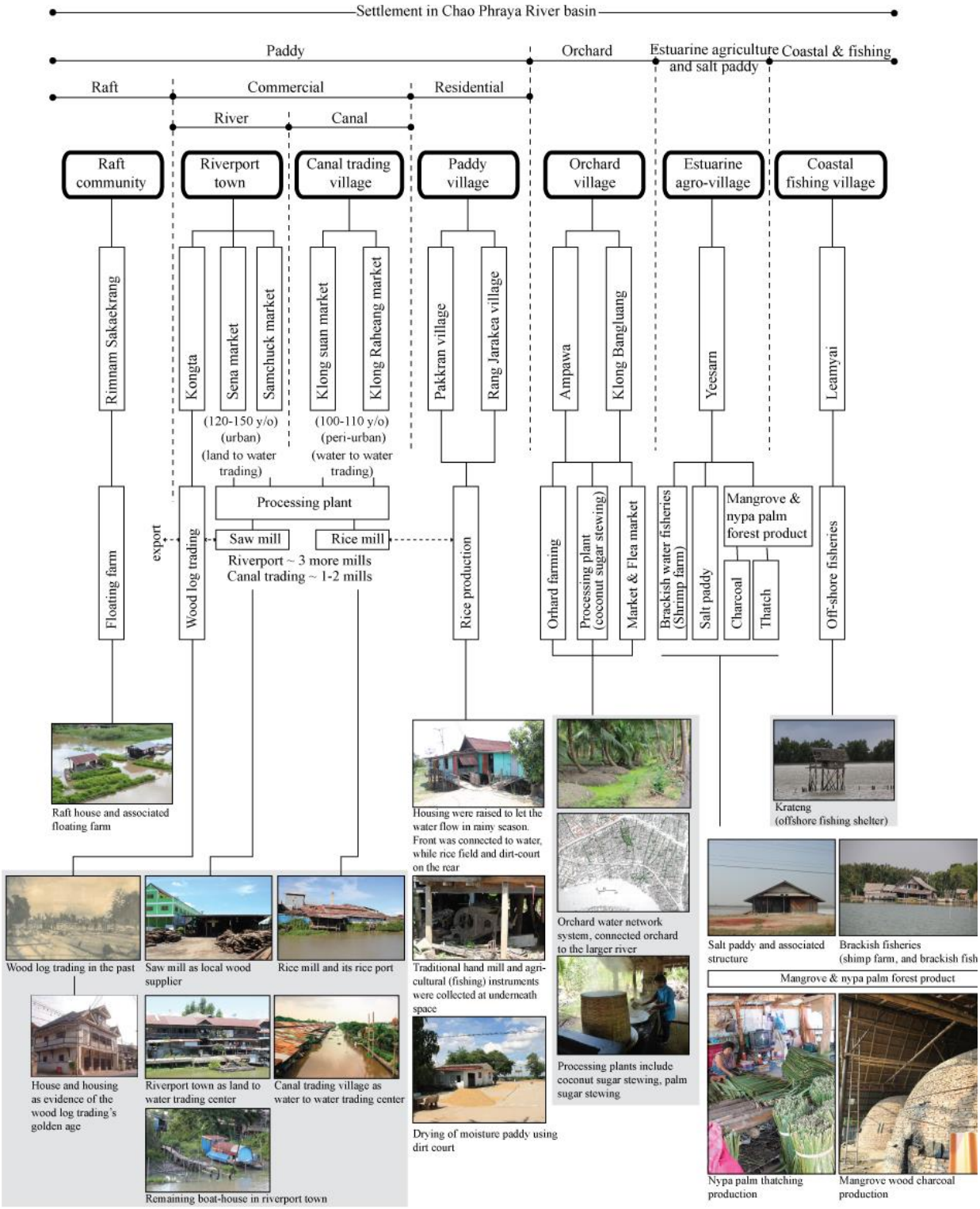

Figure 46 Summary of settlement pattern and contemporary livelihood

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Chapter 4
Appraising Cultural Value

4.1 Introduction

The Chao Phraya River Basin and its tributaries flow primarily through the great central plains of Thailand. Its topographical features and cultural landscape which influence the indigenous design can easily be seen in the vernacular architecture. The tangible characteristics of the waterfront communities in the Chao Phraya River Basin are classified into seven types of cluster based on their differing cultural landscapes and agricultural activities. These are a raft community, a riverport town, a canal trading village, a paddy village, an orchard village, an estuarine agricultural village, and a coastal fishing village (Yodsurang et al., 2015).

These traditional waterfront community complex comprise the model for the interaction between human settlement and the natural environment. The understanding of their natural environment and its efficient adaptation to their way of life reflects in the architectural and built heritage, in the intangible cultural heritage, which is considered a genuine and an outstanding model for sustainable way of life.

4.2 Research method

The study was based on the examination of architectural and community survey records and documentation. The first was carried out through on-site observation, architectural survey, and supporting interviews to address the current traditional building techniques still in existence for historical structures and the reasons behind them. While documentary studies were implemented, multi-disciplinary approaches employing primary and secondary documentation analysis were also used to support/argue the findings.

Table 5 Summary of possible value of the properties in global, national, and local significance

No.	*Paddy village*	*Global significance*	*National significance*	*Local significance*
1	Baan Mae Klangluang			✓
2	Baan Mae Kampong			✓
3	Chunchon Pongsanook			✓
4	Chumchon Baanlook			✓
5	Baan Thungyaw			✓
6	Baan Nongdoo			✓
7	Chumchon Rim Nam Takeanluen			✓
8	Baan Nongbua			✓
9	Baan Mae Khammee Tha Meelor			✓
10	Trok Baancin			✓
11	Tha Ith-Tha Ith Lang			✓
12	Chunchon Baankungtapaw			✓
13	Chumchon Phrafansawanburimuneenat			✓
14	Tha Talad Community			✓
15	Chao Jed Community			✓
16	Baan Krod Wat Kanon Community			✓
17	Raang Jorakae Community		✓	✓
18	Klong Takean Community			✓
19	Pakkran Community	✓	✓	✓
20	Bangbaan Canalside Community		✓	✓
21	Ladchit Canalside Community			✓
22	Baan Seangsom Community			✓
23	Baan Pak klong Community			✓
24	Baan Tha Kak Community			✓
25	Baan Thalap Community			✓
26	Baan Fangklong Community			✓
27	Klong Mahasawat Trainstation Community			✓
28	Baan Koh Rad Community			✓
29	Pasuk Thaiyuan Riverside Community			✓
30	Meala Riverside Community			✓
31	Baanranam Community			✓
32	Baan Laanka Community			✓
33	Makham lom Community			✓
34	Rangbua Community			✓
35	Wat Bat Community			✓
36	Wat Kudeetong Community			✓
37	Baanthaladnue Community			✓

No.	*Orchard village*	*Global significance*	*National significance*	*Local significance*
1	Chumchon Klong Bangluang		✓	✓
2	Wat Raiking Riverfront Community			✓
3	Klong Aomnon			✓
4	Koh Kred Community			✓
5	Bangkuwiang Floating Market Community			✓
6	Baan Bangnaikrai Community			✓
7	Ladplee Floating Market Community			✓
8	Baan Klongmon community			✓
9	Bananampheung community			✓
10	Bangnokkwag Community			✓
11	Bangnoi Community			✓
12	Kwai Aom Community			✓
13	Wat Pradoo Community			✓
14	Bangkae Canalside Community			✓
15	Bangpongpang Canalside Community			✓
16	Prajachonchuen Canalside Community			✓
17	Bangchak Canalside Community			✓
18	Amphawa Canalside Community	✓	✓	✓
19	Mae Klong Canalside Community			✓
20	Thaka Floating Market Community			✓
21	Mae Klong Riverside Community			✓
No.	*Estuarine agricultural village*	*Global significance*	*National significance*	*Local significance*
1	Chumchon Mon Bangkradee			✓
2	Sakhla Community			✓
3	Sappasamit Canal Community			✓
4	Khaoyeesarn Community	✓	✓	✓
5	Bangkaew Salt-paddy Community		✓	✓
No.	*Coastal fishing village*	*Global significance*	*National significance*	*Local significance*
1	Leamphapa Community			✓
2	Bangjakreng Community			✓
3	Leamyai Community	✓	✓	✓
No.	*Riverport town*	*Global significance*	*National significance*	*Local significance*
1	Yaan wat ketu Tanon Charoenrat			✓
2	Yaan Karnkha Talad Kongta		✓	✓
3	Talad rim Nam PakNam pho Yaan Talad Bonkai			✓
4	Talad lao			✓
5	Yaan Taladchumsang			✓

No.	*Riverport town*	*Global significance*	*National significance*	*Local significance*
6	Chumchon Kaw Leaw			✓
7	Talad Phayuhakiri			✓
8	Chumchon wang krod			✓
9	Chumchon Thalor			✓
10	Yaan Talad Bangmoonnak			✓
11	Chumchon Talad rim Nam Baan Kampaengdin			✓
12	Chumchon Phrompiram			✓
13	Chumchon Talad rim yom			✓
14	Srisamrong			✓
15	Chumchon Talad Tai Sawankalok			✓
16	Baantaak			✓
17	Chunchon Talad Baankawsakaekrang			✓
18	Talad Saanchao Rongthong Community			✓
19	Talad Ladchadou			✓
20	Talad Hua Rau Community			✓
21	Talad Baan Pan Comminuty		✓	✓
22	Talad Wat Sing Community			✓
23	Talad Poh Nang Dam Community			✓
24	Talad Muanglopburi Community			✓
25	Talad Nakhon Chaisri Community			✓
26	Talad Bangluang Community			✓
27	Talad Klong Lamphraya Community			✓
28	Talad Don Whai Community			✓
29	Talad Pohtaram Community			✓
30	Talad Jedsamean Community			✓
31	Baanpong Community			✓
32	Thachalom Community			✓
33	Talad Mahachai Community			✓
34	Talad Baan Peang Community			✓
35	Talad Pak Bang Community			✓
36	Talad Singburi Community			✓
37	Talad Intrburi Community			✓
38	Talad Kao Hong Community			✓
39	Talad Baan Sood Community			✓
40	Talad Kor Wang Community			✓
41	Talad Samchuk Community	✓	✓	✓
42	Talad Pho Phraya Community			✓
43	Talad Sriprajan Community			✓

No.	*Riverport town*	*Global significance*	*National significance*	*Local significance*
44	Talad Thachang Community			✓
45	Talad banglee Communtiy			✓
46	Chachoengsao Commercial Community			✓
47	Talad Bannmai Community			✓
48	Talad Bangkla Community			✓
No.	*Canal trading village*	*Global significance*	*National significance*	*Local significance*
1	Talad Huatakae			✓
2	Talad Tonson			✓
3	Klong Raheang		✓	✓
4	Talad Pak Klong 3 Community			✓
5	Pak Klong 5 Community			✓
6	Pak Klong 7 Community			✓
7	Pak Klong 11 Community			✓
8	Pak Klong 13 Community			✓
9	Tald Rangsit Historic Community			✓
10	Lakha Floating Market Community			✓
11	Damnoensadook Floating Market Community			✓
12	Talad Bangplee			✓
13	Talad Bannpeaw			✓
14	Klongsuan Community	✓	✓	✓
15	Talad Luangpang Community			✓
16	Talad Preng			✓
17	Talad Nakhonnuengket Community			✓
18	Talad klong 16 Community			✓
19	Talad Klong 15 Community			✓
20	Baangboo Community			✓
No.	*Raft community*	*Global significance*	*National significance*	*Local significance*
1	Sapan dam			✓
2	Paknai Fisherman Village			✓
3	Raunpae Meanam Nan			✓
4	Raunpae Meanam Sakraekrang	✓	✓	✓

With a limited time and resources, the detailed survey selected the most outstanding traditional site from seven types communities among 138 governmental listed traditional waterfront communities. The case study selection procedure employed the critical case sampling method for study heritage site where seemingly contained the highest and appropriate to described at global significance (table 5). The criterion for selection relied on a typical spatial configuration pattern of a traditional community (Kwansuwan, 2014) to screen traditional conditions. Besides, remaining authenticity of connection between traditional housing's space, surrounding traditional uses of cultural and agricultural landscape, and waterbodies usage was the first priority to be concerned in selection criteria. Together with the prior researches and surveys, which was carried out by other scholars, were also took into consideration. Therefore, to be selected on the sampling list, a site needs to meet some of above mentioned authenticity (on the connection) over time and across geographical location.

The seven communities were named in table 6. These seven communities expected to be an example of traditional places of sustainable water and land use systems where represented cultural value at the global level.

Table 6 Selected case studies for cultural value investigation at international level

	Selected community	***Cluster type***	***Found (as of 2016)***
1	Talad Samchuk Community	Riverport town	before 1896 (119 years)
2	Pakkran Community	Paddy village	Ayutthaya period (over 250 years)
3	Raunpae Meanam Sakraekrang	Raft community	settled before 1605 (over 400 years) *archeological evidence over 3000 years
4	Klongsuan Community	Canal trading village	1868 – 1910 (approx. 100 years)
5	Yeesarn Community	Estuarine agricultural village	1703 (312 years)
6	Amphawa Canalside Community	Orchard village	Early Rattanakosin p. (Approx 200 years)
7	Leamyai Community	Fishing village	80-100 years

The survey observed traditional building techniques and materials being used in the selected cases. This is to point out the authenticity still remaining in modern construction. This is intended to uncover the causation and meaning behind the structural ensemble, especially for the waterfront communities in the Chao Phraya River Basin.

The critical survey took places in 7 representative communities. Within those boundaries, a detail survey was conducted by architectural analysis, to assess how traditional housing and associated structures were fitted into their community space and revealed its ongoing circumstance on the contemporary society. A guide to the criteria for selecting important structures for investigation was based on key elements of the cultural significance of earthen architecture (Guillaud, 2014) which expands beyond the value of architectural heritage alone. Such values are set out below:

- Exceptional traditional characteristics influencing development of construction technologies for mobilizing local resources.
- Contains a wide range of cultural identity values of past and present societies.
- Remarkable technological and cultural diversity of construction practices
- Fabric of the building is associated with landscapes, and multiple traditions of vernacular habitats.
- Reflects diverse sophisticated knowledge systems, and fulfills vernacular knowledge.

As a result, in total 21 structures including seven traditional houses, three raft houses, four row houses, and seven associated structures were selected for observation. selected structures were testimony of the indigenous traditional knowledge and practices for adaptation in particular area, the Chao Phraya River basin, which were developed over long periods of time. At the same time, these indigenous structures still remain vivid aspects of their day to day living behaviors, provided valuable insights into the ways they evolved as well as information.

4.3 Result: Identifying authenticity and integrity at cultural heritage sites

The waterfront community complex in the Chao Phraya River basin contained an outstanding example of traditional communities and land use systems which are representatives of a culture that is becoming vulnerable under the impact of irreversible change, particularly seen the urbanization, commercialization of the area and the gradual disappearance of traditional systems. The traditional waterfront settlement is an outstanding example of land use and the interaction with the environment, using the natural water circulation to develop trading, transportation and agricultural systems.

This section synthetized cultural value through case studies for the connection/relation of indigenous and traditional waterfront structures and surrounding environment for adaptation in contemporary society. The synopsis was drawn from the findings of the following points which reflected cultural value of indigenous settlement in Chao Phraya River basin for understanding and assessing impacts, vulnerability and adaptation to contemporary society.

4.3.1 Human settlement and indigenous resources in agricultural landscape

Since The traditional waterfront community in the Chao Phraya River Basin was classified into seven clusters showing the diversity of the cultural landscape and agricultural activities exerting influence on the community complex. Cultural landscapes are defined as landscapes that have evolved with the modes of life or livelihoods of the people and the geo-cultural features of the region, which are indispensable to the understanding the lifestyles and/or livelihoods of the people. This could be said that cultural landscape created characteristic of community and its built environment, and agriculture, is the most important driving force that shapes landscape sceneries (Plieninger, Höchtl & Spek, 2006).

The typical housing and building environment in the Chao Phraya River Basin consisted of wooden traditional vernacular houses on high stilts erected from the ground, leaning at an angle of

about 2% towards the center of the structure. The construction features lightweight materials with a high pitched roof settling along the waterway, as well as a unique characteristic based on the nearby cultural landscape. With the passage of time, vernacular houses have changed in response to modernity. Additional parts might vary, depending on lifestyles. Modern construction techniques have replaced the traditional to form an entire structure.

However, the survey found that an immediate cultural landscape and day-to-day living behavior still exerted influence on waterfront housing. Traditional techniques responded to the surrounding environment, and locally available resources played an important role in the traditional community. Existing traditional building techniques varied, depending on the community type.

A) Paddy village of Pakkran community: Settlement of the flood plain

The traditional paddy village of Pakkran, a rural village along the Takean canal in Ayutthaya Province, surrounded by abundant paddy fields. Local dwellers still rely on rice cultivation activities. However, they have adopted new technologies to increase agricultural production, improving hygiene standards and their quality of life. Agricultural practice has incorporated traditional beliefs, represented in the architectural space and its function in response to their daily lives. Houses and associated structures reflected this phenomenon.

In the past, the Takean Canal was used as a main transportation route connected to Chao Phraya River on both upper and lower stream. However, the canal was not in used anymore since the road turned to be a crucial mode of transportation in modern society and, importantly, when new water gates were built to control the water level of the inner rivers. Waterway was then unable to use and flow naturally. This has turned canal to pollution, and abandonment.

Traditionally, the group of traditional houses clustered along the Takean Canaal. The housing was clustered amongst the family which reflects the needs of families and individuals living in extended houses. Selected case study was a family compound located in Pakkran

community (fig.47). The first house was built along the river, when the extended family built their house extended to the road side. The housings were connected through the dirt court which was located on the center of the housing compound, on both physical and mental dimension. The court was used as a multipurpose area reflecting day-to-day living behavior. Basically dirt courts were used to dry moisture from the post-harvested grain, besides that, it was a place for cultural activities, gathering people and bound family relationship through the mutual aids system.

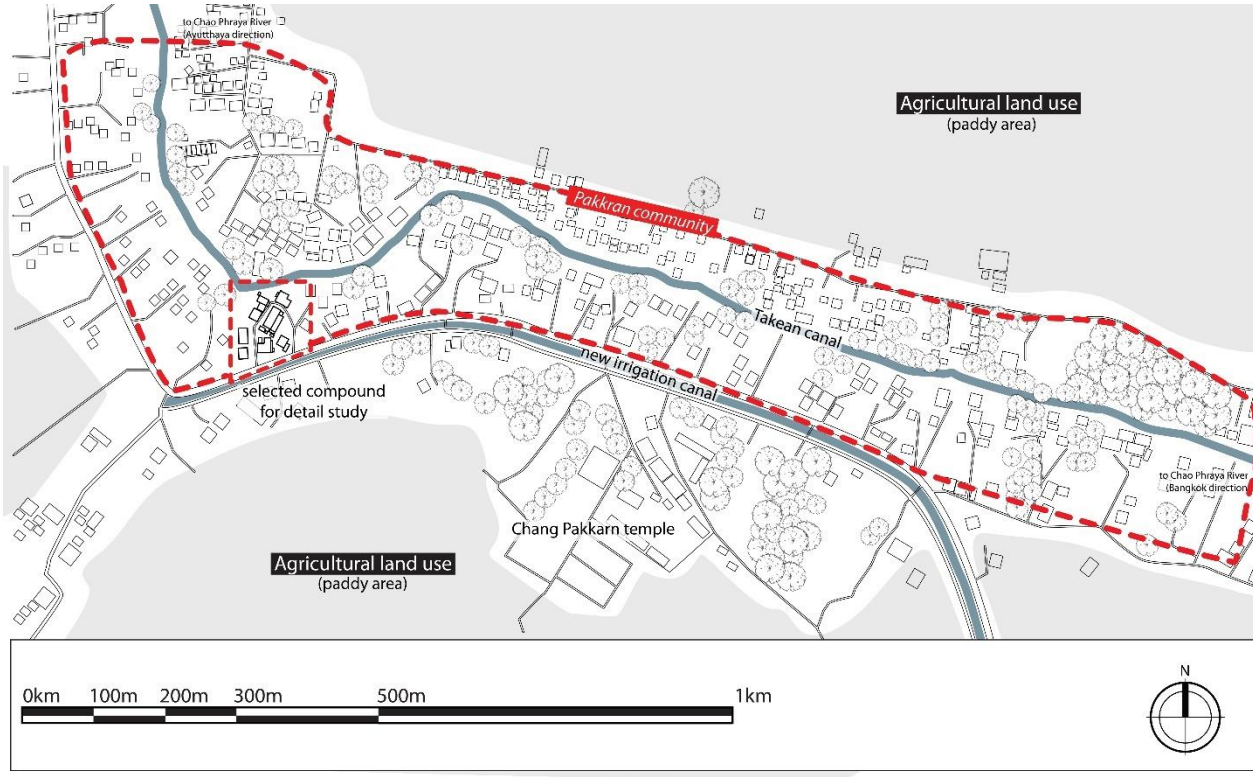


Figure 47 Group of traditional houses in Pakkran community

The community was at risk of annual flood. Thus, the houses were raised above the highest water level. Main buildings (central room) were kept in the original form with open-plan interior space, while new additions were added, expanding side by side to provide more usable space. The main roof down to the footprint still used the traditional joint system to connect wooden parts together. Deteriorated parts have been repaired through piecemeal replacement. Nails may have been added for strength. Associated structures such as granary, dirt courts, or man-made mounds still remain and could be seen, although they have been reused in different ways. However, the

daytime living space was underneath the house. The space was light, and without walls, while compressed dirt was used instead of concrete pavement, for ventilation control and thermal comfort. This was also used as a gathering space for neighbors to form social ties.

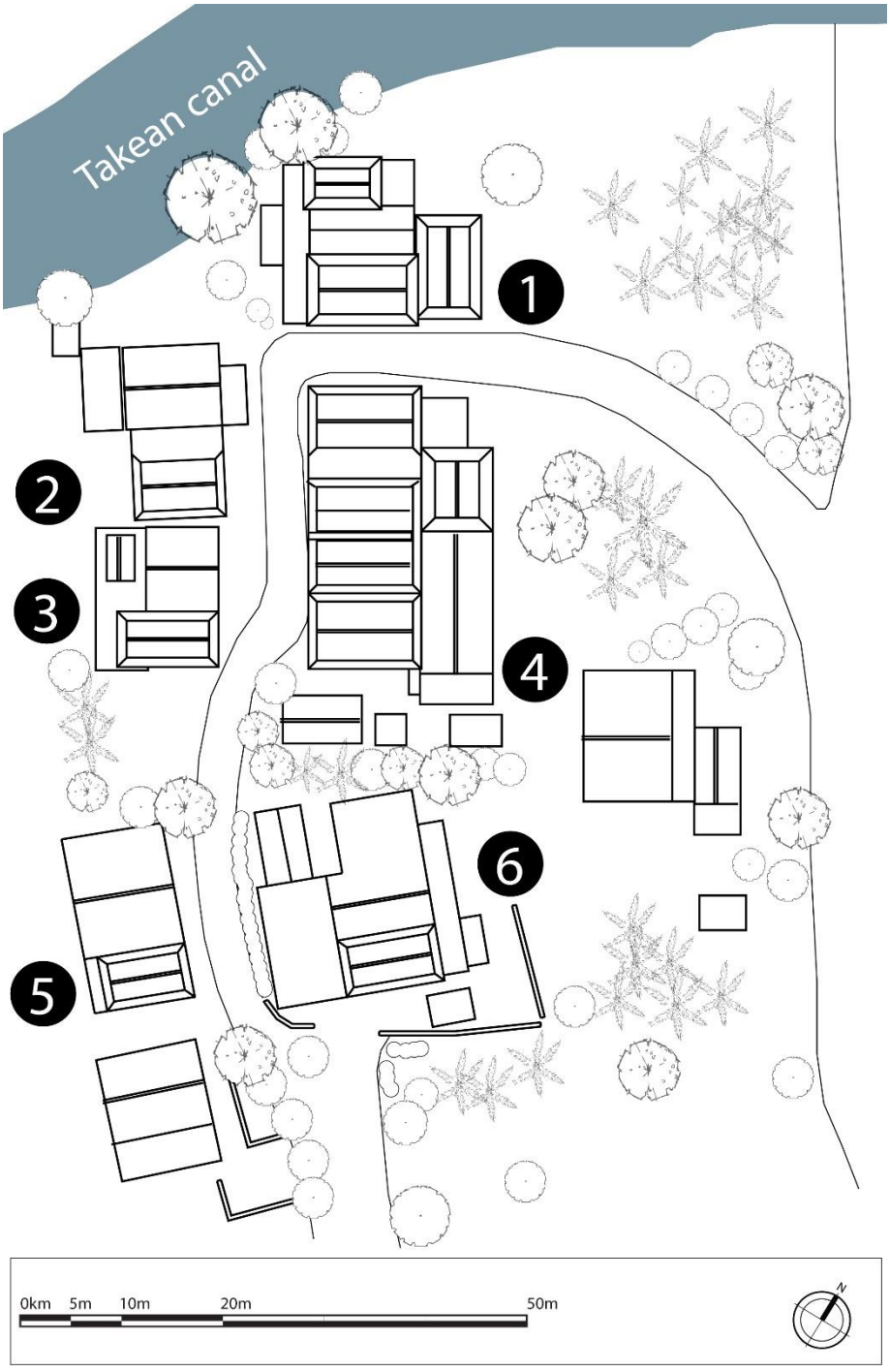


Figure 48 Selected group of traditional houses in Pakkran community

Figure 49 Traditional house no.1 in Pakkran

Figure 50 Traditional house no.2 in Pakkran

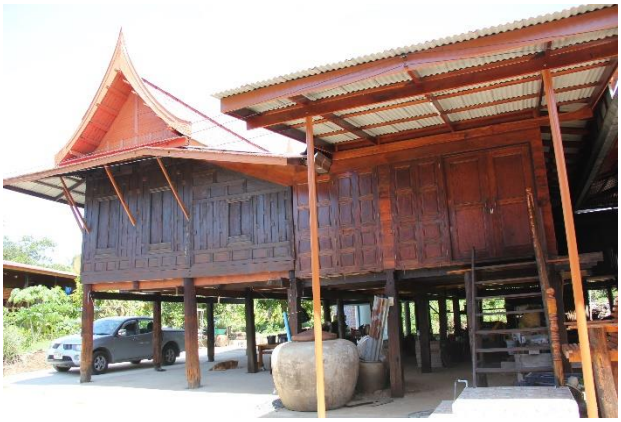


Figure 51 Traditional house no.3 in Pakkran

Figure 52 Traditional house no.4 in Pakkran

Figure 53 Traditional house no.5 in Pakkran

Figure 54 Traditional house no.6 in Pakkran

Table 7 Basic attributes and traditional housing condition in the paddy village of Pakkarn

No.	*Bldg. attributes*	*age*	*Members*	*Main occupation*	*Change/alteration or originality remarks*
1	Traditional house	90	5	agriculture	Add concrete toilet and kitchen, core remain
2	Traditional house	80	5	agriculture	Extended to no.2, then detached
3	Traditional house	60	0	n/a	Detach of no.2
4	Traditional house	80	4	agriculture	Extended northwards, add toilet
5	Traditional house	50	4	agriculture	Add room underneath, toilet kitchen
6	Traditional house	50	3	agriculture	Add toilet and kitchen, living extension

The traditional house no.4 was the outstanding house in the compound (fig.55) by its four continuous gable roofs. The house was extended several times using traditional elements. The original part was located on the south built in traditional Thai house style with sleeping space. The extension was expanded to the north wing attaching by the twin-gable roof open-plan space to the north bedroom. The east part was service area and auditioned modern toilet.

Since the natural ventilation was blocked by the extension, the upper floor caused higher temperature than before. Thus, living space during the daytime was in the underneath space where residents spend most time doing housework and post-agricultural production. Associated structure in the southern part of the house was a buffalo shed. However, it was not being in used anymore but firewood storage and toilet. Rice barn has also turned into storage to keep things, using original wall partitioned.

Another example of traditional living in *Pakkarn* Community was the Traditional house no.6 (fig.56). Due to an extension, veranda was enclosed and turned into central hall surrounding by functional room. Besides, the rhombic mudbrick roof tiles, which were once used to be a roof material, were replaced by metal sheet according to labor shortage, budget control and durability. This caused the upper floor hot and humid. Resident usually spends their life underneath space. There was passive of natural air flow underneath the house, keeping the house as a whole drier, cooler, and healthier.

Figure 55 Plan and section of traditional house no.4 in Pakkran

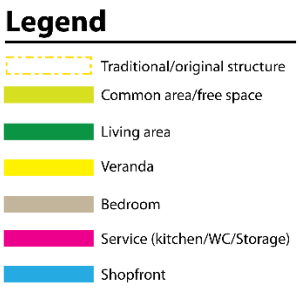
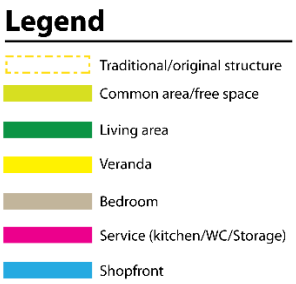


Figure 56 Plan and section of traditional house no.6 in Pakkran



Agricultural reformation in 1860s caused significant impact to agricultural frontier. Since then, rapidly rising volume of exports was turning the traditional rice culture into a commercial production system (RRAFA, 2007). Demand and supply of rice crop have been increasing significantly. Meanwhile, the water requirements were increasing due to rice production needed, new irrigation system has been provided. Traditional methods were replaced by new machinery and technology. Besides pollution originating from industrial wastewaters had contaminated the canal, an environmental problem caused by waste of modern agriculture has been gradually occurred. Pesticide and fertilizers waster enter to surface waters, river then became pollutant, and turned out to be an unwanted area (fig.57).

Figure 57 natural canal became pollutant as a consequent of agricultural reformation, and turned out to be an unwanted area.

Figure 58 Water gates were constructed on existing rivers to control water flow in the dry season.

B) Orchard village of Amphawa: a mixture of agriculture and commercial use

The west bank of the lower delta of the Chao Phraya River Basin was best suited to fruit orchards. However, an outstanding orchard village in the Bangkok area remains in a ruinous condition, while many examples are well-maintained along the neighboring Mae Klong River.

The orchard village of Amphawa in Samutsonkram Province, located along 2.8 kilometers of Amphawa canal, represented an outstanding example of orchard life along the canal landscape (fig.59). The canal system is connected to the Mae Klong River, and the area therefore consisted of rich soil, best suited to fruit orchards. The system created an unlimited water network throughout the area. However, it was mainly used as irrigation for agricultural purposes, and this network could be routed through the raw water reservoir to reduce the impact of floods (Palopakorn, 2010). This unique characteristic affected the indigenous building environment.

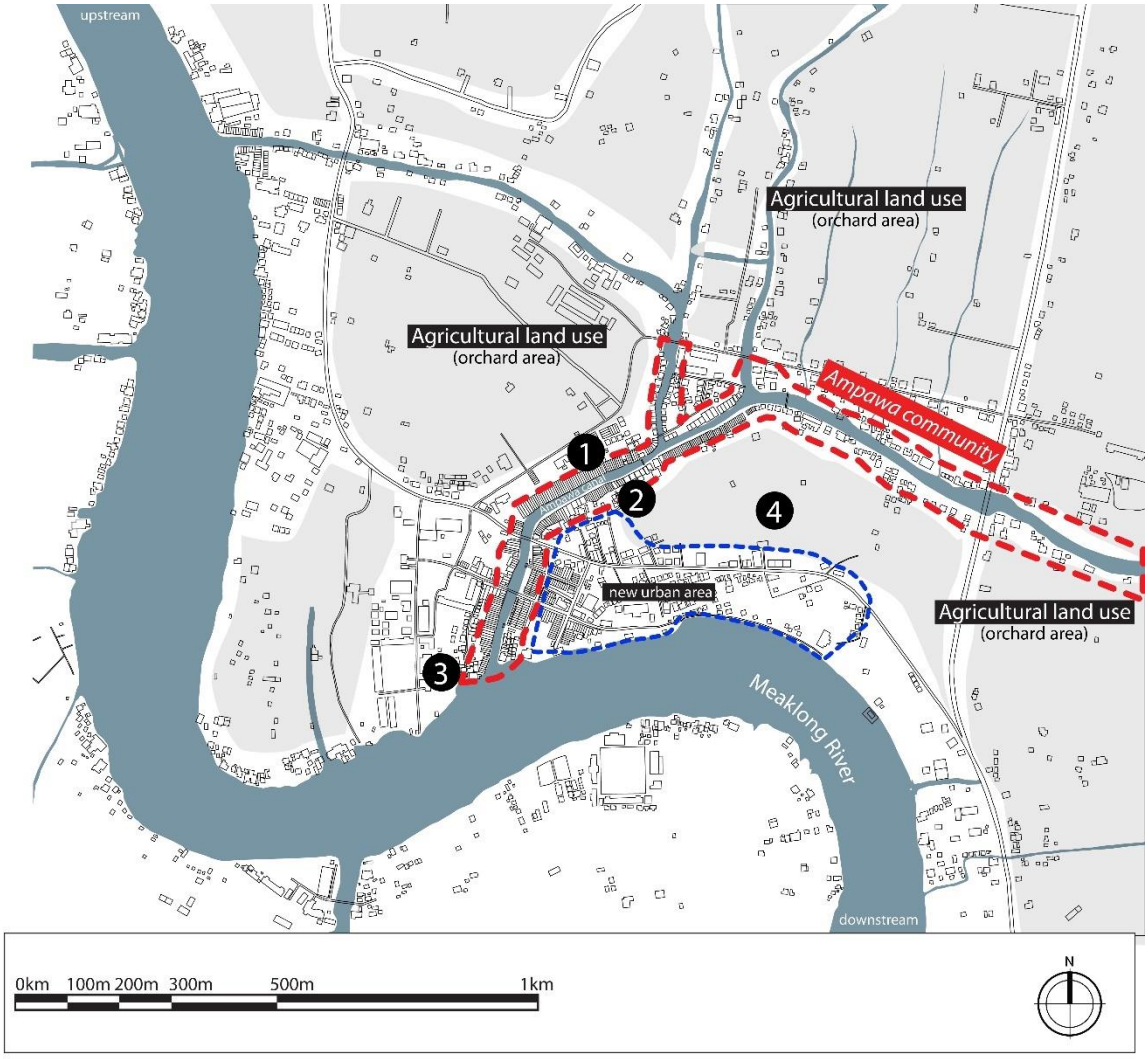


Figure 59 Selected group of traditional houses in Amphawa community

Table 8 Basic attributes and traditional housing condition in the orchard village of Amphawa

No.	*Bldg. attributes*	*age*	*Members*	*Main occupation*	*Change/alteration or originality remarks*
1	Waterfront row house	70	3	Commercial	Addition modern facilities on the back
2	Row house extension	60	5	Coconut sweets	Extension backward to traditional house
3	Relocated raft	100	3	agriculture	Shift on stilts, add modern room backside
4	Coconut sugar stove	50	n/a	Coconut sugar	Change bricks every 10 years

The area dominated by traditional wooden row houses with distance followed by individual wooden house and few number of modern concrete buildings. The row houses aligned along the two side canal which predominantly remain in their original form, even though their function has changed in accordance with economic requirements. The area dominated by traditional wooden row houses with distance followed by individual wooden house and few number of modern concrete

Figure 60 Rowhouse No.1 in Amphawa

Figure 61 Traditional house No.2 in Amphawa

Figure 62 Traditional house No.3 in Amphawa

buildings. The row houses aligned along the two side canal which predominantly remain in their original form, even though their function has changed in accordance with economic requirements. This is because: 1) the row house was a rental property where the structure could not be altered by the user; and 2) the building code no longer allows the construction of new buildings adjacent to the river (when waterfront housing was demolished, rebuilding must be set back at least six meters from the canal). This circumstance may also be found in other commercial communities.

The outstanding example of Amphawa's typical row houses was the Chaipattana Foundation's row houses (fig.60) which remain in good condition according to restoration budget of the "Thailand Cultural Environment project" during 2000-2008. The houses divided into two main parts. the frontal space where connected the walkway and Amphawa canal, consisted of an open plan free space which was flexible to trading and living accommodation upon users. Whilst back of the house were primary kitchen, storage, and working (processing) area. Existing hip roof remain in original form which was covered by clay tile. Facade occupied by wooden folding door

set in order to maximize the natural ventilation, in the same time creates the open plan and flowing of space between inside and outside.

Traditional house no.2 (fig.61) was combined traditional house, contemporary house, and row house together. The original traditional house was built on the back side of the housing unit connecting to orchard, while the wooden row house was built on the canal side. Structure itself was built in a traditional wooden structure on stilts with high pitch gable roofs and attached veranda. The extension has been made to enlarge usable space for the traditional house which was built in traditional form expanding to the front. The later stage of extension was built to connect traditional house and the row house in contemporary style and material.

Housing and associated structures were influenced by water behavior. Life existed on the upper floor because the ground underneath was wet and moist. Traditional houses were built on a raised floor, but the level was lower than that of the paddy village. However, the idea of keeping the main house in its original form was almost the same. Since the area was not affected by flooding due to the canal network system, row houses and relocated rafts were able to be built on the ground adjacent to the waterways, and more importantly in the market area. This allowed local dwellers to be connected to the waterways with easy access to natural water for household purposes.

Traditional house no.3 in Amphawa community (fig.62) was the raft house. This relocated raft house was moved and set the permanent living onto land. Raft structure was replaced by wooden stilt. The house was extended several times during past decades to serve modern living and improving hygienic standard. Main service such as toilet and kitchen were added on the back side of the house using modern building materials, while the fronted building remains in original. Roof remains in original form and structural ensemble, but replaced by a metal sheet material.

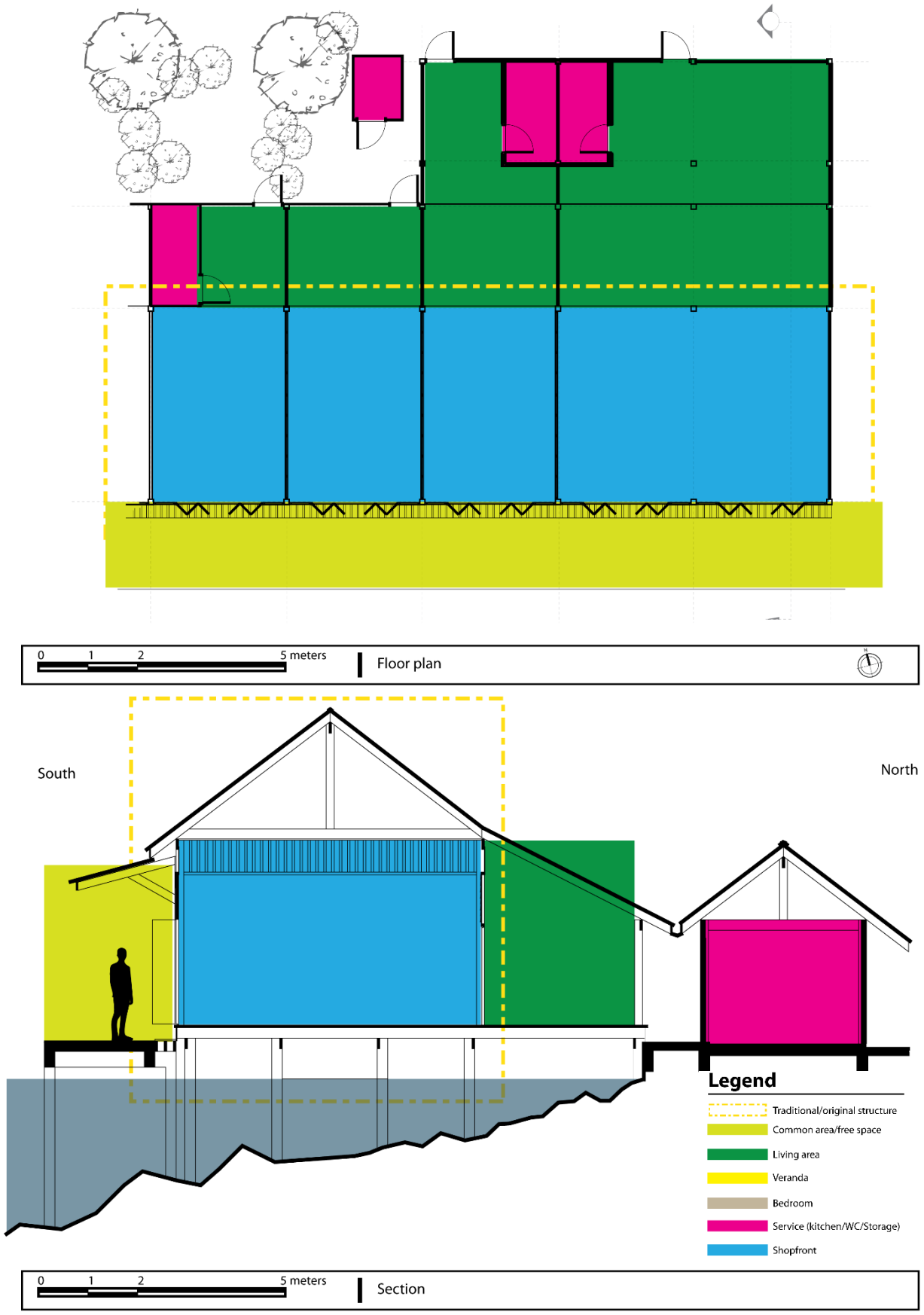


Figure 63 Plan and section of row house No.1 in Amphawa community

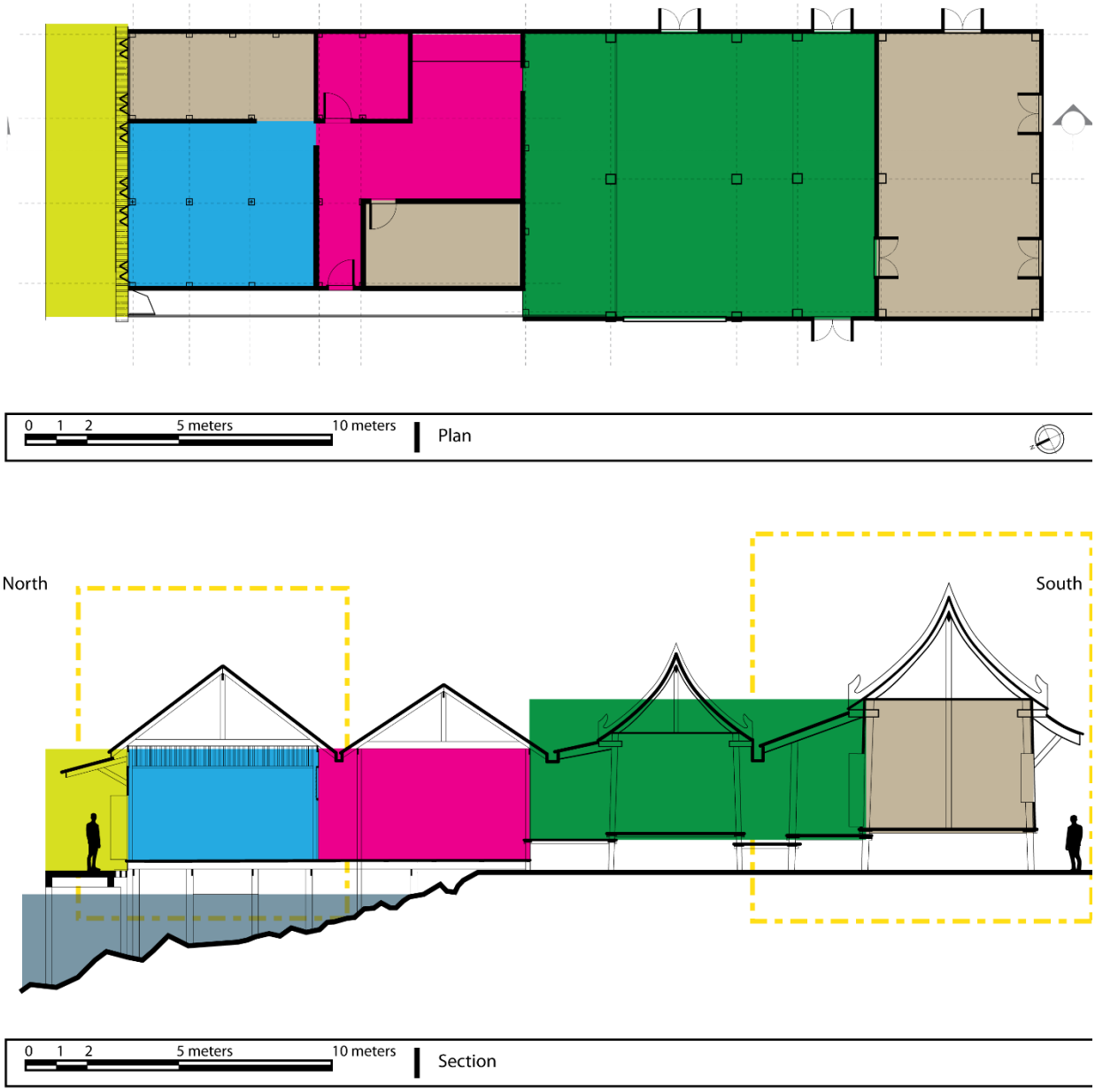
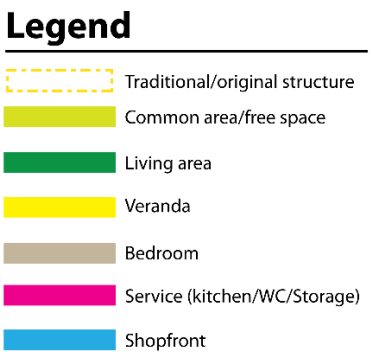


Figure 64 Plan and section of row house No.2 in Amphawa community



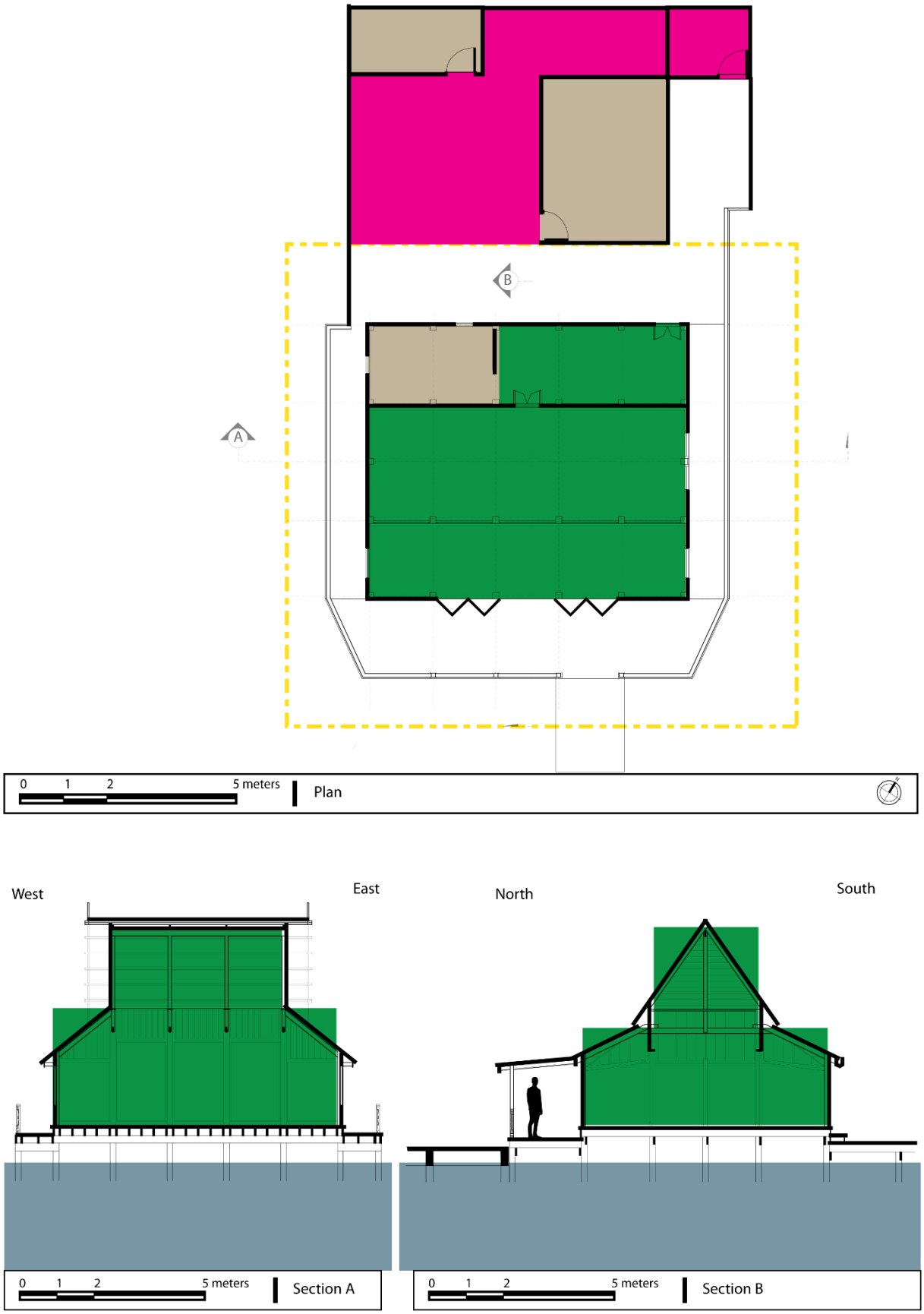


Figure 65 Plan and section of traditional house No.3 in Amphawa community

Figure 66 Associated structure no.4 (coconut sugar stewing plant) in Amphawa community

The coconut sugar stewing plant was an important associated structure in the orchard village. Such plants were usually located in or close to the orchard area for convenient transportation to the market by canal. Abundant of coconut plantations of Amphawa's orchard area supplied coconut stewing processes. The traditional method required natural sugar production, from climbing up a coconut tree to retrieve its nectar, collecting sugar in bamboo containers hung overnight, stirring in a large black iron pan over a wood fire until ready.

There are many kinds of stoves that are used in making coconut sugar upon the artisan design upon their experiences to constitutes appropriate technique, form, and design (i.e. Tao Waan, Tao Tan Dee, and Tao Thai Derm). However, the common features of traditional stove were coconut leaves, husk and shell as fuel sources. Wok was placed on the stove which can accommodate three woks at one time. The woks were filled with freshly collected coconut juice about 25–30 liters in each wok and the fire is started. (Aristanti, 2001).

The stove was not required to blow the fire. It utilized heat ventilation, generated by burning fuel, more by the deflection of flame and hot air inside travelling to the second opening with the help of an in-built opening located at the lower end of stove, before the hot air exited out of the chimney, which the basement was made of un-burnt clay bricks. Despite traditional stewing methods being gradually replaced by modern techniques, traditional knowledge was still needed to control air ventilation and distributing heat from the wood burning stove.

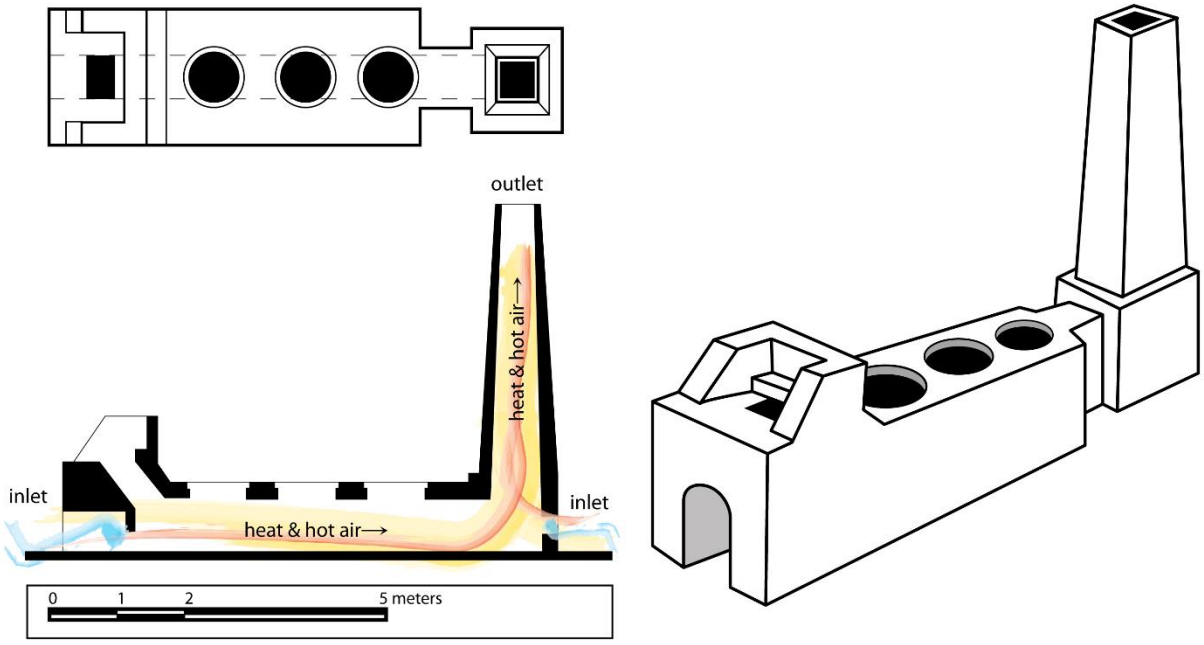


Figure 67 Details of coconut sugar stove

Land transformation caused consequent impact to the water flow changes in the orchard farm land. Since the water distribution network used in orchard was hierarchical network which can result in the failure of a whole distribution system if any system member withdraws (fig.68). While urban development gradually continued, most of the orchards and agricultural lands were replaced by road, housing estate, resort, or even parking spaces. As a result, this increasing of the water impermeable area led the network of ditches flow difficulty into the inner land. Slow water flow or stagnant caused pollutant and flooding. Irrigation systems allowed deteriorating which subsequently led to abandonment.

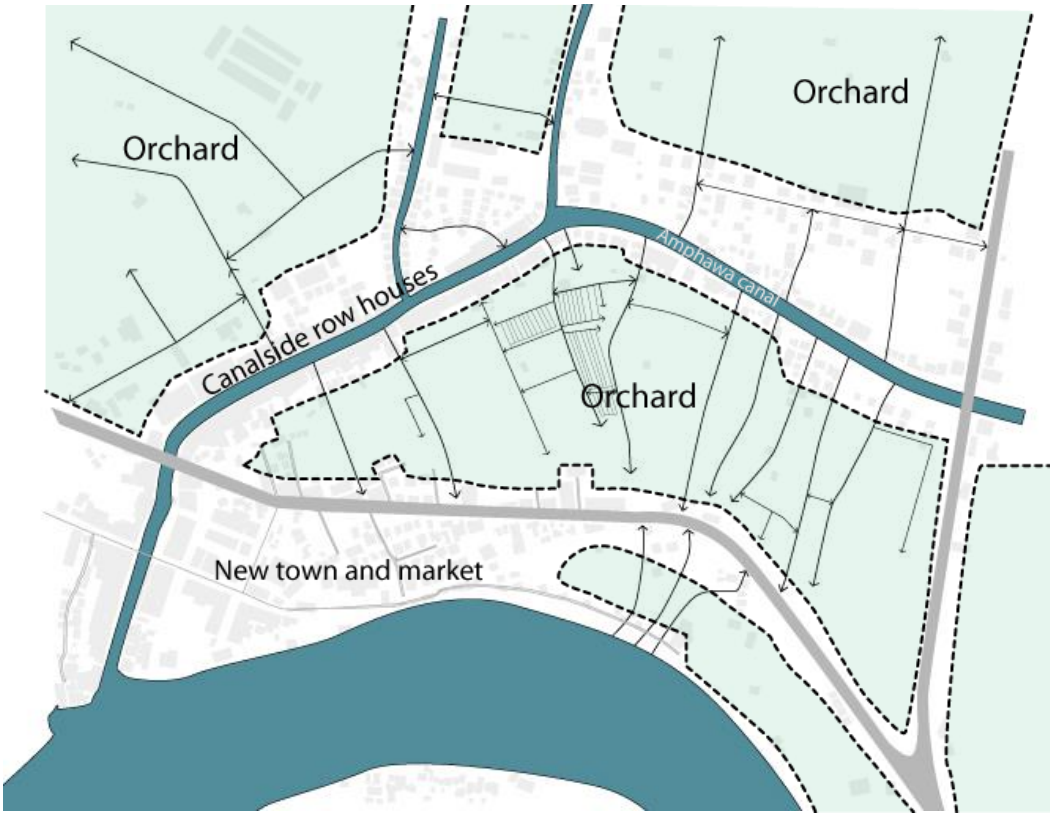


Figure 68 Canal network system in the Amphawa community

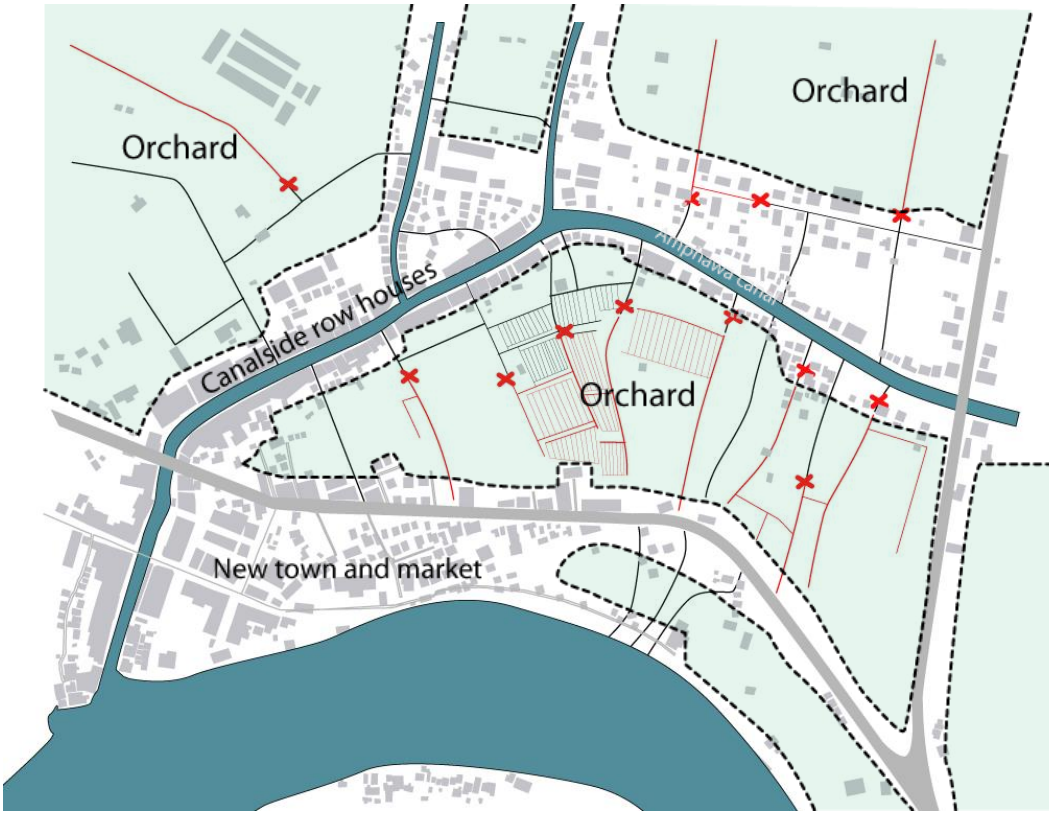


Figure 69 Failure of a whole distribution system as a consequent of land transformation

Local economies development for post-agricultural product must be concerned. The purpose of local economic development is to build up the economic capacity of a local area to improve its economic future and the quality of life for all (Swinburn, Goga, & Murphy, 2006). It is important to initiate and introduce an innovative technology to improve traditional/local product based on the use of local resources to meet modern market need. When local economy created enough jobs, the boomeranging or delayed home-leaving young generation will draw back home.

C) Estuarine agricultural village of Yeesarn community

The Samutsonkram Province in the Mae Klong delta was an abundant area, rich in both natural and cultural resources. The Yeesarn community was an estuarine agricultural village located five kilometers from the gulf. The village nestled in the foothills of the Yeesarn Mountain, surrounded by mangrove and a man-made canal connecting the gulf and other inland communities. Despite being a commercial community during the Ayutthaya period, the community is currently based on estuarine agricultural activities, influenced by seawater interpenetration

Table 9 Basic attributes and traditional housing condition in the estuarine agricultural village of Yeesarn

No.	*Bldg. attributes*	*age*	*Members*	*Main occupation*	*Change/alteration or originality remarks*
1	Traditional Thai house	100	6	agriculture	Add modern kitchen and toilet
2	Traditional Thai house	40	2	commercial	Add room underneath, add shop area
3	processing plant	30	n/a	Charcoal	Temporary built bamboo structure
4	Salt granary	20	n/a	Salt product	Temporary built mixed bamboo-hardwood

Figure 70 Traditional house no.1 in Yeesarn community

Figure 71 Traditional house no.2 in Yeesarn community

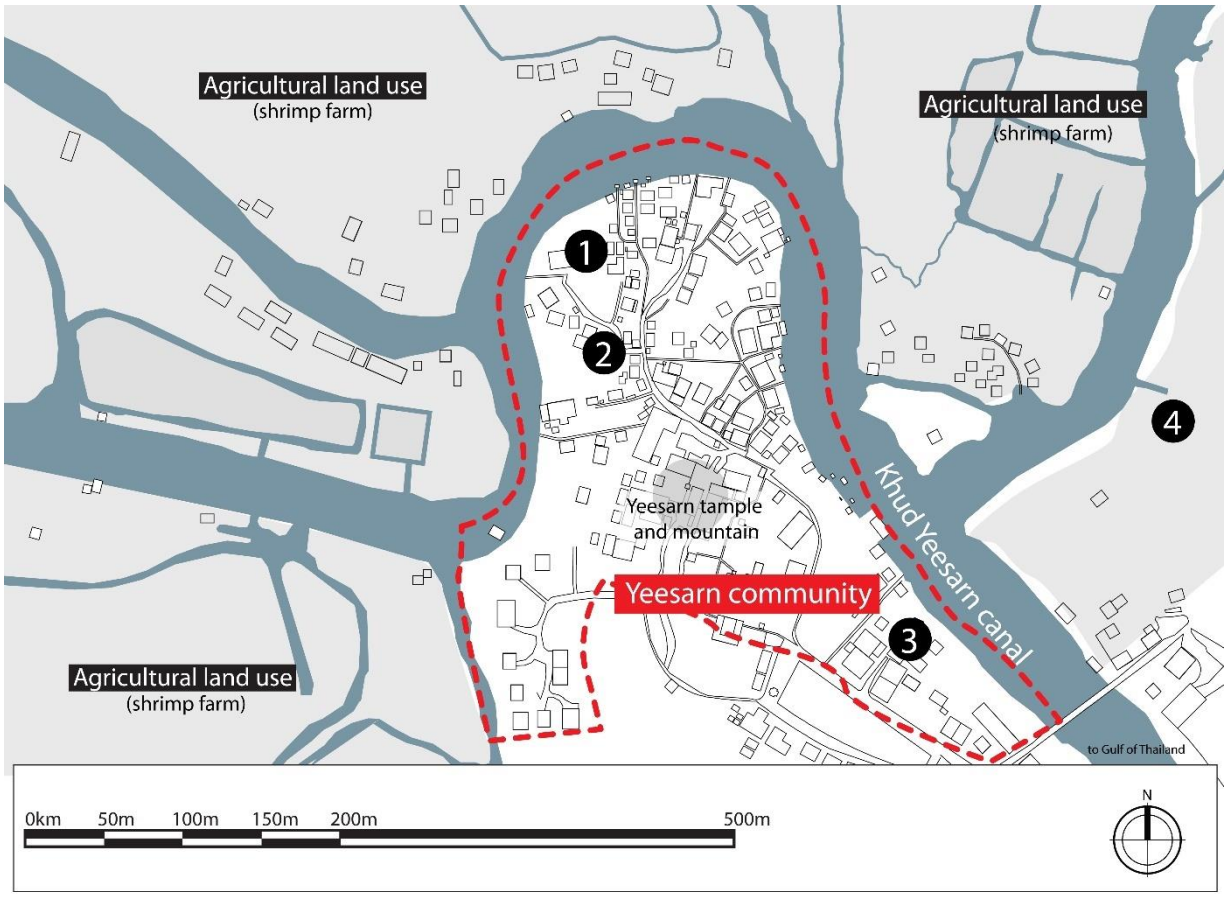


Figure 72 Selected group of traditional houses in Yeesarn community

Selected case study in Yeesarn Community was an outstanding example of the traditional vernacular housing standard which stood for over several decades, has been altered many times, and remains in use. Families living in the housing compound were clustered along the watercourse at the first stage. Later on, new road and extended families have made the housing unit expanded to the inner land and occupied, almost, full area.

Housing reflected the cultural identity of the Central Plain. The main features were a high pitched wooden structure with a raised floor. The central room still retained its original form, and the upper main gable roof could identify the authenticity of the house. Traditionally, people lived their lives on the lower floor. However, most additional room was made here using modern concrete blocks, due to the limited space for expansion. The new open-air social space was shifted to the side of the house.

The Original version of traditional house no.1 in Yeesarn community (fig.73) was stood for over 100 years. However, modifications have been made 50 years ago (Tragoonram, 2009), but partly change has been made several times. Main building has not changed much, but roof material-- since the traditional mudbrick roof-tiles leaking as its durability reached limitation. During the great modification concreate columns were added to strengthened basement structure.

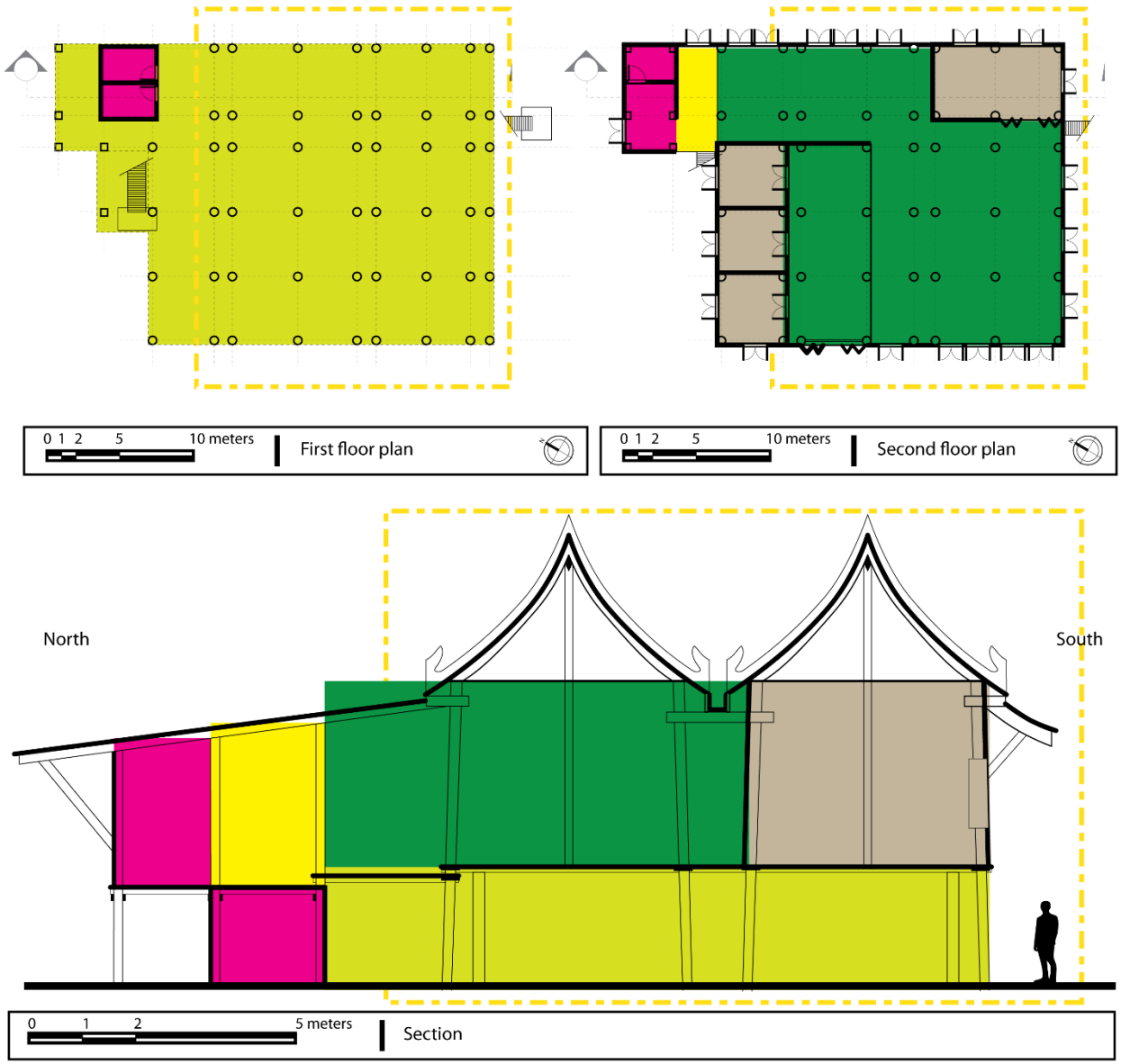
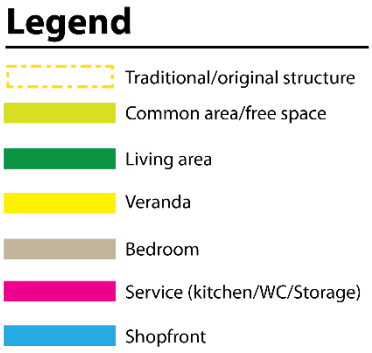


Figure 73 Plan and section of traditional house No.1 in Yeesarn community

Figure 74 Plan and section of traditional house No.2 in Yeesarn community



The case study of traditional house no.2 in Yeesarn community (fig.74) was moved from the other side of the canal for over 40 years. The house was combined residential unit and shop coincides. The upper part remains in original form and material, but roof. Since the owner was getting old, living space was moving downstairs several years ago. The traditional underneath open-space was turned into a typical bedroom and toilet, where the new wall and pavement were also use modern material like concrete block and ceramic tiles. Fronted canopy was added to provide a covered space for grocery store and local restaurant. The gathering space was then shifted from underfloor to this area.

Thailand is the Asian country with the largest charcoal production (Kirk et al, 1998). The production of mangrove charcoal in Yeesarn community was began in 1930s (Yeesarn people and mangrove charcoal, 2016). 13-15 years old mangrove from planted forests, which considered as the oldest planted forest in Thailand, were substantially used to supply its charcoal demand. In wooden charcoal processing, modern technique has succeeded the traditional buildings, even though traditional knowledge is still practiced from time to time. The traditional cycle to produce a batch of charcoal usually took about 45 days which intensively took 7 days of heating and 5 to 7 days of cooling inside the masonry kiln until the process was completed.

Charcoal production could be made as high as eight times a year, which during the periods, kiln needed to be repaired. The associated structures have responded to traditional techniques, with ventilation control and locally used materials being employed in producing mangrove charcoal products (Seangsayan, 2006). Architecture itself was built by bamboo frame and was covered with thatching work (both roof and wall panels) on the earthen floor with only a single door opening. The kiln was built completely with bricks in hemispherical shape of 5-6 meters' diameter. Charcoal fines and mud are used as mortar, with no iron or steel support. this type of traditional masonry kiln was considered one of the most effective methods of charcoal production worldwide (FAO, 1987).

Figure 75 Associated structures (Charcoal processing plant) no.3 in Yeesarn community

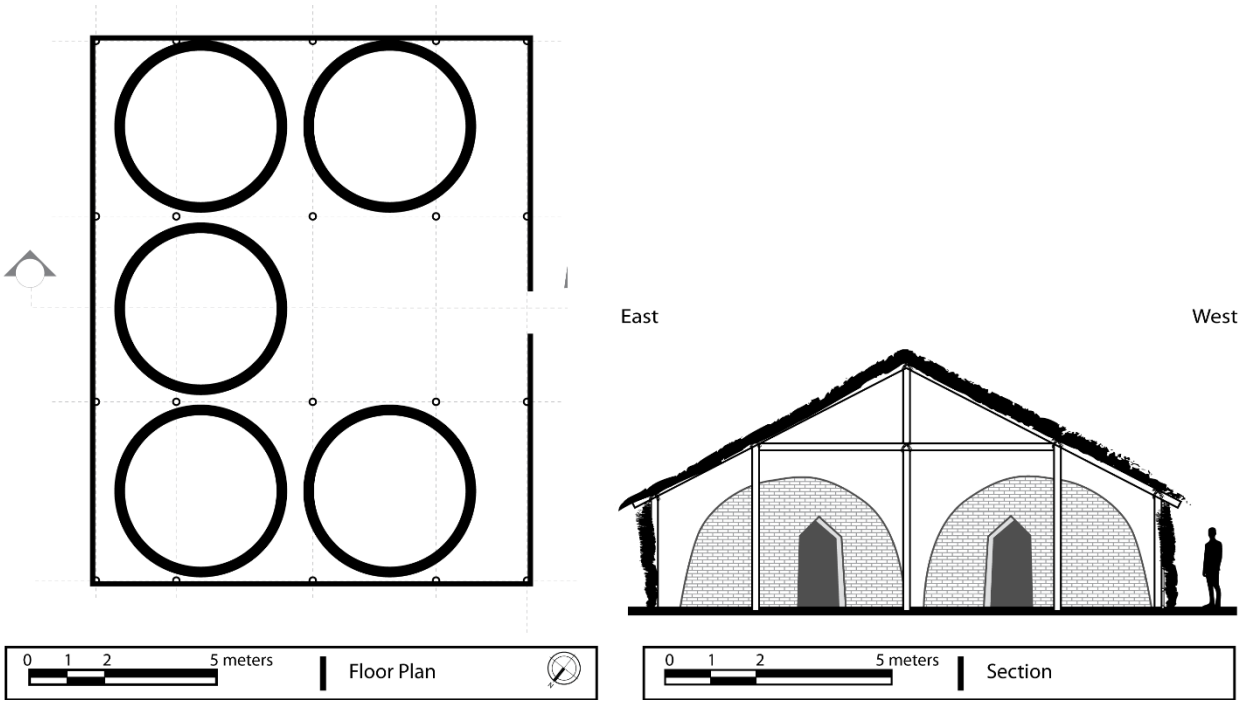


Figure 76 Plan and section of charcoal processing plant in Yeesarn community

The estuarine agricultural activities included salt paddy and wooden charcoal processing, as well as modest fishing traps, and these contributed substantially to the local economy. Salt production has been passed down through generations and fostering community bonds (IPST, 2012). Salt farming required large areas of land where ideal land for salt production was flat and close to the coast. The production of salt required a combination of several techniques, coming from the local indigenous knowledge of the people. salt was derived from sea water that was irrigated into the paddies and left to evaporate in the sun. The sun evaporated water out of brine leaving only the concentrated salt crystals. When the salt crystal reached the desired thickness, the farmers transported the salt for storage and dry it once more before selling (Sintusaard, 2009).

Figure 77 Associated structures (Salt granary) No.4 in Yeesarn community

A salt granary, one of the most outstanding features sitting alone on the endless white paddy, was a simple bamboo structure which made it easy to dismantle and moved to other locations. Salt granary typically rectangular in shape and of frame construction which was built on the ground to keep salt products. Posts directly supported roof structure and the bamboo studs were braced the wall partition from outside to protect structures against lateral forces caused by live load of salts.

Figure 78 Surrounding area of Yeesarn community

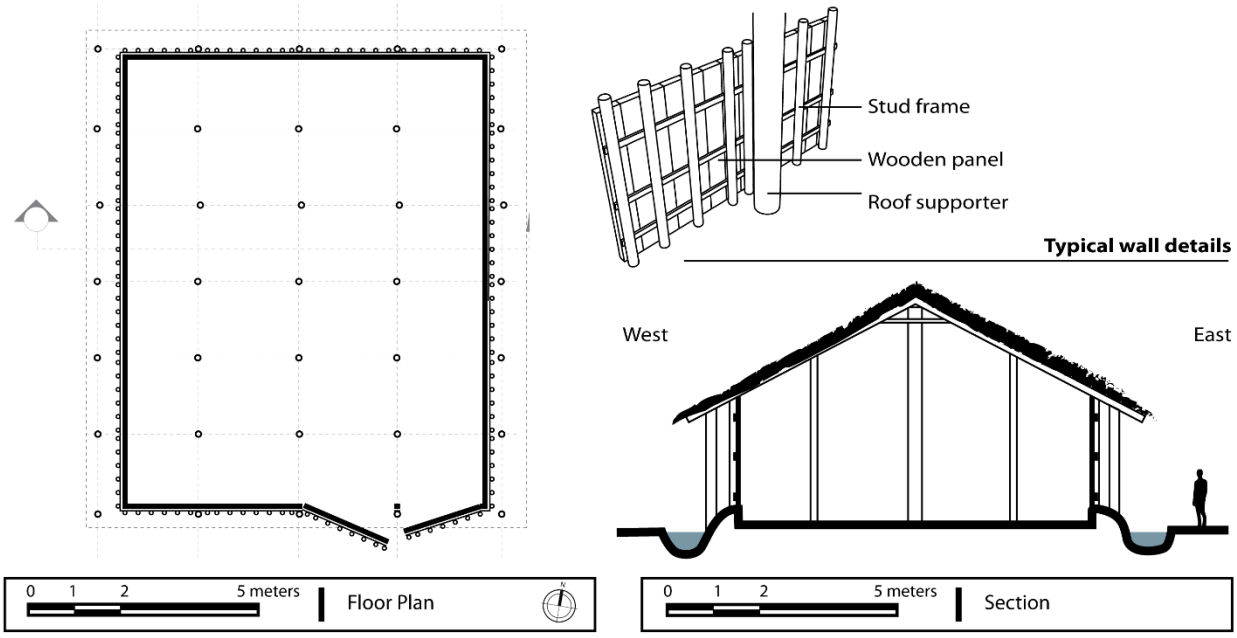


Figure 79 Plan and section of salt granary in Yeesarn community

Figure 80 Traditional fishing net was prohibited and being treated as overfishing instrument

(Source: Department of fisheries, Retrieved from http://www4.fisheries.go.th/)

In the waterfront and water related communities, people were mandatory make a living by fishing. Traditional methods and instruments were being used till nowadays. However, overfishing and illegal fishing practices in modern time like lighted nets and fishing traps caused by indiscriminate trapping of non-targeted fishes and juvenile animals (fig.80).

Since the EU issued 'yellow card' warning on the Thailand illegal fishing activities, Thai junta promulgated article 44 of the interim charter, which legalized the junta's hard order, to deal with the illegal fishing (Ganjanakhundee, 2015). However, the rigid law enforcement in fishery industrial became opposed to traditional fishing methods and faced a predicament because of traditional fishing traps (subsistence fishing) are, also, prohibited. The banned traditional fishing traps are "Ai Ngo", “Sai Nang”, and "Pong Pang" stow nets because of their use of lighted net trap and overfishing in which created an environmental hazard (“Knowing Pong Pang”, 2015).

D) Coastal fishing village of Leamyai community: Ramsar and local community

The coastal fishing village of *Leamyai* and its offshore fishing shelter were well-represented in the plentiful natural resources of the delta area. This village was part of designated Ramsars wetlands of *Don Hot Lot* (literally means mudflats of the razor clam) consisting of brackish water ecosystems in estuary areas with fertile mud beaches providing habitats for various species (Convention on Biological Diversity, 2014). In 2001, mudflats area between channels and bars of the Mouth of the *Mae Klong* River, in *Bangchakreng, Bangkaew, Laemyai* and *Klongkone* was designated as a Ramsar Site.

The site was important source of fisheries production, occupation and income. *Hoi Lot* (razor clam) was the most valuable species, whilst in Leamyai village, *Hoi Clang* (ark clam aka blood cockle) was another economic species which was captured from the site at 596 tonnes in 1990 and 1,246 tonnes were cultured, making a total of 6.7 million Baht of local income (Ramsar Sites Information Service, 2001). People's livelihood was dependent on the harvesting and trading clams which much relied on natural resources.

The conservation and sustainable use of *Don Hoi Lot* Action plan was drafted by many concerned agencies and was already approved by the National Environment Board since 2000, but has never been implemented. The natural resources of the site have not been protected by any laws and it is up to the government to decide what to do case by case.

However, there was a group of local people called "The *Don Hoi Lot* Conservation Group' actively engaged in conservation of site and clams through awareness raising and community involvement. These activities included monitoring the status of *Don Hoi Lot*, and organizing study tours to other communities to exchange experiences regarding the management of natural resources (IUCN, 2011).

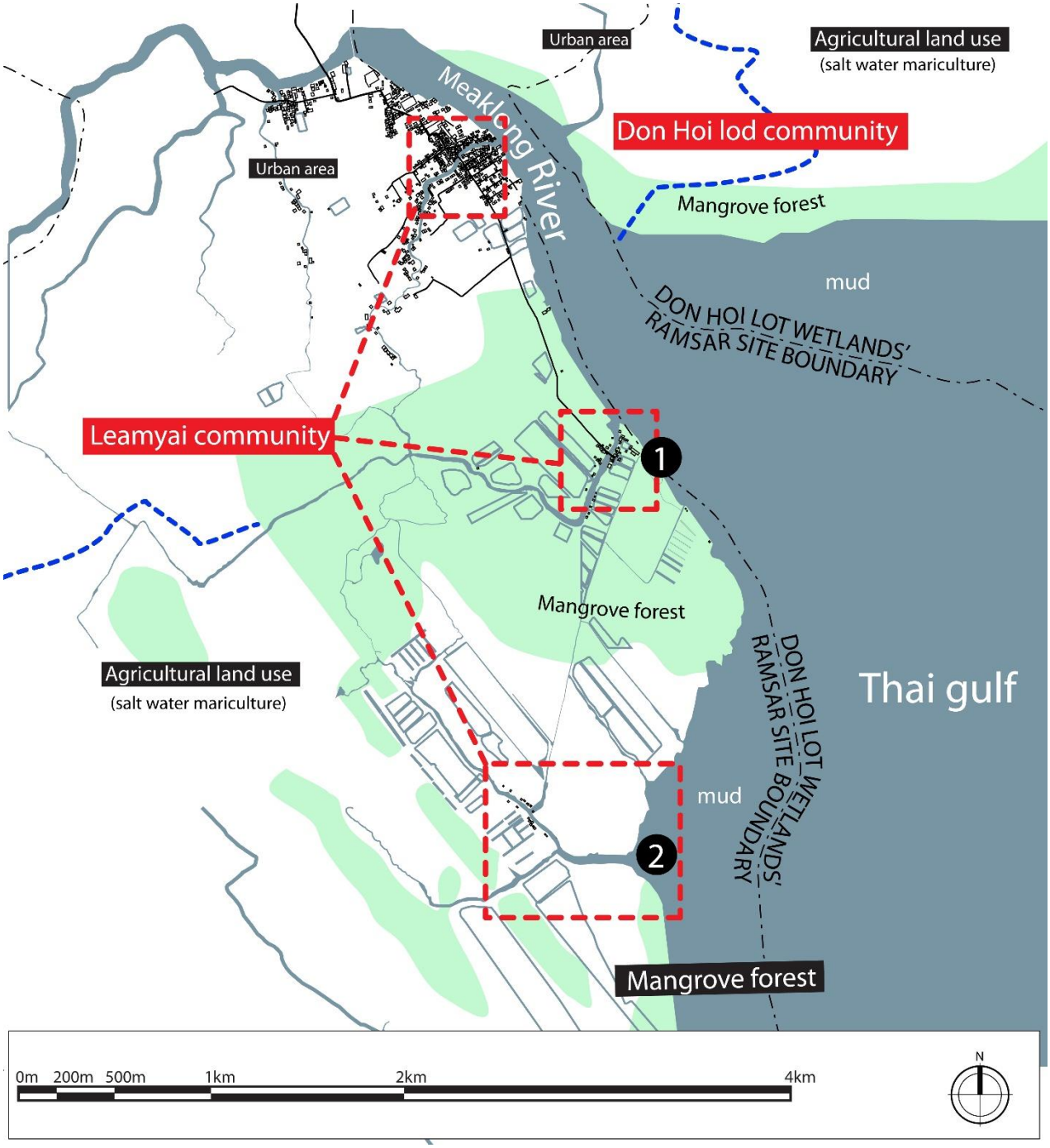


Figure 81 Selected group of traditional houses in Leamyai community

Table 10 Basic attributes and traditional housing condition in the coastal fishing village of Leamyai

No.	*Bldg. attributes*	*age*	*Members*	*Main occupation*	*Change/alteration or originality remarks*
1	Vernacular house	20	2	n/a	Extension expanded from traditional core
2	offshore shelter	10	n/a	Cockle farming	Example of authentic bamboo shelter

The oldest structure in Leamyai community was erected 80 years ago using modest bamboo structure. Since the house owners were two old-ages grandparent who unable to coup with the regular house care. Together with the durability of bamboo structure required regular maintenance, the original house was demolished and built the new one in the last 20 years. The new house was built in traditional style with a large open veranda surrounding the core area of the house (fig.82) where was used as bed room and kept valuable stuff. Since its open plan with open wood lattice-work, the owner usually lived their life in the veranda and closed to the water during the daytime. This example of traditional house in Leamyai community was still represented traditional space utilization in the contemporary days.

Figure 82 Traditional house No.1 in Leamyai community

Housing and the building environment were based on the available resources, including bamboo and mangrove wood. Houses with a low-rise floor were built along the waterways where the space underneath could not be used in daily life. Traditional building techniques were not visible, since construction materials have always been considered as temporary, and not surprisingly, they

were replaced or rebuilt several times. However, the central space of the house still retained its traditional open-plan use for sleeping and keeping valuables, while surrounding verandas were used for the purposes of daily living.

Figure 83 Plan and section of traditional house No.1 in Leamyai community

The offshore shelter was an outstanding associated structure aligned almost five kilometers away from the shoreline. The shelter was originally built using bamboo tied together in a modest design sitting on high stilts. It was a detached house used for monitoring cockle farms during the night. However, the shelter nowadays is not only used for agricultural purposes, but also serves the tourism sector. Most of the shelters have been turned into exotic homestays and restaurants on a gigantic scale. Concrete columns and lightweight gypsum board have replaced traditional materials to increase durability and vulnerability. New and modern facilities were also needed to improve service quality and hygiene standards.

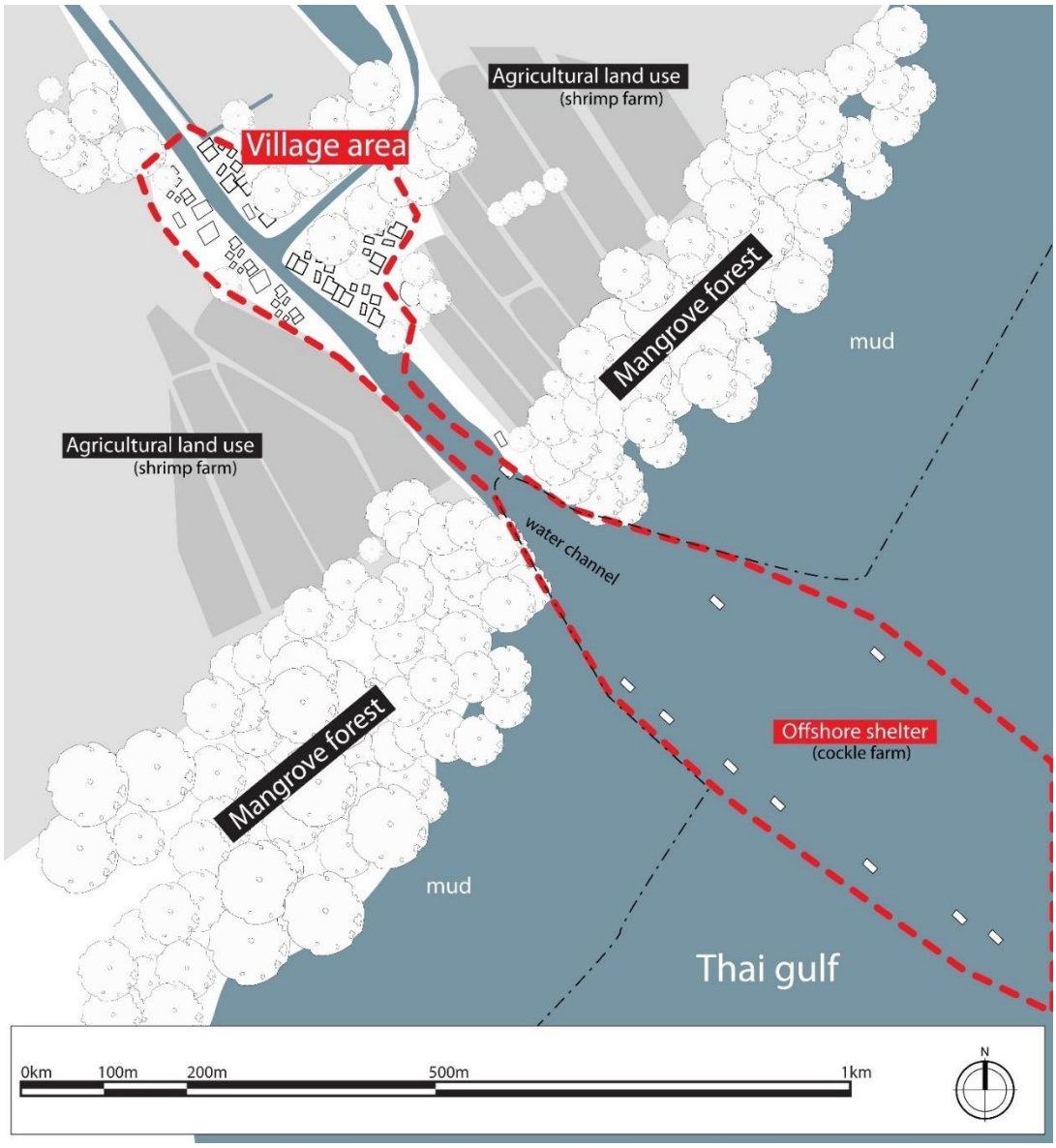


Figure 84 Selected group of traditional houses in Leamyai community (village and offshore shelter area)

Figure 85 Associated structure (offshore shelter) in Leamyai community

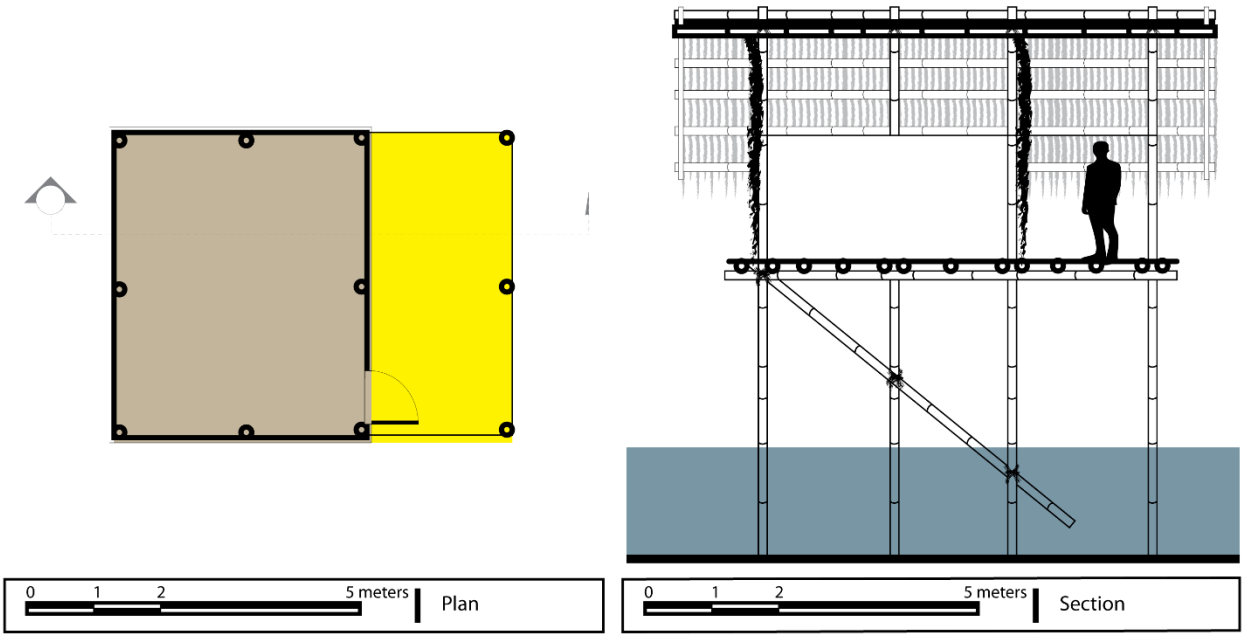


Figure 86 Plan and section of offshore shelter in Leamyai community

Even though the Ramsars sites are part of another form of protected area – either a national park or a non-hunting area, and so in theory are managed as part of the overall management plan of that protected area, however, Don Hoi Lot was currently outside of any kind of protected area. The different approaches of Thailand's law to prohibit any use of resources inside the protected area, whereas Ramsars is based on the philosophy of "wise use". It is therefore difficult to see how the same area can be effectively managed under these two very different approaches (IUCN, 2011). Thus, the site was still open to access, and have no clear legal and regulatory basis for their management.

With uncontrolled natural resources exploitation, this issue caused significant impact to traditional livelihood, traditional off-shore fishing shelter turned to be another exotic tourist destination with gigantic scale. The local restaurants overharvested and encroached into the mudflat which was likely to be polluted as a result of these alienate structures.

Decreasing of the mangrove forest was another issue. Between 1979 and 1996, up to 90% of the mangroves along the Inner Gulf of Thailand were converted to shrimp farms. Environmental costs are very high for shrimp farms located in the mangrove area, having impacts on nearby farmlands (Hazarika et al., 2000). The destruction of mangrove forests in the coastal wetlands is drastically decreasing local species and inhabitant. When the shrimp industry crashed, decline in fish catch over this same period made many fishermen understand the importance of mangroves, and that a balanced ecosystem is vital to their fishery. This could be done through Community Based Forest Management (CBFM) model strategies which give coastal communities and fisherman primary responsibility for managing their costal resources (Graham, Anthony, & Arthur, 2006). This form of management is more localized and, therefore, the management techniques can take many different forms depending on regional differences and the nuances of different fisheries. Under CBFM, fisheries management measures are enforced by the communities themselves.

Figure 87 Traditional off-shore fishing shelter turned to be another exotic tourist destination

Figure 88 Decreasing of mangrove forest causes significant impact to local inhabitant

4.3.2 Cross-culture influence of multi-racial communities

This section will be published in Yodsurang, P., and Uekita, Y. (2016) Overseas Chinese in the Chao Phraya River Basin: The Cross-Cultural Influence of a Multi-Racial Community. Asian Profile, 44(5), 459-470.

The Chao Phraya River Basin and its associated traditional waterfront community complex represent a model for the interaction between human settlements and the natural environment. The understanding of their natural environment and its efficient adaptation to their way of life is reflected in the architectural and intangible cultural heritage, which is considered as a genuine and outstanding model for a sustainable way of life.

A multi-racial community settled along the Chao Phraya River Basin and made a living based on the cultural baggage of both individuals and groups. This is particularly true in the lower delta where the multi-racial community exhibits its uniqueness in different geographical settings. These communities were called by names usually implying a specific group of people, although not always (Poland and Mare, 2005), including *Chumchon Mon Bangkradi* (a Mon community) in Bangkok, *Chunchon Kohkred* (a Mon community) in Nonthaburi Province, *Chumchon Makamlom* (a Tai Phuan community) in Suphan Buri Province, *Chumchon Tai Yuan Rim Meanam Pasuk* (a Tai Yuan community along the Pasuk River) in Lopburi Province, and so on (ONEP, 2012).

However, most ethnic communities in Thailand are descendants of people who migrated from Southern and Southeastern China. A large Chinese community in Thailand was highlighted in A History of Thailand (Baker and Phongpaichit, 2014), depicting its influence both politically and economically. Pertinently, Chinese diaspora who contributed much to Thailand's economic development, began settling in the Ayutthaya period, approximately 400 years ago, and continued migrating until reaching a peak as a consequence of the Bowring treaty in 1855. The communities of Chinese descendants were scattered throughout the river basin, mixed with the indigenous race and possessing outstanding features which were testimony to the commercial community in the

Chao Phraya River Basin. Non-indigenous Chinese communities are representative of a culture that is becoming adapted, mixed, and blended under the impact of irreversible change, particularly seen by religious structures and dwelling units.

Thus, this section aims to provide evidence of the cross-cultural influence of a mixed-race community, particularly the cultural baggage of Chinese diaspora in the Chao Phraya River Basin, and their adaptability in a multi-racial community. The results provided in this paper offer ideas as to how and why people used geographical settings and natural resources to create a traditional settlement along the main river. The part also expects to provide knowledge and understanding of an outstanding water-based settlement in this region.

A multi-racial, ethnic community in the Chao Phraya River Basin

According to the cultural environment: traditional community conservation handbook (UNEP, 2013), an ethnic community is a settlement of people connected by nationality or ethnicity, etc. Most of these communities contain immigrants from neighboring countries accompanied by cultural baggage. However, this type of community is outstanding in intangible features and retains its original identity to some degree, even though the physical and social structures may have changed.

Thailand's Chao Phraya River Basin comprises migrating mixed racial families who have settled mainly along the main transportation route. Functionally, the traditional community in the Chao Phraya River Basin is defined into two main clusters of agricultural and commercial communities (Yodsurang, Miki, and Uekita, 2016). Agricultural communities comprising paddy, orchard, estuarine agriculture, and estuarine fishing villages of indigenous migrants from neighbouring kingdoms have been found in different historical periods. For several reasons, the collapse of neighbouring kingdoms has resulted in the spread of migration into this region over time such as, the Mon, Phuan, Yuan, Lao, and several Thai ethnic groups. The transborder migration of indigenous people who share common cultural roots and speak similar languages and dialects was very common (LePoer, 1987). Several of these close contact ethnic identities became blended with

the larger society and merged into the Thai community, so that their authentic roots could not always be identified. However, some communities still maintain their cultural uniqueness, but very few.

The commercial community along the main Chao Phraya River exhibits non-indigenous multiraciality, particularly concerning Chinese diaspora, whose shrines represent its unique physical characteristics, thereby migrating cultural baggage.

This distinguishing feature is prominent in the 48 riverport towns and 20 canal trading villages among the 138 traditional communities settling along the main transportation route running through the north-south and east-west corridor of the river basin, which have a significant relationship to Chinese shrines in the commercial community (Yodsurang, Miki and Uekita, 2016). These types of community have been associated with Chinese immigrants since the early Rattanakosin period, and have made a significant contribution to the development of trading and agricultural product distribution (Tachakitkachorn and Shigemura, 2005).

Chinese diaspora and the new settlement

The Chinese diaspora has been witness to the revolution of Thailand and the relationship between Thailand and China, in terms of culture, politics, economics, and lifestyle. This kind of relationship has changed over time, and reflects the political and economic revolution. The recording of trading contacts and diplomatic relations between the Sukhothai Kingdom and China was established from 1250–1438 (Seviset, 2014). The migration of Chinese influence has been grounded in the confluence of the Chao Phraya River and its tributaries, i.e., *Nakhon Sawan, Peadrew, Thachine*, and so on (Yodsurang, 2012).

In the Ayutthaya period, the Chinese migrant community was the only non-indigenous population allowed to settle close to the inner capital of the Ayutthya Kingdom. The community was located near the main port of Ayutthaya, in the main market of the capital. However, after the capital was moved to Thonburi in Bangkok (after 1782), Chinese settlements from Ayutthaya

relocated down river and settled along the riverfront of the lower delta, as the area was a strategic point for international shipping.

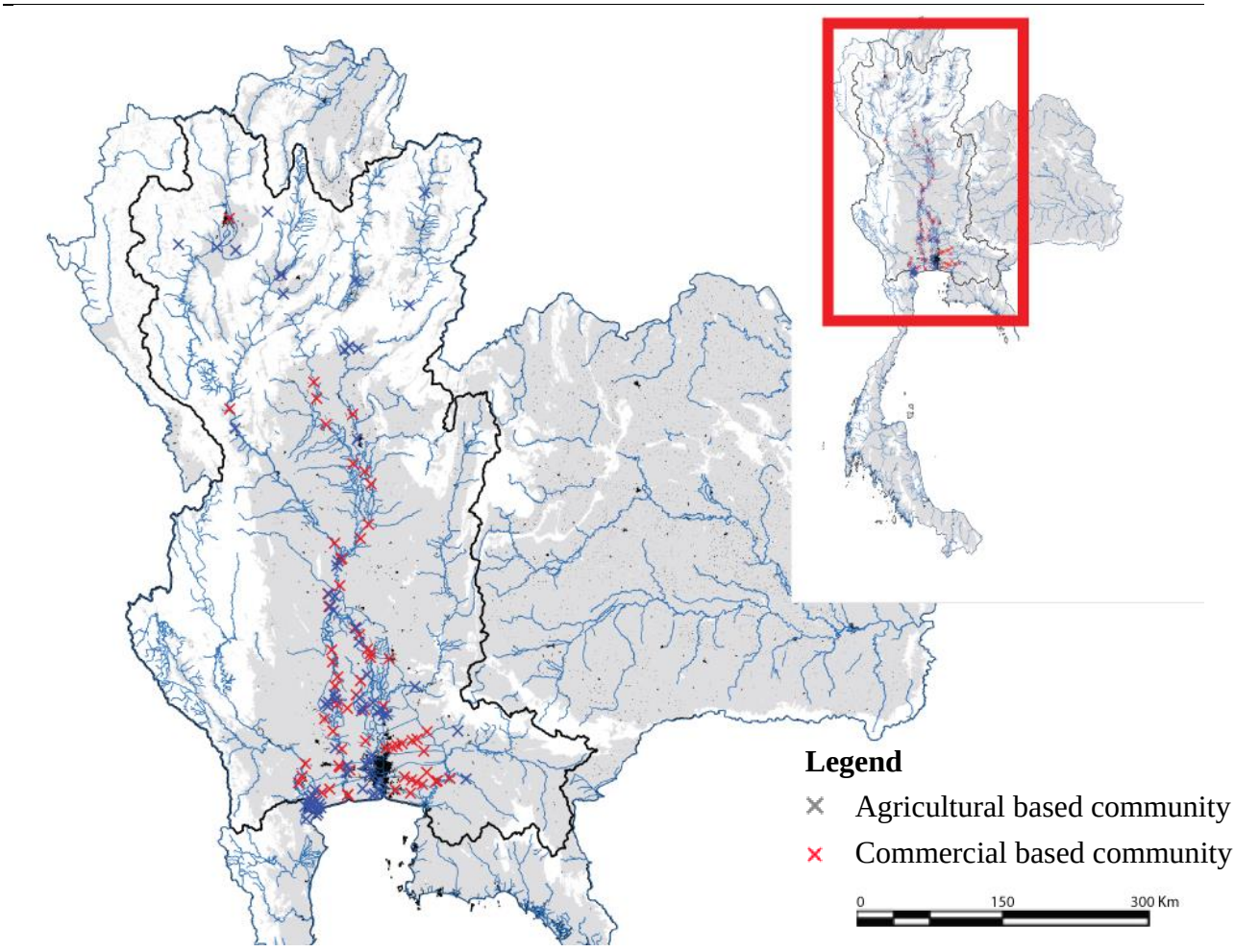


Figure 89 Location of traditional communities in the Chao Phraya River Basin classified by function

The wave of Chinese migration to Bangkok in modern times began after 1783. Besides contributing to trade and government service, Chinese workers were involved in the building of the new capital and related structures. At that time, there were over 1,500,000 Chinese migrants from the Cantonese region (Yodsurang, 2012). Non-indigenous newcomers in modern times faced property ownership restrictions. Unlike the cross-border indigenous migrants who settled in the traditional period there was not much difference in cultural identity. Consequently, these groups could own land and had the right to operate agricultural businesses.

In the earlier period, the non-indigenous population could not own land, so they made their livelihoods in the agricultural sector, construction, and boat house trading. As a consequence of the Bowring Treaty (1855), there was significant expansion and reformation of the canal system in the lower delta to expand agricultural land use as well as housing and land development along the new waterway transportation facility (Boonnak, Noppakhun, and Thadaniti, 1982). The canal was extended towards the east and west corridor of the Chao Phraya River Basin in the 1880s, and Chinese workers were employed as the main labor force. The new waterside was claimed for agriculture and rental housing development by aristocrats. Soon after and during the new canal construction, Thai, Chinese, Muslim, Mon, and Khmer people settled along the way and made a living (Preecha, 2008).

However, the cultural baggage of non-indigenous Chinese migrants was distinguished by their sailing and trading skills. There were substantial areas of rented row houses, where communities were grounded by shrines or religious structures, unlike agricultural communities where a dirt-court provided a gathering space and was the center of several activities. Thus, members of the community began trading and turning the area into a commercial hub for the agricultural and agro-industrial products of the canal network. A combination of Thai-Chinese culture created a unique architecture, corresponding with the cultural landscape.

The combination of Thai-Chinese culture has created a unique architectural and cultural landscape. Eventually, the races have become mixed, as testament to their ancestors' efforts to shape and maintain the cultural baggage of Thailand's modern waterfront society, both tangibly and intangibly.

E) Riverport town of Samchuk: economic bustling of the river-based transportation of the north-south corridor

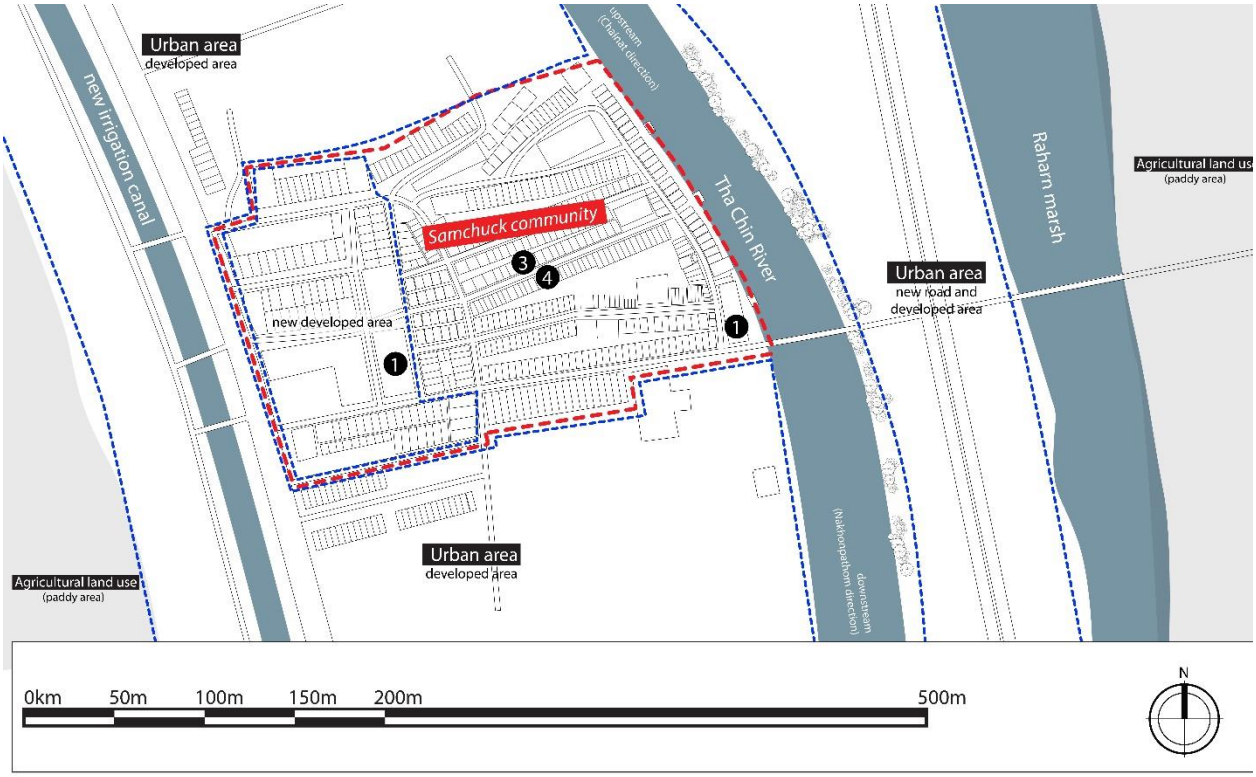


Figure 90 Selected group of traditional houses in Talad Samchuk community

The commercial community along the Chao Phraya River Basin has been dominated by people of Chinese descent. According to a survey in 2016, among 138 traditional waterfront communities, 60 are commercially based settlements, with a Chinese shrine located at the center for both physical and spiritual reasons.

Table 11 Basic attributes and traditional housing condition in the Riverport town of Samchuk

No.	*Bldg. attributes*	*age*	*Members*	*Main occupation*	*Change/alteration or originality remarks*
1	Central market	60	n/a	commercial	Reconstruction, same as original
2	River front market	80	n/a	commercial	Ruinous, 2nd floor changed to residential unit
3	Typical shop house	60	4	commercial	Added toilet and 2nd floor changed to storage
4	Typical shop house	60	3	commercial	Added toilet and 2nd floor changed to storage

Shrines, religious structures, and the establishment of livelihoods

In areas where migrants settled, shrines were established and dedicated to a specific deity according to their individual beliefs. Thus, such shrines are symbolic of the Chinese community and their settlements are identified by a distinctive cult (Lertlamampai, 2010). However, due to a fear of communism in the 1950s, an anti-communist policy established itself under the military regime, targeting minorities like the Chinese and Vietnamese. With the old militarist and proven racist regime back in power, the overseas Chinese became scapegoats for the ills of an endemically unjust and oppressive society (Flood, 1977). Due to a lack of adequate support from the government, shrines became a traditional gathering space for the Chinese community, and shrine associations actively initiated infrastructure and community welfare development on a self-supporting basis (Nipaporn, 2012). This created social ties and strengthened communal identity.

Chinese shrines are generally called *Sanchao,* literally meaning house of god. One popular such deity is *Pun Thao Kong* (本頭公), a god of wealth locality worshipped in Southeast Asia (Pornpan and Mak, 1994 in Kataoka, 2012). *Pun Thao Kong* literally means head of the clan, established to represent community's ancestors of earlier settlements, held in high esteem by Chinese migrants.

Another interpretation is that in the Philippines, *Pun Thao Kong* was a crew member on the voyages of Z*eng He* (1371–1433) who was the first global Chinese naval traveller. He landed at Jolo, remained there, raised a large family, and now the majority of Chinese in the area are descended from him (Stevens, 1972). *Pun Thao Kong* is commonly known in Thai as *Sanpooya* which literally means grandpa and grandma's shrine. However, local interpretation and meanings might vary by region.

As it housed the god of wealth, *Pun Thao Kong* existed along with the commercial community on various scales. However, in the waterfront community, the main *Sanchao* were located near the river or with easy access to it. A great example of non-indigenous mixed traditions in the waterfront

community are exhibited by the *Samchuk* commercial community, a well preserved waterfront commercial community, which was awarded a UNESCO Cultural Heritage Preservation prize in 2009. Among those scattered throughout the area, the main *Sanchao* is devoted to *Pun Thao Kong.* However, it is locally known as *Sanchaopao Lukmuang* (literally meaning city pillar shrine) or *Sanchaopao Samchuk* (literally meaning the shrine of *Samchuk*'s deity). Although *Sanchao* was founded in 1764, the existing structure was rebuilt in 1924, when the town centre was relocated, and has been repaired several times. The structure itself has been built in the Chinese architectural style on a modest scale. A small and humble *Sanchao* structure, sitting on the main river access, fills the space between an alignment of wooden row houses along the main river. Indeed, the interior has been decorated with several items relating to Chinese mythology such as dragons and tigers. However, planning consisted of only one main altar of a pair of graven Hindu god images which were representative of a hybrid identity in non-indigenous tradition.

Even though the architectural value of this Sanchao is not representative of its humble appearance, the structure also powerfully manifests community spirit (Rattanapahu, 2004). Traditional events such as *Trut Chin* (Chinese New Year), *Sart Chin* (Ghost Festival), *Tesakarn Kanom Chang* (Dragon Boat Festival), and so on, are being maintained by the *Sanchao* association. However, the most important festival held in this community is *Praphenii wai Sanchao* (Sanchao Worship Festival) which is held twice a year.

Figure 91 Sanchao Pun Thao Kong in the Samchuk community

Figure 92 A pair of Hindu god graven images in Sanchao

Figure 93 Layout plan of Sanchao and its associated area

Dwelling units and socio-economic activities

The rented wooden row houses and market places are testimony to the flourishing past of its commercial and shipping businesses. The typical market compound consists of two types, depending on the size of water bodies. In the main river, the series of row houses cluster around the central market, lining two sides of the small alley connecting it to the waterfront. However, in the canalside community, the series of row houses face directly onto the water front, with a walkway running between.

This riverport town was a major trading center along the main river on the north-south corridor of the basin. Talad Samchuk, a flourishing riverport town along the Tha Chin River during the first era modernization, was once a center for trade and transportation in the Suphan Buri Province in the 1960s. However, in the 1980s the wooden row house market community has

suffered as a result of substantial urban sprawl and land use change, when roads became the primary mode of transportation. During that time, housing and associated market structures were abandoned.

After the nostalgic tourism boom in the 2000s, the community came back to life once again, and traditional structures still remain in good condition. A compound of two-storey wooden row houses was built along the road to the public pier at the waterfront end. Over several decades, the function of the row house has changed. Some continued as local stores, some were merely residential units, and some were shophouses serving the tourist industry without a living unit. However, the façade, building mass, and volume have not changed much. Detailed ornaments were still visible, enabling the identification of building techniques and the date of construction. However, since the shophouse has limited inside space, the living space was located in front. Likewise in the agricultural village, this was a gathering space and formed a social tie.

The most important associated structure in Talad Samchuk was the market place, which was the heart of the commercial community. In Talad Samchuk, there were three market buildings within the compound. The markets were built with vernacular ventilation features, using roof vents for natural air flow through a stacking effect. Traditional market buildings as well as new markets used this technique.

Figure 94 Associated structure No.1 (market building) in Talad Samchuk community

The market building No.1 in Talad Samchuk community (fig.94) was originally built in wooden widespan structure with a large open space in 60 years ago. Since the physical structure was in crucial condition, the market building was rebuilt in the same pattern as before. One

outstanding element of the traditional ventilation control in vernacular design still remains. Stack ventilation has been employed through the upper louvers vent to reduce the heat on the daytime days and allows cool winds pass through, which was widely accepted and being use in other market buildings in Talad Samchuk community.

Figure 95 Associated structure No.2 (of *Taokea Baeu's* market building) in Talad Samchuk community

The most prominent market building in Talad Samchuk community was located along the main river. The building originally housed a fresh market, but currently was used as food stall area. However, the upper floor was used as dwelling unit. Structure itself was employed wood-trussed widespan to increase the market space. The building was accessible from both road and the river which the main river access was covered by dormer roof. Thus, this access made the building distinctive and was being another landmark of Talad Samchuk community from the river.

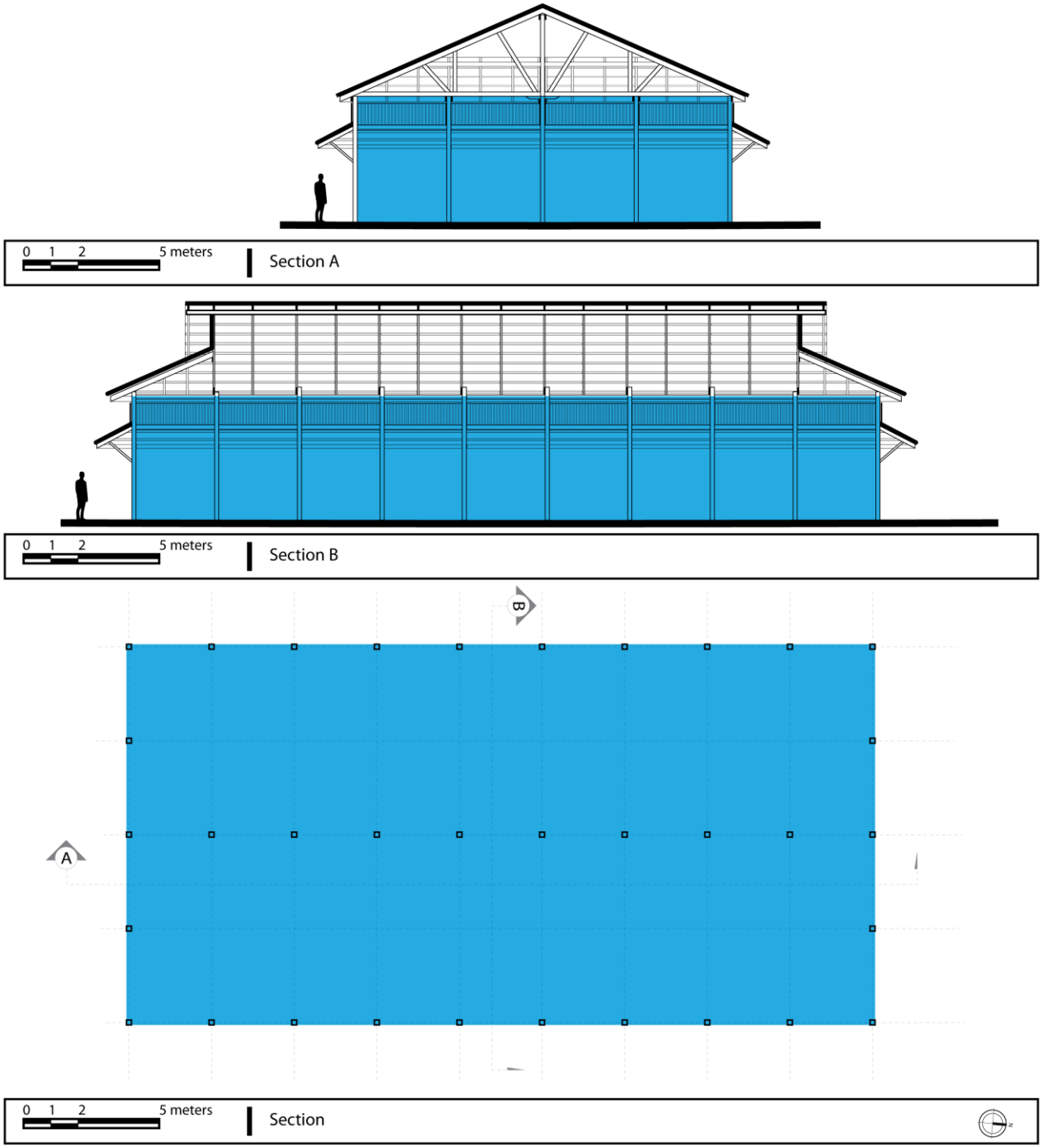


Figure 96 Plan and section of market building No.1 in Talad Samchuk community

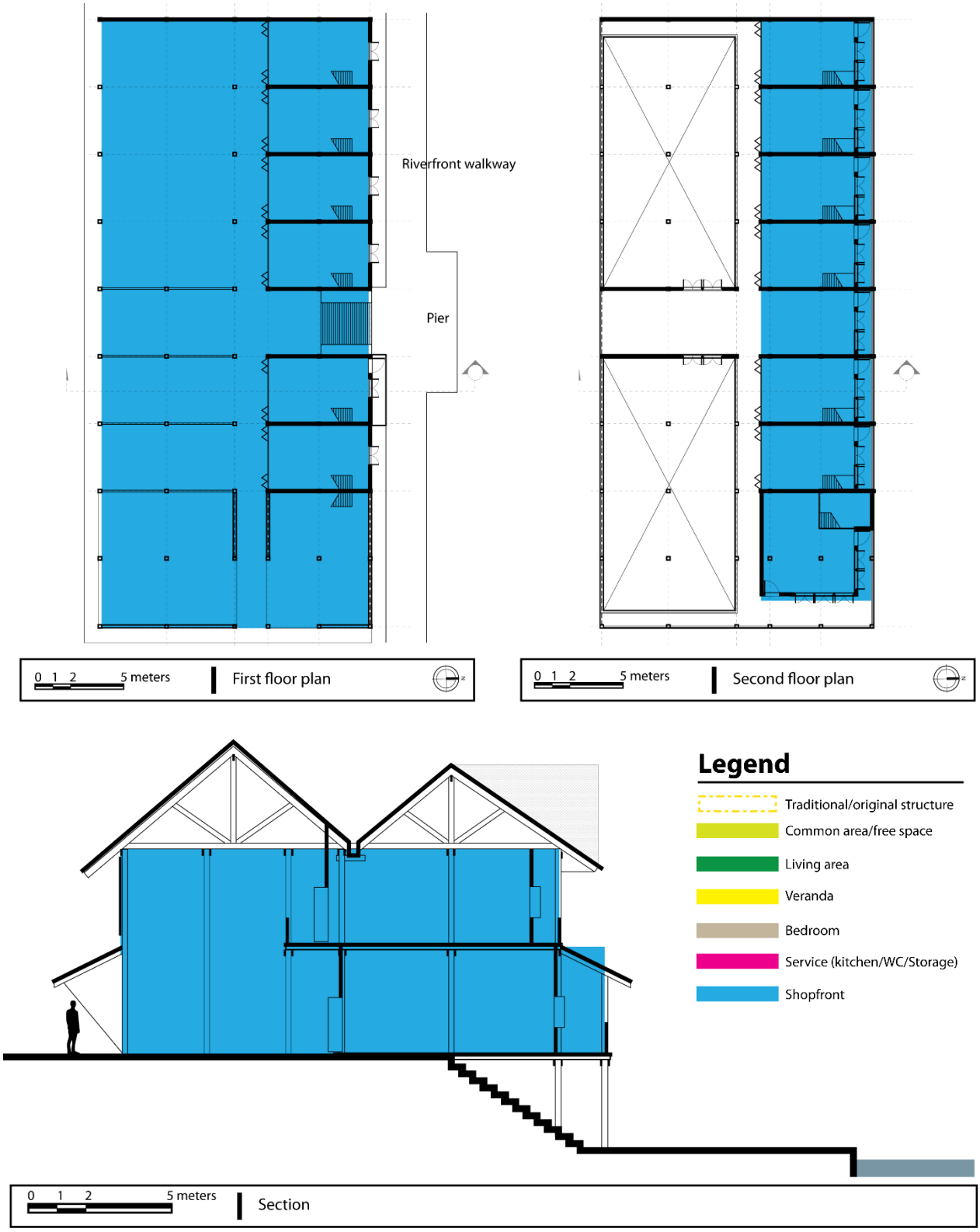


Figure 97 Plan and section of *Taokea Baeu*'s market building (No.2) in *Talad Samchuk* community

The dwelling units in the *Samchuk* community are an outstanding example. The compound combines three central markets surrounded by grid-type rental wooden row houses. Besides *Sanchao*, markets have always been the center of the commercial community for economic reasons. The market compound was built close to the river in early settlement time, and expanded outwards with the passage of time. The example of *Taokea Baeu* market (named according to its owner) has a long history dating back to the early settlement period. The building originally housed a fresh market, but is currently used as an area for food stalls. The upper floor is used for dwelling units, combining both public and private spaces. The structure itself employs wide-spanning wood-trusses to increase the market space. The building is accessible from both the road and river, with the main access covered by a dormer roof. Thus, this access makes the building distinctive and represents another visible landmark of the *Samchuk* community from the river.

In the earlier stages, single-storey row houses were built. Subsequently, as a consequence of the bustling local economy, the expansion of the market has increased the demand for shophouses, and the rental market for such wooden buildings has substantially grown. The structures are modest, with two storeys, and a gable roof with long fronted eaves. Although, all houses appear almost the same (i.e., louver vents, handrails, doors, windows, etc.), the decorative parts are perforated. These perforated ornaments, which basically let the wind flow through, were very popular during the peak building period because importantly, they exhibited the individuality and social status of dwellers. These detailed ornaments are still visible, enabling the identification of building techniques and date of construction.

The market compound combined the series of shophouses lined the two side of small alleys. The series the shophouses were built almost the same time, Before WWII. On the first stage, the wooden shophouses were built in a single storey combining hardwood and bamboo (Suphachaturas, 2013). Later on, as a consequence of local economic bustling, the expansion of the market has made the demand of the shophouse increase. The wooden shophouses (fig.98) building for rent were

drastically growth. The structures were built in a simple structure, two storeys gable roof with long fronted eave. However, most parts (i.e. louver vent, hand rails, doors, windows, and etc.) were perforated to let the wind flow through. Besides, perforated ornament was very popular during the period and, importantly, it proved the social status.

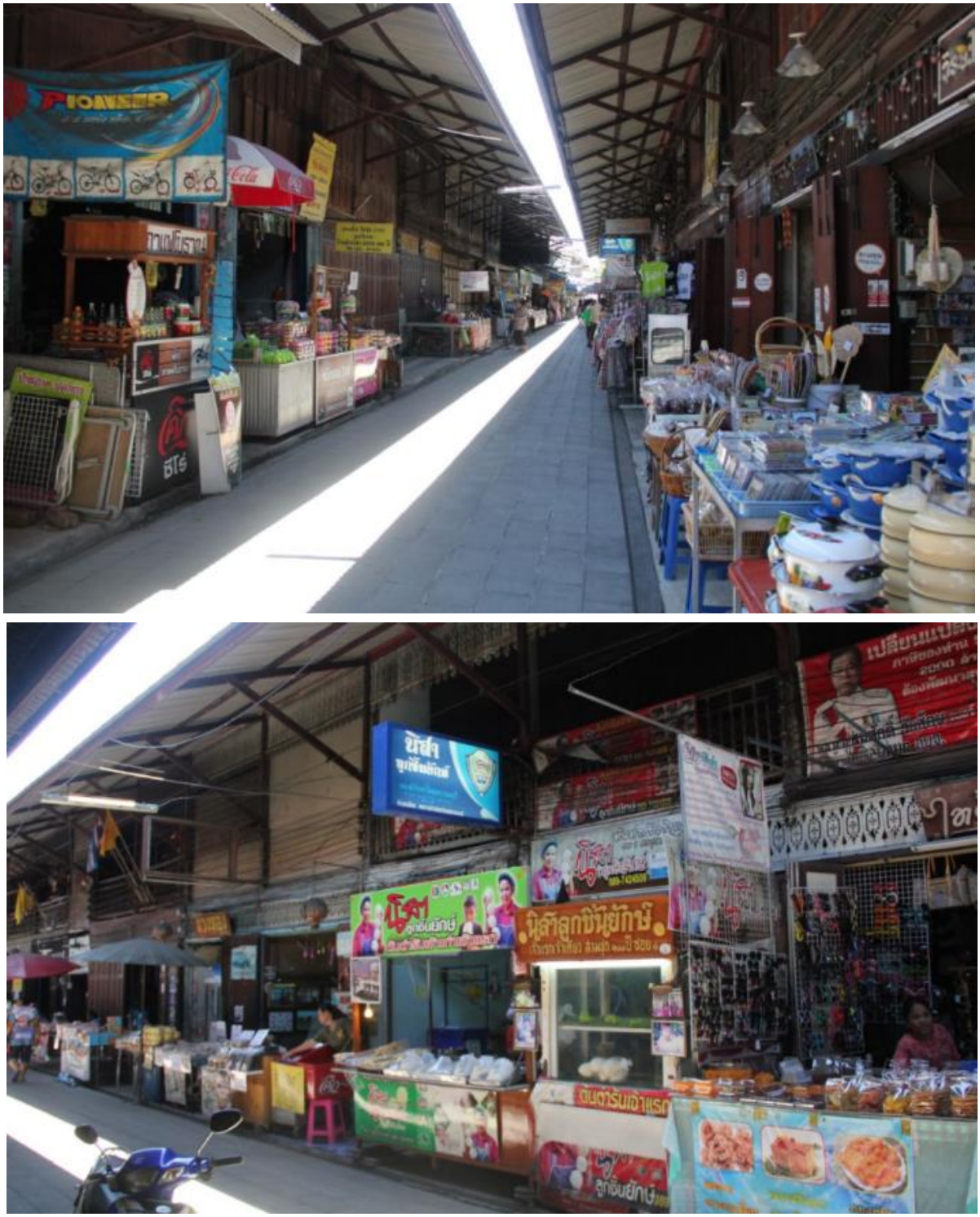


Figure 98 Shophouses No.3 and No.4 in Talad Samchuk community

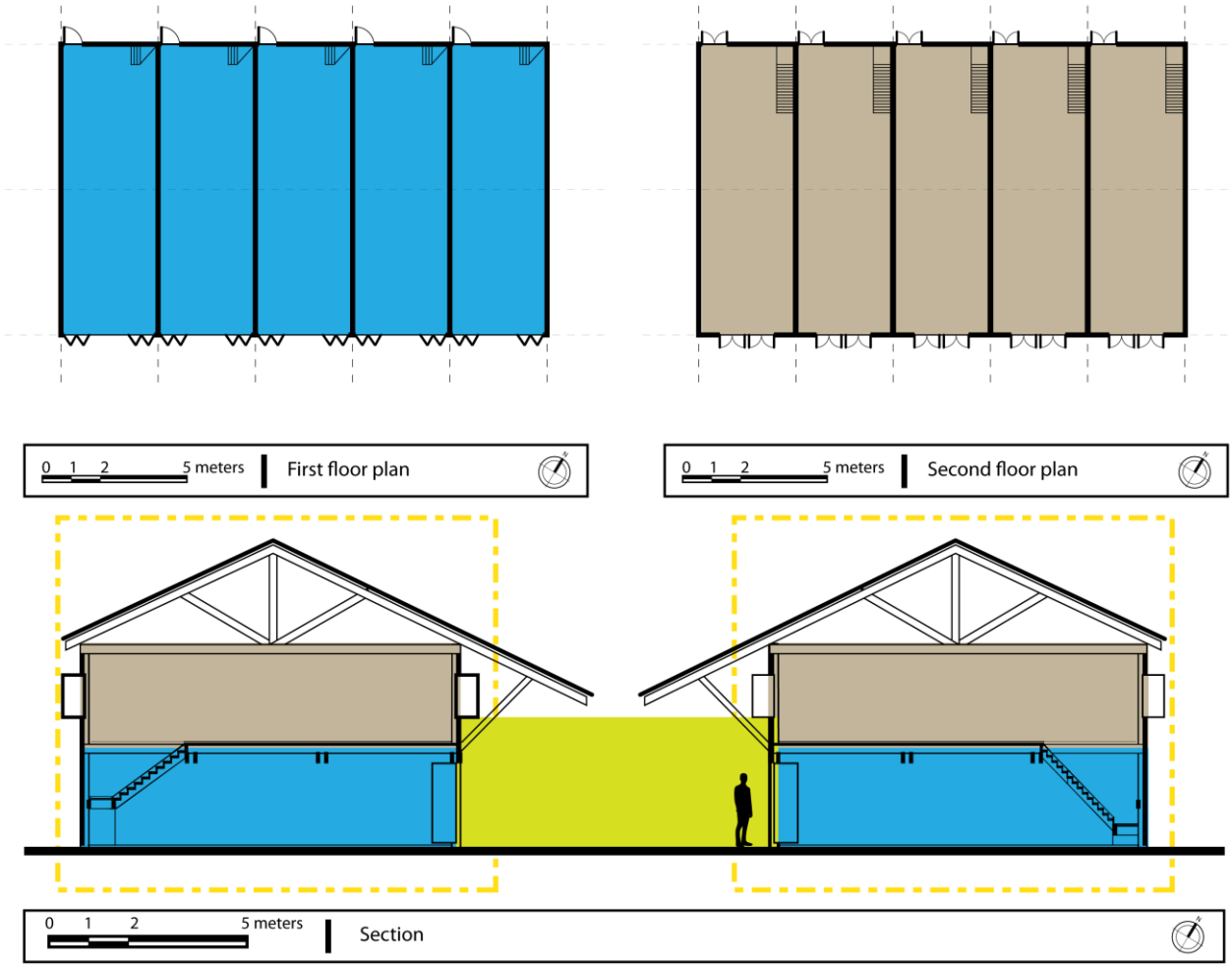


Figure 99 Space utilization of a typical row house (No.3 and No.4) in the Samchuk community

However, since 2011 flood crisis, construction of flood barriers, in some spots as high as 5.5 meters, going up along the Chao Phraya River. A massive structure is going up along the main river in major settlement from Bangkok to Nakhon Sawan province, which is expected to prevent floodwater from flowing into the city zone. However, floods in Thailand are also generally caused by overflow from the rivers, which results in widespread flooding. Construction of flood barrier will obstruct flow especially for inland flow. The floodwalls and dykes along the Chao Phraya would raise the level of water in the river and cause it to flow more rapidly.

Figure 100 New waterfront structure and flood barrier (which was at 5.5 meters height in some area)

F) Canal trading village of Klong suan community: Small scale commercial hub of the east-west corridor

Example of the relationship between *Sanchao* architecture and community is located along the *Pravejbutirom* canal. The small scale commercial community of *Klong Suan* lived harmoniously with different ethnicities and beliefs, namely, Chinese, Thai, and Muslim. Socially, diversity was represented by three landmarks; *Wat Khlong Suan* (Buddhist temple), a mosque, and a *Sanchao,* which were built within a 1.5-kilometer sphere. The multi-ethnic communities live there together peacefully, like a family.

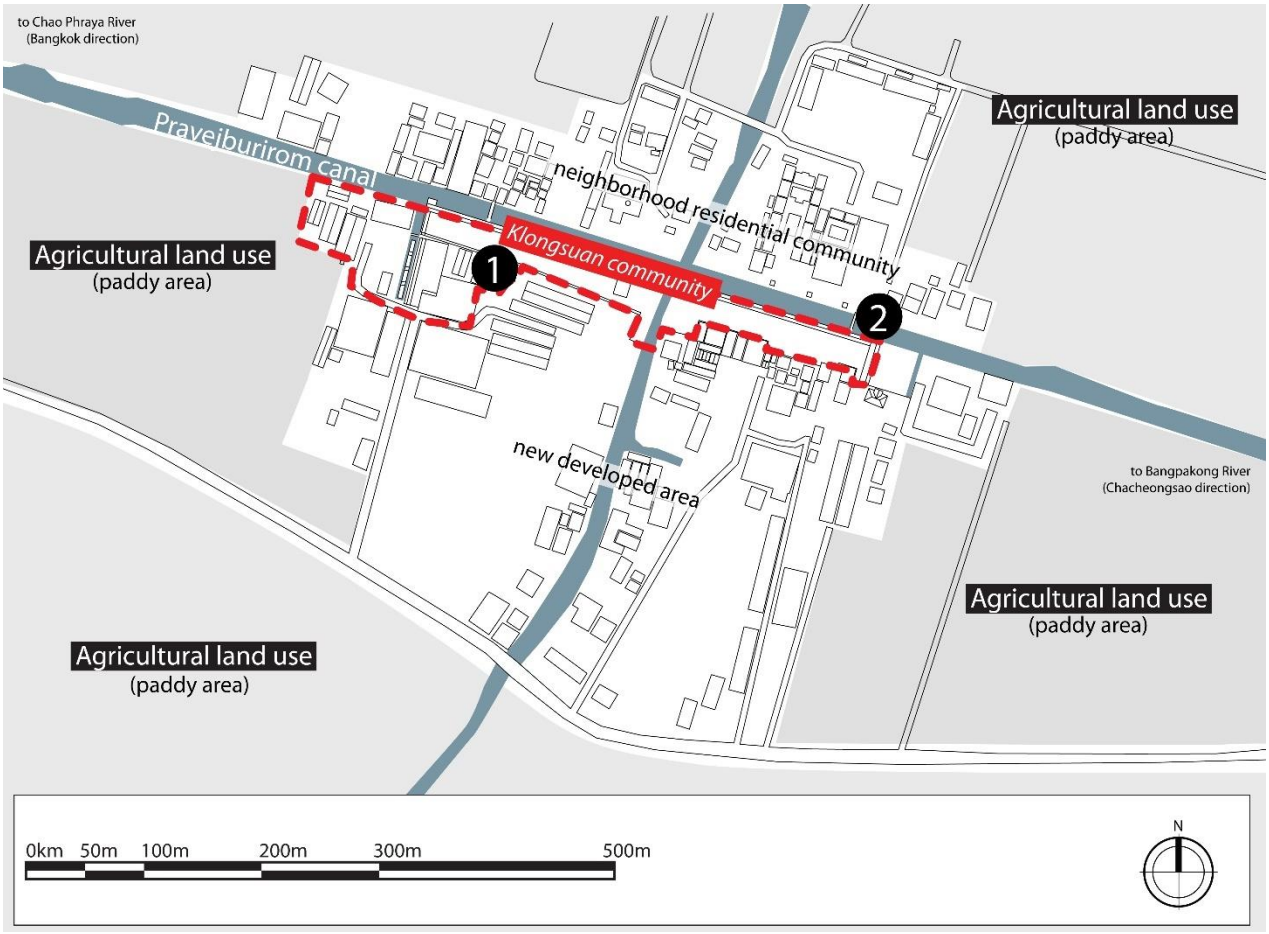


Figure 101 Selected group of traditional houses in Klong Suan community

Table 12 Basic attributes and traditional housing condition in the Canal trading village of Klong suan community

No.	*Bldg. attributes*	*age*	*Members*	*Main occupation*	*Change/alteration or originality remarks*
1	Typical row house	100	5	commercial	Extended the back side for residential purpose
2	Steep wooden bridge	40	n/a	n/a	Remain its heights for transportation

Shrines, religious structures, and the establishment of livelihoods

The most important, and held in high esteem by the community, is *Sanchaopoa Klong Suan* (literally meaning *Shrine of Klong Suan's deity*) or the new *Sanchao Pun Thao Kong* (新本頭公). This *Sanchao* was originally built in wood on a modest scale. However, as a consequence of community expansion and a bustling local economy in the 1960s and 70s, a new concrete *Sanchaopoa Klong Suan* was rebuilt on a larger scale (Yuankhuntod 2012). As with other commercial communities, *Sanchaopoa* is also devoted to the god of wealth (Preecha 2008).

Wat Khlong Suan, together with *Sanchaopoa Klong Suan, Sanchao Pun Thao Kong, and Peng Ang Tua almshouse,* were founded in 1887. Likewise, the *Al-Watoneeyah Mosque* was built two years later within walking distance. However, the community and its housing were established by Chinese families who had a majority in the community, and much was influenced by them (Vinitwatanakhun 2014), as evidenced by the architecture, decorations, and lifestyles, as well as many Chinese festivals and events, including Chinese opera, Chinese puppet shows, and other rituals.

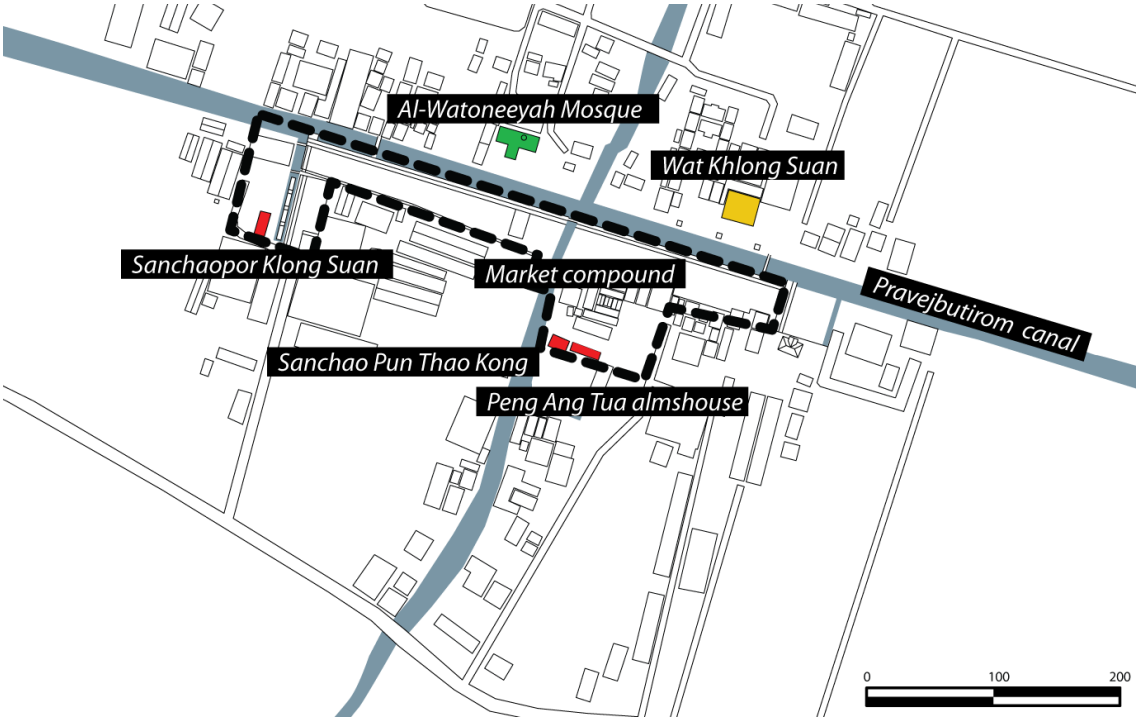


Figure 102 Layout plan of the Klong Suan community and its associated structure

Figure 103 Sanchaopoa Klongsuan

Dwelling units and socio-economic activities

Example of a small scale commercial Chinese community is *Klong Suan,* testifying the importance of cross-cultural identity. Since the waterfront houses in the community are in single-family ownership, lessees cannot make any changes to their physical structure. Thus, they have remained almost in their original condition, with no alienated buildings or materials being in evidence.

The canal trading village, a smaller commercial community, was located along the east-west corridor of the basin surrounded by agricultural land. The communities of the canal trading village

usually settled along the man-made canal, so this could guarantee the water level, control floods, and regulate the water.

The row houses combine commercial and residential units, aligned over 1.5 kilometres along the main canal. The shop front is directly connected to the waterfront, but the walkway running between is a micro scale commercial hub for the distribution of post-agricultural products carried by small boats through the canal network. *Khlong Suan* was once one of the most prosperous commercial communities, and the rice mill is testimony to its past prosperity, indicating the abundance of agricultural products. People travelling to Bangkok had to interchange here and a high steep wooden bridge shows that the canal still functions to let boats pass beneath. This system continues to successfully bond people to the canal.

Figure 104 Typical row house No.1 in Klong Suan community

The Klongsuan community, an outstanding canal trading village, is located along the Prawet Burirom Canal. The community is a local market and distribution center for agricultural commodities on the border of Samut Prakan and Chachoengsao Provinces. Like other commercial markets, properties are in single or double family ownership. Users or lessees were unable to make alterations without permission, so the building remained almost in its original condition.

The typical double floor wooden row house along one side of the canal incorporating a shophouse and dwelling unit remain both in architectural form and function. The exterior façade,

door panel, or decorated ornaments identify the origins of the time when it was built. Alterations were rare, since the local economy has not boomed like other urban areas.

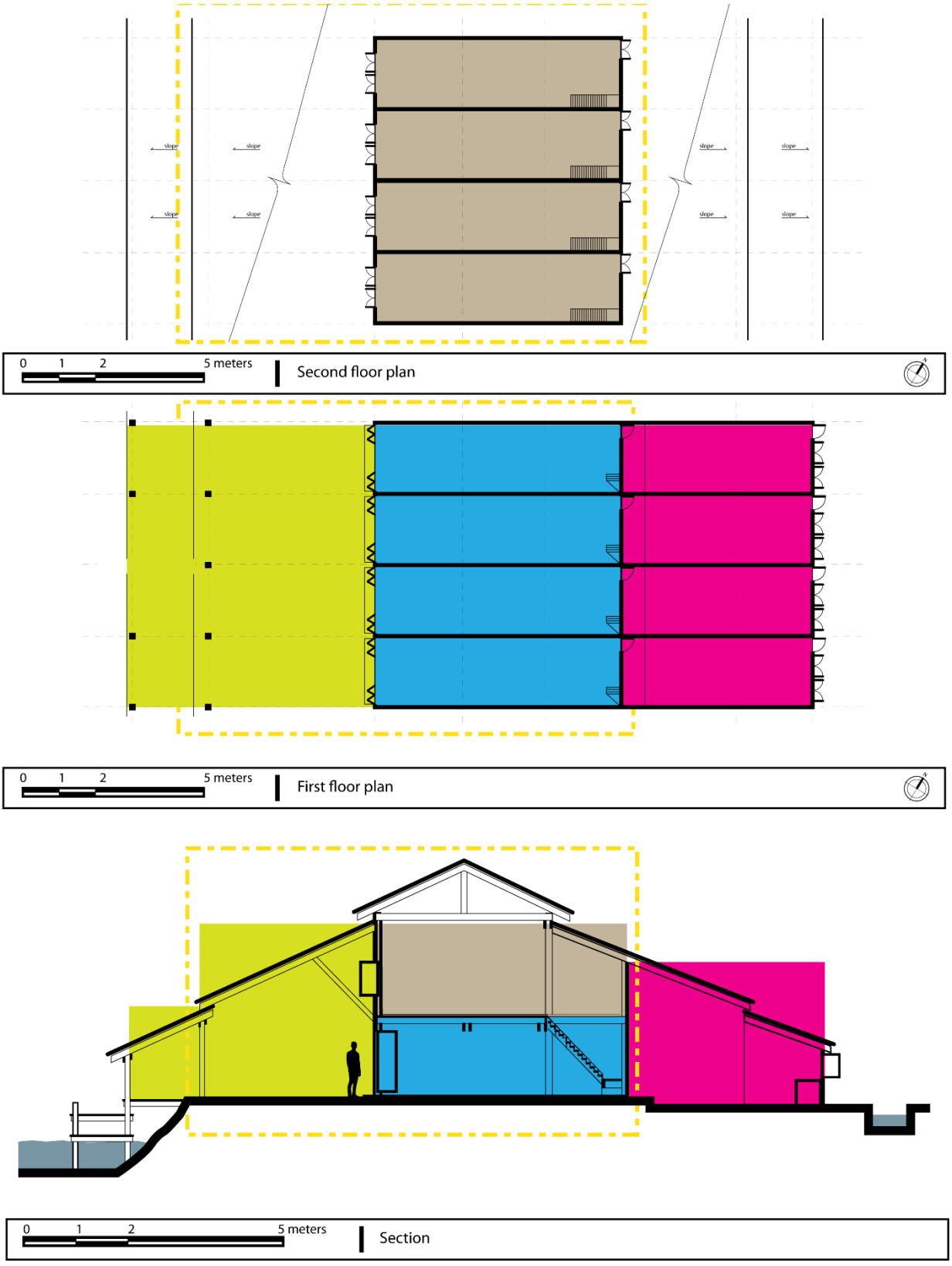


Figure 105 Plan and section of a typical row house (No.1) in the Klong Suan community

Figure 106 Associated structure (high steep wooden bridge) No.2 in Klong Suan community

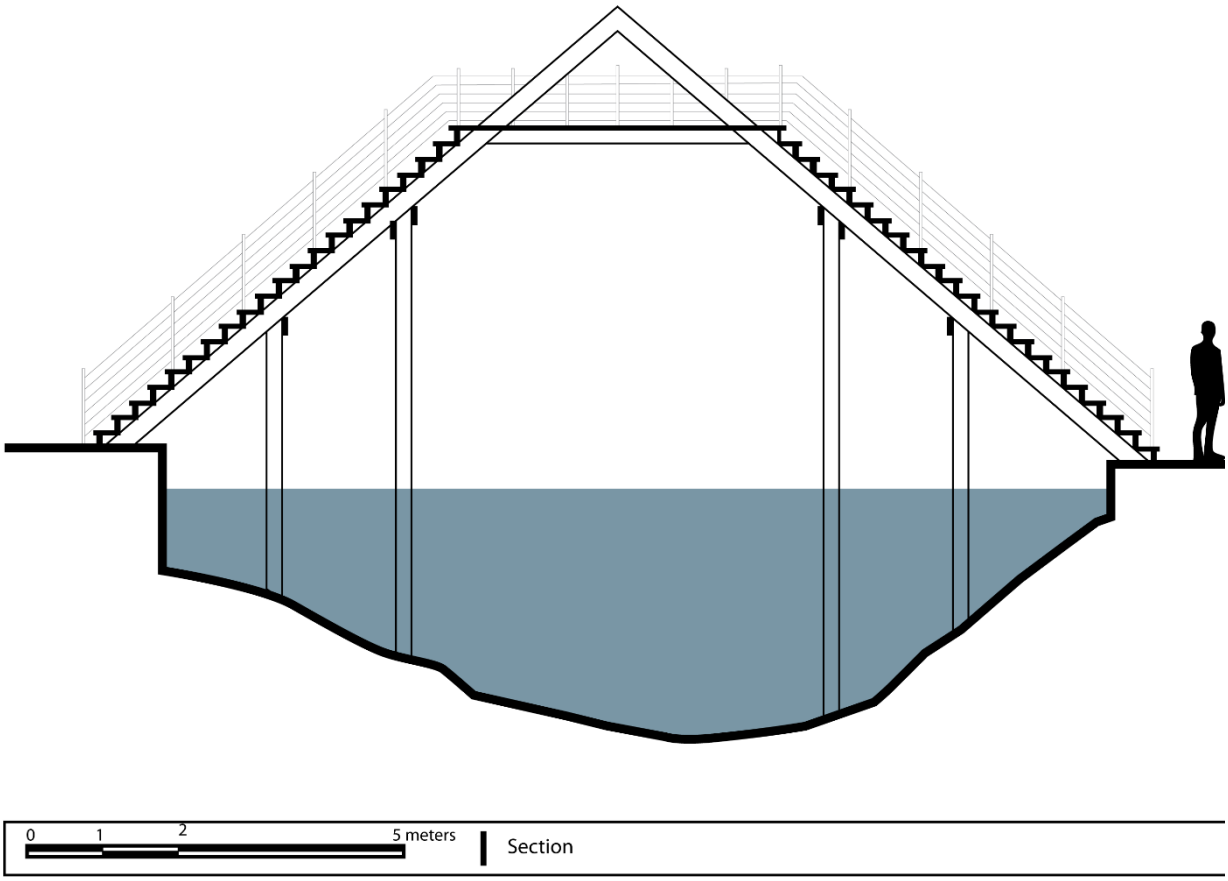


Figure 107 Section of high steep wooden bridge (No.2)

Traditional life in Klongsuan has been maintained. The walkway running between housing units and the canal continues to be a gathering space and serves as a public space in the small village. This corridor connected people in both a tangible and intangible manner. Yet, a high steep wooden bridge shows that the canal still functions to let boats pass beneath.

Figure 108 Abandonment in commercial community

A classic treat to the historic area is that new urban areas have grown along the modern communication axis. In commercial communities, the new town, along with infrastructure and modern facilities, attracted new commercial activities than the historic area. Roads led to the foundation of a number of roadside communities where they needed somewhere to shop. A number of roadside markets and convenience store were established, coming into direct competition with the old riverfront markets. The riverfront center soon became obsolete according to their distance to the roadside markets (Sriwichien, Keeratiboorana & Soungsaweng, 2015). The riverfront centers were gradually abandoned and left unfunctionable. Besides, the problems of poor housing condition and inadequate infrastructure made it uncompetitive in local market. The units were fundamentally

rental shophouse, thus it was not easy to be able to customize, remodeling, or even changing of layout. The existing structures and open spaces were found difficulty to adapt ingeniously to the modern trade and market activities accordingly.

4.3.3 Interconnection of community network: Raft community

Raft and boat houses were settled along the main river and scattered throughout the river basin. In early settlements, it was a primary but temporary location in the early settlement days for multiracial immigrants. According to its adaptability for transportation up and down the river, rafts and boat houses were clustered in front of the riverport town, which was actively engaged in commercial activities and water-based trading. The remaining number of raft and boat houses were drastically decreased, since modernization came with a new method of transportation and standardized livelihood. As a consequent, they were considered as pollutant for being obstacle to water navigation and inadequate hygienic standards.

However, raft community was the evidence of prosperous river transportation and socio-economic movement of the past riverfront community network. Waterfront communities were bonded together by the river network that connected through socio-economic movement. Abundant of raft and boat houses clustered and connected not just only its neighboring area, whilst go further along the river to Bangkok and/or to the upstream major city like *Nakonsawan* or *Lampang*.

Forestry products (wood log and lumber) which was the principal building material in the past, was harvested and processed in the mountainous region from *Lampang* and other northern provinces. Woods were transported by boat down the river to the riverport town in the lower delta, then distributed to the house construction site through the network canal. Thus size of building material was limited by this carrying capacity. Loading and unloading of the wood as well as its transport at the site was handled primarily by family members and/or neighborhoods. Likewise, agricultural products from the upstream (i.e. rice, sugar, corps, etc.) were also used to transported

down the river in exchanged the modern consumption and luxury products from Bangkok as well. This invisible connection helped much in distribution of consumption and agricultural products throughout the river basin and created a unique feature along the river. Even though most of the raft and boat houses were disappeared, but trace of connection still remains.

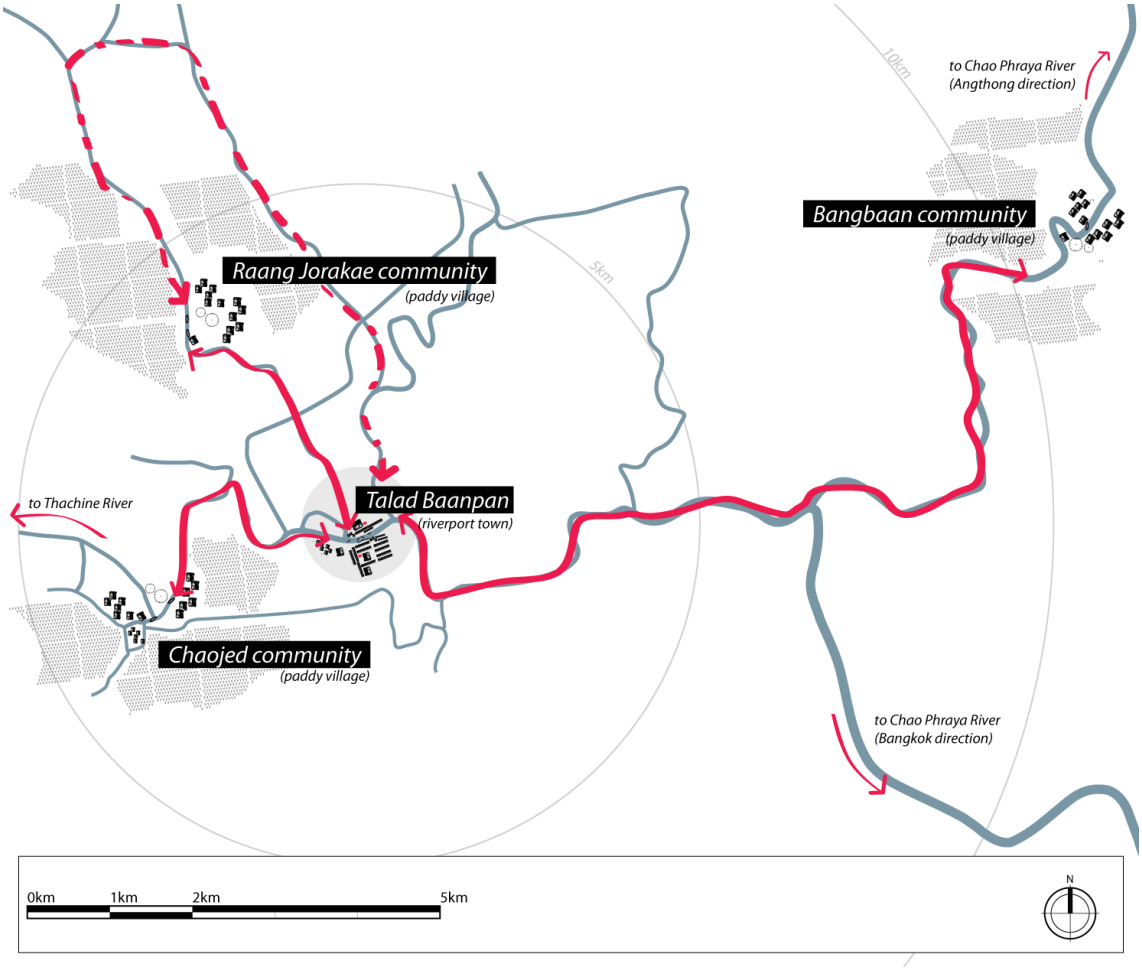


Figure 109 River network of Talad Baanpan

One outstanding network connection could be seen in *Talad Baanpan*, market and riverport town in *Sena* district, Ayutthaya province. The community was settled since Ayutthaya period and being a center of *Sena* district inclusively surrounded by a vast plain of rice cultivation community namely *Phak Hai*, *Baan Sai*, *Baan Lat Bua Luang*, etc. *Talad Baanpan* located along the Noi river surrounding by small canal network system navigable by small boats which facilitated access to the neighbored traditional waterfront paddy village within 10 kilometers range with land use dominated by paddy field of *Chaojed*, *Raang Jorakae*, and *Bangbaan* community (fig.109) (Sena Agriculture

Office, 2016). Boat or barge ran through a crisscrossed canal network for collecting and transporting of raw crops, goods and people return the processing plants (i.e. rice mills) in *Talad Baanpan* over several decades.

Figure 110 Raft and boat houses in front of Talad Baanpan (Sena Market) during its peak (1980s).
(Retrived from http://library3122.blogspot.jp/p/blog-page_1064.html)

However, since after modernization and revolution of agricultures, most of the tangible structures were lost to modernization. Mode of transportation had been shifted to road access, which led to introduce an advance agricultural machinery (i.e. truck, grain dryer, harvester and etc.) into the traditional area. Truck can carry more corps than the conventional boat. Individual usage of this advance technology will further increase resulting in a relatively high demand of agricultural production. The canal network was then treated as abandon. Due to decreasing usage of water transportation, the water gate has been constructed to control the water flow in the dry season. Besides, the water gate obstructed traditional waterways which led to lead to deteriorating water transport facilities. During dry season, the new irrigation channel was filled with water whilst the inner canal could be dry once the water gate was closed. The inner canal then became the polluted area as a consequent.

Figure 111 Raft house and boat house stranded in front of the market in current day

G) Raft community of Sakraekrang River: The last river's network community

Besides, raft structures were very popular since they responded well to seasonal flooding in the central floodplain, by being able to float on the flood waters. However, due to socio-economic conditions, changes in the standard of living and hygiene, most of the raft communities have been resettled onto land. The raft population has drastically decreased in modern periods.

Table 13 Basic attributes and traditional housing condition in the Raft community of Sakraekrang River

No.	*Bldg. attributes*	*age*	*Members*	*Main occupation*	*Change/alteration or originality remarks*
1	Traditional raft house	100	3	agriculture	Barge extension, core remains original
2	Traditional raft house	100	2	agriculture	Remain original
3	Small raft house	15	1	agriculture	Use bamboo raft structure, upper part changed

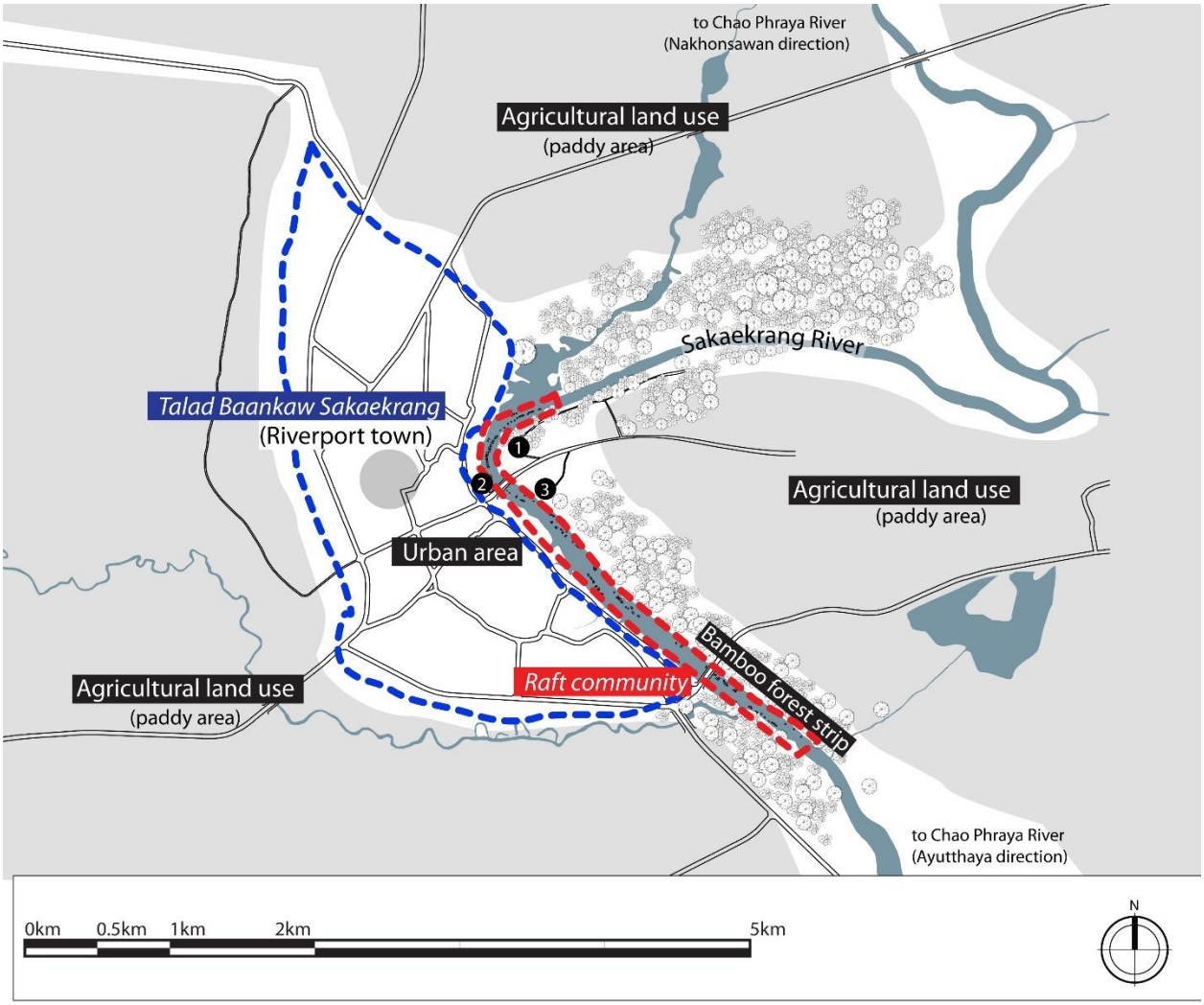


Figure 112 Selected group of traditional houses in Sakraekrang River community

The raft community of the Sakraekrang River in Uthai Thani Province was very unique and still remains in good condition. There were over 400 rafts 40 years ago, and currently 150 raft structures remain in use. Even though the function of the raft house has changed from commercial to residential, the concept of living (including space planning) has not been changed. The idea of using an open-plan living space with few or non-existent wall partitions has continued, even after modernization, but building envelopes (external frame, façade, and roof) have changed. This see-through envelope can help protect the properties from burglaries by neighbors being able to watch, thus providing extra security.

Figure 113 Raft house No.1 in Sakraekrang River community

Structure and construction of the raft house was built in the same manner of the house on land, but raft structure. Raft house no.1 in Sakraekrang River community (fig.113) was built in the gingerbread house style mixing local and Victorian taste containing rich decoration with carved and cut wooden perforation, which was popular during the reign of King Rama V (1853-1910). The distinctive element was the three continuous gable roofs where perforated woodwork has been used to decorate a gable end. Structural envelope remains in original condition, but space planning has been altered several times up on contemporary requirement. The current space utilization was conventional modern planning which contain a bedroom, bathroom, and kitchen dividing by wooden wall panel. However, the interior multi-purpose area and a wide-large exterior veranda have setup an ethno house where a glimpse on traditional living could be found.

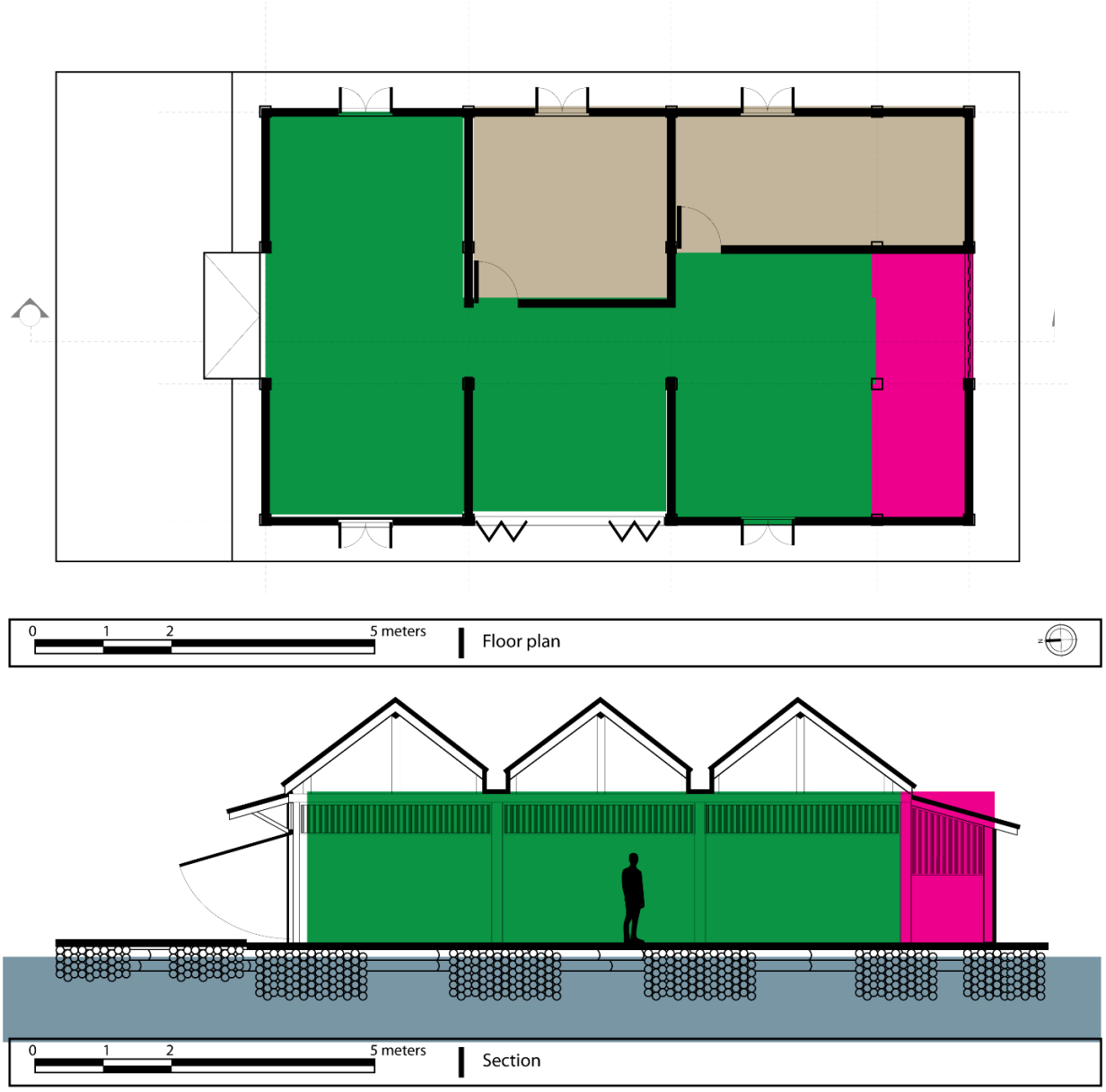


Figure 114 Plan and section of raft house No.1

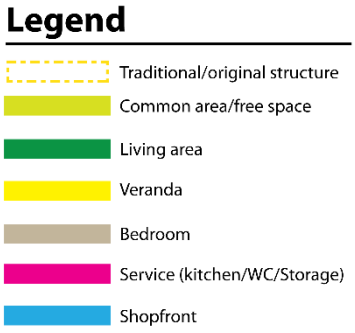


Figure 115 Raft house no.2 in Sakraekrang River community

Raft house no.2 in Sakraekrang River community (fig.115) was built in traditional Thai house style covering twin gable roof with perforated woodwork on the gable end. The house consisted of two parts; inner room and the open veranda. Space planning was not change much which consisted of open plan living space. Likewise other traditional Thai houses, the inner room was used only in the nighttime and kept valuable stuffs, while during daytime people were usually living outdoor. However, modern facility (toilet) was unable to add directly to the traditional structure; portable polycarbonate toilet raft has been adjoined to the existing raft.

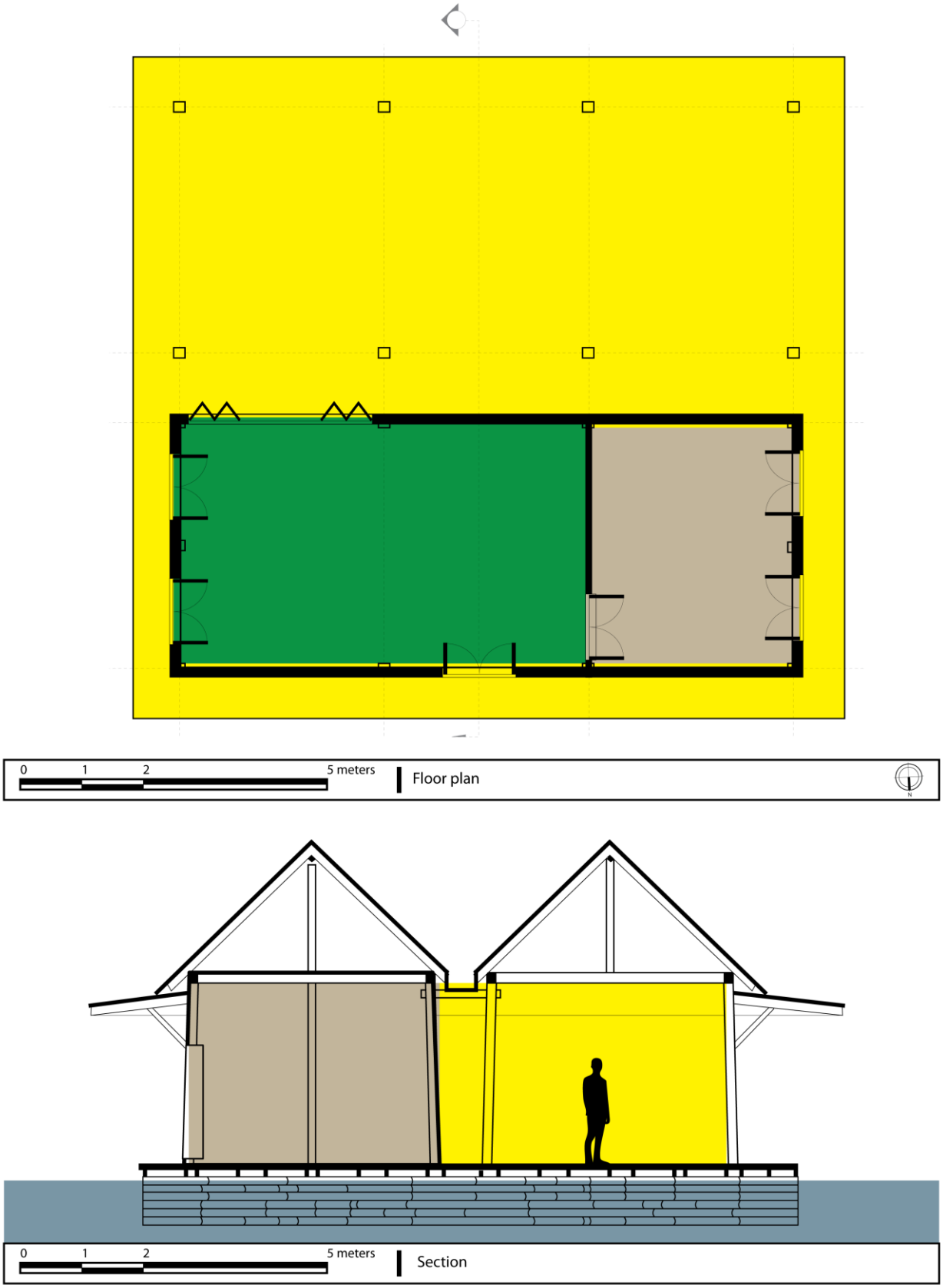


Figure 116 Plan and section of raft house No.2

Raft house no.3 in Sakraekrang River community (fig.117) was a typical small raft house the inner space employed an open-plan interior with no partition. The glimpse of multi-purpose area seems to have a crucial influence to traditional living behavior. This space planning system applied on both interior and exterior space. Flexible living space incorporated river tides pattern created unique lifestyle. Structure and building ensemble were built in modest contemporary style. Building envelop was almost see-through and has been changed or upgraded several times up on the owner's personal economic condition. Even though this kind of raft house was not as old as the traditional raft house, it still represented a contemporary life of people who made a living harmony on the water surface.

Figure 117 Raft house No.3 in Sakraekrang River community

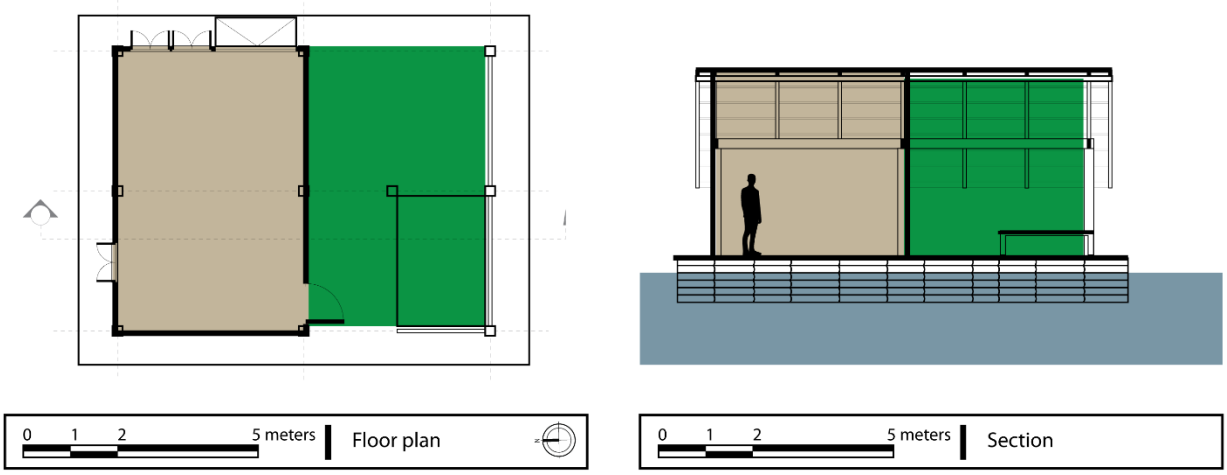


Figure 118 Plan and section of raft house No.3

Traditionally, the raft structure used bamboo as a major building material. A typical raft was constructed by tying 70–100 bamboo poles, with 3–5 bundles upon a raft scale. Replacement of these bamboo bundles was required every three to five years or so. However, although the price of bamboo dramatically increased, the community bamboo forest decreased. The traditional raft-building technique faced an impending threat when local dwellers could no longer afford to build bamboo rafts.

Figure 119 Ruinous raft house “ON SALE”

Figure 120 Increasing of urbanization caused significant impact to community bamboo forest

Threat to life along the river was that to evict the communities from the river. Since 1960s, raft and waterfront housing are considered as a pollutant and going against water management policy and a healthy city. The dwellers of the river, importantly raft communities, were offered to resettlement onto land (Prakard kong kanapratiwat chabub tee 44, 1959). Since then, most of the raft communities were relocated from the river. However, only four authentic raft communities are still remained in the Chao Phraya River basin in impending or threatened condition. To improve a hygiene standard which has enabled quality of life and a decisive impact on social development in the modern world, management and disposal of waste is required. However, waste management systems can be maintained by low income communities when include community participation. This does not require high technology and inappropriate machinery. Community participation in waste management may be including collecting, transporting, and recycling (UNHABITAT, 1989).

4.5 Chapter synopsis

The traditional waterfront commercial community provides the best representation of the cross-cultural influence of a multi-racial community in the Chao Phraya River Basin. Urbanization and commercialization has resulted in the disappearance of traditional mutual living systems. However, the Chinese diaspora in *Samchuk* and *Klong Suan* communities are outstanding testimony of how non-indigenous cultural luggage can be mixed with the indigenous tradition of the water-based settlement.

There are various canals that are both natural and manmade, which create the waterway network all over the river basin. The water circulation patterns exert influence on the traditions of daily life which determines the dominant feature of the landscape, the land use, and the way of life of the Chao Phraya people, which closely interact with the natural environment. This made possible the development of a network of agricultural plantations, salt farming and fishery occupations, and the trade and commerce practices of the people.

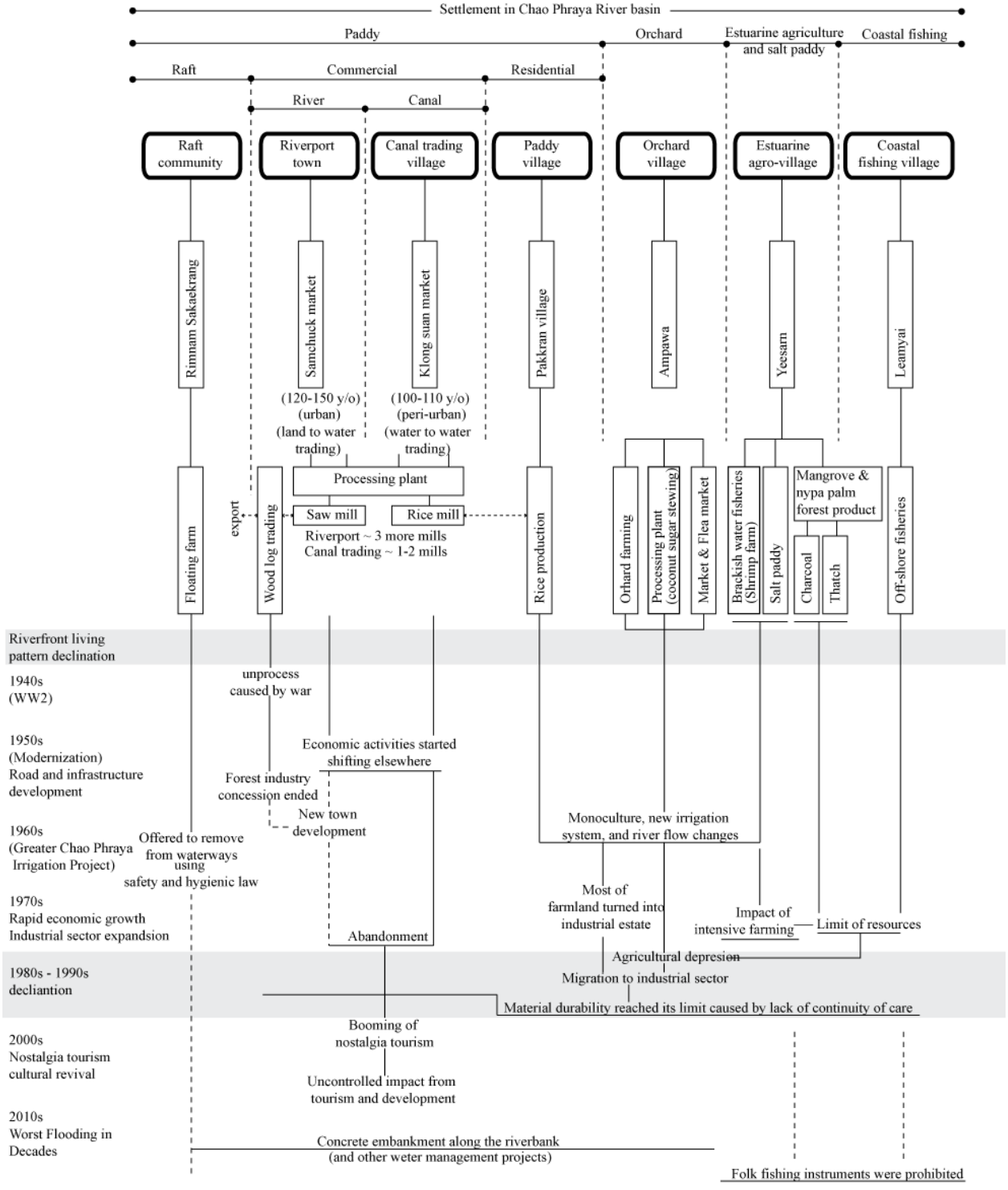


Figure 121 Summary of settlement pattern and potential threats to traditional waterfront community

The intangible resources have more or less shaped the tangible, particularly regarding architecture. The floating market has been developed into a waterfront market with immigrants living and selling, and turning the market into a community, combined with different religious architectures resulting from various ethnicities, religions, and cultures. As the community has grown, so has its prosperity, expanding for economical purposes, and becoming a commercial hub and having a post-agricultural product processing plant.

They exhibit their uniqueness through physical appearance. The combination of culture has created a unique community and architecture, shaping the waterfront society.

Traditional building techniques have been developed from an immediate environment, setting up building forms using natural ventilation and locally sourced materials. Local building techniques have evolved over time and building performance has been optimized based on the available resources. However, change is inevitable. Modernization has caused drastic changes to local livelihoods. New and modern facilities have been added to historic structures in order to improve the convenience and hygiene standards of living. Nevertheless, the way of life from generation to generation has moved towards maintaining the local creativity and cultural aspects.

The aim of this paper is to describe the traditional architecture and material condition which still exist in the traditional waterfront communities. In order to identify the process of deterioration, subsequent alterations, maintenance, and current condition of the structures are also examined to study the effect on their overall integrity.

Commonly, the main building with an open-plan interior and the traditional use of living space have remained in the agricultural community, while building skin still exists in the community. However, in the raft community, the traditional bamboo raft structure can still be found in its original format. The remaining traditional building techniques represent the preservation, of both cultural and natural resources. Local builders (in most cases, it was a neighbor) optimized their performance over time based on locally available materials and the immediate environment.

Traditional space was created by nature or the habits of the actual dweller, developed by its inhabitants, and shared within the community. These relationships formed social ties and gave the place an identity.

Agro-biodiversity is a resource to be protected along with wild (natural) biodiversity, and the need to find models of sustainable land use (Phillips, 1998). The management objectives of sustainable development include supporting lifestyles and economic activities which integrate community knowledge in management, making man more responsible for variations in social and environmental conditions, etc. (UNESCO World Heritage Centre, 2003). Sometime conservation through architecture and built environment was not able to cover some cultural issue and its setting. In many landscapes the natural and cultural heritage was inextricably bound together and that the conservation approach could benefit from more integration (Mitchell & Buggey, 2001).

These traditional structures are of great significance in understanding the role and influence of natural features on amphibian cultures and lifestyles. The waterfront housing along the Chao Phraya River and its vicinity has been characterized by modern transformation. However, this is reflected in a mixture of influences which have created unique architecture, cultures, and townscapes. Another surviving factor of the waterfront community is the adaptability of vernacular architecture in a contemporary socio-economic environment. However, risks related to the gradual disappearance of traditional architecture and materials conditions were resulted from agricultural landscape transformation.

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Chapter 5
Conclusion and discussion

5.1 Conclusion: thesis summary

Thailand plans to nominate the new possible "The Cultural Landscape of Chao Phraya River" to the World cultural heritage tentative list. However, the proposed cultural significant of Chao Phraya River was focused only the areas of central Bangkok where the golden pagodas and the national historic places were located. Life along the river, including local people who make the river home, modest irrigation works for agriculture, indigenous fishing traps, and different use of water has been overlooked.

Thus, research provided the fundamental information on the interaction between human settlement and the natural environment along the Chao Phraya River throughout the river basin. The understanding of their natural environment and its efficient adaptation to their way of life reflects in the architectural and built heritage, in the cultural landscape, which is considered a genuine and an outstanding model for sustainable way of life. This is an important inventory accumulation contributing to waterfront community preservation measure in the future. This project is expected to be an example of a well preserved traditional riverside space and river environment which to be considered as a part of "The Cultural Landscape of Chao Phraya River" 's World Heritage List nomination.

The research posed systematic description of the cultural and natural phenomena in motivated mixed method which conducted at both macro (large-scale river basin) and micro (buildings, community and their surroundings) levels. In macro scale analysis, this research identifies the complexity of traditional waterfront communities using statistical method. To classify the waterfront community, the rapid survey of structural remaining in Chao Phraya River basin has

been implemented through qualitative methods using hierarchical clustering and decision tree analysis. Then principle component analysis has been employed to grasps complex variations in each cluster. The case study analysis will be employed to analyze micro level approach to socio-economic and cultural background, through the quantitative survey of the visual data and secondary documentation. The selected case studies intended to represent hierarchically arrangement of the heritage value of the traditional waterfront communities complex at global, national and local significance level.

Chapter 2 gave a systematic overview of the traditional waterfront community complex in the Chao Phraya River Basin to identify the phenomenology and salient features characterizing the waterfront community through the analysis of the following: 1) features of geography and waterbodies; 2) cultural landscapes and agricultural activities; 3) urban components; and 4) architectural features. A total of 138 traditional waterfront communities was selected using the purposive sampling method. In this chapter, quantitative data collection was conducted using field investigation to collect and evaluate the validity of properties in actual conditions. The data were analyzed using a statistical analysis program to examine the similarity and correlation of the data set. To identify characteristics, hierarchical clustering and decision-tree analysis were used to group similar communities together and classify the complexity of a traditional waterfront community. Principal component analysis was then used to detect the true association between the relevant variables. In addition, qualitative assessment of secondary document collection, legislation, previous and present public policies, research, and criticisms were used to support the argument for statistical analysis. The results provided seven clusters based on common preferences consisting of

- Riverport town,
- Paddy village,
- Raft community,
- Canal trading village,

- Estuarine agricultural village,
- Orchard village, and
- Coastal fishing village.

These clusters show diversity in the cultural landscape, with agricultural activities exerting influence on the community complex, creating both direct and indirect association, with several significant variables.

Chapter 3 provided information on the significance of water to the cultural human living pattern. Based on contextual characteristics of the waterfront community complex, it reveals the influence of water-to-landscape through analyzing the relationship between settlement patterns, way of life, and environment. The perspective narrows down to the community level, where the selected twelves case studies were investigated.

The study is based on a qualitative approach, to examine the general pattern of amphibious livelihoods from past to present, including changes and processes of adaptability to declination. Investigation was implemented by reviewing secondary data collection and oral history and collective memory by the interview method. The results found that water circulation patterns have exerted influence on traditional daily life over several decades:

- River overflows in paddy villages,
- Irrigation network of ditches in orchard villages,
- Brackish water circulation in estuarine agricultural villages,
- Wetland fishery in coastal fishing villages,
- North-south corridor river trading in riverport towns,
- East-west canal network trading in canal trading villages, and
- Surface water livelihoods in the raft community.

Chapter 4 is appraising and synthesizing of heritage value of the properties, which represented the global significance of traditional waterfront communities complex in Cha Phraya River basin and its tributaries. The sites are considered as the outstanding example of

- Human settlement and indigenous resources usage of the flood plain
- Cross-culture influence on local economy of the river-based transportation network
- Interconnection of community network

They are indispensable for understanding man's adaptation and interaction with their natural environment, using the canal and river system for the historical development of human technology related to agriculture, trading systems and transportation. The understanding of their natural environment and its efficient adaptation to their way of life reflects in the architectural and built heritage, in the intangible cultural heritage, which is considered a genuine and outstanding model for sustainable way of life.

This chapter is also explored the existence of traditional structures and building techniques in the waterfront wooden housing standard of the Chao Phraya River Basin and its vicinity, in order to identify the current state and condition of traditional structures, processes of change, and the effect on its overall integrity. The results indicated that patterns of traditional building techniques remain in community typology. The remaining techniques represent the preservation of local cultural and natural resources, which modernity has become an integral part of life and the community has chosen to adapt rather than be eliminated.

Then, the result led to discussion of the possible of measure or program to protect the Chao Phraya River and its associated traditional waterfront community complex, drawing from latest theoretical developments in heritage studies and literature reviews, and formulate the objects of protection relevant to cultural landscape and its settings.

5.2 Discussion

The Chao Phraya River Basin and its traditional waterfront community is an outstanding example of migrating people who have developed and applied technology to control and use the natural water circulation system as a multiuse model to this interface. The cultural landscape and agricultural activities show that Thailand's contemporary local development is not too far away from the lifestyles of certain periods. The technological ensemble of the river system and the cultural elements found in the area exemplify and illustrate the significant stages in human history in relation to cultural development. This is particularly true of Asia's river-based trading systems, agricultural development, and transportation.

This waterfront community is also an outstanding example of a traditional human settlement, land-use, water surface-use, and sea-use, showing the interaction of man with the environment, influencing the development of local transportation, trading, agriculture, and food production for over one hundred years. However, it is currently being subjected to the impact of urbanization, modern techniques in agriculture, trade, and commerce. The indigenous population and multi-racial migrants celebrate cross-cultural expressions generated through the dialog of everyday life and mutual respect.

The geographical, economic, cultural, and social influences as well as materials and constructive systems are expressed in the tangible structures of vernacular architecture, and a community created from the cultural landscape and agricultural activities (see Chapter 2). With limited resources, local craftsmanship has created a unique building technique using the available resources. Traditional building techniques and many features have been transmitted from one generation to another. Even though modernization has resulted in drastic changes, the combination of culture has created a unique community architecture exhibited through physical appearance. Integrity and resilience to change is maintained by the diversity of cultural resources and extensive environmental assets.

Besides, life along the river relies on river flow (see Chapter 3). As a part of river system, the effect of changes in river flow goes beyond mere technical concerns when considering potential future threats such as loss of traditional functions and pressure from transformation factors. Rivers are sensitive to change as well as human impacts such as flow modification and land-use change. These changes have been identified as major threats to traditional livelihoods, with a consequent impact on the tangible structure.

Since the 1950s, several dam constructions and water control projects on the Chao Phraya River corresponding with modern agricultural irrigation and urban water use on existing canals and rivers have caused some problems after 30 to 40 years of operation. Changes in river flow have resulted in an unexpected and unpredictable flooding pattern. Moreover, as a consequence of Thailand's flood damage in 2011, barriers were constructed in major cities along the river to hold and control the floodwater, with limited success, and the river has overflowed onto nearby floodplains. The physical connection between the waterfront and river has therefore been completely lost.

In addition, rapid land-use change from forest to agriculture and agriculture to urban, are the reasons why changes in runoff cause unpredictable flooding and drought in many areas. Overall, the effects of unpredictable flooding and drought need to be considered along with other evolving factors affecting agricultural production, which could make it more difficult to grow crops, raise animals, and catch fish in the same way and at the same locations as in the past.

However, local people have adapted and applied solutions to solve the problem of severe contemporary conditions such as frequent flooding. Buildings are deliberately designed to fail and be replaced (both in space and material), rather than erecting uneconomical or even implausible structures to withstand such adverse conditions. Local craftsmanship (dwellers, or members of the neighborhood community) created solutions based on locally available materials and the immediate

environment. Over time, vernacular resilience has become an integral part of life and communities have chosen to adapt rather than be eliminated.

Communities, housing, and tangible structures are well-express in the cultural dynamism of contemporary society. This waterfront community is an outstanding example of modernity manifested in tradition. For creativity and contemporary lifestyles to co-exist as part of the living culture, continual development is essential. Several case studies have revealed (see Chapter 4) that new rooms have been added—around or underneath the traditional core space, and extended from the existing structure with seemingly unlimited growth, while traditional spaces remain almost in original condition. The extension could potentially be expanded indefinitely in accordance with additional space requirements.

Since dynamism is part of the vernacular, communities have adapted and adjusted the materials and space to suit a contemporary livelihood. Vernacular architecture is a living heritage that should be allowed to grow, and perhaps even replicate. It is impossible to restrict adaptations or alterations, and creativity is bustling among the local population. With such high dynamism, any restrictions and/or guideline enforcement might cause a negative impact on creativity.

Tangible structures are a result of the agro-cultural landscape, and traditional livelihoods a consequence of the river. Controlling any inappropriate changes through maintaining the cultural land and river scape as a source of livelihood must be a central concern. Preserving this traditional waterfront heritage means dealing with living environments, not merely building structures, to ensure that heritage policies directly benefit local people and their livelihoods, and improve the quality of their physical surroundings, both from the constructional and socio-economic points of view.

Thus, this is the most vibrant and comprehensive example of human interaction in a land-river-agriculture interface, creating a new form of rural development and human settlement in Asia. The waterfront community on the Chao Phraya River represents one of the most diversified and

sustainable uses of land, river, and agriculture achieved by an early migrating community, which is gradually disappearing in Asia.

Since cultural landscapes have particularly close relationships with the modes of living, life is constantly changing. Accordingly, conservation plans incorporate potential changes in respect to livelihoods (Edani, 2012). It is easier to involve local communities in managing cultural landscapes by presenting principles and values rather than regulations. It turns out that cultural landscape conservation has been more successful in regions which have taken into account the values, priorities, needs, concerns, and aspirations of the local population (Mitchell and Buggey, 2001).

Once the cultural landscape and its features have been analyzed and assessed for significance, decisions can be made regarding conservation. The appropriate approach to conservation management is determined by the significance of the landscape and its features, condition, and conservation requirements, as revealed in research and analysis. Monitoring must be done through the proposed management body for the site. A monitoring officer ensures that the values of the site are preserved and that future developments are made within the framework of sustainable development. However, a number of issues must be considered in relation to community groups and cultural landscape management in-situ.

The principal focus of the conservation and management of waterfront communities involves the attributes and features associated with or conveyed by the value of the properties. This is to ensure that the value, authenticity, and interiors of the properties are sustained for the future through effective management of the attributes (Marshall et al., 2011).

For landscapes with high sensitivity to change, whereby the siting or design of a single building may have an impact, overlay control is the most appropriate approach (Melton City Council, 2016). The overlay approach has developed into spatial planning and design by transforming in different ways. Although using layered models is not a new thing, this model has

hit a nerve in spatial planning practice, initially on a national level, but later on the provincial and municipal level as well (Van Schaick et al., 2011).

However, there are a number of options for managing landscape significance through the application of a layer model. An overlay approach runs as a guideline to ensure that the values of the site are preserved and future developments are carried out within a sustainable framework. However, a number of issues must be considered in relation to community groups and cultural landscape management in-situ.

- **Human settlements and the use of indigenous flood plain resources**

  This response is of ***human settlement significance*** for natural or cultural influences in building a heritage which aims to protect and enhance places of vernacular and tradition. It represents ***geographical and environmental significance*** in response to human settlement and indigenous resource usage of the flood plain, including the land and river scape, applied to areas of specific environmental importance, including land subject to inundation, identifiable by land in a flood storage or flood fringe area and liable to inundation by overland flow from drainage systems.

- **Cross-cultural influence on the local economy of the river network**

  Cross-cultural significance responds to the tangible or intangible heritage of cultural origin with an indigenous context. It has also adapted an indigenous form but retains the concept of space and functionality.

- **Interconnection of community network**

  The ***interconnection significance*** of the river corridor responds to the river-based transportation network which aims to protect the river and canals.

To develop these approaches and gain support for further control, the layer model concept is a crucial part of the management process.

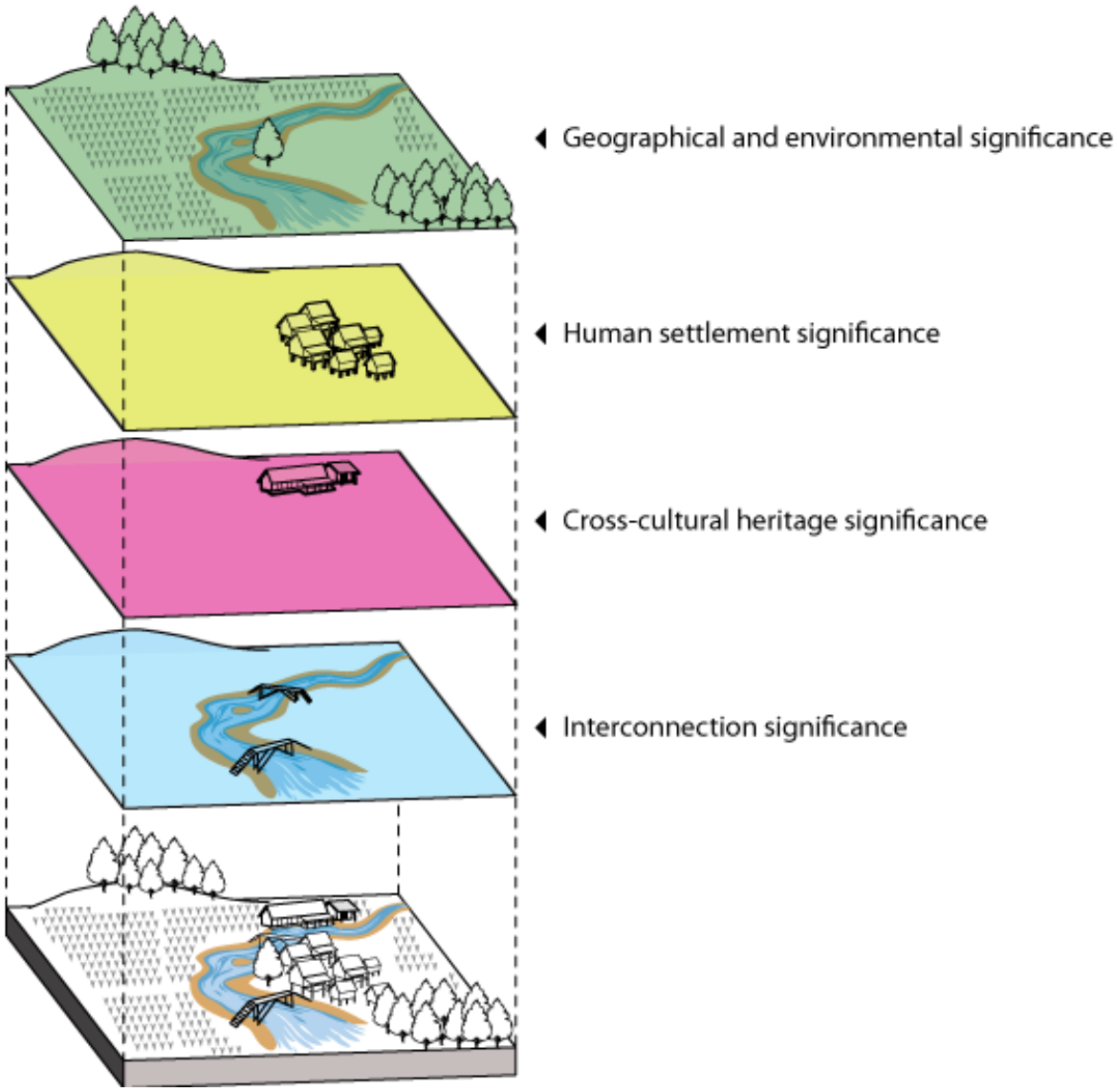

Figure 122 An overlay approach to waterfront community complex

A number of treatments for the conservation of cultural landscapes and their features are set out in the following paragraphs. Some properties also have overlay approaches to protect such things as heritage and vegetation or indicate areas needing special care, for instance, those prone to flooding. These aspects apply to the conservation of places with cultural significance. However, the conservation program for a specific cluster of the traditional waterfront community complex along the Chao Phraya River Basin and its vicinity concern the specific potential threat and characteristics of each cluster.

A) Paddy village: Naturalized river overflow

Table 14 Statement of significance in paddy village using overlay approach

	Human settlement significance	Geographical and environmental significance	Cross-cultural inf. on local economy significance	Interconnection significance
Paddy village	River overflow and agricultural activities shaped outstanding community and architectural characteristics	Vast alluvial plain, which suitable for intensive rice cultivation, has moderate fertility causing by river overflow		Rice production supplier, where connected to riverport town
Potential threats	Changing of river overflow and agriculture modernization caused missing or adding building's traditional element	Watergate and modern water controlling system providing stable water level, no flooding anymore		Intensive agriculture using new irrigation for water supply, caused abandonment of natural river
Counter measure	archive traditional technique and vernacular building guideline	Naturalized river overflow		Rehabilitation and reuse of natural river

Natural river overflow influences architectural and traditional daily life in the paddy village. A vast alluvial plain along the Chao Phraya, suitable for intensive rice cultivation, has moderate fertility caused by river overflow. As a consequence, substantial dwelling units and agricultural activities have been based on this phenomenon, creating a unique characteristic where both tangible and intangible structures respond to flooding conditions. During a one year period, the life circles of rice and humans intertwine in every aspect.

However, river overflow changes as a result of modern intensive agriculture with a consequent impact on the traditional life circle. Modern facilities such as water gates, flood barriers, and new irrigation canals, provide more stable water levels so the river no longer floods. Besides, due to natural fertility loss in paddy farmland, traditional elements of the vernacular buildings have been altered in accordance with contemporary conditions.

Thus, rehabilitation of the riverfront and natural environment will be the centerpiece of the restored cultural landscape within the cluster, while also creating a historical attraction. Any program must bring together partners at both national and local level. Once the canal is restored, it will draw visitors to learn about the historical context of the waterfront culture in commemoration of the past. Such restoration will also support Local Economic Development (LED) by enhancing the community's attractiveness as a tourism destination.

B) Orchard village: Zoning and rehabilitation/protection of irrigation orchard ditches

Table 15 Statement of significance in orchard village using overlay approach

	Human settlement significance	Geographical and environmental significance	Cross-cultural inf. on local economy significance	Interconnection significance
Orchard village	Outstanding settlement combining orchard farm land and commercial area where traditional structure settled along mostly a man-made canal	Orchard ditches network system is providing water for agricultural purpose, and reducing flood impact as the water reservoir	Chinese immigrants settled in the market area, then help contributed much in economic development for domestic cluster	Agricultural products transported to market area using canal and ditches network
Potential threats	Uncontrolled urbanization in both farm land and commercial area	Replacement of ditches system by modern housing and land development project	Market area was re-bustling once again after recession to served tourism industry (outsider tenant)	Shift of transportation mode and ditches network was blocked by inappropriate development
Counter measure	Zoning enforcement by the local administration	Recording ditches network and zoning the key ditches route	Promotion of Local Economic Development (LED)	Rehabilitation of irrigation orchard ditches

The orchard village combines farmland and a commercial area, where the community is settled along the canal and connected through the outstanding crisscrossing ditches network, providing water for the farmland, and reducing flood impact as a water reservoir. Indigenous people mainly work in agriculture, both raw commodities and post-harvest handling, not only producing subsistence crops for household usage, but also commercial agriculture. Agricultural products supply the cluster where Chinese immigrants have settled, helping to contribute substantially to its

domestic economic development, creating an integrated and efficient circular socio-economic pattern.

However, tourism has resulted in uncontrolled urbanization of both the farmland and commercial area, and this rapid economic growth has come at a cost. Modern housing and land development projects have replaced the orchard ditches network, leading to the inner orchards becoming unproductive or abandoned, affected by loss of water supply. Besides, the traditional water transportation which used the ditches network has been blocked by inappropriate land transformation.

Thus, it is essential to retain the traditional orchards and irrigation system as a centerpiece to protect the characteristics of the orchard village. Zoning should be established with guidelines for each village, in cooperation with the private sector and local dwellers. The traditional orchard ditches network must be surveyed and assessed, and an inventory prepared to identify the existing water circulation in each area and classify them into water zones. All information should be organized through a GIS database which is easy to use, and can quickly update and analyze the status of the water circulation for further planning and management. This is to prevent communities from flooding, as well as reducing the maintenance budget afterwards. However, an action plan is necessary for further programs where the local administrative organization can play a key role in anticipation and response under local ordinance.

Besides, the guide to LED will encourage and support local people to become involved in the regeneration of both the local economy and production. Locally grown fruits and fruit-based products could be sold directly to tourist consumers at the cluster's market. This has the dual advantage of generating employment and income while promoting cultural production. Hence, a fruit story could be constructed to connect tourists to the area by creating value through the tourism experience. However, this would not occur without the ditches network.

C) Estuarine agricultural village: Sustainable estuarine resource management

Table 16 Statement of significance in Estuarine agricultural village using overlay approach

	Human settlement significance	Geographical and environmental significance	Cross-cultural inf. on local economy significance	Interconnection significance
Estuarine agricultural village	Outstanding example of human settlement in the lower delta surrounding by agricultural land and mangrove forest where influenced by brackish water interpenetration	Brackish water farming alternating with salt paddy associated estuarine vegetation-habitats were extremely important to the indigenous livelihood		Communities connected to remote farms and forest by curvy network of natural canals
Potential threats	Insufficient locally used building material and estuarine vegetation-habitats caused by overexploitation leading to labor migration	Overexploitation use of estuarine resources which environmentally sensitive to change		Changing in mode of transportation to road access which is more convenient with larger loads carried provided by heavy truck
Counter measure	Community Based Management (CBM) of locally available resources	Protection and rehabilitation of mangrove forests by zoning and raising public awareness		Reuse of natural canal for recreational trails, landscaped pathways

The estuarine agricultural village surrounded by agricultural land and mangrove forest provides an outstanding example of human settlements in the lower delta influenced by brackish water interpenetration of the Chao Phraya River Basin. Brackish water circulation exerts influence on agricultural activities and day-to-day living behavior. Brackish aquaculture, alternating with salt paddy, and associated estuarine vegetation-habitats are extremely important to indigenous livelihoods. Villagers roamed through the remote farmland and mangrove forest using a curvy network of natural canals.

However, overexploitation of estuarine resources, which are environmentally sensitive to change, has caused serious impact on locally available resources. Over the past two to three decades, intensive agricultural production (shrimp farms) has dominated the local economy and area. Road

access is more convenient for transporting agricultural products, with larger loads carried by heavy trucks, which will no doubt lead to abandonment of natural canals in the near future. The destruction of mangrove forests in the estuarine area has drastically decreased the amount of indigenous vegetation and habitats. As a consequence, overexploitation, insufficient local building materials, and estuarine vegetation-habitats has led to labor migration. Lower catch rates, decreasing harvests, and uncertain resource availability has led to economic inefficiency and social stress. Thus, the working generation has moved to bigger cities and/or the industrial sector.

In the past, the Thai government prohibited all acts of overfishing, which is classed as illegal. Besides, the traditional fishing methods face a predicament since traditional fishing traps (subsistence fishing) are also prohibited as a result of general policies

Due to the diverse use of estuarine resources, any restrictions should be alleviated for indigenous traditional fishing and livelihoods. Management mechanisms should be carried out at both local and national level, in cooperation with local fishery officers, and the indigenous population. Community-based management, including local control and a focus on the ecosystem would be an appropriate strategy to adopt. It was first successfully initiated in 1955 in Phang-Nga Bay along the Andaman Sea coast, resulting in better overall outcomes, especially in terms of participation and equity (Panjarat, 2008). Economic security means that villagers seriously concerned about the degradation of estuarine resources and coastal ecosystems, can fully participate in their management and traditional sustainable fishing methods.

D) Coastal fishing village: Community Based Fisheries Management

Table 17 Statement of significance in coastal fishing village using overlay approach

	Human settlement significance	Geographical and environmental significance	Cross-cultural inf. on local economy significance	Interconnection significance
Coastal fishing village	Outstanding settlement of the coastal line locating inside one of Asia's most important wetlands: The Inner Gulf of Thailand	Brackish water ecosystems in coastal area with mangrove forests and fertile mud beaches providing habitats for various species which was important source of fisheries production		Sea channel connected village to the offshore shelter, where provided economic resource of the local dweller
Potential threats	Decreasing of locally natural bamboo and mangrove wood, local bldg. materials were replaced by modern concrete structure, include the shelter	The site was open to access, and have no clear legal and regulatory basis for their wetlands management		Aquaculture recession and modern business led the subsistence offshore shelter became another tourist attraction, which causing overexploitation, wasted and shallow channel
Counter measure	Protection and rehabilitation of community forests by zoning and raising public awareness	Community Based Forest Management (CBFM) model strategies which give coastal communities and fisherman primary responsibility for managing costal resources		Making balance between tourism and coastal habitat restoration based on CBFM

Fishing villages along the coastal line located inside one of Asia's most important wetlands, the Inner Gulf of Thailand, represent outstanding settlements, and some parts, have been nominated as Ramsar sites. The brackish water ecosystems with mangrove forests in coastal areas, and fertile mud beaches providing habitats for various species are an important fishery source, while the sea channel connecting the village to an offshore shelter provides an economic resource for local dwellers.

However, the site is open to access, with no clear legal and regulatory basis for wetland management. Since the 1950s, mangrove forests in Thailand have decreased significantly. More recently, clearance for agricultural land, human settlements, and infrastructure (such as gas silos) has also taken place. This clearance is a major factor behind mangrove loss. There is no doubt that the existence of the fishing village and its traditional livelihood relies on coastal resources.

More recently, aquaculture recession and modern business models have led to the subsistence offshore shelter becoming another tourist attraction, resulting in overexploitation, as well as wasted, shallow sea channels. As a consequence, locally available resources like natural bamboo and mangrove wood for building materials have been replaced with modern concrete structures, including the offshore shelter.

Fishermen are generally likely to be more on the conservation side than development. The Community-Based Forest Management (CBFM) model strategy might provide coastal communities and fisherman with the primary responsibility for managing their own costal resources by creating a balance between tourism and coastal habitat restoration. Community forests must be protected and rehabilitated by zoning and raising public awareness.

To strengthen the process and ensure that local communities have a better understanding of the sustainable use of wetland products, it is important to work with local groups and communities. Legislation should strongly encourage joint management with local communities. Legislation should be flexible to accommodate wetland nature and dynamic cultural practices which move spatially over time.

E) Riverport town: Reconnecting/reclaiming the waterfront

Table 18 Statement of significance in riverport village using overlay approach

	Human settlement significance	Geographical and environmental significance	Cross-cultural inf. on local economy significance	Interconnection significance
Riverport town	Riverfront settlement, including commercial area and post-agro processing plant, contributed to economy development along the north-south corridor of the main river		Cross-cultural carried tangible and intangible cultural heritage manifested and blended with local tradition	Port and riverfront area were an evidence of the connection of commercial community and agricultural community along the north-south transportation corridor
Potential threats	Socio economic activities grow along the road and led to riverfront area being unused (both physical and activities)		Rapid urban and population growth under economic reasons causing moving in migrants lost and not being connected to the existed heritage	Flood barrier blocked the river access
Counter measure	Reconnecting people to the riverfront by involving community participation		Recreation of riverfront open spaces where attractive and accessible, and let people engage in cultural activity	Reconnecting/reclaiming the waterfront

The river port town has been an urban riverfront settlement along the north-south corridor of the Chao Phraya River since the agricultural revolution in the 1850s. It includes a commercial-residential cluster and post-agricultural processing plant (rice mill, saw mill), contributing to economic development, both on a micro and macro scale. This phenomenon has been acknowledged by Chinese immigrants who contributed much to the commercial activities along the main river, while the indigenous population focused on agricultural production and government service. The communities of Chinese descendants, with their tangible and intangible cross-cultural heritage, have manifested, blended, and mixed with the indigenous race, possessing outstanding features which were testimony to the commercial community in the Chao Phraya River Basin. Evidence of the

connection between the multi-racial cross-cultural activities in the Chinese-indigenous and commercial-agricultural community along the north-south river corridor is represented by shrines, ports, and transportation routes along the riverfront area.

Rapid and uncontrolled urbanization are likely to result in social and spatial fragmentation. The pressures of rapid urban growth have also made cities places of great inequality. However, economic activities along the road, in new urban areas have become increasingly important, leading to the riverfront being unused (both physically and for activities). Besides, rapid urban growth provides opportunities for employment and education. Population growth for economic reasons has caused migrants to move and become disconnected to the existing heritage, including its tangible and intangible components. The connection between people and the river is then lost.

Flood barriers have been constructed along the forgotten river to prevent flooding overflow. Such construction obstructs the flow, especially inland. Additionally, the waterscape will be blocked, and locals along the river will no longer be able to have access to it; they will see a high wall instead. Therefore, this uncoordinated development has torn down the connection between people and the river. Waterfronts are assets which enhance the quality of a built-up environment in urban areas. Water is a powerful draw and can help instill a strong sense of place (Gillotti, 2005). It is essential to encourage people to come back to the water for entertainment, recreation, and quality of life activities. Reconnecting people to the natural systems of the waterfront requires the participation of the community and the human systems of the city. This will eventually help to reconnect the market and the waterfront once again, providing commemoration of the past.

F) Canal trading village: Revitalizing local economies

Table 19 Statement of significance in canal trading village using overlay approach

	Human settlement significance	Geographical and environmental significance	Cross-cultural inf. on local economy significance	Interconnection significance
Canal trading village	Settlement were developed during agricultural revolution era which contributed to local economy development along the east-west corridor		Cross-cultural influence on both tangible and intangible cultural heritage manifested and mixed well in small local community	Rowhouses directly connected to the canal where connected the east-west transportation corridor
Potential threats	Economic recession due to mode of transportation change led waterfront structures left abandon		Moving out migration causing people unable to connect to the physical representation of their cultural influence	Canal lay abandoned and unused caused by changing mode of transportation which led water hyacinth and alligator weed often grow covering the water surface
Counter measure	Local Economy development (LED) model		Incentivize moving out migrants to move back based on LED model development	Reuse of canal for passenger transport service and recreational purpose

The canal trading village was developed during the agricultural revolution era, and contributed to LED along the east-west corridor of the Chao Phraya River Basin. The cluster of row houses aligned alongside the canal are directly connected to the east-west transportation corridor. The settlement was developed as a local hub for the distribution and collection of agricultural production. Likewise for the river port town, the cross-cultural influence of the Chinese immigrants has manifested itself on both the tangible and intangible cultural heritage, mixing well in a small local community. However, the local economic recession as a result of a change in the mode of transport, has led waterfront structures and economic activities to be abandoned. People have moved

elsewhere due to the economic shift. Young people have found jobs in the cities. Consequently, people are no longer able to connect with their cultural influences.

Besides, canals lay abandoned because of a change in transportation mode, which has meant that water hyacinth and alligator weed often grow on the water's surface. The area then becomes polluted and undesirable.

The canal trading village can be preserved and revived only with a stable local economy which creates community regeneration and the preservation of cultural resources. There is great potential for the traditional community to provide economy stimulation by nostalgia-oriented tourism. The increase in tourism is also a major asset for the small businesses of local dwellers, allowing the younger generation to return home. However, traditional economic activity is often inaccessible to the majority of the population. Entrepreneurial coaching is required, enabling local businesses to run sustainably with limited cultural resources, as well as initiatives to revitalize the local economy, and get it back on track.

G) Raft community: Revitalizing community forest for domestic use

Table 20 Statement of significance in Raft community using overlay approach

	Human settlement significance	Geographical and environmental significance	Cross-cultural inf. on local economy significance	Interconnection significance
Raft community	Water surface settlement clustered together with the riverport town, which was actively supported and stimulated as a front market.	raft structure used bamboo material as a major building material which was harvested from neighborhood forest	Respond to water-based trading and land-free housing units for multiracial immigrants in the early period	Efficiently transported throughout the river
Potential threats	Poor housing condition and being considered as a pollutant and going against water management policy and a healthy city	lack of local available bamboo caused by community forest decreased, so dwellers could not afford new raft material	Young generation moving out and resettled on to land caused by changing of economic activities in modern condition	Water hyacinth mats effected on transportation and fishing, and could degraded water quality by blocking photosynthesis

Counter measure	Waste management and improvement of hygienic standard	Revitalizing community forest for domestic use	Reconnecting people and rehabilitation of economic activities on the river	cutting and use water hyacinth for biogas production, fertilizer, and other things.

The water surface settlement of the raft community is clustered together with the river port town, actively supporting and stimulating as a front market. The existence of the raft community is testimony to flourishing water-based trading, which responded with land-free housing units for multi-racial immigrants in earlier times, and efficient transportation throughout the river. The outstanding raft structure utilizes bamboo as a major building material, harvested from the neighborhood forest. Due to the temporary nature of raft houses, bamboo structures toned to be maintained every three to five years. The maintenance cycle requires a great number of bamboo poles. In the past, local people could use bamboo from the neighborhood forest, but unfortunately, with a significant decrease in the forest area, they are unable to find this local material and have to buy it from the market. This has resulted in higher living costs for local people in maintaining the raft house. Thus, revitalizing the community forest, and bamboo in particular, is recommended for domestic use in raft house maintenance. It is important to promote and support the practice and expansion of a sustainable community forest.

Poor housing goes against water management policy and a healthy city. Household waste flows directly into the waterways. Besides, water hyacinth mats affect transportation and fishing, and could degrade water quality by blocking photosynthesis. The younger generation tends to move away and resettle on land due to poor housing standards and the changing day-to-day activities of modern life. However, the primary task concerns waste management and the improvement of hygienic standards by utilization of the appropriate sanitation and water management subsidies. A subsidy should be given to construct a toilet, or offer incentives for attaining total sanitation under supervision of the local authority. Then, the LED model should be used for the rehabilitation of economic and recreational activities along the river to allow people to connect with the river once again.

Table 21 summary for conservation of cultural landscapes and their features

Cluster type	*Critical area*	*Counter measure: general outline*
Paddy village	Watergate and dam	Naturalized river overflow
Orchard village	Ditches network	Zoning and rehabilitation/protection of irrigation orchard ditches
Estuarine agricultural village	Mangrove forest	Sustainable estuarine resource management
Fishing village	Wetlands area	Community based fisheries management
Riverport town	Riverbank	Reconnecting/reclaiming the waterfront
Canal trading village	Canal route	Revitalizing local economies
Raft community	Community forest	Revitalizing community forest for domestic use

A brief conservation measure for cultural landscapes and their features was summarized in table 21. The result revealed a simple concept of a "landscape overlay control" which provided numbers of option for managing landscape significance targeting specific type of community. Further conservation policy and implemented programs could go straight to the point focusing on "their issues" in "their critical area". These counter measure model could be implemented in spatial planning practice, initially on both national level, provincial, and municipal level.

However, in describing the waterfront community complex as part of "The Cultural Landscape of the Chao Phraya River" for nomination to the list of World Heritage Sites, Thailand government must be confident that the property will be effectively protected and managed. There must be an appropriate management plan or other documented management system which specifies how the value of a property should be protected, presented, and transmitted to future generations, preferably through participatory means. Besides, it is essential to encourage the preparation of tentative lists with the participation of a wide variety of stakeholders, including site managers, local and regional governments, local communities, NGOs, and other interested parties and partners. However, in describing a legal mechanism (see Chapter 1) in the conservation of a traditional community, it should be mentioned that local government is seemingly a key contributor in progress toward further management plans.

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Appendices I: List of abbreviations

Abbreviation	
Ancient monument act	Ancient Monuments, Antiques, Objects of Art and National Museums Act
Environment act	Enhancement and Conservation of the National Environmental Quality Act
Old town regulation	Regulations of the Office of the Prime Minister on Development and Conservation of the Rattanakosin and Old Town
Board for Old Town	Board for Development and Conservation of the Rattanakosin and Old Town
APTU	Faculty of Architecture and Planning, Thammasat University
BMA	Bangkok Metropolitan Administration
CBFM	Community based fisheries management
FAD	Fine Arts Department
HUL	Historic urban landscape
ICOMOS	International Council on Monuments and Sites
IUCN	International Union for Conservation of Nature
LED	Local economic development
ONEP	Office of Natural Resources and Environmental Policy and Planning
MONRE	Ministry of Natural Resources and Environment
LUCNCE	Local Unit for Conservation of Natural and Cultural Environment
DPT	Department of Public Works and Town & Country Planning
FAR	Floor-area Ratio
OSR	Open Space Ratio
MD	Marine Department
MOI	Ministry of Interior
NGO	Non-governmental organization
NHA	National Housing Authority
ONEP	Office of Natural Resources and Environmental Policy
PCI	Principle component analysis
RRAFA	Foundation of Reclaiming Rural Agriculture and Food Sovereignty Action
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNHABITAT	United Nations Human Settlements Programme

Appendices II: List of traditional communities and their location

Access GIS data via Google maps:

https://goo.gl/m4bJrd

Table 22 Paddy village 37 communities

No.	*Community*	*Watercourse*	*Latitude*	*Longitude*
1	Baan Mae Klangluang	Klang	98.546845	18.538577
2	Baan Mae Kampong	Mea Lai	99.353822	18.866088
3	Chunchon Pongsanook	Wang	99.496866	18.294594
4	Chumchon Baanlook	Mea Jang	99.523942	18.116018
5	Baan Thungyaw	Sarn	99.071737	18.502166
6	Baan Nongdoo	Ping river	98.899302	18.52333
7	Chumchon Rim Nam Takeanluen	Chaophraya River	100.100662	15.638493
8	Baan Nongbua	Nan River	100.786012	19.087973
9	Baan Mae Khammee Tha Meelor	Yom River	100.177469	18.266086
10	Trok Baancin	Ping river	99.125132	16.86791
11	Tha Ith-Tha Ith Lang	Nan River	100.104571	17.621373
12	Chunchon Baankungtapaw	Nan River	100.140363	17.655033
13	Chumchon Phrafansawanburimuneenat	Nan River	100.228886	17.637327
14	Tha Talad Community	Noi River	100.4152556	14.6499937
15	Chao Jed Community	Chao Jed Canal	100.374446	14.316437

No.	*Community*	*Watercourse*	*Latitude*	*Longitude*
16	Baan Krod Wat Kanon Community	Pho Canal	100.60894	14.290712
17	Raang Jorakae Community	Raang Jorakae Canal	100.38109	14.347074
18	Klong Takean Community	Takean Canal	100.553373	14.327075
19	Pakkran Community	Pakkran Canal	100.517197	14.312666
20	Bangbaan Canalside Community	Bangbaan Canal	100.477044	14.397015
21	Ladchit Canalside Community	Ladchit Canal	100.351324	14.433145
22	Baan Seangsom Community	Chaophraya River	100.578038	14.282882
23	Baan Pak klong Community	Makhamtao River	100.0548298	15.2638041
24	Baan Tha Kak Community	Chaophraya River	100.0938476	15.3592578
25	Baan Thalap Community	Chaophraya River	100.08519	15.229062
26	Baan Fangklong Community	Thadang	101.262777	14.162285
27	Klong Mahasawat Trainstation Community	Klong Mahasawat	100.2594131	13.8080577
28	Baan Koh Rad Community	Thasarn-Bangpla	100.14663	13.967557
29	Pasuk Thaiyuan Riverside Community	Pasuk River, Chaophraya River	100.85655	14.556429
30	Meala Riverside Community	Meala River	100.330418	14.946324
31	Baanranam Community	Chaophraya River	100.296728	15.073893
32	Baan Laanka Community	Thachin River	100.132221	14.4112
33	Makham lom Community	Rangthong	100.069782	14.384802
34	Rangbua Community	Rangbua	100.066324	14.348518
35	Wat Bat Community	Rangthong	100.040741	14.365679
36	Wat Kudeetong Community	Thachin River	100.118553	14.453834
37	Baanthaladnue Community	Thalad Canal	101.3533	13.724711

Table 23 Orchard village 21 communities

No.	*Community*	*Watercourse*	*Latitude*	*Longitude*
1	Chumchon Klong Bangluang	Bangluang River	100.4649257	13.7320199
2	Wat Raiking Riverfront Community	Thachin River	100.2586512	13.7434858
3	Klong Aomnon	Klong Aomnon	100.477803	13.853903
4	Koh Kred Community	Chaophraya River	100.4790379	13.9090305
5	Bangkuwiang Floating Market Community	Bangkoowieng	100.429126	13.831108
6	Baan Bangnaikrai Community	Bangnaikrai nok	100.4384751	13.8188805
7	Ladplee Floating Market Community	Damnoensadook Canal	99.952639	13.525369
8	Baan Klongmon community	Damnoensadook Canal	99.974671	13.575089
9	Bananampheung community	Bananampheung	100.567433	13.683862
10	Bangnokkwag Community	Damnoensadook Canal	99.9270676	13.5014368
11	Bangnoi Community	Bangnoi Canal	99.9442405	13.4619792
12	Kwi Aom Community	Kwi Aom	99.940093	13.439546
13	Wat Pradoo Community	Pradoo Canal	99.888157	13.425405
14	Bangkae Canalside Community	Bangkae Canal	99.921911	13.41534
15	Bangpongpang Canalside Community	Bangpongpang Canal	99.925882	13.399624
16	Prajachonchuen Canalside Community	Prajachonchuen Canal	99.950729	13.416022
17	Bangchak Canalside Community	Bangchak Canal	99.958557	13.435328
18	Amphawa Canalside Community	Amphawa Canal	99.955237	13.425671
19	Mae Klong Canalside Community	Mae Klong River	100.018627	13.449647
20	Thaka Floating Market Community	Thaka Canal	99.995331	13.471878
21	Mae Klong Riverside Community	Mae Klong River	99.998574	13.41209

Table 24 Estuarine agricultural village 5 communities

No.	*Community*	*Watercourse*	*Latitude*	*Longitude*
1	Chumchon Mon Bangkradee	Sanamchai	100.4086663	13.6026532
2	Sakhla Community	Yaibua canal	100.500765	13.545058
3	Sappasamit Canal Community	Sappasamit Canal	100.521659	13.55881
4	Khaoyeesarn Community	Yeesarn dug canal	99.9017095	13.3063035
5	Bangkaew Salt-paddy Community	Bangbo	100.03145	13.41628

Table 25 Coastal fishing village 3 communities

No.	*Community*	*Watercourse*	*Latitude*	*Longitude*
1	Leamphapa Community	Sappasamitr Canal	100.574016	13.573995
2	Bangjakreng Community	Mae Klong River	100.007181	13.367104
3	Leamyai Community	Mae Klong River	99.991796	13.344746

Table 26 Riverport town 48 communities

No.	*Community*	*Watercourse*	*Latitude*	*Longitude*
1	Yaan wat ketu Tanon Charoenrat	Ping river	99.002988	18.791806
2	Yaan KarnkhaTalad Kongta	Wang	99.498361	18.291009
3	Talad rim Nam PakNam pho Yaan Talad Bonkai	Chaophraya River	100.13616	15.701953
4	Talad lao	Ping river	100.144726	15.709246
5	Yaan Taladchumsang	Nan River	100.309723	15.896555
6	Chumchon Kaw Leaw	Ping river	100.074057	15.846931
7	Talad Phayuhakiri	Chaophraya River	100.134678	15.45843
8	Chumchon wang krod	Nan River	100.387912	16.398816
9	Chumchon Thalor	Nan River	100.328494	16.512413

No.	*Community*	*Watercourse*	*Latitude*	*Longitude*
10	Yaan Talad Bangmoonnak	Nan River	100.377995	16.030794
11	Chumchon Talad rim Nam Baan Kampaengdin	Yom River	100.218603	16.581362
12	Chumchon Phrompiram	Nan River	100.198952	17.03477
13	Chumchon Talad rim ym	Yom River	99.957391	16.931882
14	Srisamrong	Nan River	99.862597	17.168721
15	Chumchon Talad Tai Sawankalok	Yom River	99.832422	17.316215
16	Baantaak	Ping river	99.068449	17.044478
17	Chunchon Talad Baankawsakaekrang	Sakae Krang River	100.028575	15.38232
18	Talad Saanchao Rongthong Community	Noi River	100.354875	14.593137
19	Talad Ladchadou	Nakoo/Bangkee	100.319568	14.460789
20	Talad Hua Rau Community	Pasuk River, Chaophraya River	100.573631	14.366671
21	Talad Baan Pan Comminuty	Noi River	100.402895	14.326827
22	Talad Wat Sing Community	Makhamtao canal	100.0409123	15.263461
23	Talad Poh Nang Dam Community	Chaophraya River	100.286851	15.076235
24	Talad Muanglopburi Community	Lopburi river	100.61036	14.804111
25	Talad Nakhon Chaisri Community	Thachin River	100.1963398	13.7916165
26	Talad Bangluang Community	Thachin River	100.11905	14.120459
27	Talad Klong Lamphraya Community	Thachin River	100.204534	13.958502
28	Talad Don Whai Community	Thachin River	100.2858855	13.768132
29	Talad Pohtaram Community	Mae Klong River	99.850005	13.696328
30	Talad Jedsamean Community	Mae Klong River	99.820845	13.635961
31	Baanpong Community	Mae Klong River	99.875802	13.813174

No.	*Community*	*Watercourse*	*Latitude*	*Longitude*
32	Thachalom Community	Thachin River	100.272104	13.5383
33	Talad Mahachai Community	Thachin River	100.276667	13.545378
34	Talad Baan Peang Community	Chaophraya River	100.439433	14.808575
35	Talad Pak Bang Community	Chaophraya River	100.437783	14.847123
36	Talad Singburi Community	Chaophraya River	100.409601	14.885148
37	Talad Intrburi Community	Chaophraya River	100.33074	15.01328
38	Tald Kao Hong Community	Thachin River	100.134431	14.405102
39	Talad Baan Sood Community	Bangyeehon Canal	100.243962	14.33563
40	Talad Kor Wang Community	Thachin River	100.147451	14.36458
41	Talad Samchuk Community	Thachin River	100.093098	14.755423
42	Talad Pho Phraya Community	Thachin River	100.1240877	14.5341561
43	Talad Sriprajan Community	Thachin River	100.144563	14.619153
44	Talad Thachang Community	Thachin River	100.080485	14.86539
45	Talad banglee Communtiy	Songpeenong Canal	100.037607	14.23116
46	Chachoengsao Commercial Community	Bang Pakong River	101.0785422	13.6915256
47	Talad Bannmai Community	Bang Pakong River	101.09125	13.698244
48	Talad Bangkla Community	Bang Pakong River	101.2058609	13.7258572

Table 27 Canal trading village 20 communities

No.	*Community*	*Watercourse*	*Latitude*	*Longitude*
1	Talad Huatakae	Pravej Canal	100.78959	13.7229411
2	Talad Tonson	Chedipuja Canal	100.184906	13.80469
3	Klong Raheang	Klong Raheang	100.4202596	14.041483

No.	*Community*	*Watercourse*	*Latitude*	*Longitude*
4	Talad Pak Klong 3 Community	Klong 3	100.663841	13.99441
5	Pak Klong 5 Community	Klong 5	100.709743	14.008985
6	Pak Klong 7 Community	Klong 7	100.755824	14.028471
7	Pak Klong 11 Community	Klong 11	100.847141	14.060049
8	Pak Klong 13 Community	Klong 13	100.892157	14.075534
9	Tald Rangsit Historic Community	Rangsit Prayurasak Canal	100.610025	13.982283
10	Lakha Floating Market Community	Damnoensadook Canal	100.037619	13.5531356
11	Damnoensadook Floating Market Community	Damnoensadook Canal	99.958284	13.520877
12	Talad Bangplee	Samrong Canal	100.708667	13.604511
13	Talad Bannpeaw	Damnoensadook Canal	100.1069285	13.5896346
14	Klongsuan Community	Pravej Canal	100.956513	13.661886
15	Talad Luangpang Community	Pravej Canal	100.854907	13.698862
16	Talad Preng	Pravej Canal	100.902539	13.680875
17	Talad Nakhonnuengket Community	Nakhonnuengket Canal	100.9919427	13.7737456
18	Talad klong 16 Community	Klong 16 Canal	100.958213	13.966492
19	Talad Klong 15 Community	Klong 15	100.981541	14.146213
20	Baangboo Community	Chaiyanuchit Canal	100.849385	13.577617

Table 28 Raft community 4 communities

No.	*Community*	*Watercourse*	*Latitude*	*Longitude*
1	Sapan dam	Chaophraya River	100.109969	15.684539
2	Paknai Fisherman Village	Nan River	100.681241	18.052132
3	Raunpae Meanam Nan	Nan River	100.247426	16.805794
4	Raunpae Meanam Sakraekrang	Sakae Krang River	100.037077	15.376274

Appendices III: Conditions Survey

List of Publications

Yodsurang, P., and Uekita, Y. (2016). Overseas Chinese in the Chao Phraya River Basin: The Cross-Cultural Influence of a Multi-Racial Community. Asian Profile, 44(5), pp.459-470.

Yodsurang, P., and Uekita, Y. (2016). 9323 Architectural features and their amphibian environment of the traditional waterfront wooden housing in Chao Phraya River basin. Summaries of technical papers of annual meeting Architectural Institute of Japan, 2016, pp.6457-646, 2016-08

Yodsurang, P., and Uekita, Y. (2015). A Traditional Waterfront Community in the Chao Phraya River Basin II: Influence of Water Circulation on the Traditional Living Culture according to the Settlement Pattern. Asian Culture and History, 8(1), pp. 112-125., http://dx.doi.org/10.5539/ach.v8n1p112

Yodsurang, P., Miki, H., and Uekita, Y. (2015). A Traditional Waterfront Community in the Chao Phraya River Basin: Classification and Characteristics of a Waterfront Community Complex. Asian Culture and History, 8(1), pp. 57-68., http://dx.doi.org/10.5539/ach.v8 n1p57

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