



LANDSCAPE CONSERVATION AS A PREVENTIVE MEASURE IN
CONSERVING TEMPLES NEAR WATER BODIES IN CENTRAL THAILAND:
DEVELOPING GUIDELINES FOR THE PREVENTION OF FURTHER
DETERIORATION OF THE WAT KAMPANG (*KLONG BANGJAK*)

By

MRS. Muenkaew Charutula WACHIRATIENCHAI

An Independent Study Submitted in Partial Fulfillment of the Requirements
for Master of Arts CULTURAL HERITAGE CONSERVATION AND
MANAGEMENT

Silpakorn University

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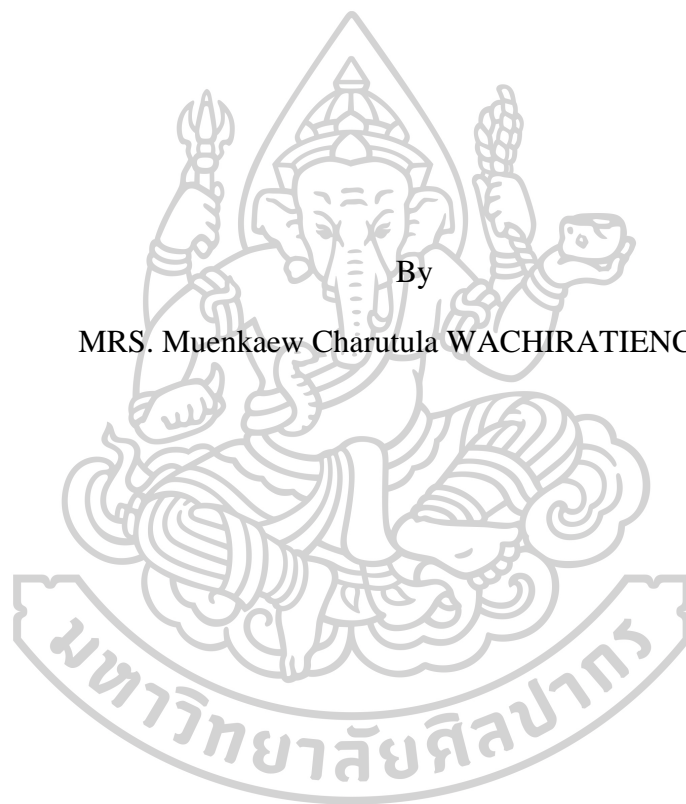
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Title Landscape Conservation as a Preventive Measure in Conserving
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Thailand: Developing Guidelines for the Prevention of Further Deterioration of the
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Landscape Conservation as a Preventive Measure in Conserving Temples
Near Water Bodies in Central Thailand

Developing Guidelines for the Prevention of Further Deterioration of
the *Wat Kampang (Klong Bangjak)*

The primary goal of observing landscape architecture and its philosophy is to explore and provide insight into the dynamic of the management of landscape architectural design and heritage site conservation regarding the physical surroundings of ceremonial grounds. The author's independent Master's degree research of *Wat Kampang* temple at *Klong Bangjak* Canal, Thailand, is utilised as a reference for landscape conservation as a preservation technique. The environmental context of the cultural item, the heritage building, and the landscape architecture of the heritage sites all significantly impact the degradation of heritage structures. This study examines case studies from local and abroad that used a standard premise, architectural style, setting, and material. As a result, landscape design is important as part of preventative conservation to avoid future degradation of historical artworks in heritage buildings. Landscape preventive measure guidelines must be considered for temples close to water bodies in Central Thailand.

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Introduction

In Thailand's Central region, many temples were built close to canals or the Chao Phraya River because of the high importance of water transportation in the old days. Moreover, a thousand years ago, the central region, now Bangkok and the suburbs, used to be under the sea level. These circumstances also lead to present-day deterioration according to humidity.

There is a significant relationship between the environmental context of the heritage object, the heritage building, the landscape architecture of the Buddhist ceremonial courtyard, and the deterioration of murals in heritage buildings close to the river. A well-planned landscape design would minimise further damage to the heritage building, heritage objects and the artworks in the heritage building as a part of preventive conservation.

The Cultural Heritage Conservation and Management (CHCM) Master's degree class participated in a two-week workshop together at *Wat Kampong* to explore the building and its artworks, and it evolved into a viable thesis topic.

One objective is to find case studies that use a similar hypothesis, such as the same type of material or a similar climate, as an assumption and prototype studies by taking two groups of projects, local and abroad. The projects in Thailand that have mural painting conservation in a similar condition to *Wat Kampong (Klong Bangjak canal)* by The Fine Art Department of Thailand focused on conservation procedure and schedule of conservation such as *Wat Bang Nam-Phueng Nok*, Samut Prakan province. Another project from abroad that uses landscape as a preventive measure for heritage monuments is the *Jongmyo Ancestral Shrine* from the Republic of Korea. The case study analyses how the site and environmental context are managed. Moreover, collect data on the artworks' condition inside the building.

This research aims to study heritage site management in *Wat Kampong*, Bangkok, which has heritage buildings and objects close to the waterbody, to analyse whether or not its deterioration relates to landscape architecture and environmental issues. It includes establishing principles or guidelines for preventing further

deterioration of heritage buildings and objects inside, such as murals and artworks. The thesis should also clarify the proper management of traditional Thai heritage buildings close to water bodies in a central region of Thailand such as heritage temples. *Phra Vihara* (the assembly hall) and *Phra Ubosot* (the ordination hall) predominantly have Buddha statues and mural paintings inside, frequently affected by the deterioration of the building. For instance, the brick-wall-bearing structure of these heritage buildings, which act as a background and frame of the mural painting, has been damaged by humidity and underground water. When the building structure starts to have a problem, it further deteriorates the mural painting.

Bringing the hypothesis to study the heritage site of *Wat Kampong* at *Klong Bangjak* Canal and inspecting conservation practices, scientific data, and literature review are also the support tools of this research. *Wat Kampong*, *Klong Bangjak* canal, was chosen due to its environmental context and historical data. It can be a model for other temples in Thailand's central region with similar conditions.

The research process monitors environmental conditions around the heritage site and building, such as on the building wall, floor, and under the trees around the building. Visual monitoring and surveys without taking samples, using photogrammetric, are also required. Underground water info in the monsoon season is used to support the hypothesis. The result will be the development of design guidelines from the landscape conservation concept of *Wat Kampong (Klong Bangjak)*. The current state of the heritage sites, including artworks and artefacts, is intended to be renovated by the Fine Arts Department of Thailand. Due to its damage and faulty design, the irrigation system, hardscape floor, and vegetation must be improved. A maintenance plan and procedures suitable for the renovation schedule according to the Central region of Thailand's climate and environment are also proposed.

Overall, this study attempts to explain the current condition of *Wat Kampong* and provides recommendations for preventive conservation. The study is divided into five parts. The first chapter is about the background of *Wat Kampong* at the *Klong Bangjak* canal. Secondly, case studies from local and abroad as a preventive

conservation method are discussed. The third chapter is about a technological survey of *Wat Kampong*. Fourthly, the condition survey of *Wat Kampong* in February 2023 is demonstrated. The fifth chapter is about the aim and concept of preventive conservation measures. Last chapter will be mentioning maintenance, guidelines, and outcomes.



1. Wat Kampang temple in Klong Bangjak, Thailand

Wat Kampang is a Buddhist temple in Thonburi's *Klong Bang Luang* neighbourhood. It is listed on the Fine Arts Department (FAD) of Thailand's Historic Sites Registration. The FAD drawing study in March 2000 identified eight historic structures out of the twenty-two in the master plan. There are eight *sima* (boundary stone marking) with their roofs, two small *Viharns* (assembly halls), three different 12-recessed chedis with ornamentation, two *Prang*-shape chedis, a bell-shaped *chedi* (stupa), *Buddhavas* wall, two *Buddhavas* gates, two small wooden pavilions, and an old waterside pavilion. The mural was painted on a lime plaster wall. The wooden panels of windows and doors are gilt lacquer paintings at the ordination hall. Outside the ordination hall, flower-stucco ornaments were used to frame the doors and windows. The roof is made of wood and unglazed terracotta tiles.

1.1. Cultural and art historical background

For the archaeological report of the FAD¹, there is no evidence of the time of construction of *Wat Kampang (Klong Bangjak)*, although the earliest source proving the temple's existence is a Thonburi 2430 B.E.² ancient map (1887), as seen in figure 1. It depicts the site of *Wat Kampang* near *Klong Bangjak (Bangjak canal)* as surveyed during King Rama V. The maps illustrate the temple's surroundings and layout but do not include the temple's name. The temple's boundary had four main buildings, two to three smaller structures, and passageways. The north boundary of the temple is connected to *Klong Bangjak*. *Klong Bangkok Yai* or *Klong Bang Luang* form the eastern border. The south boundary is connected to allotments and the *Wat Thong* temple, as seen on the map. The map also illustrated the area of *Buddhavas*. It is a low-in-height wall surrounding the ceremonial area with an *ubosot* (ordination hall) inside, sometimes including a *vihara* (assembly hall) and *chedis* (stupa).

The antique map of *Thonburi* (see figure 1) depicts two primary entrances to the temple, one via the *Klong Bang Luang* canal and the other by the *Wat Thong*

¹ The Fine Arts Department of Thailand, Archaeological Report on *Wat Kampang* at *Klong Bangjak*, Bangkok 2019

² Buddhist era years are measured in B.E., 543 years earlier than the Gregorian calendar.

temple across the bridge.³ Because the temple layout is similar to the late Ayutthaya master plan, *Wat Kampang* must have been built during the late Ayutthaya period. According to the excavation study⁴, the original brick path and foundation were discovered 2.6-3.00 meters below the current ground level.



Fig. 1: Thonburi 2430 B.E. (1887) antique map shows the *Wat Kampang* area surrounded by allotments and orchards.

Source: The Fine Arts Department of Thailand, Archaeological Report, 18

The major restoration was reportedly completed in 2367 B.E. (1824) during King Rama III's reign. It was restored when Phraya Pisalphonpanich (Jean Shi), a Chinese officer who provided the funding in 2426 B.E. (1883), made significant alterations. The painting of a standing Buddha on the exterior wall above the doorway can date back to King Rama IV's or King *Mongkut's* period, during 2394-2411 B.E. (1851-1868). According to the FAD 2563 B.E. (2020) report, the FAD restoration

³ The 2430 B.E. Map of *Thonburi* and Bangkok. (The Fine Arts Department of Thailand, Archaeological Report, 18)

⁴ The Fine Arts Department of Thailand, Archaeological Report, 87-131.

started with the murals' restoration in 2011, and numerous further projects followed (see chapter 3 for more records).

Two murals are painted at the front and back inside of the *ubosot*. The upper wall of the front shows scenes from the life of the Buddha, a confrontation with *Mara*⁵ (demon) scene. The upper wall of the back shows scenes from *Traiphummikatha*, or the Story of the Three Planes of Existence, which brought the moment of the Lord Buddha's history when he descended from heaven to the human world. And the lower wall along the windows and doors opening depicts the scenes from *the ten Jataka*, the Thai rendition of the Buddha's past life. There are the *Temeey Jataka*, the *Mahachanaka Jataka*, the *Suwan Sam Jataka*, the *Nemee Rajataka*, the *Mahosot Jataka*, the *Puritat Jataka*, the *Chanthakuman Jataka*, the *Narth Jataka*, the *Withoon Jataka* and the *Vessantara Jataka* (see Appendix I). The daily life of people in the past has been inserted into the painting harmoniously.

The long side painting on the left and right of the *ubosot* is divided into three stacks of tiers of the god and goddess called *Thep Chumnum*⁶. The images consist of angels as human beings, giants, garudas, and nagas sitting cross-legged, facing the Buddha image. A fan separates each angel with a front image of *nakala*⁷ (a monster in Hinduism and Buddhism). *Prajamyam* pattern stripes separate each tier. The bottom stripe is a stacked flower pattern. A *Sin Thao* line divided a flying figure of a flying musician angel from the uppermost part. The background image in the upper layer is a deep vermilion (*Dangchard*). The middle layer is reddish-orange, and the bottom layer is reddish-purple brown decorated with falling sacred flowers from heaven.

In this period, *Thep Chumnum*, or divided gods and angels gathering image, is the most typical painting type in *ubosot*, the same style as *Wat Bang Num Pueng Nok*

⁵ *Mara* (Sanskrit: मरु or *Māra*, Thai: มาร) In Buddhism, is a malicious heavenly monarch who sought to prevent Prince Siddhartha from attaining enlightenment by seducing him with his celestial army. In Buddhist cosmology, *Mara* is related to death, reincarnation, and desire. (Kalyanamitra, *Dictionary*, 386)

⁶ *Thep Chumnum* is an event in which gods and goddesses gather together for ceremonies or give a sign of blessing. (Kalyanamitra, *Dictionary*, 246-247)

⁷ *Nakala*, *Singhamuk* or *Kiatmuk*, is a time that devours everything in Hindu beliefs. In addition, in some legends, it is said that the face is meant to be the one who devours every moment in the world, which cannot be restored in Buddhism. *Kiatmuk* means "Time that eats everything" to remind humans to do their best today. (Kalyanamitra, *Dictionary*, 75-76)

in chapter 2. The styles and details were reminiscent of the reign of King Rama IV (1851-1868), with houses and landscapes painted using perspective techniques. Some Western portraits and dresses in the paintings were illustrated, which added a unique touch to traditional Thai art.

The Buddha image statue in the *ubosot* is *Luang Por Bussarakham*. It is a Buddha image of subduing *Mara* gesture. The characteristic of the Buddha is the early Rattanakosin period, inheriting art from the late Ayutthaya period with a round face. The Buddha's eyes are small, his eyes glimpsed low, and the edges are rounded. His nose is curled, and his upper mouth is thicker than the bottom, covered with oblique robes similar to flames. The arms and fingers look distortedly large, possibly having been restored.

1.1.1 History and Buddhism

Thailand's religious and royal architecture mainly evolved through layering, the accretion of forms and influences over time. The layering is a form that expresses a profoundly Thai worldview shaped by a *Theravada* Buddhist cosmology from a Hindu-Buddhist doctrine manuscript called *Trai Phum*⁸ (aka the Three Worlds). The diagram of the mandala and other elements is symbolised by temple architecture through bases, walls, columns, roof spires, furniture, and decorations. Moreover, it also represented a relationship between Buddhist architecture, the temple and its surrounding context. To describe the ambiguous periphery relationship between traditional Thai architecture and wisdom, understanding the *Traiphummikatha*⁹ manuscript is a necessity. The manuscript illustrated the hierarchy of the Three Worlds: heaven, earth, and underworld. It shows the structure of the world through

⁸ *Trai Phum*, or the Three Worlds, is a Cosmological Buddhist text that describes the World of Desires, the World of Form, and the World of the Absence of Form, commonly depicted in Thai mural painting. It illustrates the relationship and hierarchy of space and living beings around a mythical Mount Meru. (Kalyanamitra, *Dictionary*, 142)

⁹ The manuscript was kept at the Bangkok National Archive of Thailand. Thai Buddhist scriptures and manuscripts are documentation heritage listed on the Memory of the World Register due to their authenticity and irreplaceable values. Most of the scripts were written on palm leaves. Traditional methods of keeping *Tripitaka* scriptures and other sacred manuscripts are to wrap them with fabric. (Veraprajak, *Traditional Thai Book*, 1-2,23,39) The wrapped scripture is housed in wooden cabinets decorated with magnificent gilded lacquer. The cabinet decoration attempts to worship the scriptures and manuscripts stored inside. It is like the representative of the Gautama Buddha. (Veraprajak, Korkaew; Tasukon, Niyada, *Thai Lacquer*, 6)

the section and plans, as seen in figure 3 of chapter 2. Thailand's layering architecture and hierarchical architecture elements have symbolised these concepts since long ago.

1.1.2 Architecture and art description

The vocabulary used to describe the basic structure of the temple was carefully chosen based on the work of renowned Thai architecture historian Professor Joti Kalyanamitra, as well as the analysis of Dr Somkid Jiratassanakul, a professor of Thai traditional architecture at Silpakorn University and other respected scholars in the field. This attention to detail ensures the terminology is accurate and reflects Thai architecture's rich history and traditions.

In *Architecture of Thailand: A Guide to Traditional and Contemporary Forms*, it was noted that Thai roof forms are quintessential elements in Thai public architecture. The various ornamental stages, adornment, multiple layers, and height above ground symbolise the building's significance. All of these components derive from the supremacy of royalty, Buddhism, and the Thai Kingdom's richness of culture.¹⁰ The more ornate the roof, the higher the hierarchy status of the building. It also implies the status of the person who authorized it.¹¹ As for the function of the tiered roof, multiple roof tiers help to ward off the sun and rain.

Chua or gable roofs in Thailand are usually built with a steep concave shape. The roof's concave shape is designed to deal with heavy rainfall during the monsoon season and protect wood panels from direct sunlight. They are sluicing water down and shooting it out past the wall to prevent it from seeping through the roof covering and protecting it from rotting. Additional rain and sun protection is provided by a short eave below the main top on two or all four sides. Then, the hot air escapes through the opening under the eaves.

National Artist of Thailand in the Architecture field, Nithi Sthapitanonda, mentioned that regional variations in roof forms are adapted to climate and culture,

¹⁰ Sthapitanonda, Nithi; Mertens, Brain, *Architecture of Thailand*, 79-83.

¹¹ Sthapitanonda, Nithi; Mertens, Brain, *Architecture of Thailand*, 136-141.

such as Thailand's Northern, Southern, and Northeastern (*Isan*) regions.¹² The chiller weather in the north is matched with the roof dropping lower to window level and not concave. The roofs of the south are larger and steeper to survive heavy rain and a windy natural environment. The aridity of the *Isan* functions best with the roof's gentle slope. As aesthetical, it also illuminates the massive roof appearance of the large building.

*Na Chua*¹³ or roof wall panels of the traditional building, protect the indoor space from weather. It is usually made of wood. Some pediment patterns, such as the *Chua Bai Prue*¹⁴ and the *Chua Phra Athit*¹⁵ motif, are designed for ventilation with an opening between wood planks and gaps. The panels are conventionally attached to the post and beam using joinery rather than nails. It makes the structure sturdier because it is not weakened by the shrinkage or expansion of timber when it reacts to moisture and temperature fluctuation. The modular wooden wall panels are made in different shapes for different regions of Thailand, with walls and posts that slope towards the roof, shaped like a tall trapezoid. The interior panel is painted beautifully with a Buddhist-related scene, making it a sacred and holy space suitable for sheltering the Buddha image.

*Lai Rod Nam*¹⁶ or Thai lacquered and gilded art, is one of the essential Thai cultural craftsmanship art.¹⁷ The art technique has been used for ages, decorating Thai architectural elements and traditional furniture. The wooden windows (the interior side) were decorated with this technique.

Doors and windows (*Pratoo* and *Naatang*) are simple wooden panels, but wealthy temple patronage may sponsor carved, painted, or gilded panels. At the base of the window, there is usually a fixed panel of carved wood called *Yong*. *Yong* is both aesthetic and functional, providing beautiful ornamentation to the wall and ventilation of natural air to the inside.

¹² Sthapitanonda, Nithi; Mertens, Brain, *Architecture of Thailand*, 48-51.

¹³ The pediments of the gable roof building. (Kalyanamitra, *Dictionary*, 512.)

¹⁴ Horizontal slats with an opening design for ventilation. (Sthapitanonda, Nithi; Mertens, Brain, *Architecture of Thailand*, 54-55.)

¹⁵ A sunray design motifs pediment. (Kalyanamitra, *Dictionary*, 144-145.)

¹⁶ Kalyanamitra, *Dictionary*, 441.

¹⁷ Neangnoi, Suksri; Chakrabongse, Narisa; Limpabandhu, Thanit, *The Grand Palace*, 249-251.

Nithi mentioned that most visible wooden materials are made from teak.¹⁸ Its outstanding properties are to withstand Thailand's hot and humid climate and termite damage. It is Thailand's most essential wood for timber structures due to its outstanding properties and qualities. Teak timber is outstanding for its durability, water resistance, and aesthetic natural colour. The teak tree grows tall and straight naturally and can be milled into quality timber. Teak wood contains a specific sap that makes it resistant to insects¹⁹ and fungus²⁰, helping the teak building to last up to 200 years. Other common timbers are made from Narra²¹, Siamese rosewood²², Monkeypod²³ tree, and Malabar ironwood²⁴, widely used for various things, from building structures to furniture in Thailand.

Ancient Indian *stūpas* are the foundations of *stupas* in Thailand and Southeast Asian countries. *Chedi* or Pagodas in Southeast Asia are all developed from Indian *stūpas*.²⁵ As for the oldest evidence of *stupas* in Thailand that exists in the past, the oldest period found today is in the 11th to 18th century B.E., the Dvaravati period. However, the appearance cannot explain the form of the *chedi* concretely because most of them collapsed, leaving only the *chedi*'s base. Since *chedis* were mostly built of bricks, they were less durable. At the same time, the base of the *Chedis* was built with laterite, which was more durable. Therefore, the laterite-base part often survived to the present day. However, the architectural form can be assumed from votive *stupas* or stucco images above some cave walls or images carved on *Sima* of the same

¹⁸ Teak tree or *Sak* (*Tectona grandis*) in Thai is a tropical hardwood species of the Southeast Asia region. It is a large deciduous tree found natively in a mixed hardwood forest. (Sthapitanonda, Nithi; Mertens, Brain, *Architecture of Thailand*, 70.)

¹⁹ English Heritage, *Timber*, 131-177.

²⁰ English Heritage, *Timber*, 178-203.

²¹ Narra tree or *Pradu* is *Pterocarpus macroarpus*, a hard medium-weight timber with a yellow colouration at a reasonable cost. (Sthapitanonda, Nithi; Mertens, Brain, *Architecture of Thailand*, 70.)

²² Siamese rosewood tree or *Payung* (*Dalbergia cochinchinensis*), in Thai, is used for furniture. (Sthapitanonda, Nithi; Mertens, Brain, *Architecture of Thailand*, 70.)

²³ Monkeypod tree, or *Maka Mong* (*Azelia xylocarpa*) in Thai, is a heavy solid wood used for floors, stairs, furniture, beams, windows, door frames, wall panels, and veneer. (Sthapitanonda, Nithi; Mertens, Brain, *Architecture of Thailand*, 70.)

²⁴ Malabar ironwood tree, or *Thakien Thong* (*Hopea odorata*) in Thai, is a vast tree used widely in construction. (Sthapitanonda, Nithi; Mertens, Brai, *Architecture of Thailand*, 70.)

²⁵ Cummings, *Buddhist Stupas*, 14.

period. This evidence is enough to explain the appearance of the *stupas* in the past of Thailand.²⁶

Stupas in Thailand have developed various styles based on the beliefs and values of each era until now, as Professor Dr. Somkid described in his book.²⁷ Thai-style *stupas* can be characterised as *Anda* has developed into a bell-shaped structure while *harmika* became the rectangle throne-shaped above the *chaitya*, and *chhatra* has become a spire of the *chaitya* or *plóng cha nai* in Thai, which is on the top of *chaitya*. It was said that “Thailand arguably contains the greatest variety of *stupa* styles of any country in Asia. As an important commercial and transport relay point between ancient India and the Khmer Kingdom to the west and east, between China in the north and the Malay-Indonesian archipelago to the south, the area now occupied by the Thai nation was crisscrossed with religious and cultural influences from many differing sources.”²⁸ As Thai scholars classified *Chedi*, it can be categorised into four groups: a round-planning pagoda, an octagonal-planning pagoda, a square-planning pagoda, and other miscellaneous pagodas.²⁹

Professor Dr. Somkid³⁰ and Nithi³¹ narrated that temple compounds consist of two main areas: a Buddhist ceremonial area, *Buddhawas*, and the monk’s quarters, *Sanghawas*. The *Buddhawas* area is encircled by shorter walls that form a courtyard around the building. This Buddhist ceremonial space is an essential part of the temple where religious rituals happen. It is filled with significant religious buildings, statues, and ceremonial sites, for instance, *stupas*, a sacred *Bodhi* tree, and a scripture pavilion. *Chedi* used in the *Buddhawas* area plan is divided into five types according to location and function.

The main *chedi* is designated as the temple’s main structure. It is usually the largest *chedi* in the master plan. Most of them are in the middle of the layout, on the main axis behind *ubosot* (the ordination hall) or the *vihara*. *Chedi Rai* is a small

²⁶ Jiratassanakul, *Temple*, 37-38

²⁷ Jiratassanakul, *Temple*, 37-54

²⁸ Dohring, *Buddhist Stupa*, 5-8

²⁹ Dohring, *Buddhist Stupa*, 9-145.

³⁰ Jiratassanakul, *Temple*, 27-35.

³¹ Sthapitanonda, Nithi; Mertens, Brain, *Architecture of Thailand*, 76-116.

pagoda included in the layout as a secondary pagoda. *Chedi Rai* will be lined up around the main building, such as *ubosot* or *vihara*. *Chedi Thit* is an important minor pagoda in the plan determined to be located in the four directions or corners of the plan.³² It is also known as the corner pagoda. *Chedi Thit* is a pagoda of secondary importance in the layout that is determined to be located in the layout of the four directions or the four corners of the plan. It is also known as *Chedi Moum* or the corner pagoda. *Chedi Kuu* is a twin Pagodas made in pairs and located in front of important buildings such as *ubosot*, *vihara*, or *phra-prang* (the Khmer-Siam style stupas) such as in *Wat Kampong at Klong Bangjak* (see figure 59). Lastly, *Chedi Moo* is a group of pagodas built in a group situated in the same area. This kind of *chedi* emphasises the significance of the whole group and does not focus on any pagoda special.³³ (see further information in Appendix II)

Sima (see figure 58) is a slabbed stone that marks the ceremonial area in the *Buddhavas* area, where Buddhist rites and circumambulation rites are performed. Eight pieces of *sima* will surround the ordination hall, which refers to the Buddhist Eight Path. Most of them were heaped on the altar or in a tiny pavilion.³⁴ The design of the *sima* shrine varies with each architectural style period. Characteristics and patterns of *sima* have four forms in determining the location. The first type of *sima* is the standing-alone *sima*, placed directly on a raised-up base on the ground around the *ubosot*, such as *Wat Kampong at Klong Bangjak* canal, Bangkok. The second type of *sima* is the *sima* on the low wall. These *sima* are on the low-wall connecting all eight *sima* pavilion bases, such as *Wat Pathumwanaram* temple, Bangkok. The third type of *sima* is the *sima* that is located or attached to the wall of *ubosot*. The construction of this third type of *sima* is usually used with a large *ubosot* that fills the entire space, such as *Wat Chana Songkhram* temple in Bangkok. The last type is a special kind of *sima*, different from others. This special type of *sima* is not made of slabbed stone but uses symbols on the floor, such as *Wat Buppharam* temple and *Wat Pak Nam* temple, Thonburi.

³² Kalyanamitra, *Dictionary*, 150.

³³ Jiratassanakul, *Temple*, 37-44.

³⁴ Jiratassanakul, *Temple*, 77-80.

2. Landscape architecture as a preventive conservation method

The primary objective is to explore the dynamic of conventional landscape architectural design and perspectives toward the physical landscape architecture of sacred sites via observation of the environmental context and its philosophy. In the latter chapters, these two case studies will serve as a resource for developing the preservation strategy of landscape conservation for *Wat Kampang* at *Klong Bangjak* Canal. The conclusion will be reached after considering the exceptional worth of the architectural design and philosophy of the Rattanakosin era of Thailand and the Joseon era of the Republic of Korea.

This research will examine traditional architecture by reviewing historical research, on-site study, and practical work. The author gathers data acquired during the conservation process as the landscape conservator for *Wat Bang Num Pueng Nok*. It was a conservation project by the Fine Arts Department of Thailand (FAD) from 2018 to 2020. The information on the 2018 participation in the *Jongmyo Daeje* rituals event at the *Jongmyo* Ancestral Shrine was researched during the Asia Cooperation Program on Conservation Science (ACPCS) at the National Research Institute of Cultural Heritage (NRICH), Republic of Korea. These two projects defined the analysis criteria for evaluating the similarities and differences across the locations. Both of these projects use the environment to safeguard historic places. The similarities and contrasts between these two case studies are highlighted. The advantages and disadvantages are discussed.

Acknowledging the benefits of traditional conservation methods will enhance the consciousness of their valuable resources and cultural heritage wisdom that preserve the heritage sites. The study is not only considering the heritage building but is also concerned with its environmental context. These studies will promote the adequate protection of cultural heritage to thrive by paying attention to the relationship between heritage buildings and their ecological context.

The study seeks to realise and explore links and differences in wisdom between Thailand and the Korean Peninsula. The Rattanakosin and Joseon eras will be explored via landscape architectural spaces and customary norms. A comparative analysis of Asian cultural heritage sites between Thailand and the Republic of Korea case studies is explored.

Buddhism in the region is mainly divided into two sects. The first is Theravada Buddhism. It has been a prominent religion of Thai and Southeast Asian royal families since the Dvaravati period. Brahmin and Hinduism from ancient India had a significant influence. Second, Mahayana Buddhism has been practised extensively in Mainland China and on the Korean peninsula since the Three Kingdoms era. It was a component of Confucianism philosophy and local fundamental practices throughout the Joseon dynasty. It is still the typical way of life in Korea today. As a result of the Joseon Dynasty's royal court culture incorporated in social impact, only Confucianism will be addressed in this research.

2.1. Case 1 *Wat Bang Nam Phueng Nok* temple, Samut Prakan, Thailand

Wat Bang Nam Phueng Nok is a 350-year-old temple along the *Chao Phraya* river and one of *Bang Kachao*'s³⁵ key ferry ports (see figure 2). A big Buddha image, “*Phra Luang Por Yai*”, appeared for people to pay their respects. The FAD also renovated an old ordination hall and assembly hall of the temple, which is one of architectural importance from the late Ayutthaya period (1667). Aside from the ordination hall architecture, there are also beautiful artworks on the walls, and Thai-Chinese-influenced mural paintings may be found. It also appears to depict images, wall paintings, door panels painting, or other art related to Mon culture.

³⁵ *Bang Kachao* is a habitat area shaped like a pig's stomach, full of allotments and orchards in Samut Prakan province, Thailand. It used to be famous for the lung of Bangkok, which represents the most green area of Bangkok. (The Fine Arts Department of Thailand, Conservation report: *The Heritage Conservation and Development*, 1.)



Fig. 2: Map shows the location of *Wat Bang Num Pueng Nok* temple in Bang Kachao, Samut Prakarn province, Thailand.

Source: The Fine Arts Department of Thailand, Conservation report: *The Heritage Conservation and Development*, 1.

2.1.1. Historical and religious background

Thai Buddhism's complexities and the impact of Hinduism and Brahmanism are derived from ancient India and the Khmer Kingdom. During the Dvaravati³⁶ dynasty and Khmer Empire, Hinduism and Brahmanism dominated Southeast Asia, and such influences were expressed in the types of sculpture and inscriptions associated with icon worship of Shiva and Narayana before Buddhism took root in the region. The Dvaravati kingdom, which existed between the fifth and seventh centuries A.D., was located in Central Thailand in the Menam basin, and its name was engraved on archaeological artefacts and Chinese records.³⁷ According to the Fine Arts Department of Thailand, the Dvaravati kingdom was a Hinayana Buddhist kingdom based on the excavated stone Buddha image primarily found in Central Thailand. Specifically, the first ancient Wheel of the Law was found at Phra Pathom Chedi, Nakhon Pathom province.³⁸ Eventually, in the 11th century A.D., the Dvaravati was ruled by Sri Vijaya, the Javanese-Sumatran Empire, when the Northern Buddhist tradition of Mahayana was established and eventually transmitted down to contemporary Thailand two centuries later. The Dvaravati became a part of the

³⁶ Dvaravati is a historical kingdom from the sixth to the thirteenth centuries. The capital is firmly located in Thailand's Lop Buri or Nakhon Pathom. Buddhism and Hinduism had a strong influence on Thai culture. (2nd Regional Office of the Fine Arts Department, *Phrapathom Chedi*, 4-6.)

³⁷ 2nd Regional Office of the Fine Arts Department, *Phrapathom Chedi*, 5.

³⁸ 2nd Regional Office of the Fine Arts Department, *Phrapathom Chedi*, 4.

Khmer Empire³⁹ around the 12th century A.D., but as the Khmer Empire decayed, it handed down the rule and customs of Buddhism with a touch of Hinduism and Brahmanism to the Thai empire known as Sukhothai in the 13th century A.D.

The Sukhothai Empire⁴⁰ stretched its borders to the Malay Peninsular southward under King Ram Khamheang the Great's third reign, connecting to the Northern Kingdom of Thailand controlled by King Mengrai. The Khmer Empire colonised the western Mon nation, what is now Lower Burma, and the northeast area of Thailand. To summarise, the Sukhothai Empire and its outstanding realm culture eventually became the core of the current Thai kingdom, which included the invention of the Thai alphabet in 1283 A.D., the production of glazed pottery by importing Chinese artisans, and the adaptation of Ceylonese Sect Buddhism⁴¹, which is still practised in the kingdom today.

In general, Thai Buddhism has been heavily influenced by Southern Buddhistic, Northern Buddhistic, and Hindu-Brahmin cultures. Later, in the 2325 B.E. (1782) Rattanakosin Period, cultural and construction traditional norms were from late Ayutthaya, as seen in the refined elegance of traditional rituals, exceptional artistic sensibilities of craftsmanship, and the planning of the old Bangkok area, "Rattanakosin Island", by King Rama I of the Chakri Dynasty.

³⁹ The Khmer Empire colonised the western Mon nation, what is now Lower Myanmar, and the northeast area of Thailand. At a later time, Mon people migrated and settled around Thailand, mainly found in Samut Prakarn province. (Sawatdirak, *Style of Suburb*, 1-3.)

⁴⁰ Sukhothai Kingdom innovation and civilisation included the invention of the Thai alphabet in 1283 A.D., the unique production of glazed pottery by importing Chinese artisans, terracotta waterpipe and dam, water and forest reservoir, and the adaptation of Ceylonese Sect Buddhism, which is still practised in the kingdom today. (Harris, et al., *The Illustrated Encyclopedia*, 162-163.)

⁴¹ Ceylonese Sect – Theravada Buddhism sect in Sri Lanka (Harris, et al., *The Illustrated Encyclopedia*, 114.)



Fig. 3: Thai cosmology illustrated in the *Traiphummikatha* manuscript, Thonburi period (1767-1782) No.10, created on 24 September 1776.

Source: National Archives of Thailand and Prakitnonthakan, *The Philosophical Constructs*, 138.

Thai cosmology is illustrated in the manuscript *Traiphummikatha* or the Story of the Three Planes of Existence.⁴² The oldest version of the manuscript is 800 years old, around the Sukhothai period.⁴³ The main stupa, *prang*⁴⁴, or *chedi*⁴⁵ occasionally represent the centre of the universe.⁴⁶ *Ubosot*, or the ordination hall, is also sometimes a symbol of the mythical mountain, the centre of the universe in traditional Thai cosmology (see figure 3). It is the sacred Mount *Sumeru*, the centre of the universe. Mount *Sumeru*⁴⁷ is located at the base of three mountainous hills. There are also seven mountain ranges called “*Satta Bariphanta Khiree*”⁴⁸ encircled where higher rank angels and followers live. The compound buildings of the temple ground, such as a small vihara, Buddha image chamber, or small stupa, represent the mountains. There

⁴² Royal, “*Dictionary of Tribhumikatha*”, 6-12.

⁴³ Veraprajak, *Traditional Thai Book*, 1-2.

⁴⁴ Prang is one of the Thai-Khmer architectural styles for the stupa. (Kalyanamitra, *Dictionary*, 307-308.) (Jiratassanakul, *Temple*, 45-50.)

⁴⁵ Chedi is another name for stupa, called in Thailand. (Kalyanamitra, *Dictionary*, 150.)

⁴⁶ Prakitnonthakan, *The Philosophical Constructs*, 133-137.

⁴⁷ *Khao Phra Sumeru* is above the 84,000 yotch (Thai length measurement: 1 yotch = 16,000 metres). Seven mountain ranges called “*Satta Bariphanta Khiree*” encircled this mythical mountain. Above the mountain is where gods, higher-rank angels, and followers live. (Royal, “*Dictionary of Tribhumikatha*.”, 211.)

⁴⁸ Seven mountain ranges called “*Satta Bariphanta Khiree*” encircled this mythical mountain. (Royal, “*Dictionary of Tribhumikatha*.”, 211.)

are surrounding lower wall structures called *Kampang Kaew*, indicating the boundary of the ceremonial site (*Buddhavas* area). At the top of the mountain peak is a paradise represented by the design of the roof of the ordination hall. Thai cosmology is an ideology planning the Buddhist temple.⁴⁹

2.1.2. Site studies: architecture and environment context

Wat *Bang Nam Phueng Nok* has no proof of its construction. However, based on the old *ubosot* and *vihara* architecture, the temple was most likely erected in the late Ayutthaya period, approximately 2210 B.E. (1667), or 350 years ago. Furthermore, the stone inscription revealed that *Chao Phraya Thammathikon Mung* had arrived to renovate the temple in the King Rama V period (1868-1910). Until then, this colossal structure was rebuilt or erected as a substitute for the previous *ubosot* and has since become one of the most important temples in *Bang Kachao*.

According to the report from FAD, the ordination and assembly halls were initially abandoned until 2017, when the FAD started the conservation project (see figures 4-7). Figures 9-12, architectural surveyed drawings show that the temple is a load-bearing structure made of bricks and local lime mortar. These drawings portrayed the trace of deterioration from humidity on the wall, both inside and outside. There are no roof cascades. No wooden roof decorations such as *Chor Fah*, *Bai Raka*, and *Hang Hong* are left (see figure 51 and chapters 3 for more description of the roof). There are no shared pillars between the ordination and assembly halls. However, from the research of the FAD, the ordination hall is a brick structure with mortar and a two-storey roof with the remains of *Chor Fah*, although it is now a ruined gable with no pattern. The ordination hall houses the ancient Buddha image, *Luang Pho Yai*, which is a Buddha image in a meditation position.⁵⁰

Two Buddha images are housed within the temple, as shown in figures 4-5. The one in front is in the blessing position. The latter is in the Mara position. Murals adorn the walls above the original windows and doors; however, they are faded (see

⁴⁹ Jiratassanakul, *Temple*, 29.

⁵⁰ The Fine Arts Department of Thailand, Conservation report: The Heritage Conservation and Development of Wat Bang Nam-Phueng Nok, Samut Prakan province 2020.

figure 4). The wall opposite the main Buddha portrait represents Mara on a journey. The Buddha sits on a lotus throne in the artwork's centre as the mother of the Earth. She pinches her bun above the shutters. There are representations of *Thep Chumnum* on both sides of the wall. The window of the vihara portrays a *Kumaphan*, one kind of a god transporter. *Kumaphan* is holding a god who carries a weapon called *Phra Khan*⁵¹. Figure 13 illustrates the god inside the pavilion in a painting inside the *ubosot*. Monks can be found on both the left and right sides of the Buddha picture. The shutters and windows are decorated with artwork by early Rattanakosin artists, such as images of Thai youth (Reign of King Rama III-IV, around 1824-1868). There is also a picture of a Chinese gift (with vases, fruits, and flowers), a depiction of a guardian angel carrying a lotus flower, and a picture of a Mon lady wearing a different garment (see figures 14-15). The outside wall is decorated with stucco designs on the pediment of the massive two-armed Vishnu.⁵² Polychrome paintings in the heritage buildings of the temple were in a severe condition of deterioration because of high humidity. The underground water of the heritage site, the close distance of trees, and the limited area of the surrounding area affected the artworks and the brick building damage.

The restoration project was divided into three sections and began parallelly: *ubosot* & *vihara*, landscape architecture, and mural painting & Buddha images. The conservation approach for this temple tended to highlight the genuine historical floor level that corresponded with the original *ubosot* and *vihara* storey.⁵³ As a result of this approach, high humidity from the original brick wall of the *ubosot* and *vihara* buried beneath throughout the years would be reduced. According to this approach, the landscape protection of these cultural monuments had to deal with underground water levels. Because *Bang Kachao* is located in a lowland, wetlands, and agricultural area with a modest canal system for irrigation, most locations have high subsurface water levels (see figure 2). Another important challenge was the narrow space between the

⁵¹ *Phra Khan* is a symbol of enlightenment, utilised to dispel ignorance, which is the opponent of release from the chains of worldly attachment and perpetual pain. It is thought that the light beams it emits remove the darkness of ignorance. (Kalyanamitra, *Dictionary*, 85.)

⁵² Sawatdirak, *Style of Suburb*, 24-37.

⁵³ The Fine Arts Department of Thailand, Conservation report: The Heritage Conservation and Development of Wat Bang Nam-Phueng Nok, Samut Prakan province 2020.

heritage building and the existing road and sidewalk. Upon excavation of the heritage site's original floor level, it was observed that the floor now lies lower than the surrounding area, including the existing highway and walkway. (see figures 8 and 16) The difference in elevation ranges from 0.50 to 1.50 meters, which poses a significant potential risk for heritage buildings and visitors. The safety of everyone who visits the site must take utmost priority while still preserving its historical significance. It is imperative to put up warning signs or barriers.

The drawing plan after the archaeological excavation 2020, in figure 8, shows the original structures' level. The *ubosot* is on the right, and the *vihara* is on the left, surrounded by a rectangle-shaped ruined brick wall, or *Kampang Kaew*. *Kampang Kaew* is the low-height wall marking the periphery of the Buddhist ceremony ground. Figures 9 and 11 show the elevation drawings of the *ubosot*. Both figures show the deterioration area of the lime plaster brick wall and other elements. Figures 10 and 12 show the section drawings inside the *ubosot* and the deterioration area of the lime plaster brick wall. These four drawings illustrated the connected line of deterioration on the wall at a similar height.



Fig. 4: Interior space of the *vihara*, Wat Bang Num Pueng Nok, before conservation in 2020.



Fig. 5: Interior space of the *ubosot*, Wat Bang Num Pueng Nok, before conservation in 2020.

Source: Source: The Fine Arts Department of Thailand, Conservation report: The Heritage Conservation and Development, 23.

Source: The Fine Arts Department of Thailand, Conservation report: The Heritage Conservation and Development, 16.



Fig. 6: Vihara, Wat Bang Num Pueng Nok, before conservation in 2020.



Fig. 7: Ubosot, Wat Bang Num Pueng Nok, before conservation in 2020.

Source: The Fine Arts Department of Thailand, Conservation report: The Heritage Conservation and Development, 20.

Source: The Fine Arts Department of Thailand, Conservation report: The Heritage Conservation and Development, 13.

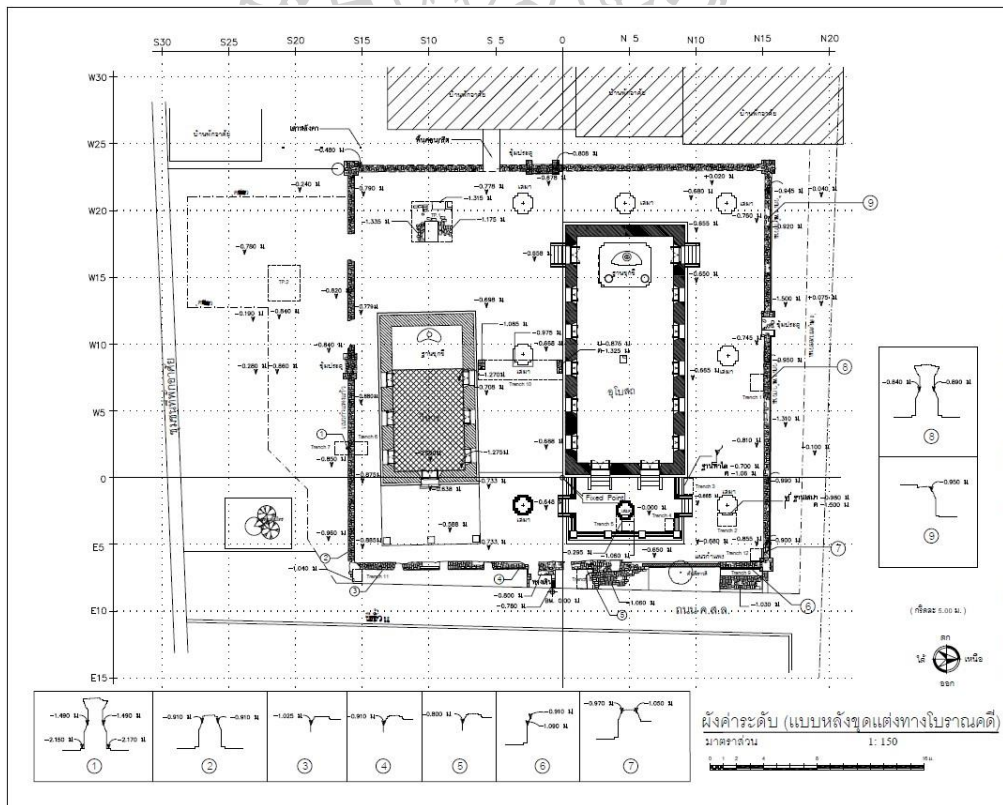


Fig. 8: Drawing plan after the archaeological excavation of Wat Bang Num Pueng Nok in 2020.

Source: The Fine Arts Department of Thailand, Asbuilt drawing : The Heritage Conservation and Development, 4.

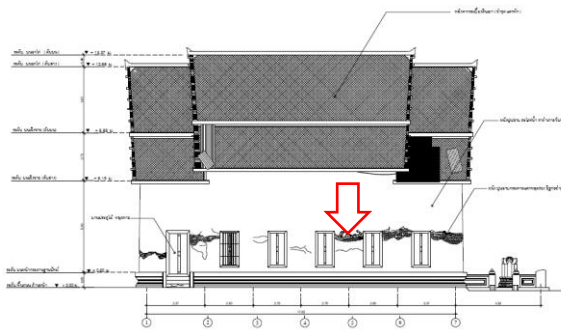


Fig. 9: Elevation drawing (south side) of the ubosot, Wat Bang Num Pueng Nok.

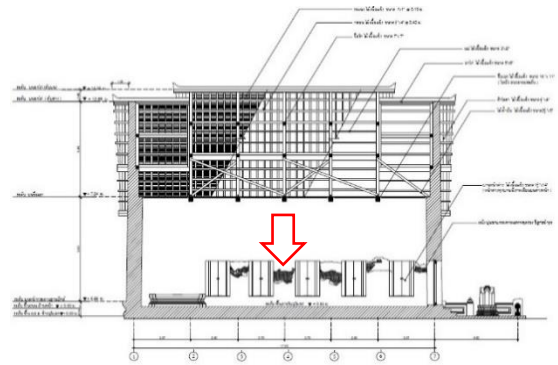


Fig. 10: Section drawing of the ubosot, Wat Bang Num Pueng Nok.

Source: The Fine Arts Department of Thailand, Asbuilt drawing: *The Heritage Conservation and Development*, 20.

Source: The Fine Arts Department of Thailand, Asbuilt drawing: *The Heritage Conservation and Development*, 17.

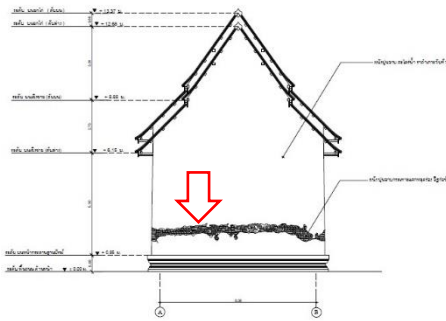


Fig. 11: Elevation drawing (west side) of the ubosot, Wat Bang Num Pueng Nok.

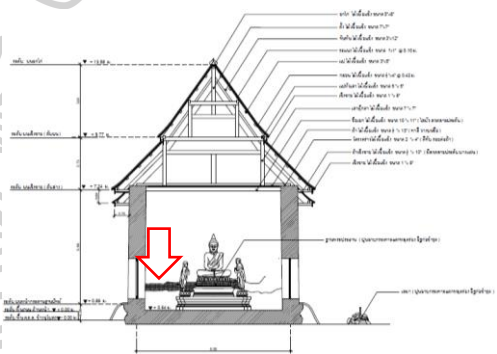


Fig. 12: Section drawing of the ubosot, Wat Bang Num Pueng Nok.

Source: The Fine Arts Department of Thailand, Asbuilt drawing: *The Heritage Conservation and Development*, 21.

Source: The Fine Arts Department of Thailand, Asbuilt drawing: *The Heritage Conservation and Development*, 16.



Fig. 13: Mural in the heritage building before and after the conservation. Before (left) and after (right) of the *Thep Chumnum, Wat Bang Num Pueng Nok*.

Source: The Fine Arts Department of Thailand, Conservation report: *The Heritage Conservation and Development*, 241.



Fig. 14: Polychrome painting of Chinese decoration objects on the door, before and after the conservation. Before (left) and after (right), *Wat Bang Num Pueng Nok*.

Source: The Fine Arts Department of Thailand, Conservation report: *The Heritage Conservation and Development*, 199.



Fig. 15: Polychrome painting of Mon Lady on the door, before and after the conservation. Before (left) and after (right), *Wat Bang Num Pueng Nok*.

Source: The Fine Arts Department of Thailand, Conservation report: *The Heritage Conservation and Development*, 200.



Fig. 16: When the foundation for the boundary fence was built, the underground water was shown.

Source: The Fine Arts Department of Thailand, Conservation report: *The Heritage Conservation and Development*, 78.

2.2. Case 2 Jongmyo, the Royal Ancestral Shrine

The historic site of *Jongmyo* (see figure 17) is one of the Republic of Korea's most valuable National Treasures. It is the embodiment of ancient Korea's tangible and intangible cultural legacy. The old cultural ritual was held at the location for a long time, together with historic artefacts employed in the holy rite. The wooden architecture on the raised stone platform presented its important cultural significance for many generations.



Fig. 17: *Jeongjeon* is the Main Shrine, which houses the ancestral tablets of the kings and queens, on 18th May 2018.

2.2.1. Historical and religious background

The philosophical and religious basis of the Joseon period is Korean Confucianism. Although Korea during the Joseon era is best known for its Confucian state, the Korean Peninsula was also home to *Dangun* myth⁵⁴, Shamanism, Buddhism, Taoism, and nature divination for thousands of years.⁵⁵ Confucianism and Buddhism were only introduced to the Korean Peninsula from China during the Goguryeo period in the third century A.D., followed by Taoist philosophy in the sixth century A.D.⁵⁶ Since then, the Korean Peninsula people have vigorously absorbed and disseminated

⁵⁴ *Dangun* myth – the story of a man-god who descended from heaven to establish the Korean people (the Old Joseon). (Koehler, *Religion in Korea*, 4.)

⁵⁵ Koehler, *Religion in Korea*, 4-6.

⁵⁶ Another theory mentioned that Taoism possibly developed spontaneously in Korea paralleled with China long before recorded around 300-400 B.C. (Koehler, *Religion in Korea*, 5.)

Buddhism via their different faiths and history. However, during King Sosurim of Goguryeo, Confucian thought became the first systematic form of education and was widely spread by the beginning of the Three Kingdoms period.⁵⁷ Confucian studies vanished briefly when the Goryeo Dynasty (943 A.D.) adopted Buddhism as the national religion, but they were restored as Neo-Confucians during the Joseon dynasty (1392 A.D.). Confucianism was central to royal court culture and basic societal thinking during the Joseon Dynasty.

Capital planning of *Hanyang* is nicely reflected in Confucianism's perspective on life.⁵⁸ The first structure to be seen in the modern-day *Hanyang* or Seoul, the new capital of New Joseon, was the *Jongmyo* Shrine. When the new capital was being built, King *Taejo*, the founder of Joseon, was under the supervision of Confucian scholars. The scholars were involved significantly in the site selection. They were adamant about implementing Confucian principles in the real world and had plans for a brand-new capital. *Hanyang*, the new nation's capital, literally means "an ideal Confucian capital".⁵⁹ The capital's development has strictly adhered to this guideline and appears to have a positive relationship with *Feng Shui*.⁶⁰ Six mountains encircled the new capital, and a stream in an auspicious shape descended from Mount Bukak in the east to the Han River in the west before terminating in the west sea.⁶¹

Doseong-do, (see figure 18), a historical map of *Hanyang* made in 1788 by the Architectural Heritage Division, National Research Institute of Cultural Heritage, the Republic of Korea, demonstrates that the planning closely corresponded to the Chinese Confucian academic practice "*Gogong-gi* or *Kaogongji*"⁶². It was adjusted to fit *Hanyang's* mountainous actual geography. Furthermore, the planning reflected local indigenous philosophy, such as *Feng Shui*. According to Kim Dong-uk, no genuine city in China followed this design as closely as *Hanyang*. These are clear

⁵⁷ Kim, "Chapter 2 Three Kingdoms," 36-62.

⁵⁸ Koehler, *Joseon's Royal Heritage*, 6-10.

⁵⁹ Kim, "Chapter 7 Confucian Influences," 176-203.

⁶⁰ Jackson and Koehler, *Korean Architecture*, 10.

⁶¹ Koehler, *Religion in Korea*, 30.

⁶² *Kaogongji* is the world's oldest encyclopedia of technologies, practised around the 5th century C.E. in China mainland with nearly 30 kinds of technologies used then. It includes the planning of the cities. The practice in the encyclopedia corresponds to the archaeological study. (Mei, "*The World's Oldest Encyclopedia*.")

indications of their Confucianism devotion.⁶³ The shrine was still connected to the palace on the map, and a forest surrounded them all. There is a road circulate the whole area.

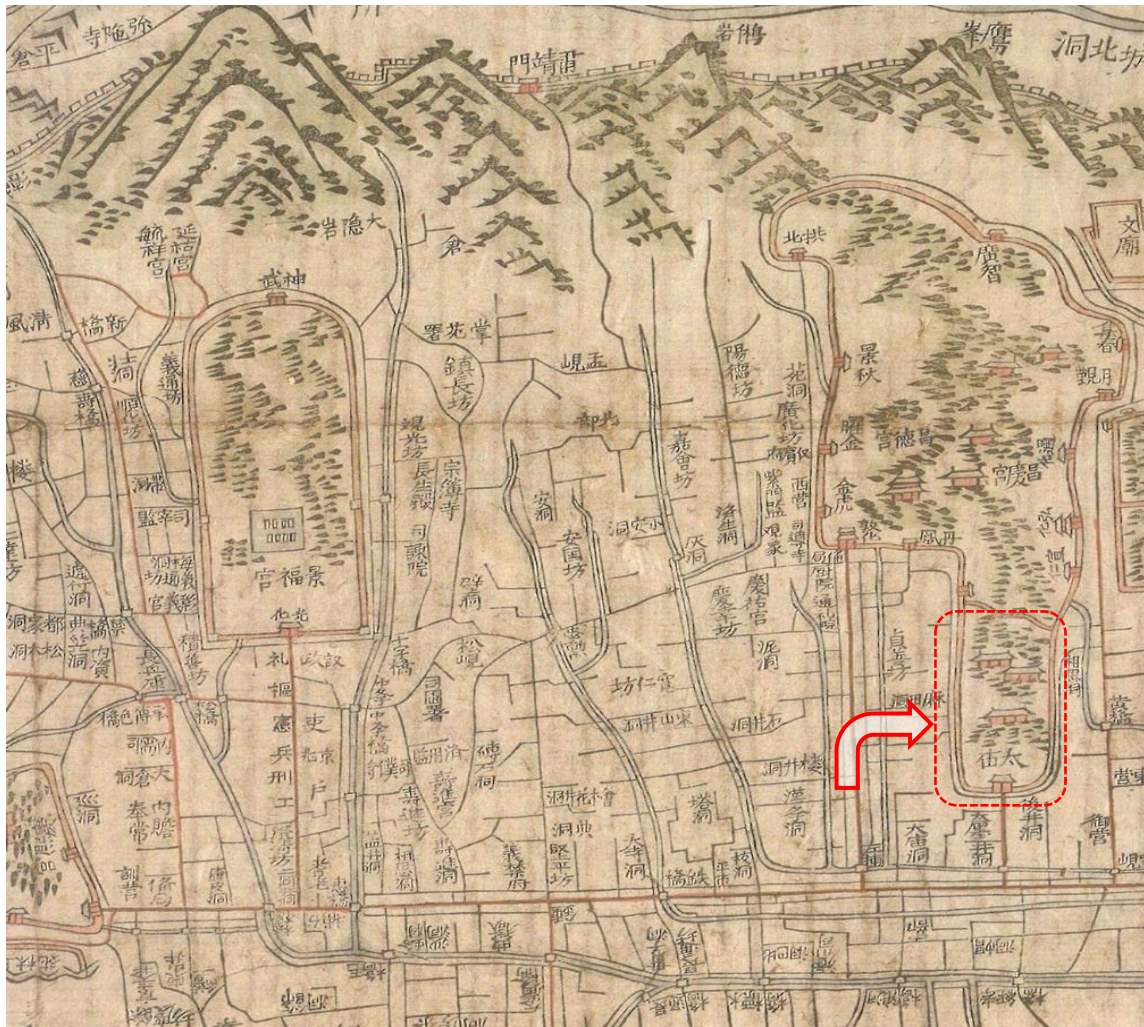


Fig. 18: *Doseong-do*, a historical map of Hanyang made in 1788, shows the location of the ancestral shrine *Jongmyo*.

Source: Cultural Heritage Administration and National Research Institute of Cultural Heritage, the Republic of Korea.

A Joseon society premise framework characterises the Confucian belief system, and evident progressive specialists focused on the Joseon king. Because of this ideology, the royal ancestors' shrine, or *Jongmyo*, was the first structure built in

⁶³ Kim, "Chapter 7 Confucian Influences," 176-203.

the capital, followed by *Sajik-dan*, or the Altar to the Gods of Earth and Grain. Infrastructure was afterwards installed from east to west. Following that, a marketplace, fortress, and the main palace *Gyeongbokgung* (see left side of figure 18) were built between *Jongmyo* and *Sajik-dan*. The government office in front of the main palace similarly adhered to the “three gates, three courts” design philosophy.⁶⁴

Researchers have noted that the royal mausoleum and every other structure in the Joseon dynasty palace faced south in observance of Confucian precepts for live rulers.⁶⁵ The same principle is applied in the audience hall of *Gyeongbokgung* Palace.⁶⁶ According to “*The Narratives of Yeolleosil*”, it explained that no one at that time constructed their buildings to face south, not even the furniture. Only regular people and clergy could enter the building from the East and West sides. These planning concepts also applied to the royal tomb’s composition, including elements often seen in palaces, such as an audience hall, a labour hall, and a recreation hall.

*Jongmyo*⁶⁷(Hangul: 종묘), or *Chongmyos*, is the first significant state shrine.⁶⁸

The ancestral shrine can be traced back to the Chinese monarch of the *Zhou* era (1046-256 BCE). *Myo* is an architectural term for a shrine that housed the ancestral tablets for the entire royal family to undertake sacrifice ceremonies yearly, also known as *Jongmyo Jerye*⁶⁹ (Hangul: 종묘 제례). Because of its significance as a monument and the most significant ceremony held by the Joseon Dynasty, the ceremonies are known as *Jongmyo Daeje* (Hangul: 종묘 대제) or *the Great Jongmyo ceremony*. During the Joseon period, the rite was held five times a year: the spring, the summer, the autumn, and the winter. The ceremony used to be held on a sacrificial day, but now it takes place on the first Sunday of May every year.

⁶⁴ Kim, “Chapter 7 Confucian Influences,” 176-203.

⁶⁵ Shin, *Customs Related*, 213.

⁶⁶ Chang, *Chongmyo shrine*, interview.

⁶⁷ In 1995, *Jongmyo* was listed on the UNESCO World Heritage List. (Cultural Heritage Administration, “World Heritage,” 1)

⁶⁸ Cultural Heritage Administration, “World Heritage,” 2.

⁶⁹ *Jongmyo Jerye* is ceremonial music recognised as a masterpiece of humanity’s oral and intangible heritage by UNESCO in 2001. Important Intangible Cultural Property No. 56 (Cultural Heritage Administration, “World Heritage,” 1.)

2.2.2. Site studies: architecture and environment context

Jongmyo is the state's supreme shrine. The shrine has eighty-three royal ancestor spirit tablets and memorial ceremonies for departed Joseon Dynasty kings and queens annually. The shrine has a total area of 187,008 square meters and is located in the heart of Seoul, near *Changdeokgung* Palace. The ancestral temple area includes the main Shrine (*Jeongjeon*) and the second Shrine (*Yeongnyeongjeon*), as well as *Jaegung*, *Mangmyoru*, *Hyangdaecheong*, and other annexe facilities.⁷⁰

Jongmyo is a site where the spirit and its idea of oriental geomancy are enshrined. The Confucian ideology dictates that the *Jongmyo* temple adheres to the same design principles and customs as the *Gyeongbokgung* Palace.⁷¹ However, *Jongmyo* differs slightly from the palace in terms of the architectural style and arrangement detail due to the various types of structures. As Shin Jihye notes in “The Architectural Character in the Space Executing the Royal Funeral & Ancestral Rites during the Reign of King SukJong in the Joseon Dynasty”, some customs were moderately altered to strengthen Confucian rites and operate the space practically.⁷² This change was brought about by harmonising the king's last will and changes in society.

The space changes are demonstrated in “its foundation and Transition; Architectural Review on *Jongmyo* of Joseon Dynasty” by Jo Sangsun. Sangsun investigated how it was repaired and changed until it appeared as it is now by using three *Uigwe*⁷³ and other relevant materials.⁷⁴ (see figure 19) In this article, the layout adjustment of *Jongmyo* will be split into two key sections based on the results of these studies. At first, the *Joseon* Dynasty's founding monarch, King Taejo, reigned in

⁷⁰ Office of Cultural Properties, *Chongmyo Shrine*, 1-2.

⁷¹ Chang, *Chongmyo shrine*, interview.

⁷² Sangsun, “*Its foundation and transition; Architectural review on Jongmyo of Joseon Dynasty*”, 150-202.

⁷³ *Uigwe* is a detailed record of the royal rituals and ceremonies during the Joseon period. The collection is composed of approximately 3,895 books. (Koehler, *Joseon's Royal Heritage: 500 Years of Splendour*, 18.)

⁷⁴ Sangsun, “*Its foundation and transition; Architectural review on Jongmyo of Joseon Dynasty*”, 150-202.

1394, when the temple was principally constructed. The 1608 was also reconstructed following the Japanese invasion of 1592, as it appears now.

When it was initially erected, *Jongmyo* was intended to house four generations of King Taejo's ancestors who had relocated from the former capital, Gaegyeong, as indicated in one of the historical documents, *Uigwe*.⁷⁵ In the early days of *Jongmyo*, *Jeongjeon* was a single hall. Then, as time progressed, requiring a large number of spirit rooms became common. Due to the kingdom's hierarchy, *Jeongjeon* could not have more spirit chambers than Ming China's royal shrine.⁷⁶ It necessitates the critical choice to construct another shrine. As a result, *Yeongnyeongjeon*⁷⁷ was built beside *Jeongjeon* in 1421 by King Sejong⁷⁸. While its structure and facilities are similar to *Jeongjeon*, *Yeongnyeongjeon* is smaller and more personal.

The forefather generations of King Taejo's royal ancestral tablets were kept in the middle chambers of *Yeongnyeongjeon* instead of *Jeongjeon*. In *Jeongjeon* architectural style, walls enclose the two-layered raised stone stage, and a gate punctures the east, south, and west walls. The middle of its roof is lifted, and beneath the raised area are four spirit chambers for the four generations of King Taejo's ancestors. In the sixth chamber on either side are tablets that were moved from *Jeongjeon* and tablets for kings and queens who were regarded with after death. Even though they were not kings, they were worshipped because Joseon could never have existed without them.⁷⁹

Under King Taejong and King Sejong, the foundation of *Jongmyo* was respectable. On the southern side of *Jongmyo*, artificial mounds were constructed during King Taejong.⁸⁰ The holy spirits were kept inside *Jongmyo* by these mounds and the surrounding natural slopes. Auxiliary corridor structures were built at right angles to the central building's east and west sides to protect from the wind and snow

⁷⁵ Sangson, "Its foundation and transition; Architectural review on *Jongmyo* of Joseon Dynasty", 150-202.

⁷⁶ Lee, "The Structural Transformation," 49-95.

⁷⁷ *Yeongnyeongjeon* means long live in peace with both ancestors and descendants of the royal family (Office of Cultural Properties, *Chongmyo Shrine*, 17.)

⁷⁸ King Sejong – the fourth Joseon Dynasty ruler. (Han, *Review of Korean*, 31.)

⁷⁹ Office of Cultural Properties, *Chongmyo Shrine*, 11.

⁸⁰ Sangson, "Its foundation and transition," 150-202.

while sacrifice rites were taking place. Authorities landed at the stone-hitching post before entering the shrine, where a stone-hitching post had been built nearby. This was the setting for *Jongmyo's* architecture. The 'Law of *Joseon*,' which took its cue from Chinese temple construction, recognised the worship site.⁸¹

Jeongjeon complex includes *Gongsindang*, *Chilsadang*, and *Akgongcheong*. *Gongsindang* Shrine and *Chilsadang* Shrine (see figures 20 and 22) are located beneath the stone yard of *Jeongjeon*, respectively, to the east and west. Spirit tablets of excellent subjects who served the monarchs whose tablets are honoured in *Jeongjeon* are kept in the *Gongsindang* shrine. The divines of *Chilsadang* were asked to ensure that all of the royal family's and the people's business would be conducted without incident at the site of worship known as the *Chilsadang* shrine.⁸² Here, the divines were honoured with state-sponsored rituals that blended Confucianism with indigenous religion.⁸³ At *Akgongcheong*, southwest of *Jeongjeon*, court musicians waited to play for customs outside the wall.

As more kings and queens were enshrined, the *Jongmyo* layout, which had been burned down during Japanese colonisation, was expanded to include a rectilinear spirit chamber on either side of the centre. *Jeongjeon* is home to forty-nine spirit tablets for kings and queens who have passed away dating back to the last era. The first room on the western end of the temple houses the earliest tablet of King Taejo, the founding monarch of *Joseon*. Emperor Sunjong, the 27th reigning ruler, was buried at the eastern end. The main temple, *Jeongjeon*, was rebuilt and extended to achieve its current length, making it the longest wooden structure ever constructed for a royal ancestral shrine. Additionally, these longest architectural shrines can only be found in *Jongmyo* and are distinctive among other Confucian ancestor shrines.⁸⁴

⁸¹ Lee, "The Structural Transformation," 49-95.

⁸² Office of Cultural Properties, *Chongmyo Shrine*, 11.

⁸³ Lee, "The Structural Transformation," 49-95.

⁸⁴ Sangson, "Its foundation and transition," 150-202.

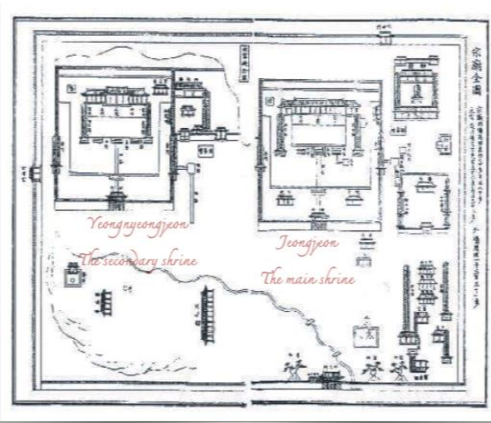


Fig. 19: Plan of *Jongmyo* as appears in the *Jongmyo Uigwe* manuscript.

Yeongnyeongjeon (left) and *Jeongjeon* (right).

Source: Cultural Heritage Administration, the Republic of Korea and Seoul National University.



Fig. 20: *Chilsadang*. Seven Deities' Shrine. On 18th May 2018.



Fig. 21: *Yeongnyeongjeon*. The separate Shrine contains the five-generation ancestral tablets of King Taejo and other royal family members.

Source: Office of Cultural Properties, Ministry of Cultural and Information, the Republic of Korea.



Fig. 22: *Gongsindang*. Hall of Meritorious Officials. On 18th May 2018.



Fig. 23: Aerial view of the *Jongmyo* Ancestral Shrine before the reconnection project 2018.

Source: Office of Cultural Properties, Ministry of Cultural and Information, the Republic of Korea.



Fig. 24: Aerial view of *Changgyeonggung* Palace and *Jongmyo* Shrine reconnected again in 2022.

Source: Yonhap News, accessed on May 8, 2023 available from <https://www.uofhorang.com/history/korean-forest-cut-off-by-japan-reconnected-in-90-years>.

Mainland China initially influenced *Jongmyo*'s rectangular-shaped Confucian architectural style before being legitimately created and established in the Korean Peninsula. This justification led to *Jongmyo*'s most important qualities being classified as UNESCO World Heritage in 1995. On the *Eungbongsan* Mountain crest that passes between *Changdeokgung* Palace and *Changgyeonggung* Palace, *Jongmyo* is built. Originally, *Jongmyo* Shrine and *Changgyeonggung* Palace were linked by a forest with a barrier. However, a roadway has separated *Jongmyo* from *Changgyeonggung* since the 1932 Japanese colonisation period. The road crossed the topography ridge and was constructed during the Japanese occupation (see figure 23). However, efforts are being made to restore the region to its previous form since 2011. And finally, in 2022, the project to reconnect the palace and the shrine was completed and opened to the public.⁸⁵ This historic preservation project is significant as it restored the historical and traditional qualities of *Changgyeonggung* Palace and *Jongmyo* Shrine by restoring them to their original spatial configuration planned by

⁸⁵ SMG, "Reconnected After 90 Years."

the nation's forebears. The original palace fence and *Bukshinmum*, an informal gate that allowed the kings to enter the shrine, were also reconstructed (see figure 24).

To enter the courtyard of *Jeongjeon*, three gates were present, each with its designated purpose. The west gate was reserved for musicians, dancers, and other entertainers, while the east gate was solely for rite officiants. The south gate was considered a “spirit gate”, serving as the entrance for spirits.⁸⁶ The main hall of the *Jongmyo Shrine, Jeongjeon*, served as the final resting place for the spirit tablets of deceased kings and queens after a three-year mourning period at the palace.⁸⁷

Initially, *Jeongjeon* contained the spirit tablets of King Taejo, the founder of the *Joseon* Dynasty, as well as spirit tablets from the four generations of King Taejo and prior kings and queens with notable achievements. *Jeongjeon* was enlarged at the right ends as more spirit tablets were enshrined, eventually becoming the long wooden edifice visible today. The vast, towering platform in front of *Jeongjeon*, which is sixty-nine meters long and one-hundred-nineteen meters broad, effectively expresses the grandeur of the highest temple.⁸⁸ A lengthy south-north corridor known as *Sillo* runs through the centre of the stone yard. *Sillo* extends from *Jongmyo*'s main gate to *Jeongjeon* and *Yeongnyeongjeon*. During ceremonies, accompanying police officers and ritual officials formed a line in the stone yard. The panorama of the rough, spacious stone yard and an enormous, gorgeous roof that seems to flow over it possesses the ultimate beauty of sublimity witnessed in classical architecture.

In *Jongmyo Shrine, Jeongjeon* (see figure 17) and *Yeongnyeongjeon* (see figure 21) are the two most important structures. These two buildings, together with *Gongsindang* and *Chilsadang*, are where the sacrificial offering ceremonies are performed. During the ceremony, the ritual sacrifices will occur at *Hyangdaecheong*, *Akgongcheong*, and *Jeonsacheong*. The central spirit chambers, side rooms, and roofed passageways are where the *Jeongjeon* and *Yeongnyeongjeon* roofs and stylobates are at their highest and lowest points, respectively. To establish a

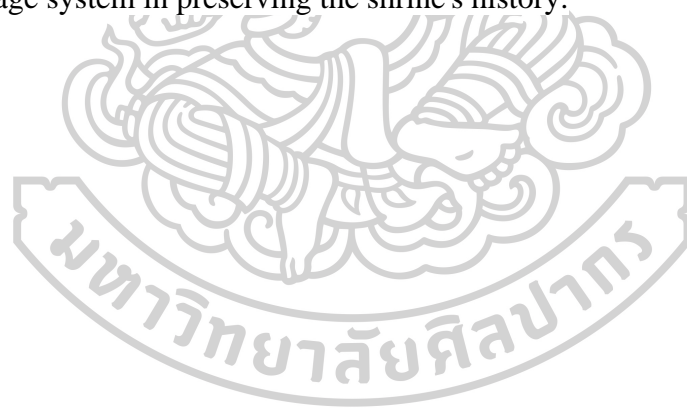
⁸⁶ Chang, *Chongmyo shrine*, interview.

⁸⁷ Shin, *Customs Related*, 213.

⁸⁸ Chang, *Chongmyo shrine*, interview.

hierarchical structure, the heights and thicknesses of the columns change in the same way. The Confucian principles are seen in these designs.⁸⁹

Jongmyo shrine's drainage system is as impressive as its exquisite architecture and rich cultural heritage. The system is designed to withstand heavy rainfall and is critical in protecting the shrine's historical significance.⁹⁰ The surroundings look simple, but the drainage system is complicated behind the scenes, ensuring the shrine remains safe and dry even during the heaviest downpours. Figure 25, the 3D layout of the ancestral shrine, shows a path and a vast green area for water absorbent and two reservoir ponds. The drainage system of the shrine has been tested several times and has consistently passed with excellent results. For example, during a particularly strong storm in the nineteenth century, the system effectively avoided floods and safeguarded the shrine from adverse effects. These incidents demonstrate to the system's success and the necessity of conserving one of Korea's most precious cultural heritages. As a result, visitors must comprehend and recognize the importance of the drainage system in preserving the shrine's history.



⁸⁹ Chang, *Chongmyo shrine*, interview
Kim, "Chapter 7 Confucian Influences," 176-203.

⁹⁰ Chang, *Chongmyo shrine*, interview
Koehler, *Religion in Korea*, 31.

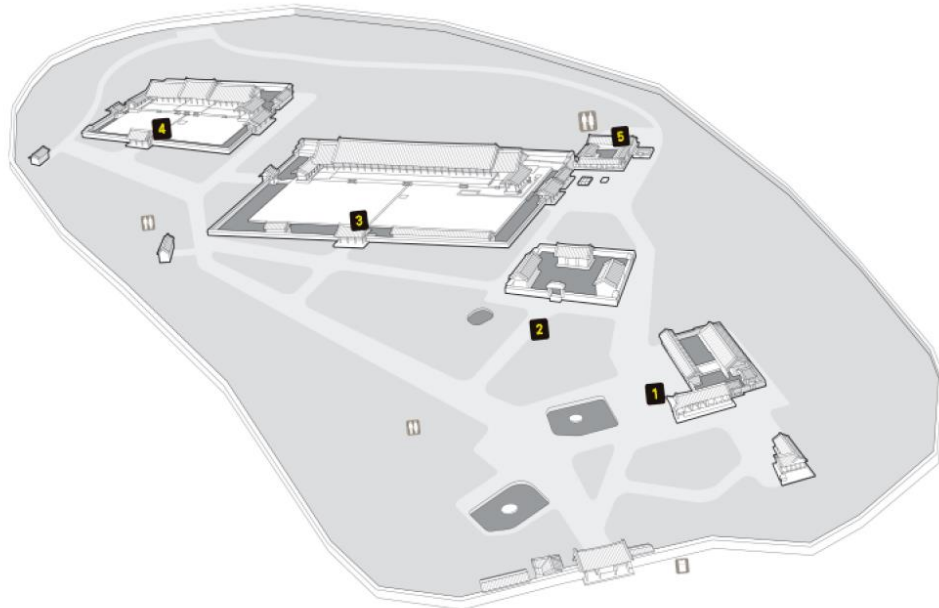


Fig. 25: Jongmyo map 1. *Hyangdaecheong* Office 2. *Jaegung* Office 3. *Jeongjeon* Hall (Main Hall) 4. *Yeongnyeongjeon* Hall (Hall of Eternal Peace) 5. *Jeonsacheong* Office.

Source: Office of Cultural Properties, Ministry of Cultural and Information, the Republic of Korea.

2.3. Analysis and discussion

2.3.1. Physical description of the sites

The buildings at *Wat Bang Num Pueng Nok* temple are constructed using brick wall-bearing structures in their original state. Brick was the primary material from the top of the wall to the underground footing. The ceiling and roof structure were timber and topped with terracotta shingle tiles. The interior floor is either a local lime plaster or terracotta tiles. The interior wall is lime plaster, adorned with polychrome mural paintings. The wooden doors and windows are also painted polychrome. The front and back pediments of the vihara featured lime stucco decorations inspired by nature. The materials used suit Thailand's hot and humid environment, particularly the area with high underground water levels. Most of the materials are porous, allowing for humidity fluctuation. The timbers used for construction are solid wood, and some are

resistant to termites like teak wood. The original pathway around the building was constructed from brick and terracotta tiles, while the rest area was filled with sand and soil. Orchards and allotments once surrounded the temple, but it has since transformed into a community.

The ancestral shrine of *Jongmyo* is a remarkable example of a unique architectural design. The building's timber column-beam structures, stone foundation, wooden ceiling, and timber roof structure with ceramic tiles contribute to its durability. The walls are constructed using local lime plaster with natural materials or bricks, ensuring they can withstand temperature fluctuations during the summer and winter of the region. The wall is painted with monochrome, without patterns, using the five fundamental Korean architectural style colours.⁹¹ The stone platform floor is an intelligent solution to the geographical challenges of the capital city's location near the mountain of Bukak. (see figure 18) The stone platform also maintains the building inside dry. Humidity from the ground cannot seep through stone, unlike brick foundations.⁹² The original main pathway to the main building was made of stone pavings, while the rest area and the path to the other building were made of sand and soil. The forest garden surrounding the heritage site acts as a buffer zone, keeping the urban civilisation away from the building and its rituals, as seen from the old map (see figures 18, 23 and 25). The forest garden trees were used to maintain the timber structures.⁹³

2.3.2. Environment context: landscape architecture

Preserving and safeguarding historic sites like *Jongmyo* can be daunting, particularly when urban developments encroach on their perimeters. For instance, *Wat Bang Num Pueng Nok* requires additional authority for the FAD to establish a buffer zone and reclaim its original boundaries. Negotiations with the local community and government are crucial to secure minimal space for the temple and the neighbourhood while ensuring that homes built over old irrigation systems do not

⁹¹ Koehler, *Joseon's Royal Heritage*, 58.

⁹² English Heritage, *Stone*, 39.

⁹³ Chang, *Chongmyo shrine*, interview

impede surface water flow.⁹⁴ Proactive measures must be taken to protect these significant cultural landmarks for future generations to appreciate and admire.

Interestingly, *Jongmyo* has been surrounded by a forest garden as a buffer zone for quite some time, which aligns with its philosophy. (see figures 18 and 23) The green space is a water-absorbent area that protects the heritage site from floods.⁹⁵ It's great to see that the physical context of the ancestral shrine is still intact, and the original boundary between the royal palace area and the royal ancestral shrine was reconnected in 2022. These measures are essential to preserve and safeguard such historic sites for future generations to appreciate and admire. Theoretically, the buffer zone is essential for heritage structures, particularly green space. Every heritage site should have a buffer zone to avoid urban sprawl.⁹⁶ It is challenging when the heritage site is in an urban location or close to a community.

An ideal hardscape or flooring material for high-humidity conditions is a porous material that can release and absorb humidity well. Without pavement, the material might be soil-packed or sand-packed, loose-joint brick or terracotta tiles, or gravel field. These examples of materials allow water to seep into the ground and air to circulate.⁹⁷

Underground and surface water drainage protects the heritage building from excessive humidity and floods. To minimise flooding inside the heritage area, *Jongmyo* Ancestral Shrine created a large drainage stone gutter as a peripheral outside the forest garden. The forest garden is also a water-absorbent area. The sand-packed pavements and paths connecting the building complex allow air circulation. A similar approach was employed for the water drainage system at *Wat Bang Num Pueng Nok*. However, because of the restricted size of the land, the drainage pipes are insufficient to preserve the cultural monument from floods during the monsoon season. A water pumping machine was planned for installation at the heritage site's corner to assist the drainage system when the temple floods.

⁹⁴ The Fine Arts Department of Thailand, Conservation report: The Heritage Conservation and Development of *Wat Bang Nam-Phueng Nok*, Samut Prakan province.

⁹⁵ Jackson and Koehler, *Korean Architecture*, 52.

⁹⁶ The Crown Property Bureau, *Guide*, 94-99.

⁹⁷ English Heritage, *Building Environment*, 37-48.

2.3.3. Comparable building /how it happens/ what is the result of the problem

Each case study has a unique problem. The *Wat Bang Num Pueng Nok* temple in *Bang Kachao* has a small land size, making it difficult to claim the property. However, the land price in Bang Kachao is lower than in Seoul. In comparison, the landscape surrounding the heritage structures at the *Jongmyo* shrine is more prominent, with ample space for run-off surface water, a water-absorbent area (planting area), and a water drainage system. Each ancient structure and complex has adequate space for a garden and pond, serving as a water reservoir for the whole shrine.

Regarding conservation, *Wat Bang Num Pueng Nok* temple aimed to restore the original floor level to as close to its original state as possible. By displaying the historical floor level, the original architecture of the sunk underground *ubosot* and *vihara* may be restored. The site's water drainage management and tourist accessibility were carefully examined. When the monsoon season approached, the conservation project included constructing an irrigation system and a pumping station; the heritage sites were only inundated for a few days and at a depth of 5-10 cm. The outcome is satisfactory, but the pumping station must be able to operate constantly for three days before breaking down. The historic wall, built of lime plaster and brick wall-bearing, is still in good condition. An annual condition assessment survey is needed for continuous maintenance to monitor deterioration from over-excess humidity in the material.

As a result, understanding the sharing aspect in both traditions of *Jongmyo* Ancestral Shrine and *Wat Bang Nam Pueng Nok* processes in the Korean Peninsula and Thailand will enhance knowledge of cultural diversity in the region. Attitudes toward royal architectural customs and local architectural design might differ slightly due to social norms, but the core of the management on environmental ideology is supposedly similar.

Historical brick, lime plaster, and wood structures require a certain amount of humidity and temperature variation for stability. Creating a landscape architecture

conservation project will aid in preserving a constant temperature and lower-to-high humidity levels. If the physical condition of the historic building is steady, the deterioration of the paints and other artworks will similarly remain stable. The finishing material for floors must be permeable. The heritage building's condition will be better-regulated thanks to the fabric's breathability. Both the irrigation system and the drainage system should be carefully considered. Using planting spaces or packed sand walkways for natural drainage is advantageous, like in *Jongmyo*. Planting areas can serve as a wood plantation for buildings while maintaining the heritage site's periphery.

Cultural heritage sites must be preserved, and the effects of human activities on the sites must also be considered. Effective, sustainable practices include raising public awareness of the importance of cultural heritage places, creating protected areas, and implementing laws that control how land is used and developed. Local communities are crucial to the preservation of cultural heritage assets, and by collaborating with them and giving them the tools to act, authorities can create a more sustainable future for both cultural heritage and neighbourhoods. Technology may also be a potent instrument for assisting efforts to save landscapes. Areas of possible risks may be identified using remote sensing and Geographic Information System (GIS) mapping and the public can be made aware of issues and mobilised to support causes using social media and other digital platforms. Additionally, drones and Artificial intelligence (AI) can improve the monitoring and management of cultural assets, enabling us to respond to new risks and apply focused conservation measures swiftly.

Climate change, habitat loss, and unsustainable land use practices are now significant obstacles to landscape protection for cultural heritage. We need to handle these issues holistically, balancing the preservation of cultural legacy with economic growth and social well-being. Engaging stakeholders from diverse sectors and implementing creative solutions according to regional requirements and circumstances may be necessary to achieve this. The public and community should be

encouraged to maintain and care for heritage sites. Awareness and implementation of maintenance are fundamental to preventive conservation measures method. Mostly, it is a simple method, such as cleaning pipes, open ditches, and roof gutters.



3. Technological survey of Wat Kampang, Thailand

The information was gathered during the Cultural Heritage Conservation and Management (CHCM) workshop at *Wat Kampang* in February 2023, led by Professor Dr Gabriela Krist from the Institute of Conservation, University of Applied Arts Vienna. The workshop is focused on surveying the current condition of the *ubosot* and artworks in the temple. The painting had to be investigated closely to do mapping surveys for deterioration, together with the architectural and historical report. The group explored and conducted a group report, some of which was earlier information conducted by the FAD during 2019-2022.⁹⁸

Past official conservation records by the FAD⁹⁹:

In 2554-2555 B.E. (2011-2012), the Painting and Sculpture Conservation Group, Archaeological Division, Fine Arts Department conducted the restoration of the paintings in the *ubosot*.

In 2561 B.E. (2018), the arch gate at the north side of the *Buddhavas* wall was restored. Then, the Painting and Sculpture Conservation Group, Archaeological Division, Fine Arts Department, conserved the Buddha image enshrined in the small *viharas*.

In 2562 B.E. (2019), the Archaeological Conservation Group, Archaeological Division, Fine Arts Department, restored the two *viharas* and the *Buddhavas* wall.

In 2563 B.E. (2020), the Archaeological Conservation Group, Archaeology Division, Fine Arts Department, supported the pagoda with twelve wooden recesses. Then, the Archaeological Registration Academic Group surveyed the temple to register the heritage site of *Wat Kampang*.

In July 2566 B.E. (2023), the Archaeological Conservation Group, Archaeology Division, Fine Arts Department, are on conserving the *ubosot*.

⁹⁸ The Fine Arts Department of Thailand, *Archaeological Report*, Bangkok 2019.

⁹⁹ The Fine Arts Department Thailand, *Archaeological Report*, 15.

The temple area is 11 *rai* 2 *ngan* 56 square *wah*¹⁰⁰ or 18,624 square meters. (see figures 26-27) It is constantly flooded¹⁰¹ according to the location of *Wat Kampang* because the two canals are close to the temple. There are the *Chak Phra* Canal in front and the *Bangjak* Canal in the back. Moreover, with the relatively low-level area of the temple, the temple is severely submerged during the rainy season.

Some past conservation of *Wat Kampang* was constructed unprofessionally. The temple does not have a crematorium for cremation, so the income of the temple is little. As a result, monks collected money from the villagers to help restore the buildings within the temple. It led to improper material and unprofessional construction due to the budget. Consequently, installing doors and windows with another layer of glass to provide light in the temple is for electrical bill savings. The terrazzo finishing on the concrete slab floor on top of the old flooring caused the decorative element on the wall footing to be covered at the bottom of the temple. The masonry wall was damaged and increased the humidity inside the *ubosot* until much of the mural painting had faded. It is one reason that keeps damaging the building structure and artwork inside. The two *viharas* were in a very destroyed condition before the FAD's conservation a few years ago. The bricks around the base of the building began to crumble.

The construction of monks' residences and buildings around the *Buddhavas* area resulted in the view of the temple from the outside is not very attractive. However, the temple wants to ensure that the facilities inside the temple are safe and suitable for living. Still, *Wat Kampang* has artistic value.

According to the study, the temple boasts twenty-two historic structures in its master plan, of which eight are particularly noteworthy and listed as heritage buildings by the FAD. These include eight *sima* structures, each with the shelter of its unique roof, one *ubosot*, two small *viharas*, three different 12-recessed *chedis* with intricate ornamentation, two *Prang*-shape *chedis*, a bell-shaped *chedi*, *Buddhavas*

¹⁰⁰ Thai area measurements and measurement conversions: 1 *rai* = 4 *ngan* = 400 square *wah* = 1,600 square metre, 1 *ngan* = 100 square *wah* = 400 square metre, 1 square *wah* = 4 square metre.

¹⁰¹ The Fine Arts Department Thailand, *Archaeological Report*, 153-155.

wall, two *Buddhavas* gates, two small wooden pavilions, and an old canal-side pavilion. One of the temple's most striking features is the mural painted on a lime plaster wall and the artwork on the wooden windows and doors in *ubosot* (the ordination hall). These windows and doors are adorned with gilt lacquer technique and framed by flower-stucco ornaments on the exterior. The roof of the ordination hall is made of timber structure and unglazed terracotta tiles, which adds to the charm and authenticity of this historic site (see figures 28-32). These photo surveys were taken by photogrammetric methods, which helped to collect accurate data on the building in 3-dimension. Using a drone is convenient and economical for data collection on height levels such as roof condition (roof pediment, roof tiles, timber structure, paintings, and ceiling). This method can generate an accurate architectural drawing. It can present condition and building measurement, which has recently become popular among Thai conservators, according to FAD projects in the past few years.





Fig. 26: Aerial view photo of *Wat Kumpang* at *Klong Bangjak* canal. On 1st April 2023.



Fig. 27: Survey plan for FAD’s Registration Heritage listed of *Wat Kumpang* at *Klong Bangjak* canal, surveyed on 2nd -23rd March 2020.

Source: Fine Arts Department, Thailand.



Fig. 28: Photogrammetry perspective photo of *ubosot* on the left side, *Wat Kampang* at *Klong Bangjak* canal. On 1st April 2023.



Fig. 29: Photogrammetry perspective photos of *ubosot* on the right side, *Wat Kampang* at *Klong Bangjak* canal. On 1st April 2023.



Fig. 30: Photogrammetry elevation photo of *ubosot* right side, *Wat Kampang* at *Klong Bangjak* canal. On 1st April 2023.



Fig. 31: Photogrammetry elevation photo of *ubosot* left side, *Wat Kampang* at *Klong Bangjak* canal. On 1st April 2023.



Fig. 32: Photogrammetry elevation photo of *ubosot* front side, *Wat Kampang* at *Klong Bangjak* canal. On 1st April 2023.

3.1. Underground

3.1.1 Underground structure

The most profound structure found after the archaeological excavation in 2019 dates back to 2367 B.E. (1824).¹⁰² Traditional buildings at that time were made from brick and laterite with load-bearing structures (see figure 33). Some buried structures are from around King Rama III period (1824-1851), such as the ruin of the arch gate seen in figure 34.



Fig. 33: Excavation pit of *Wat Kampong* in 2019.



Fig. 34: Ruin of the old arch gate, *Wat Kampong*, on 3rd March 2020.

Source: The Fine Arts Department of Thailand, *Archaeological Report*, 58.

Source: The Fine Arts Department of Thailand, *Archaeological Report*, 35.

3.1.2 Underground water

According to the Department of Groundwater Resources of Thailand, Bangkok's groundwater records date back to 1907. Over-extracting groundwater has resulted in the most significant decrease in the documented settlement of 100 cm over 21 years from 1978 to 1999. The most severe levels were 10 cm/year from 1978 to 1981. The groundwater level dropped to 55 cm below the surface. The groundwater level of Bangkok's withdrawal reached 2.2 million cubic meters per day (m³/d) in 1999 (see figure 35). Bangkok is losing its present surface level of more than 1 cm per year and may be submerged by 2030 compared to the sea level.

¹⁰² The Fine Arts Department of Thailand, *Archaeological Report*, 108-110.

As for the *Wat Kampang* site, the north boundary of the temple is joined by the *Klong Bangjak* canal. It is possible to access *Klong Bangkok Yai* or *Klong Bang Luang* from the east border. The temple has canals on two sides, raising the water level below the ground. The FAD excavated to two levels, 115 to 130 cm, in 2020. They discovered some water, which they then drained using a pump.

3.1.3 Drainage system

Drainage is crucial for regulating water supply and enhancing productivity in damp environments. Natural and artificial drainage are the two forms of drainage. Natural drainage is the natural removal of water from a region through the soil or rock. Water is evacuated from an area using man-made means such as ditches or pipelines through artificial drainage. This drainage method is frequently used to manage water resources and prevent flooding. Natural or artificial drainage is critical to maintaining beneficial and practical conditions for the heritage site. Figure 36 shows a blue pipe that pumps excess water to the drainage pitch. However, the drainage pipe in the *Buddhavas* area is not connected. It is just an absorbent pitch to the ground. Figure 37 shows the drainage trench in the *Buddhavas* area that does not connect, surveyed during the CHCM workshop in February 2023.

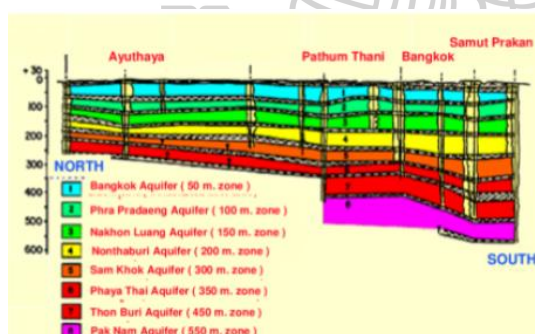


Fig. 35: Underground water aquifer diagram record in Thailand.

Source: Department of Groundwater Resources of Thailand



Fig. 36: Small holes for water collecting and drainage pump pipeline, *Wat Kampang* at *Klong Bangjak* canal. On 1st April 2023.

3.1.4 Irrigation system

An irrigation system is the artificial application of water to the landscape. The *ubosot* and *viharas* are surrounded by soft-landscape architecture and bodies of water. The temple has a water discharge canal for regular watering. The blue pipe in figure 38 is for watering plants and water plants around the *Buddhavas* area. The irrigation system was not properly planned and was not done by professionals. The figure shows that the pipeline was done later after the pavement of the floor tiles. A better irrigation system is required.



Fig. 37: Drainage system of the temple surveyed in February 2023.

Fig. 38: Water outlet pipe (blue pipe) in the *Buddhavas* area. On 1st April 2023.

Source: Fine Arts Department, Thailand and Prerana. (2023)

3.2 Hardscape and outdoor elements in the present context

3.2.1. Hardscape floor

The *Buddhavas* area features various hardscape surfaces, including concrete slab floors, concrete paver tiles, terracotta pave tiles, and tiles on concrete slab floors (see figures 34 and 39-43). It is reflected that the renovation of the floor is unplanned. The raised path towards the entrance of the *ubosot* canopy is mainly to avoid flooding (see figure 39). The walking path around the *ubosot* is paved with rectangle terracotta tiles, small hexagon concrete tiles, and then a planting plot (at both sides of the *ubosot*) or a concrete slab (at the front of the *ubosot*) (see figures 40-43).



Fig. 39: The raised path, *Wat Kampang* at *Klong Bangjak* canal on 6th February 2023.



Fig. 40: Concrete finishing floor, *Wat Kampang* at *Klong Bangjak* canal on 6th February 2023.

3.2.2. Water elements

The temple decided to expand the construction from the original *Buddhavas* wall to create a water lily pond, but unfortunately, it brought about a humidity problem for the heritage wall made of brick. As a result, the temple may need to consider eliminating the pond while restoring the wall to its former state. Around the *ubosot*, water lily pots are placed.

3.2.3. Outdoor elements (stone *sima*, statues, small *chedis*)

Stone sculptures of a Chinese couple of lions were set before the ordination hall's step. The ordination hall was marked with eight *sima*. Secondary *chedis* are formed of brick and plastered in various shapes, such as the 12-redented rectangular plan *chedi*, the *prang*-style rectangle plan *chedi*, and the bell-shaped circular plan *chedi* (see figure 60). The *Buddhavas* area has a lower wall with gates. The wall is composed of brick and plastered with lime. According to the FAD archaeological assessment, the wall base is supported by a load-bearing structure. The heritage area has an old boundary made from brick with gates on both the east and west sides. One

of them, the old gate close to the new monk dwelling, was destroyed. The structure was left around 1 m in height.

Sima and *Sima's* shrine were set up around the ubosot. *Sima* at *Wat Kampang* temple is housed in a small shrine made from pieces of stone approximately 40-50 cm tall. The front one is on the lotus base and has flat *sima* leaves. The waist of the *sima* is quite curly, and the side of the *sima* is carved with a stacked *naga* (colossal snake). At the top, the *sima* was made into a periwinkle shape, and the shoulder area made it look like sitting on the neck of the shirt. This style was popular in the reign of King Rama IV (1851-1868).¹⁰³ It is a beautiful and intricate architectural feature that adds to the overall beauty of the *ubosot* (see figures 41-43, 58 and Appendix I).

Twelve recesses style *chedis* are in front of the ubosot on the north side. Building a pair of *chedis* in front or at the end of the ubosot has been popular since the late Ayutthaya period (1688-1767), reducing the importance of *chedis*.¹⁰⁴ The construction of a temple in a later period gives significance to the *ubosot* as the temple's main building, such as *Wat Pho Prathap Chang* Temple in Phichit Province and *Wat Phaya Man* Temple in Ayutthaya Province (see figure 59).

The *chedis* has some features that make it stand out. For instance, a chopping board part (*Medhi*¹⁰⁵) can support the 3-tier Singha base set, stacked in descending order. A covered lotus supports the bell part, decorated with stucco patterns and patterns of *Sangwan* (long necklaces). The bell part has a flower decoration in the middle. A square throne part comes after the bell, followed by a lotus shape covered with vines instead of the segment, and a dewdrops shape adorns the top. All these features can be seen in the twelve wooden recesses, from the base of the chopping board up to the throne. One important observation that has helped determine the age of this *chedi* is that the lotus shape in a recess is a unique feature of the *chedi* built in the Rattanakosin period (1782-1932). This differs from the Ayutthaya-style *chedis*,

¹⁰³ Jiratassanakul, *Temple*, 81-85.

¹⁰⁴ Leksukhum, *The Rendented Added-Angled*, 6-7.

¹⁰⁵ *Medhi* is a raised circular path around the stupa for *Pradhikshina* or circumambulation. In Thai architecture, this part develops into many platform stacks above *anda* (the bell-shaped part) and becomes smaller without walking usage. (Jiratassanakul, *Temple*, 38-43.) (Dohring, *Buddhist Stupa*, 39-43.)

where all lotus shapes are circular. Additionally, the *Song Krueng chedis* style was only notable during the reign of King Rama I – III (1782-1851).

Prang-shaped chedi is in the corner of the *Buddhavas* wall behind the *ubosot*. It is on the north side of the ceremonial ground. The shape resembles corn-shaped with 16 indented corners on a square stacked platform and base, surrounded by low fences (*Harmika*¹⁰⁶). The *Prang-shaped chedi* consists of a rather high platform base. Above it is a 2-tiered *Singha*-style base and a lotus-shaped platform arranged in descending order, stacked up to the top. As for the four sides of the *Prang*, there are arches but no Buddha images inside. It has a noticeable feature; only jackfruit petals-shapes are attached to the top of the *chedi*. It means the knowledge and understanding of building a stacked angel pavilion, which aims to represent heaven, has disappeared from the minds of the technicians. The top of the *chedi* is broken. Another *Prang-shaped chedi* is located behind the *ubosot* on the south side. The condition of this one is very ruined. The style reflects the typical *chedi* around King Rama III's reign (see figure 61).

The bell-shaped *chedi* is near the twelve-recesses-style *chedis* at the back of the *ubosot*. It was built around 2441 B.E. (1898), around King Rama V's reign (1868-1910), to contain Phra Phisalphonphanit's ashes (Li Chay). The construction style is reminiscent of building a pagoda containing family relics that were fashionable during the reign of King Rama III (1824-1851), such as *Wat Rakhang Kositaram* temple and *Wat Arun Ratchawararam* temple, Bangkok. Characteristics and architectural styles of this bell-shaped *chedi* include the base of the round plan. It is one tier, supporting the vine garland's base three tiers, and the bell shape is next up. Above it is the throne in an octagonal layout, stacked small *Medhi*, and the top spire.

¹⁰⁶ *Harmika* is a square fence that surrounds the stupa's spire. It used to indicate a holy area surrounded by a fence. The *harmika* was a little platform with a railing at the summit of a stupa. Umbrellas or *Chhatra* were sometimes mounted in the *harmika* as a mark of honour and respect. (Jiratassanakul, *Temple*, 38-39.)



Fig. 41: The surrounding of *Wat Kampang's ubosot* on the right side, *Klong Bangjak* canal. On 6th February 2023.



Fig. 42: The surrounding of *Wat Kampang's ubosot* on the left-back side, *Klong Bangjak* canal. On 6th February 2023.



Fig. 43: The surrounding of *Wat Kampang's ubosot* on the right-back side, *Klong Bangjak* canal. On 6th February 2023.

3.3. Vegetation in the present context

The area in front of the temple has been allocated for the *Klong Bang Luang* water market. It has improved the surrounding scenery to be beautiful and still maintains the nature of the big tree inside the temple planted there, according to the information from the abbots. The general environment of *Wat Kampang* is shady. Distribute various shops to design harmoniously with the heritage temple and nature along the canal when renovating the area. The abbot built an herb garden, a Thai kitchen garden, and an ornamental garden beside the *Buddhavas* area near the *Bangjak* Canal as a source of learning and a place to relax.

Next to the *Buddhavas* wall is a plantation-raised bed with bamboo, trees, and shrubs, some of which are in pottery. Water lilies can also be seen in the pots in front of the ordination hall. There is a little water lily pond next to the *Buddhavas* wall.

3.3.1. Trees

Planting plots are close to the *Buddhavas* boundary, approximately 1.50-2.00 meters wide. The trees are evergreen trees mixed with deciduous trees. Most of the trees on the area's right side are middle-sized trees. There are also bamboo groves. While on the left side are higher. There are no ground coverage materials, just dry leaves. (see figure 41-44) The tree canopy grows close to the building, making a shade for the heritage building during the day.

3.3.2. Shrubs

Mixed shrubs with weeds are under the trees in the planting plot. Some are in the ceramic potteries surrounding the *ubosot*. There are small palms, flowery plants, and some tropical plants. Soil and dry leaves in the planting plots are higher than the walking path, which might lead to dirt on the floor when it rains. (see figure 41-44)



Fig. 44: Bedding plant along the *Buddhavas* wall boundary, *Wat Kampang*. On 6th February 2023.

3.4. Heritage building on the site

The single ordination hall on the master plan that might assume the influence of the late Ayutthaya style period is *ubosot* or the ordination Hall. The architectural style originates from the early Bangkok era when brick-loaded-bearing walls were typically erected alongside a timber roof structure. Unglazed terracotta tiles are commonly used for roofs in the central area. A sacred monk picture reveres little *Viharas* or Buddha Chapels. Another on the south side honoured various Buddha image sculptures from the eras of Ayutthaya (1688-1767) and Rattanakosin (1782-1932). One of these shows signs of past conservation. The wooden pavilions in front of the ordination hall have been designated as a new parking lot entry. The wooden pier pavilion indicated the position of the original canal pier, which served as the primary entry in the past.

The *ubosot* (ordination hall) is a brick and cement building with a wooden roof; both front and back are decorated with Thai ornaments according to the traditional style. The ordination hall is spacious, ten meters wide and thirty-six meters long. It is made of sturdy masonry with load-bearing brick walls and foundations. The walls are covered in plaster and adorned with beautiful wall paintings. The north and south walls have four double shutter windows each, while the east and west walls have two doorways on each side, all decorated with intricate stucco designs and floral ornaments. (see figure 28-32)

The *ubosot* is surrounded by two small *brick-and-mortar viharas* (assembly halls). These buildings have a similar structure to the *ubosot* but are smaller and more dilapidated. Inside the *viharas*, people can worship a replica of *Luang Pho Laem*.

However, neither of the *viharas* has any paintings inside. *Sala Tha Nam* pavilion, or the pavilion by the canal, is made of timber structure. The roof and gable are similar to the ones on the ordination hall and the assembly halls. It is expected to be an old pavilion built together in the same period.

The wooden pavilion (see figure 52) in front of the *ubosot* is a square-shaped building. It is a one-storey gable roof with an engraved wooden decoration. The gable is decorated with floral patterns and stained glass. It is assumed that the original one was all wooden and was built at the same time as the significant restoration of the temple during the reign of King Rama III.

The old *Tha Nam Sala* (waterfront pavilion) is located on the *Klong Bang Luang* canal bank. It is on the same axis as the *ubosot*. It is a traditional Thai traditional-style pavilion. (see figure 53) The pediment frame consists of *Chor Fah*, *Bai Raka*, and *Hang Hong*, and the roof tiles. Flora pattern is on the gable pediment inside the pavilion. There are concrete seats raised on both sides. There is a sign with the temple's name written as *Wat Kampang*, *Pak Klong* Sub-district, *Phasi Charoen* District, *Nakhon Luang* Province. The location of this pavilion also appeared on an old map made in 1887 around King Rama V's reign (1868-1910). It shows the temple layout that gives importance to the main hall axis line (see figure 1).

The restoration of the northern gate door by the FAD in 2018 was a significant event that has helped preserve the temple's cultural heritage. As part of the wall, the door is a crucial boundary marker made of varying heights on each side. Interestingly, the wall on an old 1887 map (see figure 1) highlights its historical significance.

In 2013, a Vernadoc drawing (see figure 50) showed that the Vihara building's elevation had deteriorated, exposing the bricklayer partially. The FAD managed the budget for the two *viharas*, which was successfully restored in 2019. Also, the FAD attached stupa support in 2020 to ensure they do not collapse while waiting for further restoration.

The new concrete residences on the outer side of the *Buddhavas* wall have been a much-needed addition to the site, according to the monk's necessity. However,

there has been some controversy surrounding the construction, as part of the new building has been built over the heritage wall boundary. Moreover, located next to the heritage sites, the new buildings do not blend with the heritage building of the temple (see figure 45).



Fig. 45: Monk residence concrete building, *Wat Kampong* at *Klong Bangjak* canal on 3rd March 2020.

Source: The Fine Arts Department of Thailand, Archaeological Report, 46

Buildings within the temple area that use bricks or stones as masonry materials, such as *ubosot*, *viharas*, and pagodas, have advantages over wooden buildings. Brick buildings are more robust and durable, with wood as the main structure and material. However, the disadvantage is that moisture often damages brick buildings, which can harm the building materials. It may affect the building structure until the whole building is damaged. The general maintenance of masonry buildings is similar to that of timber buildings, but must pay more attention to preventing moisture and reducing humidity in the masonry walls. Timber constructions in temples and religious buildings, such as the pavilion and scripture hall, may deteriorate owing to age. Together with Thailand's hot and humid environment, wooden buildings degrade faster than concrete ones, and there is a lack of constant maintenance from caregivers.

3.4.1. Flooring

Since marble, granite, and terrazzo flooring were not expected during the temple's original construction, the flooring was likely repaired. The terrazzo floor on the exterior balcony and the marble tile flooring within the structure are modern materials that gained popularity since the Ayutthaya era. Moreover, the altar in the

temple where the Buddha image statue is located is covered in marble tiles, indicating that it was added later.

3.4.2. Masonry wall

The temple's entry wall painted the image of the Buddha standing. The structure's base is a *Than-singha* or lion-style decoration wall, the same style as the window's arch. Inside the *ubosot*, the Buddha disciples, Sariputra and Mogallana, statues sat on the left and right side, respectively.

The *Buddhavas* wall, or the surrounding wall of the ceremonial ground, is a brick and lime mortar wall about one meter high (each side has different conditions and heights at the survey in 2020-2023). The wall is solid and quite thick. At present, some sides are only partially visible due to the higher adjustment of the surrounding usable area. There are three entrances: 1) In front of the area, which has a wooden pavilion in front of the *ubosot* as the entrance to the ceremonial ground, 2) On the north side with the arch gate, 3) On the south side with the ruined arch gate. The diagram of the *Buddhavas* wall still looks like an 1887-old map of Bangkok, as seen in chapter 1 (see figure 1).

3.4.3. Mural or wall painting

According to the FAD research, Thai mural has three fundamental colour pigments: *Chard* (Thai, meaning red), *Rong* (Thai, meaning yellow), and *Kraam* (Thai, meaning blue). *Chard* or *Dangchad* is made from cinnabar (vermilion), as seen in figure 46. *Rong* or *Rongthong* is made from gamboge tree. *Kraam* or *Khram* is extracted from indigo. Other primary pigments exist, such as *Damkhamao* (black) and *Khaokabung* (white). *Damkhamao*, or lamp black, is made from coal. *Khaokabung* is a slightly greyish-white colour made from white clay called Braytar (see figure 47). The mix of *Rong* and *Kraam* is *Khiao* or green. Natural sources of Thai traditional colour are plants, animals, stones, earth, spices, and minerals. The traditional technique is painting with dry pigments mixed with liquid adhesive from animals or

plants.¹⁰⁷ It is a conventional technique, but the disadvantage is that this type of painting can deteriorate quickly due to the humidity inside the masonry wall. Later, Western artists introduced the painting technique of *buon fresco* and other drawing techniques, such as perspective drawing (see figure 48 and Appendix I), in Thailand around the reign of King Rama IV (1851-1868).¹⁰⁸



Fig. 46: Mother of the Earth, wall painting, *Wat Kampang* at *Klong Bangjak* canal on 3rd March 2020.

Source: The Fine Arts Department of Thailand, Archaeological Report, 25

Fig 47: The Buddha life scenes when stepping down from heaven to the earth, wall painting, *Wat Kampang* at

Klong Bangjak canal on 3rd March 2020.

Source: The Fine Arts Department of Thailand, Archaeological Report, 25

¹⁰⁷ Traditional adhesives for mural painting in Thailand are made from various sources, such as buffalo skin, local acacia trees, and local tamarin seeds. (Thongchan, interview.)

¹⁰⁸ Sawatdirak, *Style of Suburb*, 80-81.
Wiryapanich, *Wat Kampang*, 90.



Fig. 48: Technology of wall painting in the *ubosot*, *Wat Kampong* at *Klong Bangjak* canal on 3rd March 2020. See the murals detail in Appendix I.

Source: The Fine Arts Department of Thailand, Archaeological Report, 26

3.4.4. Wooden elements and gilded lacquer wood panel

Thai traditional craftsmanship of black lacquer and gold leaf (see figure 49 on the left side) is usually found on scripture cabinets, doors, and windows made from wood panels (teak timber). It is *Lai Rod Nam* in Thai. It is mainly used on the exterior side of doors and windows panels, while the inside panels are polychrome paintings. (see figure 49 on the right side) *Lai Rod Nam* is one of the essential Thai cultural heritage craftsmanship. The art technique has been used for ages since the Ayutthaya period, as evidenced by the art objects in the National Museum of Bangkok. It is commonly used for decorating Thai architecture and traditional furniture.

As the National Library of Thailand describes, '*rak*' is a traditional Thai lacquer made from the milky latex from the sap of the sumac tree. It is *Anacardianaceae*, a plant native to Southeast Asia and some parts of central Asia. Lacquer work and gilding decoration's woodwork, plastering, and lacquerware also use *rak*, the method that possibly came from China. Kalyanamitra explained that there are two types of *rak*, from the south and the north of Thailand. Their chemical properties are slightly different, which results in the usage of *rak*. Southern *rak* dries more slowly but extremely solidifies, which might take a month to dry enough to

continue working on the following procedure. Northern *rak* is easy to dry and can continue working on the next step in 3 to 5 days.¹⁰⁹

Sa mook is charcoal powder from banana leaves or Kunai grass. *Imperata cylindrica* is a perennial rhizomatous grass native to tropical and subtropical Asia that has been filtered and become fine particles for use in gilding work. The substance will mix with *rak* until it becomes a sticky latex called *rak sa mook*. These solvents will apply to the ground layer of a gilding work.

The final gilding layer of the art piece is the surface of *rak sa mook*, which has been polished to perfection. Then, using *Ho radal*¹¹⁰, a yellow earth clay consisting of arsenic and sulphur. It is found naturally in red *Ho radal* and gold petals *Ho radal*. Currently, both types of *Ho radal* clay can be synthesised. A yellow clay lump is crushed to powder, and after some procedures, it can be used as a liquid for painting or drawings, such as writing a Thai book on a black background or writing outlines in the work of lacquering and gilding. The fine powder of *Ho radal* must be dissolved in the water and then let the sediment thicken to make the drawing liquid. Then, mix the water from soaking the orange pods with the sediment. After taking the solution to sun-drying in the sun, the next procedure is to wait until it becomes glutinous. Lastly, use these tacky liquids to mix with the natural latex extracted from a wood apple tree (*Limonia acidissima*) or mimosoid tree (*Leucaena leucocephala*), and it will be ready to use.

¹⁰⁹ Kalyanamitra, *Dictionary*, 414.

¹¹⁰ Kalyanamitra, *Dictionary*, 517.



Fig. 49: Outside (left) and inside (right) of the door panel of the *ubosot* (ordination hall), *Wat Kampong* at *Klong Bangjak* canal on 3rd March 2020.

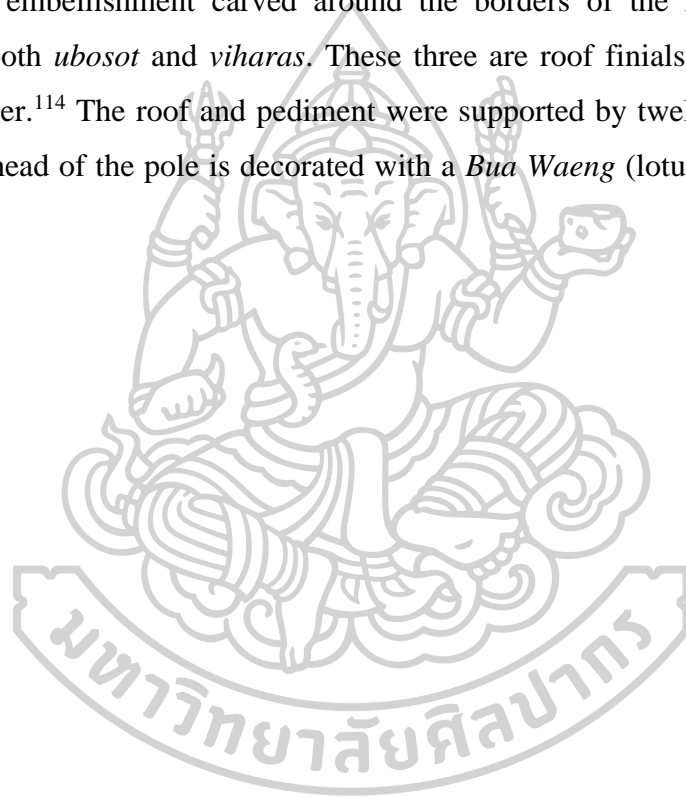
Source: The Fine Arts Department of Thailand, Archaeological Report, 23

3.4.5. Roofing

Chua or gable roofs in Thailand are usually built with a steep concave shape. The roof's concave shape is designed to deal with heavy rainfall during the monsoon season and protect wood panels from direct sunlight. Most traditional heritage buildings in Thailand, such as the temple's ordination hall and assembly hall, usually do not have roof pipes. They are sluicing water down and shooting it out past the wall to prevent it from seeping through the roof covering and protecting it from rotting. Additional rain and sun protection is provided by a short eave below the main top on two or all four sides, extending about forty to one hundred centimetres from the wall with or without brackets. Conventional roof coverings are terracotta tiles, teak shingles, corrugated iron, or palm leaf thatch, commonly constructed in Thailand and the Indochina region. The height of the roof not only coped with the rain but also maintained a specific indoor temperature; due to its no ceiling inside, the ample space

of the interior allowed hot air to rise and fly away from the user space. Then, the hot air escapes through the opening under the eaves (see figures 50-53).

The roof of the ordination hall of *Wat Kampang* is a two-storey, two-panel, gable-shaped timber building with porches on the front and rear. (see figures 28-31) A glass mirror mosaic with a floral design is fixed into the gable's wooden panel. The roof's slope is slightly curved and thatched with glazed terracotta clay tiles. *Cho Fa*¹¹¹, *Bai Raka*¹¹², and *Hang Hong*¹¹³ (see figure 51) constitute an upper roof ornamental embellishment carved around the borders of the roofs of the temple buildings, both *ubosot* and *viharas*. These three are roof finials, usually made from carved timber.¹¹⁴ The roof and pediment were supported by twelve recessed wooden posts. The head of the pole is decorated with a *Bua Waeng* (lotus) pattern, as seen in figure 50.



¹¹¹ *Chorfa* is an element found on the top of the gable roof of traditional Thai architectural buildings. The wood or stucco decorates the top end of the elongated body of the gable. The image looks like the head of a naga or mythical giant snake held up above. (Kalyanamitra, *Dictionary*, 164.)

¹¹² *Bai Raka* is a piece of wood or stucco made of fins arranged on the front of the gable between the *Cho Fa* and the *Hong Hong*, embracing the two pediments of traditional Thai architectural buildings. (Kalyanamitra, *Dictionary*, 300.)

¹¹³ *Hang Hong* is an element found on the gable roof of traditional Thai architectural buildings. An ornament shaped like a swan's tail is installed at the end of the *Ruey Raka* or the hip ridge of the roof of the traditional building. (Kalyanamitra, *Dictionary*, 530.)

¹¹⁴ Sthapitanonda, Nithi; Mertens, Brain, *Architecture of Thailand*, 142.

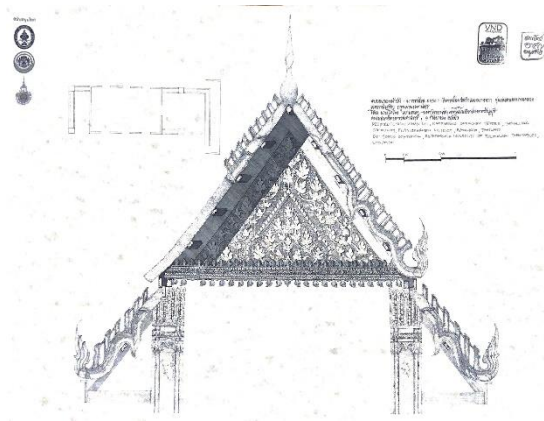


Fig. 50: Vernadoc drawing of wooden ornament for the gable of *Wat Kampang*.
Source: VERNADOC Thailand.

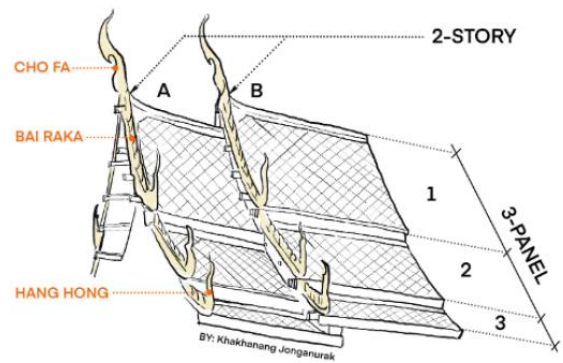


Fig. 51: Roof elements of Thai traditional architecture.
Source: Khakhanang Jonganurak (2023)

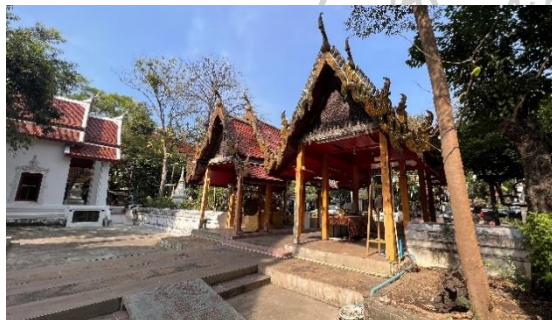


Fig. 52: Roof decorative ornament of the twin pavilion in front of the *ubosot*, *Wat Kampang*. On 6th February 2023.



Fig. 53: Roof decorative ornament of *Sala Tha Nam*, *Wat Kampang* on 3rd March 2020.

Source: The Fine Arts Department of Thailand, Archaeological Report, 45

4. Condition survey of Wat Kampang, Thailand

Many factors, such as environmental impacts, cause heritage building deterioration. Deterioration warning signs from the environment to the heritage building and artworks of *Wat Kampang* can be demonstrated from the ground and its landscape context to the top of the building.

4.1 Underground

4.1.1 Underground structure

According to the excavation report from the FAD, the condition of the ancient structure underground shows that the existing structures on the ground were built over the old ones. The old *Buddhavas* wall and footing are below 2.60 meters from the existing floor. The prang-shaped stupas at the corner of the *Buddhavas* area also have an old stupa foundation. The existing floor around the *ubosot* has two brick pavement layers (see figure 33).

4.1.2 Underground water

According to the excavation report from the FAD, further excavation after 3.50 meters depth, the ground is clay and loam. It is pretty damp; however, the excavation was operated on the archaeological site in the dry season.

4.1.3 Drainage system

Drainage is the process of naturally or artificially getting surface and subterranean water out of a wet region. Artificial drainage is used to regulate water resources or boost productivity. It may be inferred from the results that the original location was at a relatively lower level than the current one. So, it still needs to learn about the old drainage system. However, one monk points out that the drainage system must not be appropriately built because it causes the site to flood during the rainy season. Water does not flow because the slope of the specified drain was incorrectly calculated. An improper drainage system and a lack of maintenance are causing the water logging problem. It also damages the site and temple structure.

Figures 54 and 55 show the open trenches outside the *Buddhavas* wall, full of dry leaves. It shows that the open trenches lack maintenance and care, leading to frequent floods in the *Buddhavas* area. The figures also show that the heritage area inside the wall is lower than the surroundings, making the heritage area act as a sunken pool when it rains.

Furthermore, the open trenches are not connected anywhere. Actually, it seems to be open trenches to show the full height of the *Buddhavas* wall, not for drainage purposes. Low maintenance of planting plots nearby that do not have coverage shrubs lets the soil go down to the trenches when it rains.

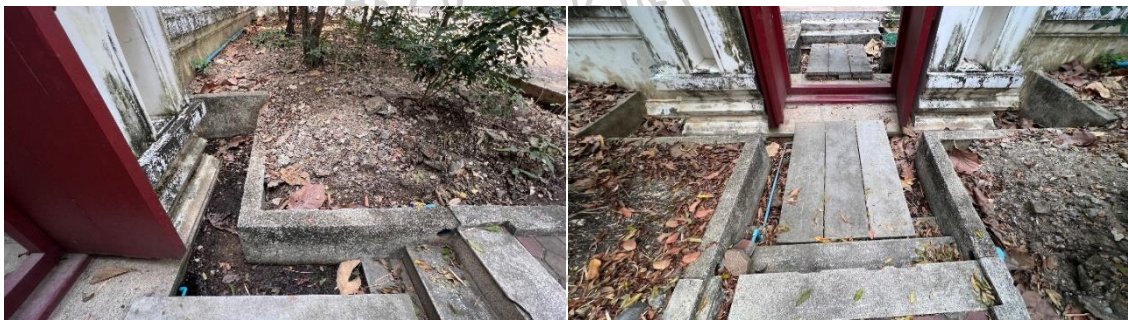


Fig. 54: Open drainage trench outside the *Buddhavas* wall, *Wat Kampong* at *Klong Bangjak* canal. On 1st April 2023.

Fig. 55: Open drainage trench in front of the arch gate, *Wat Kampong* at *Klong Bangjak* canal. On 1st April 2023.

4.2. Hardscape and outdoor elements in the present context

4.2.1. Hardscape floor

The hardscape floor of the temple outside the *Buddhavas* wall is a non-porous material. Most floor material, such as a car park and activities area, is slab concrete against moisture from evaporating. Furthermore, it does not have a proper drainage system. Various locations on the floor in the *Buddhavas* area, particularly in the cracks and holes, have some plant growth. This suggests that water accumulates in fractures and holds, making it simple for plant roots to pierce and obtain the food and

moisture they need to survive and thrive. The plant must be removed quickly when the root still has not grown much. The plant's root will gain more moisture and insects to the wall, causing further deterioration ¹¹⁵ (see figures 34, 39-44, 52, 55, 57 and 68-70).



Fig. 56: Floor tiles and stone statues, *Wat Kampang* at *Klong Bangjak* canal on 3rd March 2020.

Source: The Fine Arts Department of Thailand, Archaeological Report, 22.

4.2.2. Water elements

The small lotus pond extended from the *Buddhavas* wall is under the tree's canopy. It is full of duckweed, looks dilapidated and unattractive, and lacks maintenance in the pond. The water also harms the heritage wall due to its excess moisture.



Fig. 57: Water lotus pond extended from the *Buddhavas* wall, *Wat Kampang* at *Klong Bangjak* canal on 6th February 2023.

4.2.3. Outdoor elements (stone sima, statues, small chedis, etc.)

Lion stone statues show a trace of black bioorganisms such as algae, mosses, and liverworts. Some part of the stone is missing (see figure 56).¹¹⁶ *Sima* and *Sima*'s

¹¹⁵ English Heritage, *Building Environment*, 173-174.

¹¹⁶ English Heritage, *Stone*, 75.

shrines have also revealed a trace of black bioorganism on lime plaster (see figure 58).¹¹⁷ All these are an indicator of damp problems. They will disappear when the materials dry out. Figure 59 also shows a slight trace of black bioorganism, the twelve recesses style *chedis* situated under the sun in the front of the *ubosot*.

Moreover, the *chedis* in figures 60-61, located under the trees and damp area, are severely damaged and show a trace of black bioorganism overall *chedis* due to humidity context. Some faced mechanical breakdowns from overloading (stress and strain) or wear and tear, the one with a support steel structure. (see Appendix I) The structure system of both *sima* shrines and *chedis* are made from masonry bricks, so they faced chemical attacks from salts in building materials and other underground water contaminants, the same as the *ubosot* and *viharas* in the sites.



Fig. 58: *Sima* inside the shrine, Wat *Kampang* at *Klong Bangjak* canal. On 6th February 2023.

Fig. 59: Photogrammetry of the twelve-reddented *chedi*, Wat *Kampang* at *Klong Bangjak* canal. On 1st April 2023.

¹¹⁷ English Heritage, *Building Environment*, 314.



Fig. 60: The bell-shaped *chedi*, Wat *Kampang* at *Klong Bangjak* canal on 6th February 2023.



Fig. 61: The *prang*-shape *chedi*, Wat *Kampang* at *Klong Bangjak* canal on 3rd March 2020.

Source: The Fine Arts Department of Thailand, Archaeological Report, 42.

4.3. Vegetation in the present context

4.3.1. Trees

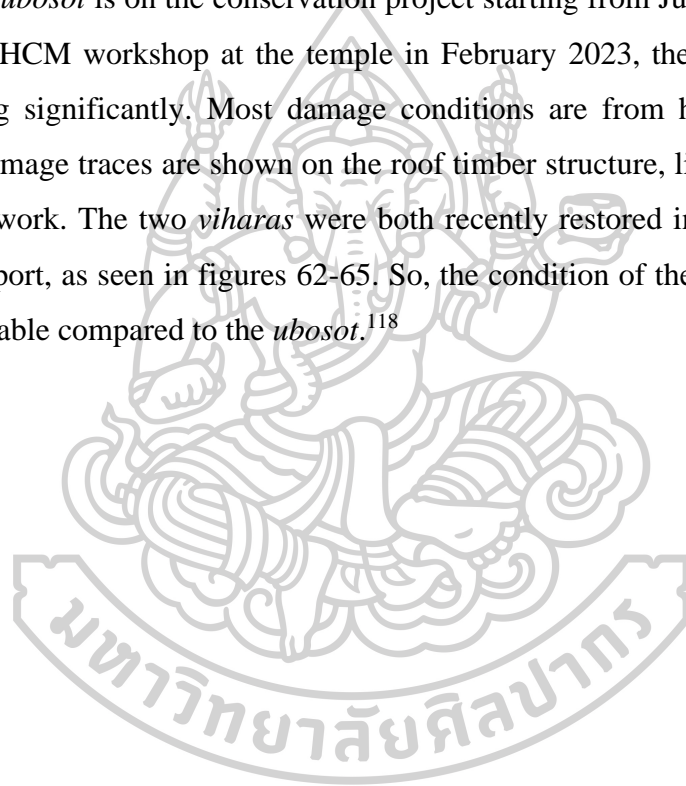
Perennial plants on the left side of the *Buddhavas* wall are quite large compared to the distance between the area and the heritage building. The trees are planted close to each other, about 3-4 meters away. Some branches stretch out to find the light close to the *ubosot* roof. Under the trees are small ruined *stupas* and the ruined *Buddhavas* gate. A strip of perennial plants plot is next to the heritage remains of the *Buddhavas* wall, which has been partially destroyed, and some are underground, according to the archaeological evidence of the FAD. While the right side of the *Buddhavas* area, the planting plot is mainly a bamboo grove. There are not many standing trees. Vegetation such as trees might implicate mechanical damage and relative humidity.

4.3.2. Shrubs

In part of the shrubs, it is unorganized cultivation intermingling with palm trees, weeds, flowering plants and newly planted perennials. All shrub species were growing indiscriminately. While this wild mix of flora may seem serene, it is evident that there is a lack of proper planning and organisation.

4.4. Heritage building on the site

The *ubosot* is on the conservation project starting from July 2023 by the FAD. From the CHCM workshop at the temple in February 2023, the *ubosot* condition is deteriorating significantly. Most damage conditions are from humidity and excess lighting. Damage traces are shown on the roof timber structure, lime plaster wall, and heritage artwork. The two *viharas* were both recently restored in 2019, according to the FAD report, as seen in figures 62-65. So, the condition of the heritage building is relatively stable compared to the *ubosot*.¹¹⁸



¹¹⁸ The Fine Arts Department Thailand, *Conservation report*, 3-62.



Fig. 62: Elevation photo of the north side small *vihara*, *Wat Kampang*, at *Klong Bangjak* canal on 3rd March 2020.

Source: The Fine Arts Department of Thailand, Archaeological Report, 38.



Fig. 63: Front photo of the north side small *vihara*, *Wat Kampang*, at *Klong Bangjak* canal on 3rd March 2020.

Source: The Fine Arts Department of Thailand, Archaeological Report, 37.



Fig. 64: Elevation photo of the south side small *vihara*, *Wat Kampang*, at *Klong Bangjak* canal on 3rd March 2020.

Source: The Fine Arts Department of Thailand, Archaeological Report, 39.



Fig. 65: Front photo of the south side small *vihara*, *Wat Kampang*, at *Klong Bangjak* canal on 3rd March 2020.

Source: The Fine Arts Department of Thailand, Archaeological Report, 39.

4.4.1. Flooring

The inside *ubosot* floor is in generally good and stable condition. But there is proof of gaps between the floor and the columns and wooden door frames that touch the ground. The balcony floor has several cracks due to using iron trays as a base for several ceremony items, and rust stains developed on the floor's surface. Bird droppings left visible traces on the floor, changing the area's colour. Past restoration on lime plaster walls is noticeable because of the painting's colour dropping.

4.4.2. Masonry wall

The temple's masonry walls are complete in shape and construction, although the exterior walls have discolouration from the ground up to a particular elevation. Due to water damage, the wall has become black, signalling the advent of black biological growth or leech. Furthermore, when the lime plaster wall cracks, a seeding plant can grow in the wall's holes (see figure 66). This impacts the aesthetic effect of the temple. The *ubosot* exterior walls' paint has also started to peel off. Salt crystallisation was also discovered on the wall where the lime plaster covering had been destroyed, and the brick was visible. (see Appendix I)

However, the FAD's report shows that the *ubosot's* exterior walls are in good condition and overall appear stable. They have been repainted during the conservators from the FAD. In addition, it seems that some ventilation holes for the masonry have been installed near the base of the building over the last 15 years. However, the survey by the CHCM workshop in February 2023 found many deterioration areas on the masonry wall from biological (see figures 58-61 and 66) and chemical attacks (see figures 67-68). It might be concluded that the small ventilation holes are not working well to release excess humidity inside the masonry wall.

The *Buddhavas* wall surrounding the *ubosot's* ceremonial space in figures 69-71 varies in height. However, the wall's layout plan remains the same as seen in the original map in chapter 1. The new wall was erected over the previous wall over time, along with the community area that filled their property, referring to the FAD's excavation report. According to current usage, several wall parts are not the

same height. The wall on the rear side of the *ubosot* is near the monk's residence (see figures 70-71). Hence, the monks maintained that wall section lower than the other side. As a result, it is both convenient for the walking path and visible from the monk's dwelling. As a consequence of abandonment, human activity, and moisture, the condition of these brick structures is poor on the rear side. Black bioorganic, flaking, and loss of structure were noticeable.



Fig. 66: The decoration wall of the *ubosot* with weed, *Wat Kampang* at *Klong Bangjak* canal during February 2023.





Fig. 67: The *ubosot* wall deterioration, Fig. 68: The *ubosot* wall deterioration around the window, Wat Kampang at Klong Bangjak canal on 6th February 2023.

Fig. 68: The *ubosot* wall deterioration around the window, Wat Kampang at Klong Bangjak canal on 6th February 2023.



Fig. 69: *Buddhavas* masonry wall, Wat Kampang at Klong Bangjak canal from the archaeological report on 3rd March 2020.

Source: The Fine Arts Department of Thailand, Archaeological Report, 43.



Fig. 70: From the archaeological report, Fig. 71: *Buddhavas* masonry wall ruin, buried *Buddhavas* masonry wall, Wat Wat Kumpang at Klong Bangjak canal on Kumpang at Klong Bangjak canal. 6th February 2023.

Source: The Fine Arts Department of Thailand, Archaeological Report.

4.4.3. Mural or wall painting

The FAD also played a role in restoring the temple. In 2011-2012, they worked to restore the wall painting. This involved removing the painting layer and ground layer to fix the structural wall and then putting it back on again. The lower parts of the temple's stucco have been restored, although the exact year is unknown. In particular, the community and other organisations have worked hard to maintain and improve the temple's condition. The wall-dampening effect is equally noticeable (see figures 72-73). The dampening has harmed the wall paintings, with water-dropping traces visible. The damage inside the building is identical in degree and height to the damage outside, showing black bioorganisms. Light and exposure from the open voids, such as windows and doors, damaged the mural. It also damaged vanished and wood panel painting (see figure 74). So, the problem of the painting deterioration is not solved.



Fig. 72: Mural inside the *ubosot*, *Wat Kampang* at *Klong Bangjak* canal on 3rd March 2020.

Source: The Fine Arts Department of Thailand, Archaeological Report, 24.



Fig. 73: *Thep Chumnum*, mural wall, *Wat Kampang* at *Klong Bangjak* canal on 3rd March 2020.

Source: The Fine Arts Department of Thailand, Archaeological Report, 24.



Fig. 74: Window panels and mural wall inside the *ubosot*, *Wat Kampang* at *Klong Bangjak* canal on 3rd March 2020.

Source: The Fine Arts Department of Thailand, Archaeological Report, 23.

4.4.4. Wooden elements and gilded lacquer wood panel

The exterior side of the doors and windows panel of *Wat Kampang's ubosot* uses black lacquer and gold leaf technique. Some areas of the door and window panel had deteriorated, and some wood sections had lost traces of gold leaf, especially around the corner of the panel. The panels were covered with a transparent acrylic sheet that they believed would protect the lacquer work. However, some damage to

the gilded lacquered layer has been found in this kind of protection. Light exposure damaged artworks, leading to vanished fade-off and paint layer cracks due to wooden expansion (see figure 74). The timber was affected by temperature and climate fluctuation on a micro and macro scale.¹¹⁹ Traditional architecture is designed to respond to fluctuating humidity, as timber will respond to equilibrium surrounding moisture in the air by swelling or shrinking. That is why the construction joint of the wooden part in the traditional building uses wooden pegs. Besides overheating, ultraviolet is also one of the main deteriorations; combined with the effect of wind and water, they can utterly produce stress on the material. Ultraviolet is the most harmful reference to English Heritage Conservation: Timber. It causes changed colour and component breakdown from loose cellulose fibres that degrade from sunray.

The inside of the doors and windows is a polychrome painting. Several panels on both sides were in fair condition after the latest conservation. Some areas of the paint layer have been damaged as a result of wood panels' shrinkage and expansion, as well as humidity. It leads the paint layer to bulge and flake off. (see figures 75-77) The colour also fades around the areas in contact with sunlight, including colour change. Most of the temple's heritage artworks and art objects have surface dirt because of the lack of maintenance. Because of a lack of maintenance, the majority of the temple's historical artwork and art pieces have surface grime. The natural airflow across the building's doors and windows contributes to dust ingress; nonetheless, the structures are surrounded by trees and shrubs. It also aids in the screening of air pollution.

For *Wat Kampang*, the community also seems to have renovated the temple. In 2009, they installed plexiglass over the existing wood panel windows and doors, as seen in figure 49, which likely helped to improve the overall appearance and functionality of the building. However, there are disadvantages of the plexiglass coverage. This coverage must be installed on the wooden panel by drilling the artwork to install knots or screw. It damaged part of the painting. It is also tricky for regular maintenance care such as dust cleaning. Moreover, in 2018-2019, they replaced a

¹¹⁹ English Heritage, *Timber*, 205-207.

granite-tiled panel on the bottom of the inside wall with a wood panel in the ordination hall. This decision was made because granite tile can damage the wall due to humidity.



Fig. 75: Wooden door painting damage; dropping, flaked off, and surface dirt, *Wat Kampang at Klong Bangjak canal on 6th February 2023.*



Fig. 76: Wooden door painting damage; bulging, droppings, uplifting, and roof-shape, *Wat Kampang at Klong Bangjak canal. On 6th February 2023.*



Fig. 77: Wooden door painting damage; abrasion, surface dirt, uplifting, and roof-shape, *Wat Kampang at Klong Bangjak canal on 6th February 2023.*

4.4.5. Roofing

Observations during the CHCM workshop showed the ornament's steel frame fasteners, which supported the ornamental parts from the previous repair. According to the FAD report, all roof decorations were renovated in 2007.¹²⁰ But in the examined times, the ornament of the roof pediment has damage, mainly at the tips and edge of the timber elements. The roof tiles are in decent shape as seen from figures 28-31. Thus, it is probable that they have already undergone restoration because the colour of the terracotta tiles around the gable pediment in figures 29 and 31 are

¹²⁰ The Fine Arts Department of Thailand, *Archaeological Report*, 15.

different from the rest of the area. Under the ceiling, there is additional electrical equipment.

The state and deterioration of the glazed terracotta tiles at the top of the roof's outer side cannot be assessed from the ground due to their lack of visibility, but it can be monitored through the photogrammetric¹²¹ method, as shown in figures 28-31. The porches and the main hall's wooden ceiling are still in place. However, a few damaged planks are on the east and west porches. Bird nests and bird droppings are also visible. There are signs of water seepage from the roof into the wall. Terracotta shingle tiles on the roof might leak and cause the watermark to be traced on the wall. Moreover, this type of traditional architecture does not have roof pipes. The routine maintenance should be concerned with leak and water pipe monitoring.

Due to significant renovations to the temple's protection and a measure of its interior, it is crucial to look for any concealed water damage in the wood ceiling of the main hall. The wooden beams are a component of the structural system, and any underlying issue might result in a catastrophic event. (see figures 78-79) Timber painted as a protecting coat to last long the timber age might be on regular primary care for maintenance.



Fig. 78: The timber deterioration of the roof structure, *Wat Kampang* at *Klong Bangjak* canal. On 6th February 2023.

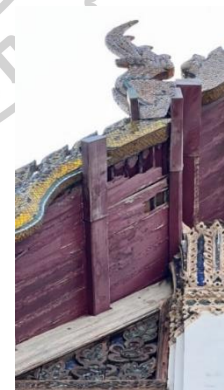


Fig. 79: The timber deterioration of the gable structure, *Wat Kampang* at *Klong Bangjak* canal. On 6th February 2023.

¹²¹ An object, a structure, or the surrounding area may all be found via a photogrammetric survey. The goal is to create a three-dimensional model that can be used to extract measurements, determine form, and, most importantly, create architectural design software like AutoCAD or BIM.

5. Aim of the conservation

The landscape architectural conservation concept is an investigation of landscape design to preserve, safeguard, and protect *Wat Kampang* and its historic landscape architecture to show value and respond to the current use of the sites. Therefore, conservation works should cover the whole area of the historic site. The heritage site is also the living space of people in the past. Monks also practice Buddhist rituals in the temple, which is valuable in archaeology, history, and art.

The landscape conservation brief objective is to maintain, protect, and safeguard *Wat Kampang* and the landscape surrounding the architecture. It must regulate and care for the environment to accommodate all historical sites of the temple by viewing a larger context rather than just one structure. The conservation must convey the significance of historic locations from various viewpoints, such as history, society, and art. It also has to accommodate the present potential activities and use of historical places without reducing the value that future generations will benefit. Lastly, It must enhance the historical site's aesthetic value of *Wat Kampang* temple.

Design for the conservation of *Wat Kampang* can use new materials, methods, and/or compositions. New designs are also permitted, but only if the design suits conservation principles and associated regulations. Landscape conservation must be a research process before design, such as researching and gathering information on the archaeological site to be created. These are practical findings from related academic fields such as archaeology, history, and art history. Personnel in such professional sectors must back up their knowledge. However, the landscape architect must acquire the following information before the conservation.¹²²

¹²² Information for the conservation design: document of the history of the area/ physical context documents/ environmental context documents/ documents related to activities and usage / other documents related to specific areas such as laws, requirements, frameworks, criteria/ Document of the projects in related areas/ economic, social and political information.

Information requirement:

1. Project specifics

- 2 . Project area specifications, such as historical records, reports, and operational documents previously completed in this work area.

- 3 . Construction area physical information is a plan of physical information such as the area's current state, buildings and structures' survey drawings, location of trees, and utility systems.

After gathering details and project documentation, the landscape architectural conservation design planning phase is complete. The following phase is operational planning and analysis of the information for conservation design. These data must be analysed in the conservation designs of *Wat Kampang*. Image-and-environmental data analysis, presumed archaeological site analysis, and activity-and-use analysis are the three data for basic requirements. Other analyses related to the main three criteria include additional specific information and analysis in an integrated way, along with connection in each aspect, concerning predictions of what will happen in the historical area's future.

The conceptual and preliminary design for the conservation project, along with the program and content of *Wat Kampang* have some measures to improve. *Wat Kampang's* landscape conservation should concern humidity and water system management. Dealing with moisture caused by underground water, surface rainwater, and vegetation must be a priority concern, together with the drainage system management of the temple and surroundings. According to the study from chapter 2, the effective drainage system of the heritage sites is to provide the surrounding moat and connect with other water reservoirs to send the water outside of the priority heritage area. However, the temple area is surrounded by two canals, which must be considered for natural drainage and tide level. Dam, and a barrage to control the water level might be considered possible. All of them should protect the heritage building inside the temple from flooding. Decreasing the risk of collecting moisture in

the area of the heritage building will support the decrease of deterioration of the material such as brick, lime plaster, and lime mortar. The surrounding moat can be smaller in a limited area, like in the *Wat Bang Num Pueng Nok* case study in chapter 2.

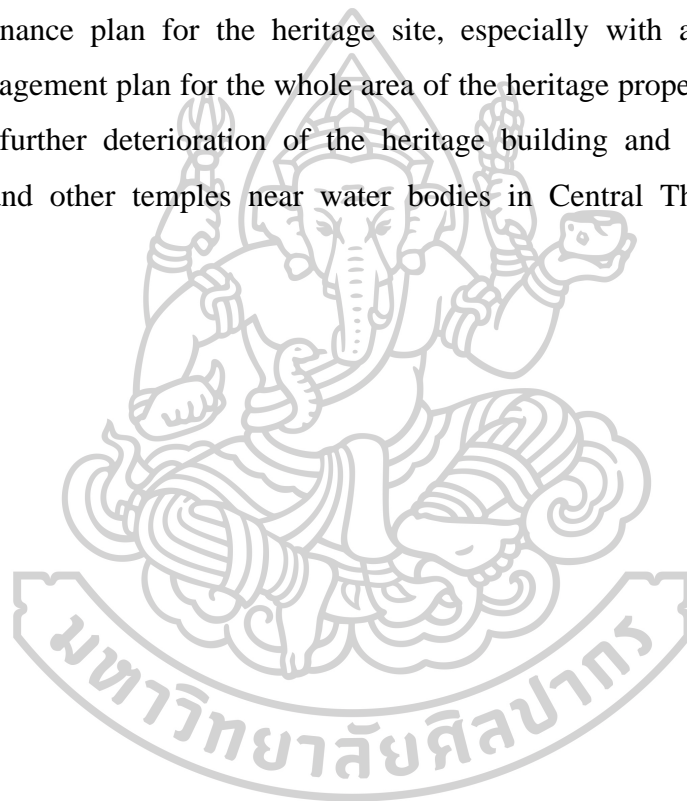
The hardscape floor of the temple might be the next factor to be of concern. Using a porous material to support drainage and moisture evaporation would be better. The existing slab concrete ground should be demolished and laid down with compacted soil or porous material aggregate. The pavement material inside the *Buddhavas* area can be related to the archaeological report, using brick or terracotta tile on packed soil. It might be a paved-only usage path and left the rest to be compacted ground like the *Jongmyo* ancestral shrine.

The plantation area might be reconsidered due to the distance from the heritage building and the tree's height. The shade and shadows of trees need to be considered, together with plant species. All sides of the building façade are preferably in the same condition of shade and light, protecting from the fluctuating environment of each side. The plantation area should have enough space from the heritage building in case of falling branches. Tree maintenance is essential for temples with limited areas, such as *Wat Kampong*. The small size of the plantation plot, located close to the heritage *Buddhavas* wall, just led to further deterioration. In the condition of *Wat Kampong*, the plantation plot inside the *Buddhavas* wall might be removed, and the drainage trench or open channel might be constructed.

From a holistic standpoint, the current monk accommodation erected nearby may be moved to protect the entire heritage building in the temple. These can be designed for a new master planning of the whole temple. After the relocation of the monk residence, the ruined *Buddhavas* wall can be reconstructed and mark the completion of the heritage area as illustrated in the old temple map.

The essential point is that the conservation process must start with environmental management and landscape conservation. Then, proceed with conserving or repairing heritage buildings with artworks inside. It should not be the

other way around, such as in the timeline of *Wat Kampang* temple in chapter 3. According to the *Wat Kampang* temple conservation procedure from 2011 to the present, the murals restored first around 2011-2012 already show signs of additional deterioration as surveyed by the FAD in 2020 and the CHCM workshop in 2023 (see chapter 4 and Appendix I). These additional signs reflect the impact of excess humidity within the heritage building, salt crystallisation, and a high level of underground water, which have not been solved yet. These three factors can be conducted with proper landscape design for the conservation area. It must include a well-maintenance plan for the heritage site, especially with a suitable drainage system management plan for the whole area of the heritage properties. It will assist in preventing further deterioration of the heritage building and its artworks at *Wat Kampang* and other temples near water bodies in Central Thailand with similar conditions.



6. Concept of landscape conservation

6.1. Care and maintenance

6.1.1 Surrounding environment

The restoration and maintenance strategy might begin with the upkeep of the surrounding environments. It is necessary to evaluate the width and flow of the road in front of the heritage buildings and sites. It will aid vehicle accidents in harming historic buildings and elements. For example, in figure 80 below, both stone statues are surrounded by steel fences due to their damage from the car strike. Rather than leaving the boundary between the road and the cultural sites vacant, it appears necessary to erect a green boundary or a ditch to ensure the site's visibility and the space between the vehicles. It is also necessary to avoid the vehicle flow impacts from lived-loaded vehicles on the road, which cause the heritage building to tremble.

Private and commercial properties placed near heritage sites or built over heritage areas must be removed following land approval to ensure the integrity of the heritage site. The problem can be seen from the local case study in chapter 2, *Wat Bang Num Pueng Nok*. The communities destroyed and evaded the temple's heritage site by constructing a home over the Buddhist ceremonial area. The new house was erected over the *sima*, the sacred stone boundary maker.

Layout, scale, type, and colour & materials should all be considered when installing a boundary fence. The design layout should be simple to maintain and well-organised in combination with modularisation. The height should be secure enough to guarantee safety. Minimising size and creating a streamlined design that satisfies structural and safety criteria would be preferred. It should be a straight plane rather than an area shape to prevent blocking the cultural site's view and avoid unnecessary embellishment. It should have a practical and concise design. Using specific images that symbolise cultural heritage might enhance the character of the heritage site, as figure 81. Continuous facilities should employ a colour less saturated than the cultural heritage or in harmony with the surrounding context. It is desirable to choose

materials that are similar to those found in cultural heritage structures. Glossy materials should be avoided.

The exterior environment of the heritage building is affected by various factors, such as the impact of rain, other external sources of water (i.e., groundwater), and the effect of wind. Drainage systems play an essential role in heritage sites because of the sensitive condition of the deterioration from humidity and chemical damage from the water to masonry brick, the primary material in Thai heritage structures. Natural disasters such as flooding need to be considered and prepared for the risk management of cultural properties and other related documents.¹²³ The additional process that needs to be monitored along with the conservation process is the conditions for the environment around the building, such as relative humidity (R.H.) measurement, temperature, and light measurement inside and outside the building. The area that must be the primary monitoring is the wall, the floor, and under the trees around the building.

Traditional techniques should be preserved using lime mortar to conserve heritage masonry buildings. As for the external wall, the traditional lime mortar and plaster may be painted over with moisture protection properties from the outside, allowing moisture from the inside to escape after plastering. These will help to extend the life of the buildings. It is not recommended to use cement to restore heritage buildings of masonry type because the mortar chemicals will react with the humidity in the bricks, destroying the bricks in the long run.

Materials for the conservation of the heritage site also play an essential role, as some traditional craftsmanship and know-how were lost during the development of urban life. General maintenance of wood materials consists of regularly checking the strength of the structure. It should prevent moisture from damaging the wood. There is a solution in the wood to reduce the flooding of water that causes moisture to accumulate in the wood, as well as being able to cause the building foundations made of wood to decay. Improving the standardised and safe wiring system also prevents the destruction of heritage buildings with wooden elements. Nowadays, wood quality

¹²³ English Heritage, *Building Environment 2014*, 461-471.

for building structures or works of art is more difficult to find. Therefore, if the damage to the timber is less than 50%, it should be restored at specific points to maintain the value of the material.

Deterioration of heritage buildings, such as timber structures with load-bearing brick walls and lime plaster painting walls, is often associated with ambient relative humidity. It includes moisture content, air exchange or wind, solar radiation and thermal control of the interior and exterior. With the tropical weather parameter of Thailand, heritage buildings are designed to respond to fluctuating humidity, as timber will react to surrounding moisture in the air by swelling or shrinking to equilibrium. That is why the construction joint of these wood buildings in the traditional style uses wooden pegs. Besides, overheating and ultraviolet are also the main deterioration factors; combined with wind and water, they can utterly produce stress on the material. Ultraviolet light causes a change of colour and component breakdown of loose cellulose fibres that degrade from sunray as referred to by the English Heritage.¹²⁴

Timber for artistry and architecture in Thailand is teak wood. Teak or *Tectona grandis* is a tropical hardwood of Southeast Asia. It is a regional deciduous woody plant in a mixed forest. Timber from teak could withstand Thailand's hot and humid climate and the damage from termites, according to the qualities of wood properties related to moisture. Moreover, its durability, water resistance, and light are outstanding. The tree can be milled into the maximum quantity because of its tall and straight trunk. A specific sap in teak makes the timber resistant to insects and fungi.¹²⁵ Other standard timber used in Thailand for traditional architecture and craftsmanship will be demonstrated in Appendix I.

Problems with building designs or materials can happen from flawed water-handling features. It also can be caused by faulty rainwater management and types of equipment. Defective ground drainage is also one of the critical factors.¹²⁶ Walls, roof claddings, windows, and doors might cause other problems. All these problems are

¹²⁴ English Heritage, *Timber*, 206.

¹²⁵ Sthapitanonda, Nithi; Mertens, Brain, *Architecture of Thailand*, 70.

¹²⁶ English Heritage, *Building Environment*, 164, 178-179.

related to poor maintenance. Some are from human activity influences such as vibration from traffic, pollution, climate changes, disasters and wars. All of them need to be closely concerned with risk management.¹²⁷

In August 2023, over 80% of the heritage city of Lahaina, Hawaii, was severely destroyed by *Maui* wildfires. The heritage town was settled in the 1700s. Strong winds from early Hurricane Dora exacerbated wildfires on *Maui*. As reported by BBC News, dozens of homes and shops in Lahaina were burned to the ground. Reuters mentioned past statistics from the U.S. Forest Service that almost 85% of wildfires in the United States are caused by humans. While the weather mainly causes wildfire events around the world.

Furthermore, Clay Trauernicht, a fire scientist at the University of Hawaii, mentioned that Hawaii's recent rainy season encouraged the invasive exotic species of guinea grass. They are commonly found in various areas of the island of *Maui*. This grass grows and flourishes around the heritage town. It can grow as fast as 15 centimetres per day and at full height of up to 3 meters. Those grasses are plentiful fuels that quickly spread the fire. It brought the fire surrounding the city in a short time.

Record hot weather this summer of 2023 has caused unusually intense wildfires in Europe and western Canada, which is related to the statement of UN Secretary-General Antonio Guterres in July 2023. He stated that people nowadays live in an era of "global boiling". These incidents reflect that long-term monitoring and management of heritage buildings and areas is necessary.¹²⁸ Protecting the cultural heritage site cannot consider only the site itself anymore, but it should be a holistic conservation perspective.

¹²⁷ English Heritage, *Building Environment*, 467.

¹²⁸ English Heritage, *Building Environment*, 472-475.



Fig. 80: The parking area in front of the temple, Marble Temple or *Wat Benchamabophit*, Bangkok.

Fig. 81: Heritage site boundary, *Wat Aranyigawas*, Ratchaburi, on 6th April 2022.

Source: Reed Thai, accessed on May 8, 2023 available from <https://reedthai.com/ร้านพวงหรีดวัดเบญจมบพิตร/ที่จอดรถ-วัดเบญจมบพิตร-/>

Source: The Fine Arts Department of Thailand.

6.12. Heritage sites maintenance plan

Historic buildings are maintained by separating them into priority maintenance zones and safety viewing zones based on the historic building's safety level in the temple and visitor circulation. The priority area, such as the *ubosot* (the ordination hall), should maintain the current state and strengthen the safety of the building and art objects inside, such as the mural painting and the Buddha image statue, by conducting the photogrammetry survey record regularly. This kind of survey will support the monitoring of the heritage site thoroughly. The survey will be more precise and accurate enough for image analysis.

The heritage adjacent to the viewing circulation line in the viewing area and a maintenance plan in the area must be safeguarded and considered. Some heritage sites require a distant viewing environment for security, a high importance and careful measure for conservation and repair. Initiating an environment that can be observed from the outside is also essential. The viewing route can use several materials according to the purpose and characteristics of the heritage sites. For example, to

express the heritage site borders, prominent historical sites in Korea are frequently demonstrated with hardened soil and turf, as mentioned in chapter 2, *Jongmyo*, the ancestral shrine. The pavement should be made of materials that are easy to walk on, water-permeable, water evaporates quickly, and harmonised with the heritage sites, such as natural stone, flagstone, terracotta tile, and bricks.¹²⁹ However, the advantages and disadvantages of each material must be considered, such as construction cost, durability, eco-friendliness, and aesthetics. This concept can apply to both the path and exterior floor of the heritage building. The parking lot should have universal and easy-to-maintenance materials such as asphalt, cement blocks, and permeable blocks. Crushed stones or blocks might be used at the boundary of planting beds, protecting the soil scatter on walkways. (see table 1)

A separate visitor circulation for disabled people might be considered part of a universal design strategy. The disabled circulation path and ramp should be harmonised with the surroundings with less alienation.

Table 1 Location of use according to hardscape material characteristics for heritage sites such as temples.

Place	Materials for use	Physical characteristics and condition
The upper surface level of historic sites	Stone, brick, block, soil cement, grass	<ul style="list-style-type: none"> -The texture and colour harmony of the historical sites -Reduced damage when in touch with remains while covering the perimeter of remains -Prevention of precipitation
Viewing path	Brick, terracotta tiles on brick, block, soil cement, packed soils or gravel on a geogrid, wooden deck	<p>(see figure 82)</p> <ul style="list-style-type: none"> -Reduce heterogeneity with the remaining -Ability to express information and direction

¹²⁹ Historic England, *Earth, Brick & Terracotta*, 654-656.

Table 1 Location of use according to hardscape material characteristics for heritage sites such as temples. (continue)

Place	Materials for use	Physical characteristics and condition
Adjacent pedestrian road	Flagstone, sandstone, wooden deck, block, pitched cone, stone gravel on packed soil, concrete	<ul style="list-style-type: none"> -Excellent walking sensation -Easy maintenance and management -Compatibility with the surrounding environment
Square	Brick, Block, Permeable cone, coloured pattern concrete, ascon, stone gravel	<ul style="list-style-type: none"> -Materials that fracture less while paving a -Materials with low reflectivity -Excellent water permeability or easy drainage -Materials that generate less dust in a vast area
Parking area	Grass block, water permeable cone, coloured pattern concrete, asphalt	<p>(see figure 83)</p> <ul style="list-style-type: none"> -Materials with low peeling and falling -Materials with high water permeability or easy draining -Materials with low noise generation while passed by the vehicle



Fig. 82: Heritage viewing path using the brick pavement on concrete, *Wat Aranyigawas*, Ratchaburi, on 6th April 2022.

Source: The Fine Arts Department of Thailand.



Fig. 83: A disabled parking lot using coloured pattern concrete block on packed soil, *Wat Aranyigawas*, Ratchaburi, on 6th April 2022.

Source: The Fine Arts Department of Thailand.

6.2. Guide for conservation

6.2.1. Landscape conservation plan

Landscape architectural design for conserving historical sites is a research of landscape design to maintain, safeguard and protect heritage sites and historic landscape architecture from demonstrating value and responding to the sites' present use. As a result, conservation initiatives cover the entire area containing historical sites. Because a historic site is a living area from the past, it is valuable for archaeology, history, and art.

Establishing a buffer zone for the heritage buildings and heritage sites is recommended. It is beneficial for the heritage sites in long-term maintenance to support the development of long-term tourism activity, land change, and urban development. Thai cultural heritage regulations and city-related laws are to be considered together. A hierarchy of gradually increasing intensity in the order of buffer area to cultural heritage is desirable to optimise the benefits of buffer zones.

The area can be divided into a strong protection area subject to regulation and permits and a mild protection area, with guidance and report in principle.

Buffer zone areas also act as green and permeable areas of the heritage site. The green area around the heritage site will absorb water run-off on the surface when the rain comes. It also stabilised the ecosystem around the heritage building; however, a suitable distance from the heritage building must be required. The distance of the green area to the heritage building is related to the humidity of the structure and art objects inside. Branches and trunks of trees close to the heritage building might cause damage to the buildings when they fall off.

In-house personnel for the small temple should be enough for routine care, such as daily watering and weekly plant trimming. Some religious events might need more people. However, for a regular day, few gardeners and monks could handle it. The temple might use an arboretum company to cut and trim the big trees yearly. The tree technician can cut the tree aesthetically and healthily to last a long lifespan. Branch controlling and trimming also enhance the visual impact of the heritage building, not block away the visitor's viewing. For the trees, the area around them should not be paved with slab concrete. The porous material pavement must be used to allow the root to breathe. It is also hidden for damage from insects such as termites. According to the English Heritage: Practical Building Conservation series, insect groups such as beetles, wasps, bees, ants, termites, and woodlice are significant causes of the deterioration and damage of timber.¹³⁰ Termites are the most wood-destructive pests in tropical and subtropical regions. They usually nest in the ground .

Recommended vegetation for heritage sites such as temples can be divided into Buddha-related trees and low-maintenance trees. The Buddha-related trees will support the meaning and storytelling of Buddhism in the temple. The trees were narrated in *Tripitaka*, such as the mango tree, bamboo tree, banyan tree, and bhodi tree.¹³¹ As for the functional tree in the temple, it will be considered up to the usage area. The ceremonial area, such as the area around *ubosot*, should avoid trees with

¹³⁰ English Heritage, *Timber*, 130-177.

¹³¹ The Crown Property Bureau, *Guide*, 183-184.

fruits and sap because it leaves the floor dirty. Deciduous trees might be used for specific areas to avoid fallen leaves. Garden maintenance might be considered hard work for a temple with a limited number of monks.

The location of trees is also essential. The planting area should be vast enough for future growth. The planting plot should be opened with concrete pavement, minimised around two square meters, allowing tree roots to breathe. It is very important as an individual experience. Many old trees from 100 to 200 years in the heritage sites started to rot due to their surrounding context, which was paved with slab concrete or other materials that did not allow tree roots to breathe. For instance, a bodhi tree from the Buddha-related site in India, planted at *Wat Saket Ratchawora Mahawihan*, Bangkok, started a sign of deterioration since the King Rama V period due to its concrete parking lots surrounding the tree closely. It was also mentioned in the news recently, and the FAD must advise the monk on managing the old tree. Some species, such as the banyan and bodhi trees, must be planted far from heritage buildings due to their aggressive root growth. It can piece through the building structure and damage the heritage building.

6.3. Outcome

It is crucial to recognise that landscape architecture is not the only field concerned with conserving the environment of heritage sites. Works of art and heritage buildings also play a significant role in this effort. Further exploration of these related areas can enhance conservation initiatives. It is important to note that the management of landscape architecture for conservation purposes varies depending on the project's scale and scope. Guidelines for preservation should be established on multiple levels, from the site itself to its surrounding areas. Additionally, it is essential to consider landscape conservation measures from an urban design perspective to address the bigger picture.

Summary

Using similar hypotheses, such as the same type of material or a similar climate, as an assumption and prototype studies supported the analysis of *Wat Kampong (Klong Bangjak canal)*. The conservation case studies were *Wat Bang Nam-Phueng Nok*, Samut Prakan province, and the *Jongmyo Ancestral Shrine* from the Republic of Korea. The study was conducted by analysing the site and environmental context of the heritages. Site management and the heritage objects' condition inside were also considered. The outcomes from the case studies were a conservation measure for the site of *Wat Kampong* and guidelines for other similar heritage sites.

The buildings near the water are particularly vulnerable to damage from their surroundings. The humidity in the air and the water can cause direct and indirect damage, leading to a deterioration of the structures. Flooding and drainage issues, as well as underground water, can all have a negative impact on the heritage sites. Even if the water does not directly affect the structures, salt crystallization, bioorganism attacks, and insects can all result from high humidity levels. This can lead to the quick decay of brick and timber, ruining the artwork and other aspects of the structures.

It is crucial to implement proper guidelines for managing the environment of the sites to preserve the integrity of heritage buildings and protect the art pieces within. This is particularly important for traditional Thai heritage buildings near water bodies, such as *Wat Kampong* in the central region of Thailand. The guidelines predominantly focused on properly managing heritage temples with *vihara* (the assembly hall) and *ubosot* (the ordination hall). By taking these measures, heritage buildings could prevent further deterioration of these important cultural sites. It also ensures that the sites are preserved for future generations to appreciate and experience.

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Appendix

Appendix I – Photo documentation

Appendix II – Related information



Appendix I Photo documentation

Wat Kampang at *Klong Bangjak* canal image before conservation on 28th July 2010

Source: The Fine Arts Department of Thailand.



Front twelve-redented *chedi*.



Front of the *ubosot*.



Doors and windows arch decoration.



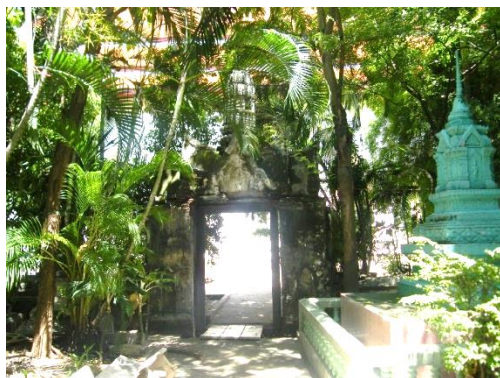
Na chua decoration and roof ornaments.



Buddha image at the front canopy of the *ubosot*. Mian *sima* slab at the front canopy of the *ubosot*.



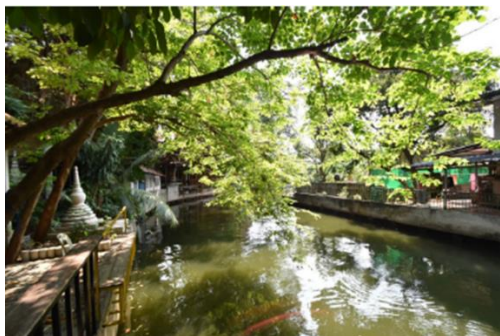
Stucco pattern on the window arch. Prang-chedi style at the back of the *ubosot*.



Buddhawas gate.

Surrounding environment of the temple on 3rd March 2020.

Source: The Fine Arts Department of Thailand.



Klong Bangjak canal.

Klong Bangluang canal.



Mural wall painting inside the *ubosot* before conservation on 3rd March 2020.

Source: The Fine Arts Department of Thailand.



Temeey Jataka.



Suwan Sam Jataka.



Nemeey Rajataka.



Mahosot Jataka.



Chanthakuman Jataka.



Narth Jataka.



Withoon Jataka.



Chulapathum Jataka.



Condition survey of *Wat Kampang's ubosot* in February 2023 during CHCM workshop

Source: IoC, University of Applied Arts Vienna and Silpakorn University International College.



Deterioration on the wall of the *ubosot*. Ventilation hole round the exterior wall of the *ubosot*.



Terrazzo tiles at canopy of the *ubosot*. Marble floor inside the *ubosot*.



Deterioration of terrazzo floor and door frame. Deterioration of terrazzo floor.



Cracked line on the terrazzo floor. Buddhist activities caused the floor's stain.



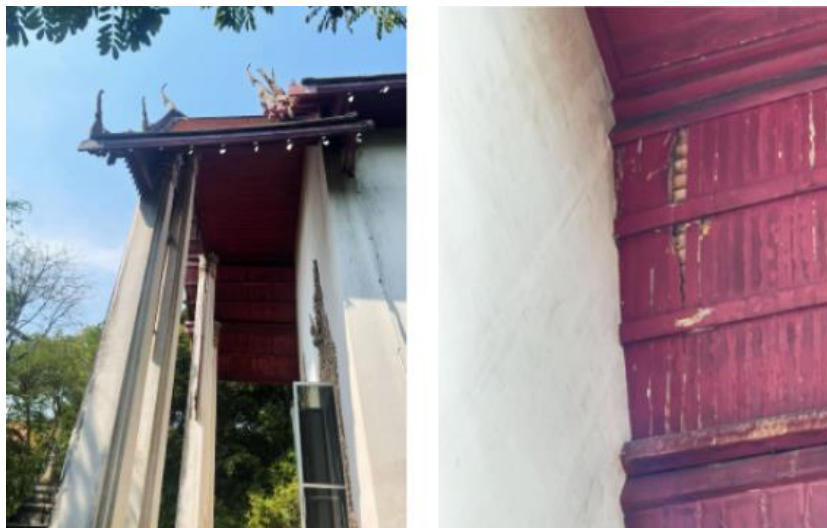
Deterioration on the base of the *ubosot*. Terracotta tiles and planting pot.



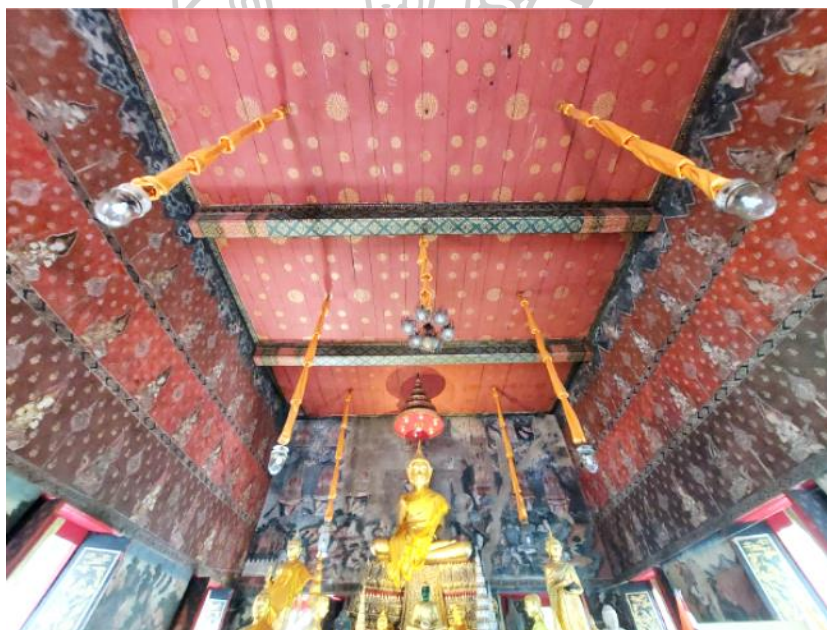
Dirt and bird drops on the column. The paint layer of the column peeled off.



Overall deterioration area of column and brick structure inside the column.



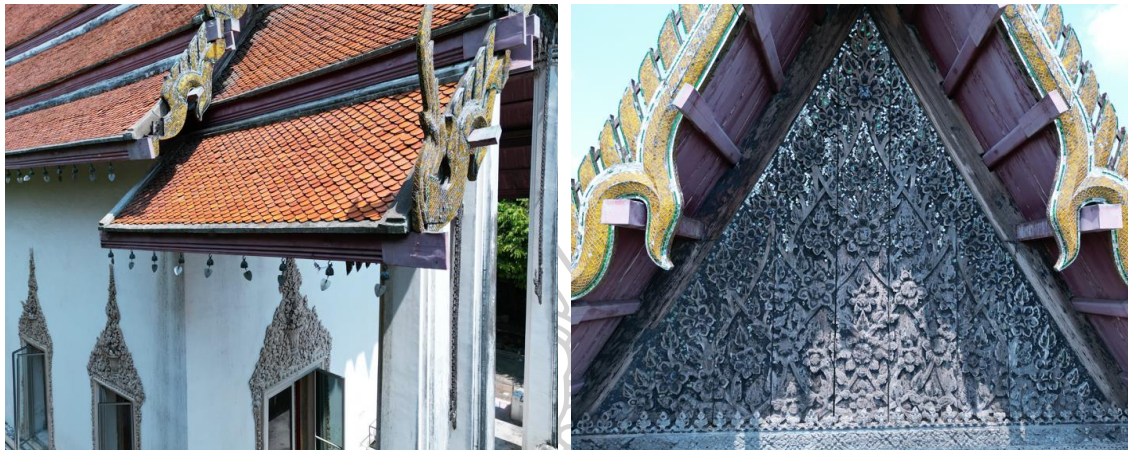
Column and timber roof of the *ubosot*. Damaged of the *ubosot* ceiling.



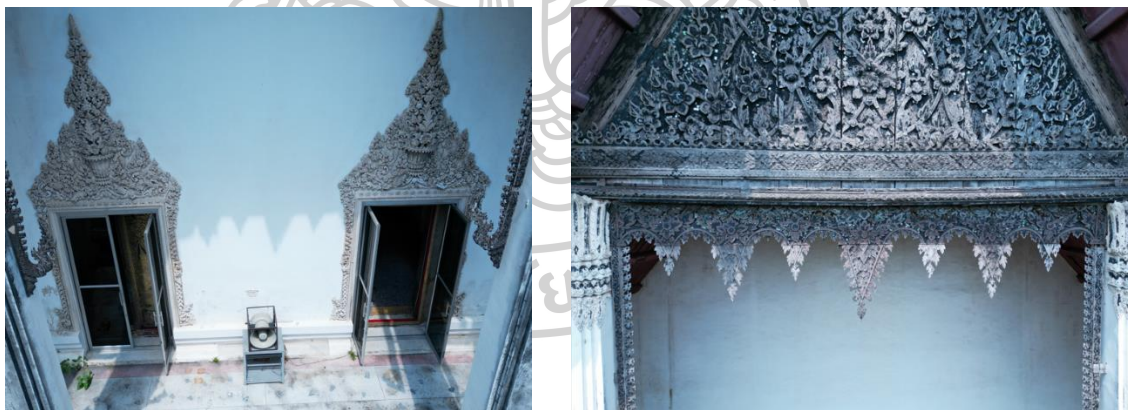
Murals on the wall and ceiling of the *ubosot* in red tone.

Photos from the photogrammetric method surveyed on 1st April 2023, *Wat Kampang* at *Klong Bangjak*.

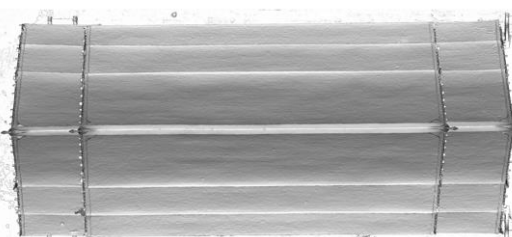
Source: Muenkaew Charutula Wachirastienchai / Naruedom Kaewchai.



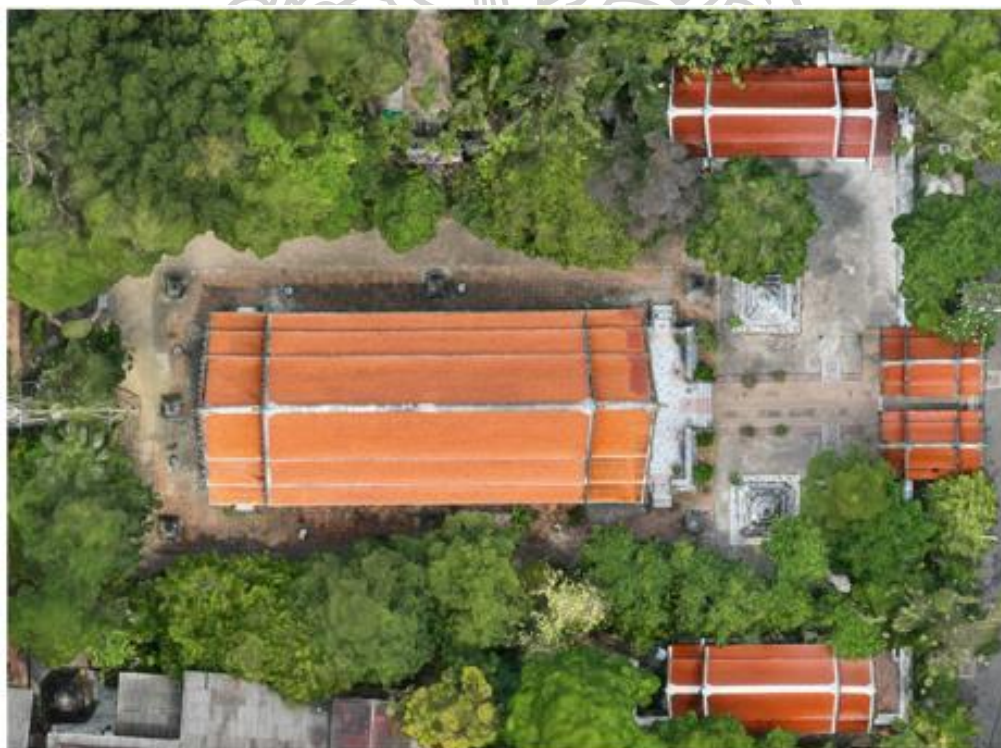
Roof tiles and wooden decorations of the gable. Carving timber decoration of *Na Chua*.



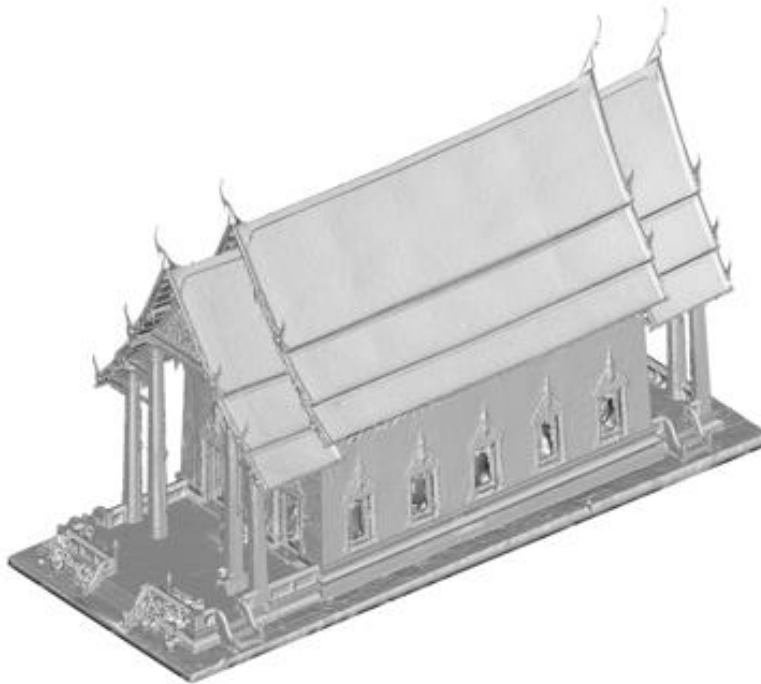
Stucco decoration arch of entrance doors. Carving timber decoration between two columns.



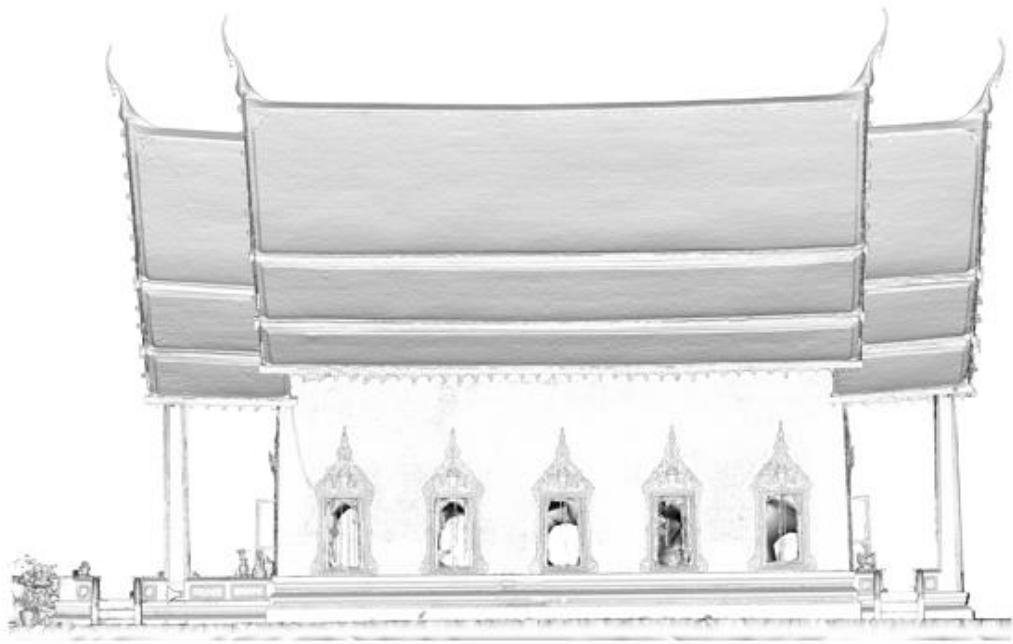
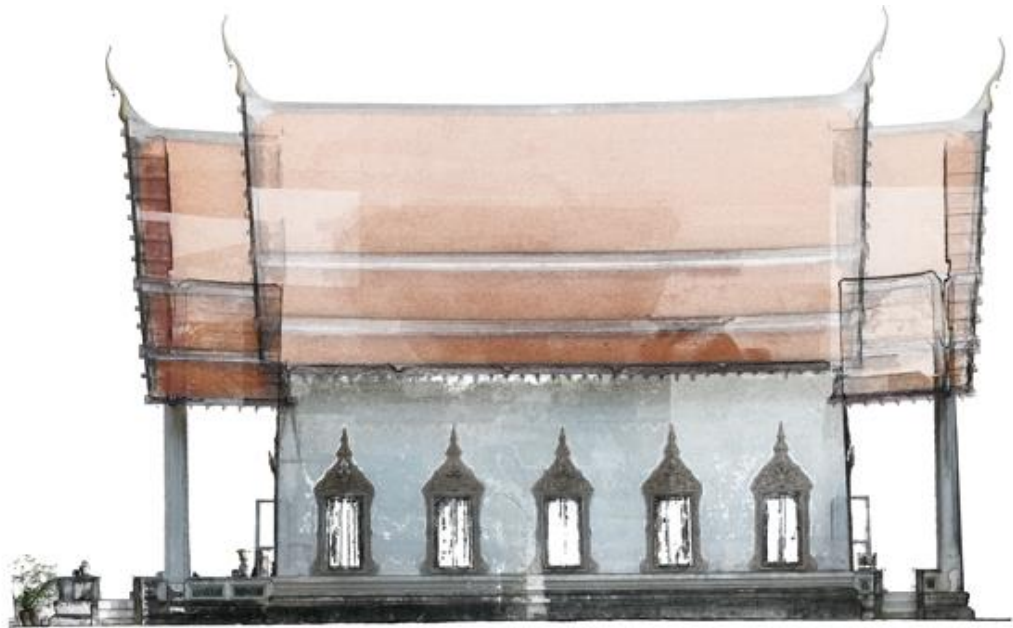
Four photos, a set of the photogrammetric methods shows the survey's marking point; the rest are the Orthogonal photo map, Point Cloud, and Digital Terrain Model (DTM) of the *ubosot* roof.



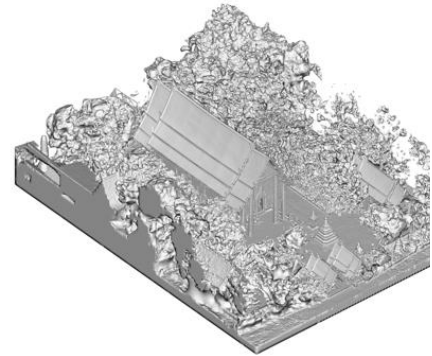
The orthogonal photo map of the *Buddhavas* area.



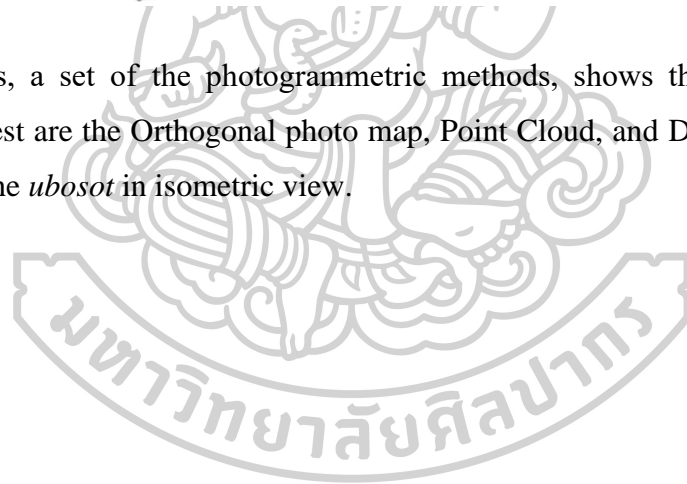
Two photos, a set of the photogrammetric methods, shows the Point Cloud and Digital Terrain Model (DTM) of the *ubosot* in isometric view.



Two photos, a set of the photogrammetric methods, show the Point Cloud and Digital Terrain Model (DTM) of the *ubosot* in elevation view.



Four photos, a set of the photogrammetric methods, shows the survey's marking point; the rest are the Orthogonal photo map, Point Cloud, and Digital Terrain Model (DTM) of the *ubosot* in isometric view.



Appendix II Related information

Chaitya-Stupa-Chedi

Chaitya is a sanctuary, or shrine with a *stūpa*, in Buddhist architecture and sometimes can mean *stūpa* alone¹³². The *stūpa* is a Sanskrit word; in the Pali word, it is *thūpa*. The meaning of these words is a burial mound derived from the mound that rises above the grave, while in the Vedic texts, it is a peak or top. In the Thai language, the *stūpa* is widely called *Chedi*. In Sri Lanka, the *stūpa* is called *dāgaba*, which *dhātu-garbha* (the Pali: *dhātu-gabbha*) means a structure containing within its womb or a reliquary or a repository¹³³. A *stūpa* is a significant structure in Buddhism. It was originally a reliquary of the relic of Buddha and symbolized the *parinirvāna* of Buddha. In a later period, *stūpa* is one of the representative symbols of the Gautama Buddha in the eyes of devotees who want the actual object for worship, along with the *Bodhi* tree and *Vajra asana* (the throne where the Buddha gained enlightenment, the Four Noble Truths)¹³⁴.

The *stūpa* structure used to contain Buddha relics and Buddhist sacred objects, as Gautama Buddha explained in the *Mahāparinirvāna Sutra*. The *Sutra* mentioned that the *stūpa* is constructed for only type of four people: a *Tathāgata* or the Buddha himself, the *Pratyekabuddha* (the Pali: *paccekabuddha*), the *arhat* (the Pali: *arahant*), and the emperor. In Buddhism, the *stūpa* taxonomizes into four groups: *Sarika*, *Paribhogika*, *Uddesika*, and votive. *Saririka* *stūpa* stands for those with the *Gautama* Buddha relics and his *arhat* disciples, including Buddhist teachers and saints. *Paribhogika* *stūpa* is constructed to keep the Buddha's belongings, such as a begging bowl or robe, as mentioned in a record called the Great *Tang* Records on the Western Region (*Da Tang Xiyu Ji*) by *Hiuen Tsang*. He is a Chinese Buddhist monk who travelled along the Silk Road in 12th B.E. from mainland China to the Indian continent to obtain Buddhist *tripitakas* and *sutras*¹³⁵. *Uddeshika stūpa* is dedicatedly

¹³² Kalyanamitra, *Dictionary*, 150.

Jiratassanakul, *Temple*, 37.

¹³³ Mitra, *Buddhist Monuments*, 1-10.

¹³⁴ Cummings, *Buddhist Stupas*, 12-16.

DK Publishing Inc., *Great Monuments*, 22-25.

¹³⁵ Harris, et al., *Illustrated Encyclopedia*, 100, 130-133.

built to be a Buddha's life memorial site, as recorded in both *Fa-hien* and *Hiuen Tsang* travelogues, such as his birthplace and his enlightenment *Bodhi* tree throne. Votive *stūpa* was the rest of it, mainly more minor than the others. It was made by the Buddhist pilgrims when they visited the consecrated places for attaining religious virtue. The materials vary from clay brick to stone to metal.

Timber in Thailand

Other common timbers are narra or *Pradu* (*Pterocarpus macroarpus*), a hard medium-weight timber with a yellow colouration at a reasonable cost. Siamese rosewood (*Dalbergia cochinchinensis*), or *Payung* in Thai, is used for furniture. Tamalin or *Ching Chang* (*Dalbergia dongnaiensis*) in Thai, known as king of wood. Monkeypod tree, or *Maka Mong* (*Azelia xylocarpa*) in Thai, is a durable wood used for floors, stairs, furniture, beams, windows, door frames, wall panels, and veneer. Malabar ironwood, or *Thakien Thong* (*Hopea odorata*) in Thai, is a huge tree used widely in construction and famous for its qualities. In Thai, gurjan or *Yang Na* (*Dipterocarpus alatus*) is commonly used in structural elements, interiors, frames, furniture, and plywood.¹³⁶



¹³⁶ Sthapitanonda, Nithi; Mertens, Brain, *Architecture of Thailand*, 70.

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