

## SUKHO THAI : ITS HYDRAULIC PAST

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**Translator's Note :** A fiend of Acharn Thiva Supajanya, the "Conjurer" in the eyes of his critics, I feel privileged to have translated one of his important works into English. This particular paper is chosen primarily because it gives the gist of Acharn Thiva's monumental works concerning the least known aspect of the Sukhothai region. As a student of Thai history, I have benefited from talks and inquisitive discussions with him. Unfortunately, most historians and archaeologists have either neglected, or turned a blind eye towards his interesting, and somewhat challenging, hypothesis. As a result, no scholar has as yet attempted to examine Acharn Thiva's contribution in a constructive way. Despite its controversial nature, Acharn Thiva's paper still merits the reader's unbiased scholarly attention.

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### 1. Background.

Sukhothai, Kamphaeng Phet and Si Satchanalai, three important ancient cities in the upper part of the central plain of Thailand, have two common characteristics : being walled and encircled by a moat or moats. Historical evidence and archaeological remains show them to have been associated cities and major centres since the Siamese began to consolidate their power in the region, probably in the early thirteenth century. Sukhothai, often thought of as the first Siamese capital, was then not only the cradle of Thai civilization but the hub of cultural activities and the centre of technological innovations.

Topographically, the upper part of the

heartland of Thailand is an expanse of land bordered to the north, east and west by ranges of mountains, and extending to the south to the Gulf of Thailand. The rivers Ping, Wang, Yom and Nan flow through the upper plain and converge at Nakhon Sawan to become the Chao Phraya, of which a tributary, the Tha Chin, winds its southerly course to the Gulf of Thailand. These rivers have not only facilitated communication between the upper plain and the sea, but they also have influenced the very patterns of settlements in this fertile region throughout history.

Sukhothai, Kamphaeng Phet and Si Satchanalai are situated on the western side of the upper plain, (Figure 1) with Sukhothai commanding a central position in between

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the other two. Kamphaeng Phet is situated on the east bank of the Ping, some 68 km. north of Sukhothai. Si Satchanalai, on the other hand, is to be found some 55 km. north of Sukhothai, on the west bank of the Yom. Peculiar enough as it is, Sukhothai stands close to a mountain, some 12 km. to the west of the Yom and at some 6 m. above the level of the Yom river plain. The Mae Ramphan canal, which runs east, connects the city moats with the Yom. Despite its curvy turns, the Mae Ramphan's straight course indicates that it is not a natural waterway, but a man-made drainage canal gravitating out-bound water towards the Yom.

## 2. Connection between the cities : the so-called 'Phra Ruang Road'.

There exist stretches of raised earth platforms dotting the route from Kamphaeng Phet to Sukhothai and Si Satchanalai. It is generally assumed that these are what remains of a road built to link Sukhothai, the capital, to the two **muang luk luang**, 'Viceroyal Cities', Kamphaeng Phet in the south, and Si Satchanalai in the north. When this assumption came about is not known, but it has influenced and prejudiced the views of conservative historians and archaeologists. It should be noted that King Vajiravudh (Rama VI) was the first scholar to have conducted a critical survey of the so-called 'Phra Ruang Road' or our stretches of earth embankments in 1907 and reported his findings in a book entitled **Thiaw Muang Phra Ruang**, 'A Study Tour of the Phra Ruang Country'. Although he concluded that the embankments were probably ruins of the 'Phra Ruang Road', King Vajiravudh also made his careful reservations. He wrote :

Let it be known that what I have written here is not meant to be authoritative. This should serve merely as a tentative assumption paving the way for researchers and historians to reconstruct a more accurate

picture. Therefore, I shall not be offended even if some other people happen to think differently. On the contrary, I should be very grateful to those for the contributions they will make to this field of knowledge.

King Vajiravudh's work is a wealth of essential information about the whole region and includes a survey map of the so-called 'Phra Ruang Road'. (Figure 2)

In 1967 the Department of Fine Arts conducted an evaluative survey of the historical monuments mentioned in **Thiaw Muang Phra Ruang**. Phithaya Dan-Ngam, a team member, observed that embankments along the route from Kamphaeng Phet to Bang Phan may have been the traces of an irrigation canal mentioned in Inscription XIII provenant from Kamphaeng Phet. This is against the firm conviction that the embankments were once a continuous road from Kamphaeng Phet to Sukhothai and Si Satchanalai.

## 3. The existence of a system of irrigation canal network.

One of Thiva Supajanya's recent studies (1983), which is based on a critical interpretation of aerial photographs and relevant data, reveals astonishingly that the partly-destroyed embankments found along the route from Kamphaeng Phet to Si Satchanalai are not to be understood as parts of a continuous road. They actually serve as the traces of the digging of two irrigation canals, one coming from the Ping river just north of Kamphaeng Phet, and the other running from the west of Si Satchanalai. These two canals meet at the lowest point of the upper plain and thus rechannel the water to run east along the Mae Ramphan, a third man-made canal, before leveling off into the Yom. The fact that a system of man-made irrigation canal did really exist is proved by the following considerations.

### 3.1 Geographical conditions.

Sukhothai, Kamphaeng Phet, and Si Satchanalai are situated in one of Thailand's dry zones. It is one area that suffers from droughts and inadequate rainfalls. The three ancient cities, being in the western part of the plain and having a mountain range in the background, stand right in the rain shadow area and thus receive no real benefit from the rain - producing southwestern monsoon. According to statistics, this region used to experience the lowest amount of rainfall of 643 mm. per annum, qualifying it as one of the driest places in Thailand. The topography of the area between Si Satchanalai and Kamphaeng Phet features a mountain foot-hill slope which adjoins the western terrace of the Yom river plain. This geographical contour lets the water pass down the slope in the easterly direction and empties into the Yom. From the geographical point of view, Kamphaeng Phet and Si Satchanalai, which stand on a river bank, are endowed with fertile soil especially suitable for sustaining the growth of extended settlements. Without the proximity of water sources, the land between Kamphaeng Phet and Si Satchanalai, despite its fertility, is hardly suitable for agriculture. However, archaeological as well as historical evicences attest to the fact that this seemingly arid zone was in the past a well-developed agricultural area, especially in the vicinity of Old Sukhothai. It is reasonable to suppose that settlers in this region did not depend entirely on the mercy of nature but possessed the kind of technology that had been used to solve the problem of water shortages. This technological expertise involved the digging of canals for agricultural, consumption and communication needs.

### 3.2 Characteristics of the embankments.

The embankments, the so-called 'Phra

Ruang Road', are the earth structures formed when piles of dug-up earth from canal construction were deposited along its bank (s). The parallel tracks of the canal and its embankments are still visible. It can be established that the embankments were constructed on both sides of the canal in the low area, and a single line of the embankments would be constructed on the lower side of the canal in the slope area. It would sound absurd if one thinks that the parallel embankments were originally conceived as two roads along the same route. In fact, these coupling earth embankments were designed to raise the level of water and channel it to run along the course of the canal. The uncoupled embankments on the opposite side of the slope were undoubtedly designed as a barrier tapping down-pouring water into the receiver canal, and consequently, flowing on along the course. (Figure 3)

### 3.3 Breaks and connections of the tracks.

Even though one can trace the entire course of the canal and its embankments from Kamphaeng Phet to Si Satchanalai, it must be noted that parts of the canal and the Phra Ruang Road (embankments) are invisible on aerial photographs owing to the thick layers of alluvial deposit. Theoretically, it is possible to identify the missing connections. Regarding the Phra Ruang Road (embankments), one fails to draw a complete through course owing primarily to the many breaks without evidence of an embankment. The canal track presents a better picture; all its connections can be identified, especially from the meeting point with the Ping at Kamphaeng Phet to Khlong Nong Kham, west of Si Satchanalai. In certain sections of the canal a natural waterway serves as a linkage. At Ban Thung Muang the canal tracks are connected through a rectangular-

shaped reservoir walled by elevated embankments. The elevation of the earth banks is a method used to raise water level in the vast low plain. (Figure 4) At Ban Thung Muang one can still see the way-in and exit tracks clearly.

### 3.4 The embankments at Kamphaeng Phet, Sukhothai and Si Satchanalai.

Aerial photographs show the city plans of the three associated cities to be ones of well preserved historical remains such as moats, walls, and entrance gates. (Figure 5) The stretches of the Phra Ruang Road (embankments) are clearly marked, but there is no evidence whatsoever to show that the track of those embankments was a road running directly to the cities.

At Kamphaeng Phet, the visible track curves towards the north of the city and terminates at the Ping. Besides, there is the evidence of the connection between the main track and the city via an irrigation canal constructed to feed consumption water to the town. This canal is presently known as the Khlong Thor Thong Daeng now being dredged up from the Ping to Bang Phan in compliance with King Bhumipol's suggestion.

At Sukhothai, the canal track and line of embankments run to join the city moat at the southeastern corner. It would be rather inexplicable if something designed and built as a road should terminate and join the eastern moat of a city and not one of its entrance gates. The eastern moat of Sukhothai is connected with the Yom by the man-made Mae Ramphan canal as mentioned earlier in this paper.

At Si Satchanalai, what is believed to be the track of the Phra Ruang Road, which shows the evidence of a canal and embankments, terminates at a meeting point with the Nong Kham canal, about 1.4 km. west of the

city. As a matter of fact, there are no traces of an elevated road running to the city. Furthermore, the canal track is separated from the city by a mountain. The Nong Kham canal, however, runs through to join the northern moat of the City, whereas another canal links the Nong Kham canal to Ban Koh Noi, an important pottery-production centre.

### 3.5 Ancient cartographic representation.

There exists an ancient map, the so-called 'Ramathibodi I's Military Map'. It is not possible to determine the date of the original copy of this interesting map, which does not locate the city of Bangkok. The existing copy, which is likely to date from the times of Rama III (1824-1850), give a fairly accurate cartographic representation of military routes, towns, rivers, hills, and some other details in what is present-day central and northeastern Thailand. The relevant western half of this ancient map is reproduced here. (Figure 6) The map shows clearly that there is a canal running from Kamphaeng Phet to a mountain adjacent to Si Satchanalai (Sangkhalok). This does not represent the course of any river, but it corresponds to the track of a man-made irrigation canal from Kamphaeng Phet to Si Satchanalai proposed for reconsideration here. The map also represents another canal linking it, at a location slightly above mid-point, to the Yom. The Mae Ramphan canal fits in with this representation beautifully.

### 3.6 Epigraphic evidence : Inscription XIII (A.D. 1510).

An inscription at the base of a Shiva image found at Kamphaeng Phet and dating from 1510 contains a brief account of the renovation of that city in the early sixteenth century A.D. A statement of this so-called 'Inscription XIII' reads :

One other thing... Since the **thor** (canal) which had been built purposely by Pu Phraya Ruang to bring water to Bang Phan had become silted up, our people had to depend solely upon rain water for the rice fields. But now as the **thor** had been discovered and dredged up, they no longer practise rain-fed but irrigated rice cultivation.

The existence of a **thor** or irrigation canal at Kamphaeng Phet and its impact on the agriculture of the region is well attested to in this inscription. The negligence of the canal over long periods may have brought about an adverse effect on the entire rain shadow area near Kamphaeng Phet. The revitalized interest in the discussed canal at the beginning of the sixteenth century A.D. seems to reflect the actual situation.

At Bang Phan, the patterns of rice fields and network of irrigation canals are the evidence of well - planned hydraulic management. In this particular aspect of small - scale hydraulic control, Bang Phan is representative of many places along the route from Kamphaeng Phet to Si Satchanalai.

#### 4. Sukhothai as a hydraulic town.

##### 4.1 Geographical aspect.

Unlike Kamphaeng Phet and Si Satchanalai, which stand on the banks of the Ping and the Yom respectively, Sukhothai is located on a high terrace at distance of 12 kilometres from the Yom. In the past, the course of the Yom was much nearer Old Sukhothai, but it still measures some 7 kilometres. Considering its natural environment, the Sukhothai area hardly offers an incentive for a town to be built there. The two adverse factors are the lack of water for agricultural and consumption uses and its relative distance from the main communication routes. Compared to all other ancient settlements in Thailand, Sukhothai is unique

in the sense that it is the only town to have developed in a most unlikely geographical environment.

Despite the existence of an irrigation dam, the **Saritphong**, in the valley of a mountain to the west of the town and a number of natural wells in the town itself, these supply sources could hardly meet the demands needed for everyday consumption use, especially in drought years. Extra use of water was needed to fill the moats, the **barai**, 'man-made reservoir', and to feed the paddy fields. This reality contrasts sharply with what is depicted in the epigraphic records mentioning a prosperous and verdant Sukhothai where "the water teems with fish and the fields are covered with rice stalks". If there is no exaggeration involved in that statement, then Sukhothai must have been supported by an efficient hydraulic system.

##### 4.2 The canal system antedated the foundation of Sukhothai

The city plan of Sukhothai (Figure 7a) shows clearly that its outer moats and walls on the side are superimposed upon the older moat and the rampart of the Phra Phai Luang, an ancient Khmer monument, probably a Hindu shrine. This superimposition and other archaeological evidence reveals that the Phra Phai Luang had stood there before the Sukhothai city plan was conceived. It is notable that the arrangement of the Phra Phai Luang plan places its square - shaped monument in conformity with the true geographical directional orientation, a distinct Khmer tradition. On the other hand, the rectangular-shaped Sukhothai with its moats and ramparts deviates slightly from the true directional orientation, and it stands at a right angle in relation to the so-called 'Phra Ruang Road' or our proposed irrigation canal. Removing Sukhothai from the map as is done here in Figure 7b will help us see the

true situation more imaginatively. The two canals, one running from the north and the other from the south, meet at a location where Sukhothai was to rise. From that junction the Mai Ramphan canal carries the water through and passes it into the Yom. It is logical to think that the Phra Phai Luang had existed there as a Khmer religious shrine and, perhaps, one of the chief functions of its officiators may have involved the management, administration, and hydraulic control of these canals.

The achievement of this hydraulic engineering feat had undoubtedly transformed the upper plain from Kamphaeng Phet to Si Satchanalai into a fertile region and contributed to the increase in agricultural production. Besides, the canals must have been used as a line of communication and for transportation. The parallel embankments, wherever they were constructed, served practically as a road. It is quite certain that when Sukhothai was first built a section of the main canal was used as the city moat on the east side. As a result, the moats and ramparts on the other sides were adjusted positionally to make a right angle in relation to each other, having the eastern moat as the base. What appears on the aerial photographs also reveals that originally Sukhothai possessed only one inner wall and moat, and they did not extend over the Phra Phai Luang enclosure. The superimposition of the outer walls and moats of Sukhothai upon the moat and rampart of the Phra Phai Luang came at a later date when it was decided that Sukhothai needed a triple-wall frame. This important change necessitated an adjustment of the whole irrigation canal network. A new irrigation canal was dug south of the city to drain water into the Yom in order to reduce water pressure

before it reached the city's outer moat. This is the Khlong Yang canal. There is further aerial photographic evidence to prove that there exists another canal running parallel with the eastern moats and connecting the hydraulic system south of the city with that to the north.

### 5. Conclusion and suggestions.

Our perception of the past for the Sukhothai-Kamphaeng Phet - Si Satchanalai region has been influenced by the jaundiced views of those historians and archaeologists who derive their interpretation from the study of ancient monuments and buildings only. It is unfortunate that no attempt has been made to present Old Sukhothai in its natural and environmental perspectives. Also, little has been said about the ability of its people to use the appropriate technology to conquer the limitation of natural resources and to transform the arid region into a fertile one. It is, in fact, the hydraulic technology described in this paper that had contributed most to the rise of Sukhothai as a prime city in the early history of Thailand.

With the passage of time, Sukhothai, ravaged by frequent wars and weakened by subsequent political changes, lapsed into its former arid state, for there was an apparent lack of central administrative control over the hydraulic network. This region is now more densely populated and the three associated cities have been renovated and registered in the World Cultural and Natural Heritage List.

**The question is what action one should take to ensure that the hydraulic past of Sukhothai be preserved and not neglected again.**

Figure 1. Map of the Upper Chao Phraya plain indicating the locations of Kamphaeng Phet, Sukhothai and Si Satchanalai.

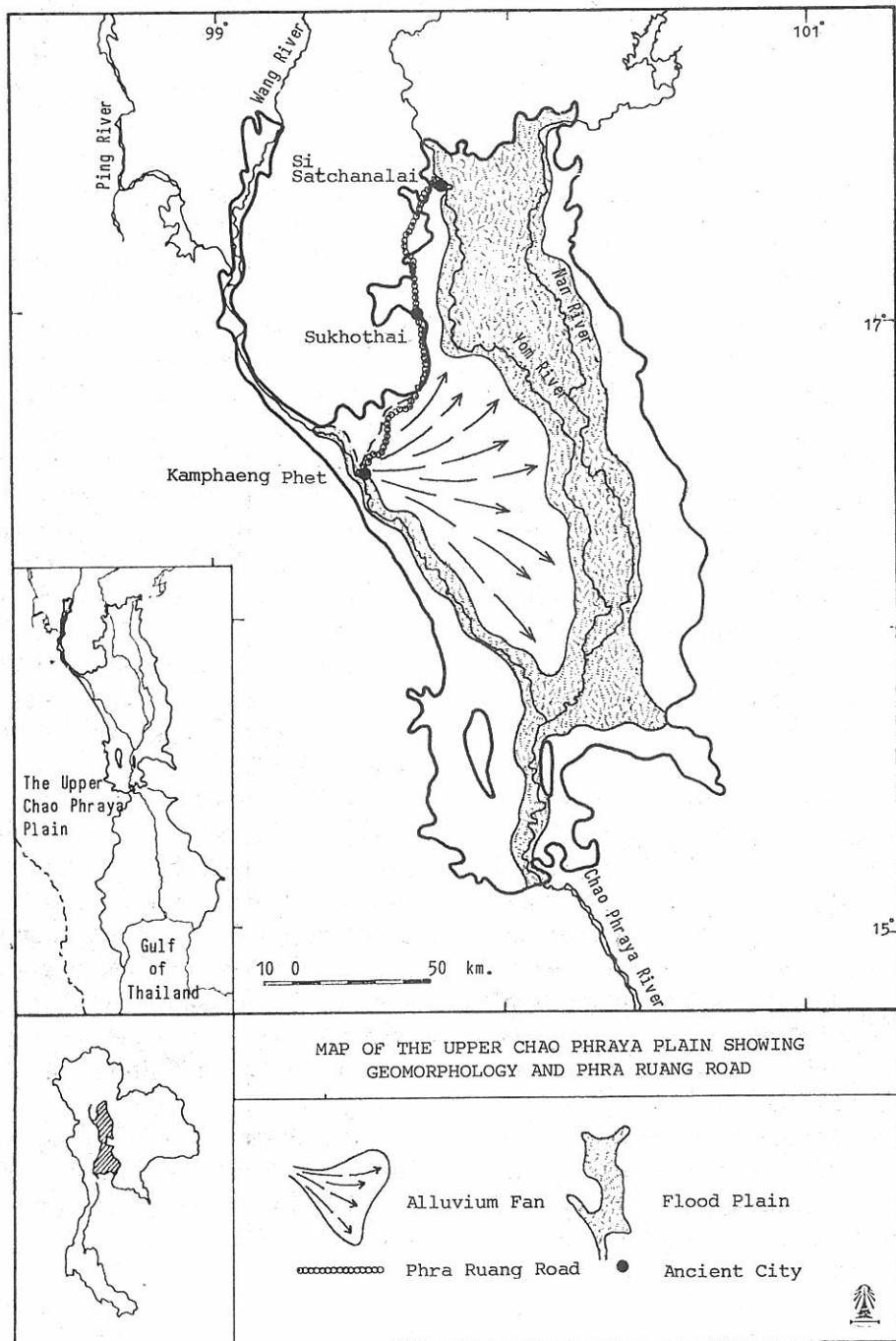
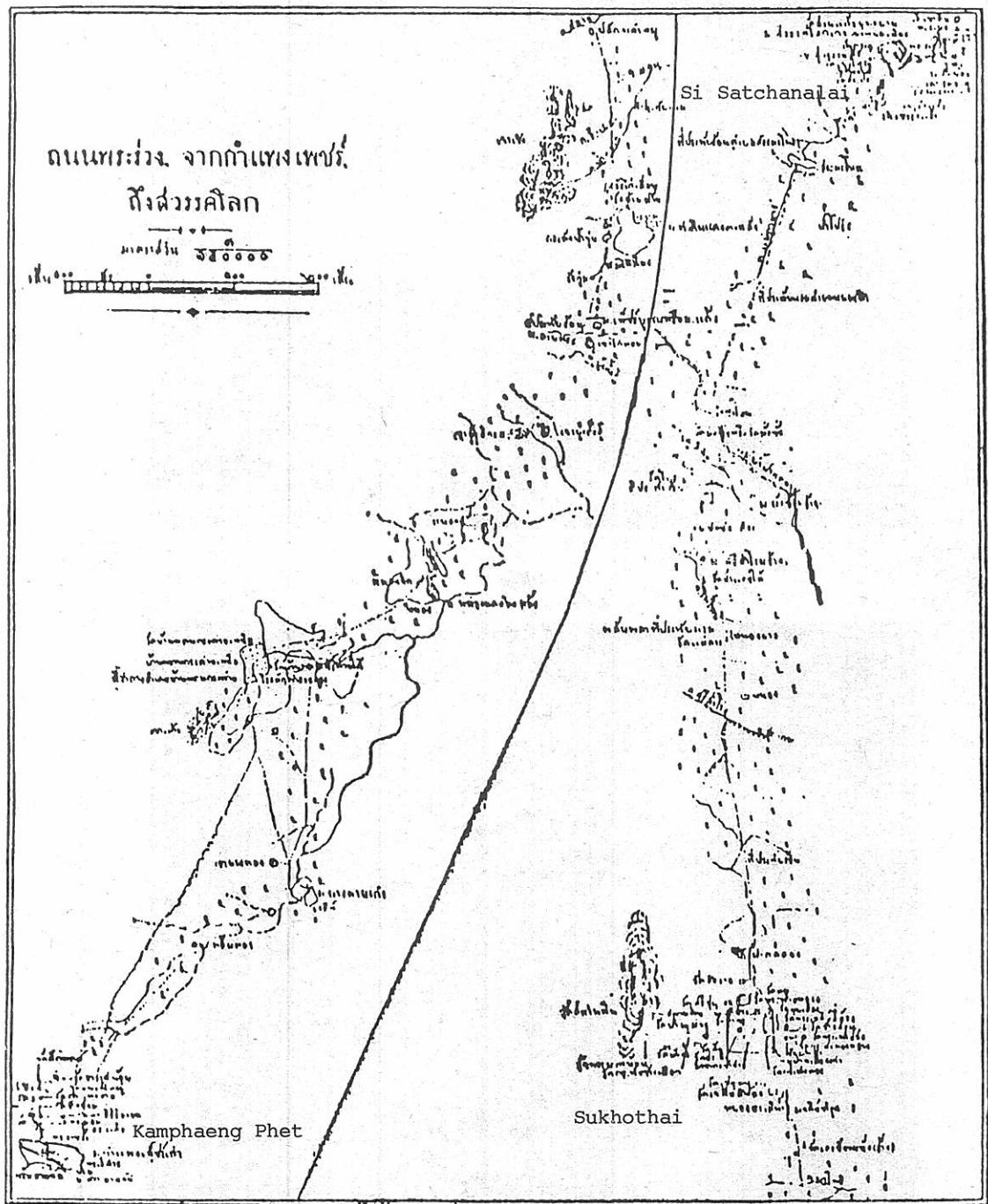


Figure 2. Route map of "Phra Ruang Road", prepared during the study tour of the Phra Ruang country by King Vajiravudh (Rama VI) in 1907.



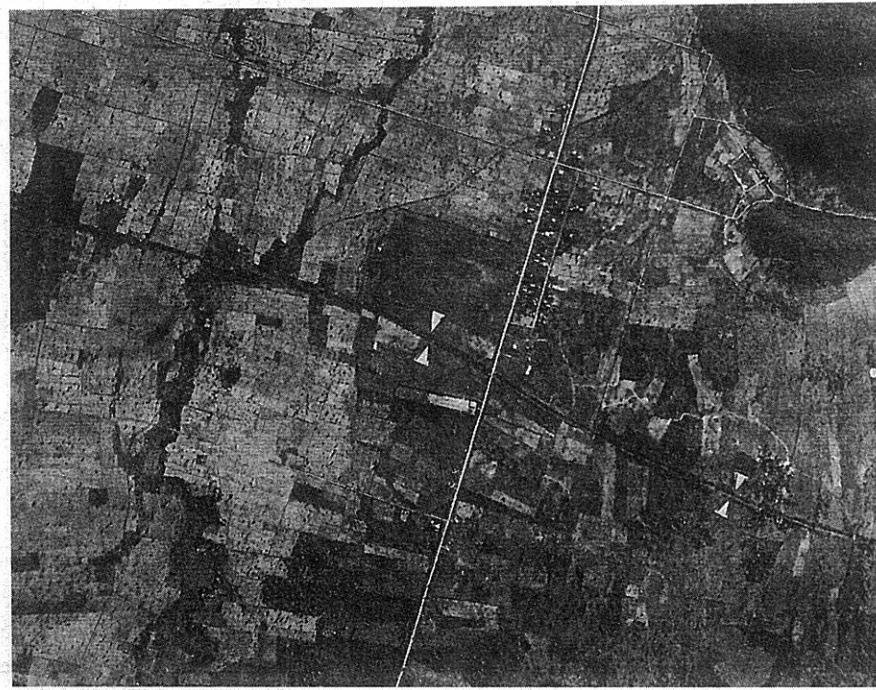
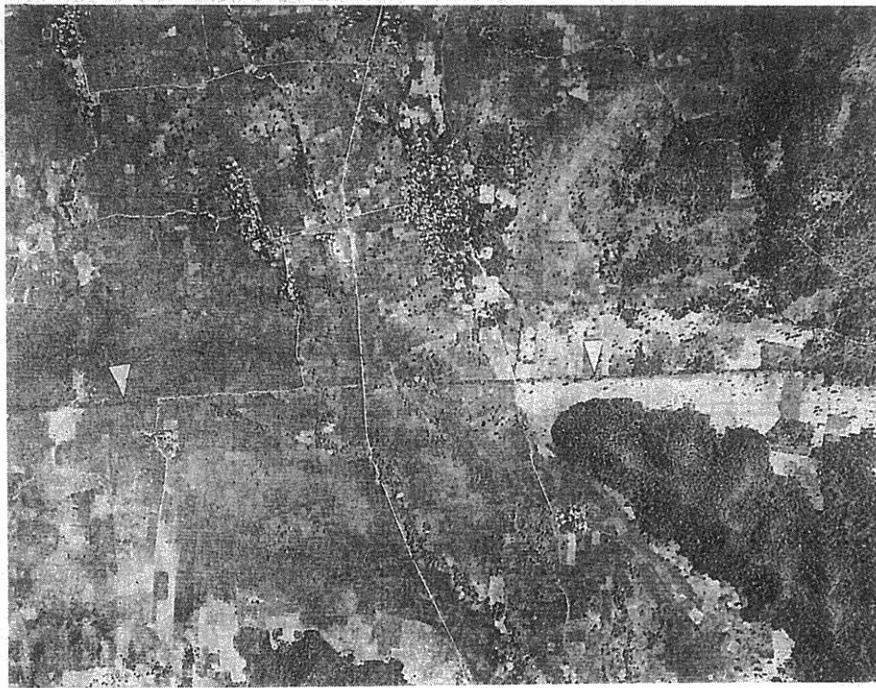


Figure 3. Aerial photograph demonstrating a canal with double embankments (left), and a canal with single embankment (right).

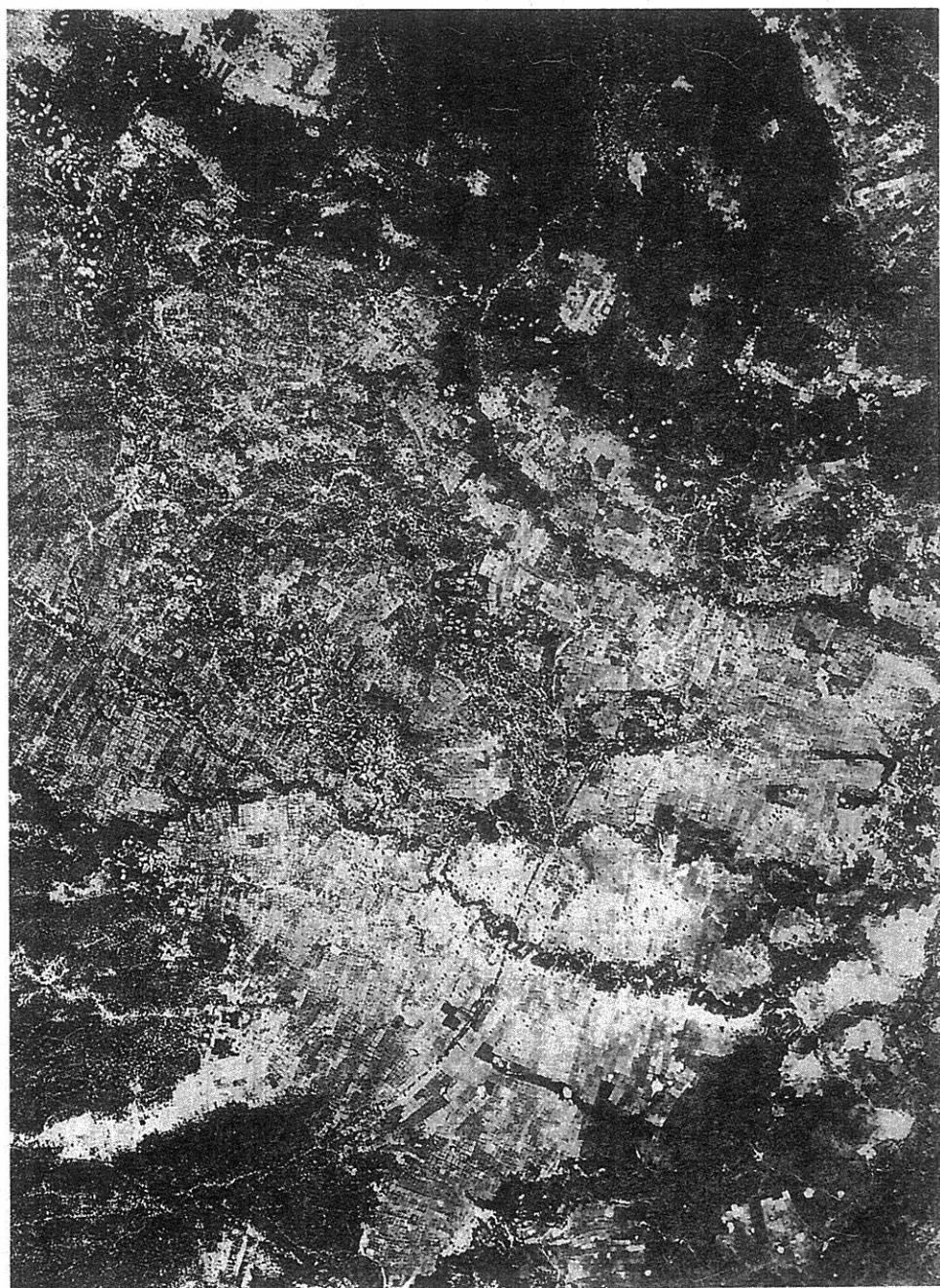


Figure 4. Aerial photograph shows large rectangular pond with high wall. It is constructed for the use of elevating water level when a canal crossing low topography.

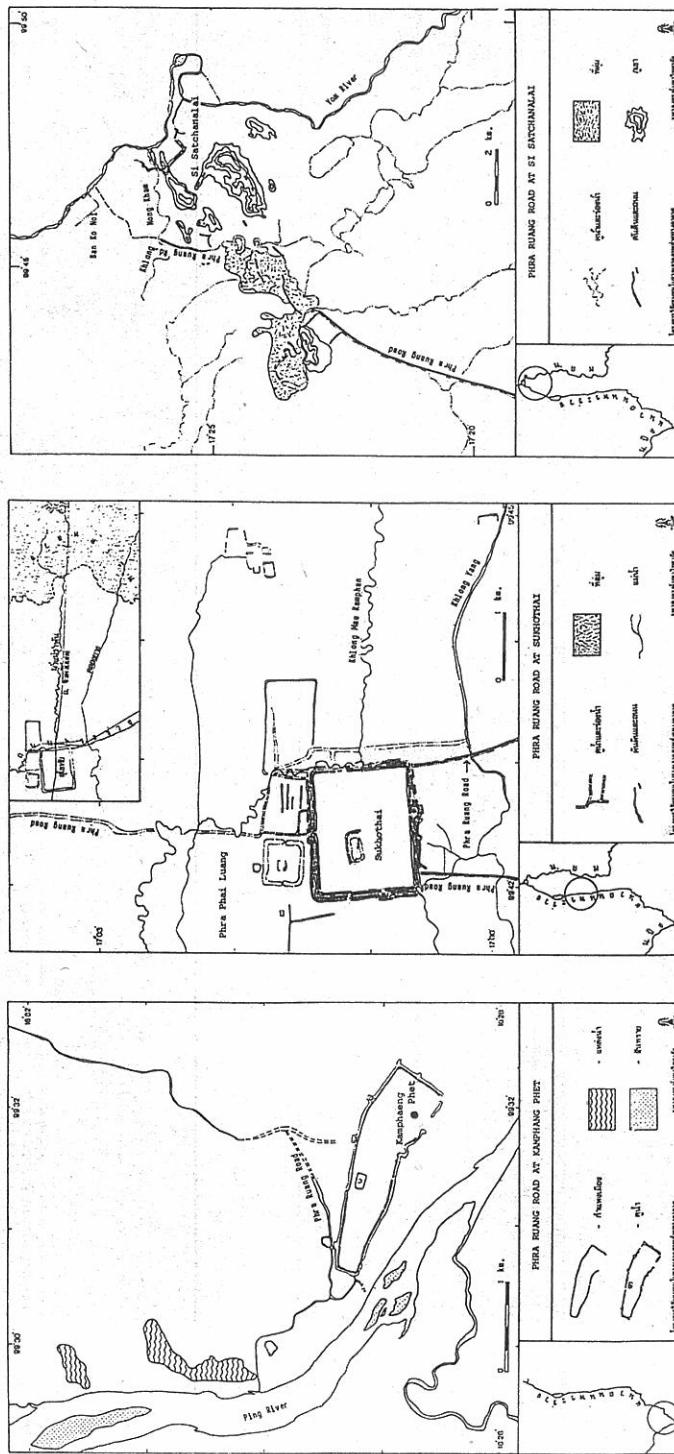


Figure 5. Map of Phra Ruang Road at Kamphaeng Phet (left) Sukhothai (middle) and Si Satchanalai (right), demonstrate an unusual connecting with the city plans.

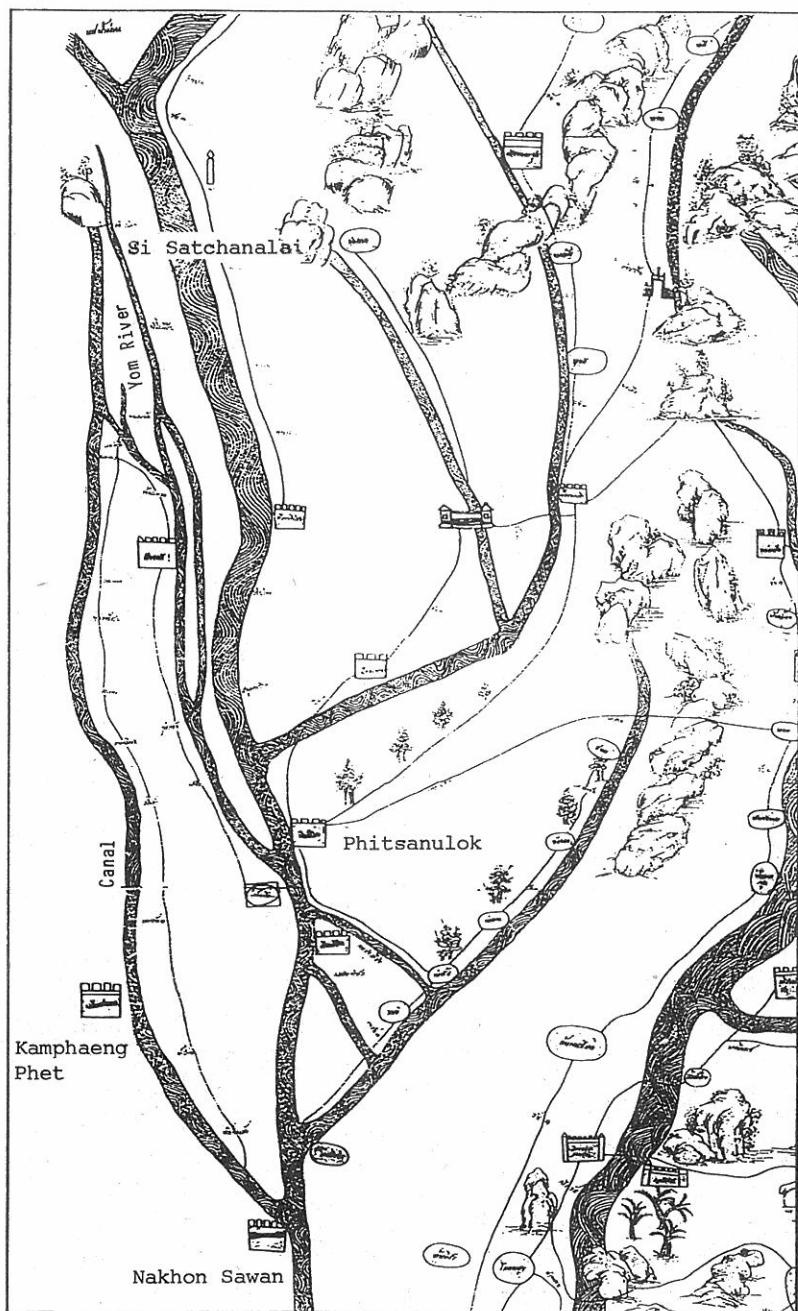


Figure 6. Map showing part of the "Ramathibodi I's Military Map", demonstrates the water way connecting Kamphaeng Phet and Si Satchanalai, and its cross connections to the Yom River.

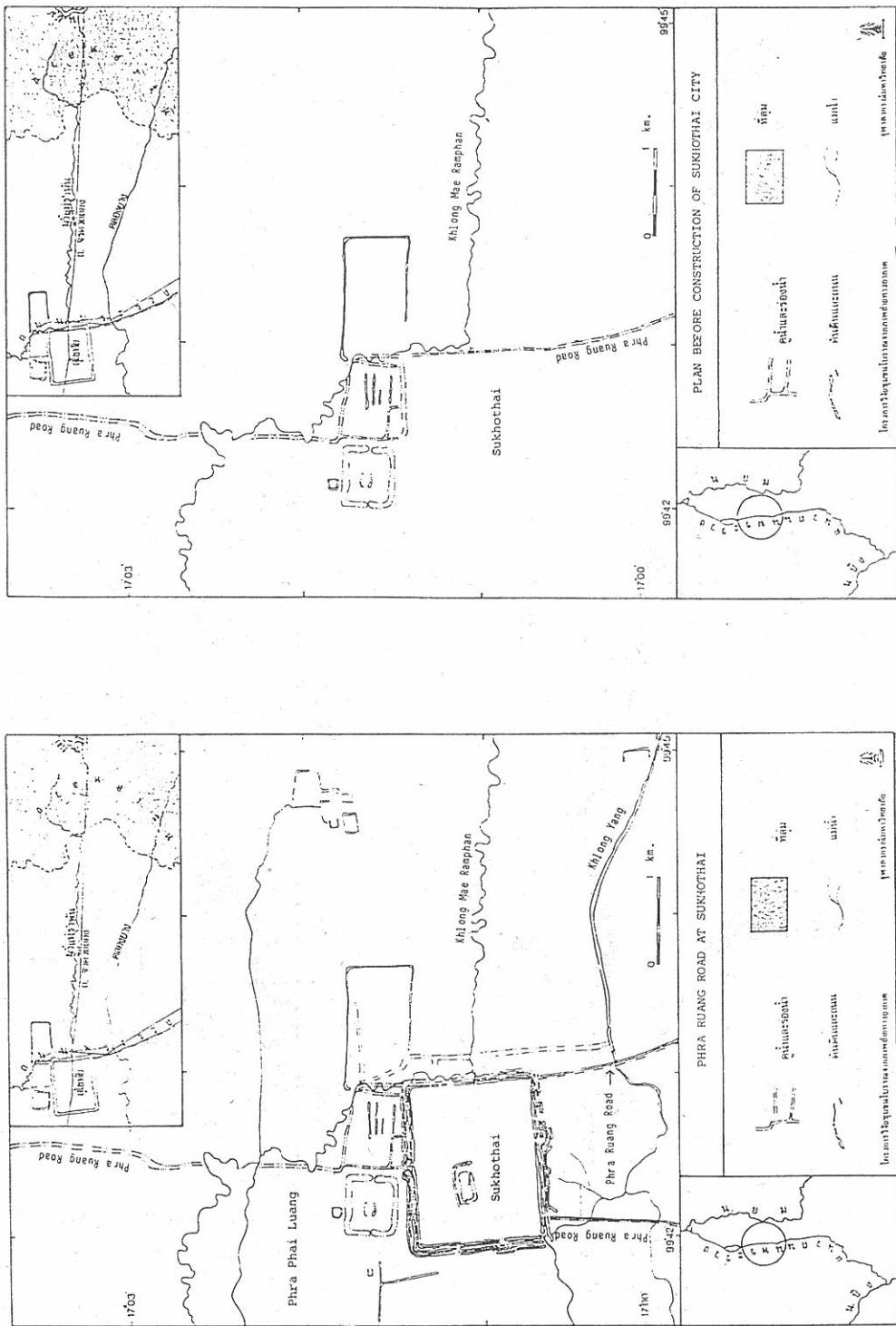


Figure 7. A city plan of Sukhothai (left) demonstrates its northern moat superimposing on the plan of Phra Phai Luang, and the plan (right) before the construction of Sukhothai City.