

FLOOD AND WATER MANAGEMENT: CASE STUDIES IN THAI HISTORY: WHAT LESSON THAT WE SHOULD LEARN?

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Abstract

For many thousands of years that people who lived in the area called ‘Thailand’ had been settled along the waterway and estuary. Water and flooding mean life and way of living to them and be part of their culture through time. The paper consists of four main sections which are 1) introduction of water culture in Thailand; 2) lesson learnt from three historic water-based cities (Sukhothai, Wiang Kum Kam and Ayutthaya); 3) discussion on flooding circumstance; and 4) a conclusion. This paper aims to present lesson learnt and good practice in how Thais live with water and flood. This research was mainly collected by relevant studies either written or pictorial documents from the authour and his research colleagues who are Supajanya and Sumet Jumsai, the two well-known geologist and architect as well as cultural related to water experts. Water-based contexts in this paper are presented since Thavaravadee era since it has reflected how water-based people were. By learning how Thais lived with water in the past show constructive ways of living by the water networks for various advantages (defensive strategic city, transportation, agriculture, etc.). Further applications between indigenous knowledge with appropriate technology for living with flood should be promoted in Thailand for coping with climate change as global challenges and for achieving future sustainability.

Keywords: Flood, Water Management, Thai History

INTRODUCTION: Thailand and Its Water Culture

For many thousands of years people who lived in the area called ‘Thailand’ had been settled along waterways and estuaries. Water and flooding became a way of life to them and became part of their culture over time. Tiva Supajanya, a geologist, and Sumet Jumsai, an architect, examined culture related to water and agreed that the ancient settlements in the central plain of the Chao Phraya River were located in areas that comprised water courses that provided convenient access to the sea and suitable land for agriculture. Those man-made canals linked some ancient settlements, allowing for trade and other contact. The waterways were used as a means of transport.

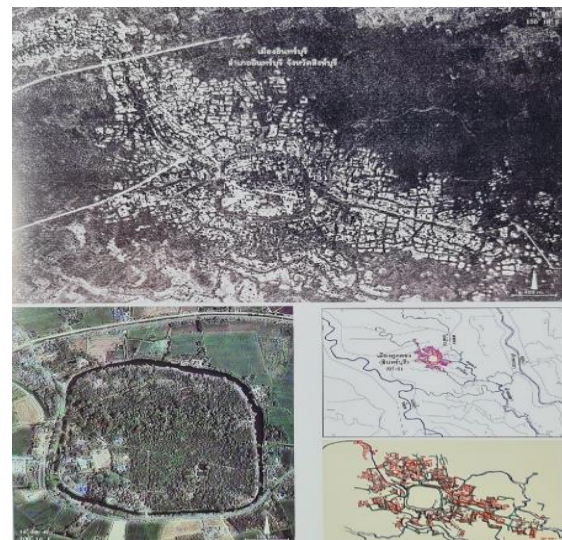


Figure 1: Maps of Thailand Central Plain area. Comparison between Dvaravadee (Thavaravadee) period and present day (Thiva Supajanya, 2004).

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This local knowledge had been applied until Ayutthaya and early Rattanakosin periods. The best example is Inburi, an ancient water-based city, of the Thavaravadee age. It was found 40 years ago in Singha buri province based on aerial photographs comparative analysis and field survey conducted by Tiva Suppajanya (Figure 1).

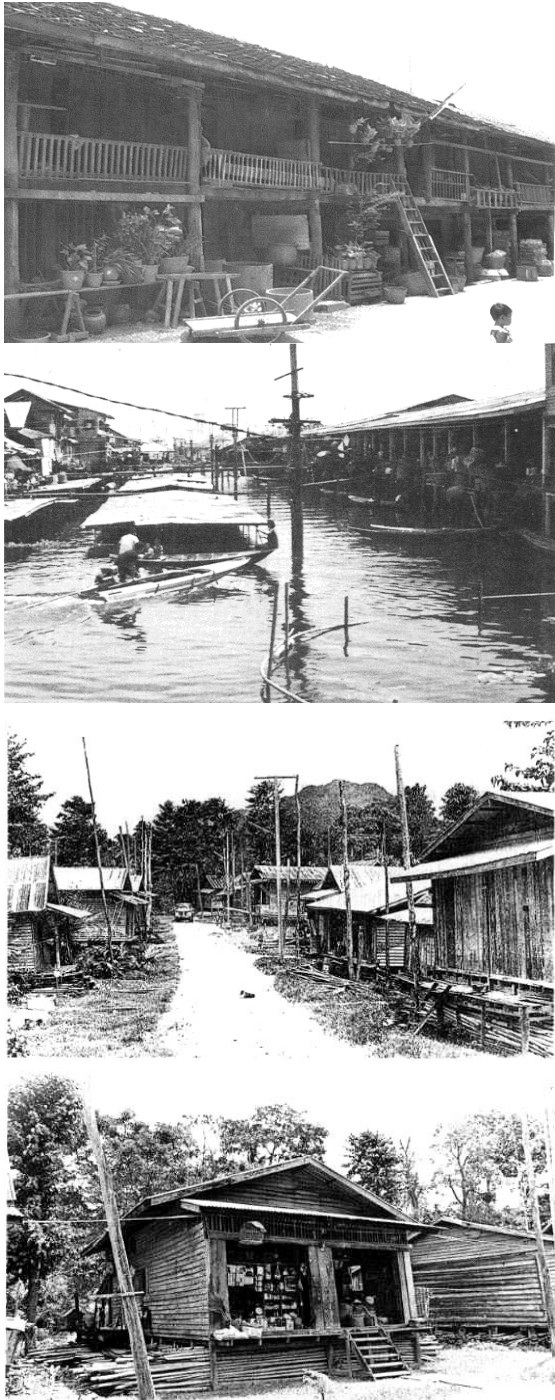


Figure 2: Bang Li, Supanburi and Tha Kanon, Suratthani. (Source: Sumet Jumsai. 1997. *NAGA: Cultural Origins in Siam and the West Pacific*. p. 99,158)

The old aerial photographs show the trace of a waterway network surrounding 20-30 small water-based settlements. We can say that people who lived in this area since the Thavaravadee era were also water-based people; as they learned how to live harmony with water.

Adaptability to Live with Water in the Past

It has been said that one of the best abilities of Thai people in their way of life is their ability to develop and adapt their home environments to the presence of water, such as building their houses on stilts or having floating homes built on rafts. The key issue is “not against water” (Shinawatra, 2002: 243). Traditional houses built on stilts or rafts can be seen in Bang Li, Suphanburi or Tha Kanon in Suratthani provinces in the old day. This form of traditional architecture reflects the ability of Thais to live with nature. It has developed over a long time and it has become part of the local culture. Today these ways of life are no longer exist and these people are forced to adapt to an urban way of life as may be seen in the case of Suphanburi.

LESSON LEARNT: Three Historic Cities of Sukhothai, Wiang Kum Kam and Ayutthaya

Before becoming Thailand, there were many stories about the rise of settlements and kingdoms in the area. Most of those historic settlements related to water and wisdom of living with water and hydraulic management. The stories of three heritage cities (Sukhothai, Wiang Kum Kam and Ayutthaya) indicate the wisdom of the past.

CASE 1: Sukhothai Heritage City

Sukhothai – The Sukhothai kingdom was established at the decline of the Khom (Khmere) Empire after Khun Pha Maung and Khun Bang Klang Hao, the two Tai Chieftains, had driven the Khom from Sukhothai in late 18 century B.E. Still, the local wisdom in settlement the city was existed. Sukhothai city was located far from the Yom river basin on the slope of a mountain where the Saleedpong

water reservoir (earthen dam) was located. It was used to supply water to support the three layers of the Sukhothai city moat and the entire city agricultural irrigation system. The remains of the water irrigation system reflect how people managed water system in efficient approach which was adapted from the Khom empire. The reason why they choose to settle Sukhothai far away from Yom river basin was to avoid annual flooding. It may be suggested that Sukhothai city planning is the prototype of Chiang Mai due to the historical record of the past with the water reservoir and irrigation system.

According to a remote sensing system technique, Tiva Suppajanya found that beside the city's local irrigation system, Sukhothai took water from both Ping River basin in Kamphangpetch in the southwest and from Yom River basin in Srisatchanalai (Si Satchanalai) in the northeast to feed the city moat by means of a gravitational canal and reservoir. Referring to a cross-sectional geography through the alignment of the three cities, it indicates that Sukhothai was situated on a lower level compared to the other cities (Figure 3).

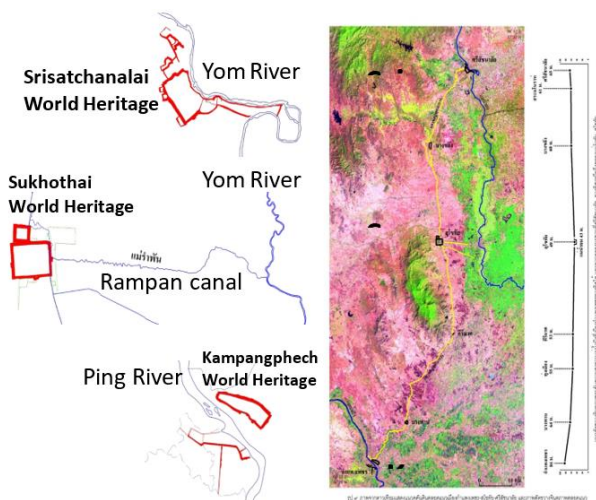


Figure 3: Cross-sectional geography through the alignment of Three World Heritage Cities (Source: Tiva Suppajanya, Geo-Informatics and Space Technology Development Agency (Public Organization). 2011. *The Heritage from Space*. P.250-251)

This gravity means that it was possible to divert water from either the Ping river to the southwest and the Yom river to the northeast through pipes and canals with the Barai Reservoir at the midway point to help increase water pressure to reach Sukhothai, located at the centre, and drain into the Yom river by Mae Rumpun canal managed to the north Barai where the Phra Pai Luang temple was built (Supajanya, 2004: 224). It may be suggested that although the same technology was used in other ancient civilizations such as the Marrakesh waterpipe and pit called “qanat” of the Arabic empire of Morocco (Pierre-Louis Viollet, 2007: 213) and the aqueducts of the Roman empire, but each case had its uniqueness of method and implementation. The lesson learnt from Sukhothai heritage case is that it is more secured to establish the city on higher ground (if available) for flood protection and a stronghold to fortify it with a proper irrigation and drainage systems.

CASE 2: Wiang KumKam, Chiang Mai

Wiang Kum Kam – It had been referred in Local Chiangmai chronicle that Phya Mungrai had moved from Hariphunchai (Previous name of Lumphoon province at the Thavaravadee age) after conquered in B.E. 1824 and five years later he had established Wiang Kum Kam to be the first capital city of Lanna Kingdom in B.E. 1829. In the annals recorded about the construction of canal four sides surrounded the city wall to let water by gravitation flow from Ping river (Figure 4).

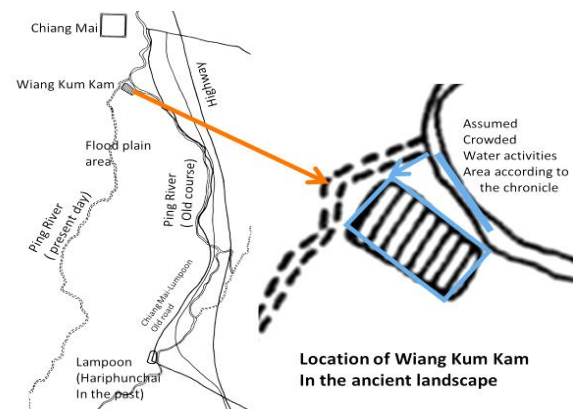


Figure 4: Location of Wiang Kum Kam in the ancient landscape (Author)

There was very crowded commercial activities and water-based transportation during his stay in Wiang Kum Kam. Once when Phya Mungrai had impersonated himself to investigate the water-based and merchandise activities. At the pier, people seemed happy. This urban fabric reflected local wisdom in choosing city location for water-based transportation and commerce including the use of city moat for protection and drain water during flooding. However, the location of Wiang Kum Kam was laid in a low plain of the Ping river making the city intruded by flooding every year (Figure 5).



Figure 5: Location of Wiang Kum Kam (Authour)

According to the consultation with his two friends, Khun Ngummuang of Payao and Khun Ramkumheang (Ruang) of Sukhuthai in B.E. 1839. Phaya Mungrai decided to move and build Chiangmai in the square form with moat and laid on the foot hillslope upper away from the Ping river bank. Later then Wiang Kum Kam was left after it was hit by a big flood in B.E.2200, since it was almost 400 years after the first year it had been constructed. Lesson learnt from Wiang Kum Kam reminded that the city shouldn't be established in high flood risk area unless proper water management and drainage system were provided.

CASE 3: Ayutthaya Heritage City

Ayutthaya is the previous capital city of Thailand after Thonburi and before Bangkok. According to a strategic location of Ayutthaya settlement, the city was planned and patterned by water network and flooding played a major role for living in Ancient Ayutthaya. The Ayutthaya Citadel was situated on an oxbow plain of old Lopburi River where 3 Rivers of Chao Phraya, Pasak and Lopburi interconnected in line with connecting moats making the city become as an island afterward (Figure 6).

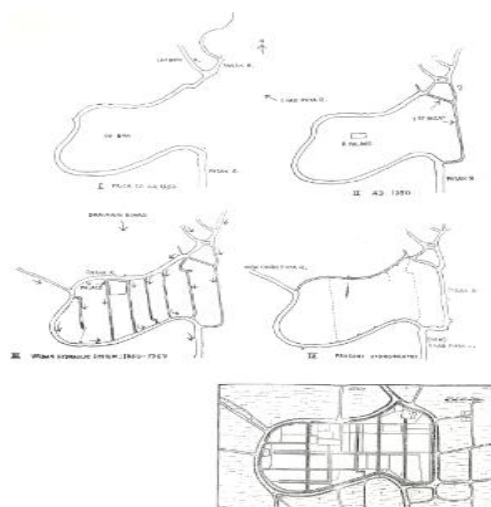


Figure 6: Sketch plan of Ancient Ayutthaya before became Island and Hydraulic wisdom (Source: Sumet Jumia, 1997)

The canal network was employed as the strategy to promote and protect Ayutthaya by that time as port and fortress town which is well-known as the hydraulic wisdom of Ayutthaya stressed by Sumet Jumsai (1997). In former times, the Thais regarded water as one of the main criteria for building a capital city. Begin with the first settled city at Tumbol Wiang Lek before moved into the Northeast area where the oxbow plain of Lopburi offered better strategic location; because this area was surround by three-sides rivers i.e. north, west and south. Afterward Lopburi River in the north was connected with the west channel by digging another eastern moat resulting in an island formation.

Then after Pa Sak old river course on the Northeast became enlarged to be a new course of Pa Sak river until present day. By this creation, Ayutthaya citadel formed as a long oval shape making it different from Khmer city characteristics (square shape) or other rectangular city forms. Furthermore, canal and shortcuts were made to connect Ayutthaya with the Chao Phraya River (Figure 7). It was the city construction principle by mean of city perimeter waterway determination.



Figure 7: Shown Sumet Jumsai's Reconstruction plan of Ayutthaya city's canal that must be revive and connect as an old canal network for flood protection. (Source: Weeraphan Shinawatra, 2010: 3)

Ayutthaya's location benefits their glory era as a Citadel Island surrounded with water (rivers) and flood plains that contributed such a fertile land after annual flooding. In some years during flood season with over demand of water, Ayutthaya people wisely used their canal networks to release water from the upstream river through the citadel island together with an irrigation system for managing their agricultural land. This city strategy with its unique water fabric reflect how Thais adapt their wisdom to live as water people. This unique way of living is created since our ancestors had learnt how to settle their city without against to the flow of the waterway and how locals learn how to live on floating or stilt house during flood season for many centuries.

Strategically, Ayutthaya's location surrounded with water was formed a strong hold fortify to protect the city from invaders by using the canal network and flood season as the

war tactical challenge to protect Ayutthaya for more than century so called "flooding tactic". According to the record in the annals, during flood season the surround flat plain is usually covered by water like a big lake without clear boundary. Regarding the flood level marked on the rice stalk by the local farmers in Ayutthaya was about 3- 4 meters high during rainy season (Figure 8).



Figure 8: The rice stalk in Ayutthaya during flood in the old day (Source: Kitti Lohpetcharat, 2011: 17)

The lesson learnt from the case of Ayutthaya present how Thais adapt their life by "living with rather than living against water". The success of Ayutthaya old day showed the Thais' hydraulic wisdom in various aspects. Firstly, to protect the city from invaders. Secondly, to manage water irrigation to do agriculture. Thirdly, to promote trading through water networks by developing water-based transportation to connect inland economy with overseas countries.

Lesson Learnt from Ayutthaya for the Current Bangkok Today

During the Ayutthaya period there were many evidences about man-made canals and shortcuts in Chao Phraya River to reduce the sailing time and distance between Ayutthaya port and the Gulf of Siam (the name by that time) which also to flow floodwater out into the sea (Figure 9).



Figure 9: Man-made canals between Ayutthaya port and gulf of Siam in the old day. (Source: Beek, Steve V. 1982, cited in Bhakhakanok Ratanawaraphorn, 2011)

The Chao Phraya River in front of Rattanakosin Island (current Bangkok) was a man-made canal before it became a current stream of the Chao Phraya. This canal was dug in ancient Ayutthaya period as a shortcut to reduce the distance and navigation time. Then the old Chao Phraya river course became part of Bangkok Noi, Bang Laung and Bangkok Yai canal at present (Figure 10).



Figure 10: Chao Phraya River in front of Rattanakosin Island was a man-made canal before became Chao Phraya River in the later stage and the old course (Authour).

Rattanakosin Island had been established to represent Ayutthaya of the past including the hydraulic wisdom for flooding management. But after the incoming of land-based concept of living from the west that had changed totally from original Thais' water-based settlement. Modern Thais decided to accept the concept of "Living against the water" without local indigenous wisdom and adaptation in the past anymore. A well-known Venice of the east had been vanished from Bangkok. Most of river and canal embankments were built with concrete barricades for flood protection (Figure 11) which had been proven that it does not work for protecting flood caused by water seepage due to the water pressure and soften soil conditions after a longer period of flooding.



Figure 11: Sketch of BMA concrete wall cross section through canal and photo during construction (Authour).

Canals network had almost been changed into roads. Water gates built to manage water flow from upstream during the flood season; however, they make water become more stagnant resulting in more polluted water. Another good practice was Lad Po canal with water gate control which was derived from the King Rama IX: King Bhumipol's concept; as this shortcut canal help releasing faster water drainage from upstream Rattanakosin Island to downstream during flooding (Figure 12).



Figure 12: Lad Po man-made canal, a diversion channel for water management under Rama IX King's project (Author)

Flooding and Climate Change

It is important to note that the massive floods of recent years, including the big floods in 2011 in and around our planet including Thailand have become more serious due to global climate change (ice melting, rising sea levels are clearly indicated). Certain predictions have not been made about the extent to which flooding and storms, especially local storms in Southeast Asia. Changes in weather conditions have led to negative impacts in lowland areas. Unfortunately, there has been insufficient information for Thailand which further investigation is required.

CONCLUSION

This paper reminds Thais to concern how they used to live coexist with water. Lesson learnt from the three historic cities reflect good practices in flood management. In contrast, flood protection seems to be considered to live with rather than to live against water. Concrete barricades may not appropriate to consolidate

the height of floodwater; because it would cause more water level with higher pressure which may breakdown the structure. This paper points out that learning from historic cities reflects how Thai local wisdom learned to manage water; however, there has been insufficient studies and implementation to adapt indigenous knowledge with proper technology for flooding preparation and management. A combination between engineering approaches (grey infrastructure) should be considered with natural-based solutions (green infrastructure) as a challenge for all Thais to work together for achieving sustainable future.

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