



# **Hue citadel into the future: Managing Natural Hazards, Environmental Pollution, Tourism, and Community Resettlement**

The 4th International Workshop between Hue University of Sciences  
and University of South Australia

Edited by

**Matthew Rofe Winsor  
Tran Dinh Hieu  
Nguyen Ngoc Tung  
Le Ngoc Van Anh**



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**HUE CITADEL INTO THE FUTURE:  
MANAGING NATURAL HAZARDS, ENVIRONMENTAL  
POLLUTION, TOURISM AND COMMUNITY  
RESETTLEMENT**

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# TRANSFORMATION OF HUE CITADEL, VIETNAM

**Dr. Nguyen Ngoc Tung, MA. Pham Dang Nhat Thai, MA. Tran Thanh Nhan, MA. Pham Manh Hung**

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## 1. Brief history of Hue

Thua Thien Hue, a province located in the central Vietnam, is bordered on the north by Quang Tri Province, on the south by Da Nang City, on the west by the Truong Son Mountain Range adjacent to Laos PDR, and on the east by the South China Sea. In 179 B. C., the land of Hue was belonging to Nhat Nam district of the northern dynasty. Then, the region was named “O-Ri” in the period of Cham Pa Kingdom (860-1693). However, the name was changed again to “Thuan Hoa” in the period of Tran Dynasty (1225-1400), after the wedding between Huyen Tran princess and the King of Cham Pa in 1306<sup>1</sup>.

In 1558, Nguyen Hoang decided to escape from the control of Trinh Kiem, who held power of Le dynasty, therefore he went to occupy the land of Thuan Hoa and Quang Nam. After he could control the area, he built palace and strengthened his force for opposing the power from the North. From that time until 1777, Vietnam was divided into two parts; the northern part belonged to Trinh clan and the southern part belonged to Nguyen clan.

During period of 1777-1802, Vietnam was in the stage of civil war among four powers; Le royals, Nguyen lords, Trinh lords, who occupied the power of Le dynasty, and Tay Son, the movement that rose up in arms at Tay Son region<sup>2</sup> (against the oppressive

rules of feudal system). In 1802, Nguyen Anh, the remaining descendant of Nguyen clan unified the country and became the first King of Nguyen Dynasty.

In 1945, Nguyen dynasty was collapsed and the Capital was moved to Hanoi in North Vietnam. After the war period (1945-1975), Hue has been the main city of Thua Thien Hue province of the unified Vietnam. In 1993, Hue city was registered to be the World Cultural Heritage Site by UNESCO and it is growing as one of the main tourist destination in Vietnam.

## 2. Formation of Hue citadel

After the land is chosen for the citadel, the residents of eight villages located in this land had to move to other places and they were compensated by Nguyen Court for the emigration such as land and money<sup>3</sup>. The construction of the citadel was started by Gia Long King (1805-1820) and continued by Minh Mang King (1820-1841). The citadel consists of three walled enclosures with more than one hundred of royal buildings. The first wall, known as the citadel of Hue, is about 10,000m in circumference and solidly built for the protection of all court activities. Imperial City, the second wall, about 2,400m in circumference, is dotted with office buildings where the monarchs and high-ranking mandarins came for daily works. Forbidden Purple City, the third wall, about

<sup>1</sup> The name “Hue” was a corruption of the native word “Hoa” in “Thuan Hoa”.

<sup>2</sup> This region is Binh Dinh province at present.

<sup>3</sup> The citadel is the land of eight villages: Phu Xuan, Van Xuan, Dien Phat, An Van, An Hoa, An Y, An Bao, and The Lai.



1,200m in circumference, is private quarters of the Emperor and his family. The citadel at present includes the areas of Phu Xuan 1 (1687-1712), Phu Xuan 2 (1738-1775), and overcomes both Kim Long and Bach Yen Rivers-turn them into the ponds and Ngu Ha River within the citadel area.

The formation of Hue citadel was constructed based on Feng Shui principle, Vauban model, and the repetition of use of former palace site<sup>4</sup>.

### Feng Shui Principle

The location of the citadel is known as the best location for setting up the royal architecture in the citadel because it contains auspicious geographical features such as river, mountain, plain, and other metaphorical characteristics representing fertile, verdant, and luxuriant attributes. According to Feng Shui principle, Huong River (representing Bright Court) and Ngu Binh Mountain (representing Peacock) are the masonry of the citadel. The river passing in front of the citadel brings a good fortune for the Nguyen dynasty since water means wealth and power of the Kings and their descendants, while Hen and Da Vien sandbanks represent Azure Dragon and White Tiger, two guardians for the citadel (Fig. 1).



**Figure 1:** The symbols of Feng Shui of Hue citadel  
**Vauban Model**

With the country that had just been unified, Nguyen Anh wanted to construct his citadel strong, solid, and protective in order to show his political and military power. Moreover, the citadel must be the defensive stronghold for protecting from enemies. Therefore, Vauban style, the typical defense rampart in the West at that period, was chosen as a model for constructing the citadel (Fig.2).



**Figure 2:** Airphoto of Hue citadel (photo: Kei Mizuno)

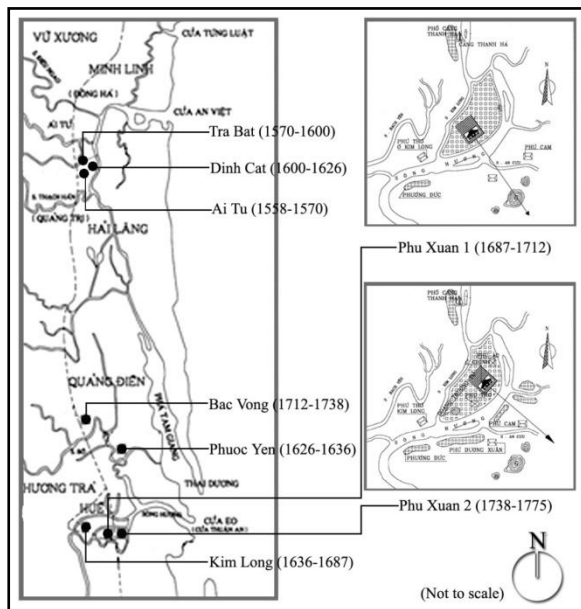
The citadel has 10 gates and is surrounded by the system of moats called “*Ho giam thanh*” totaling 7km in length connecting with the Huong River.

<sup>4</sup> Vauban is the name of a French engineer (1633-1707), owing to his expertise in military architecture, he was appointed to become Marshal and member of the French Academy in 1699. Under Emperor Louis XIV period, Mr.

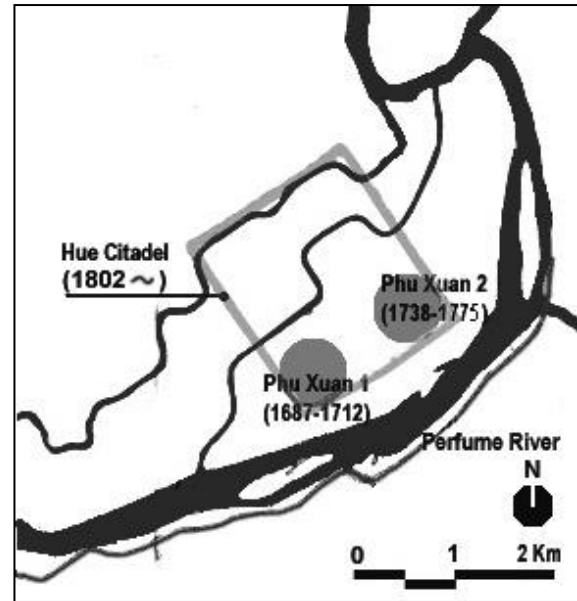
Vauban was in charge of constructing hundreds of strongholds and fortresses to defend his country. He was the person, who created the military construction type called “fortified city” or “inalienable city”.

### Repetition of use of former palace sites

The land of Hue citadel was chosen by Nguyen lords, ancestors of Nguyen Anh. During the period of Nguyen Lords (1558-1775), there are nine generations of Nguyen Lords and eight times that Nguyen Lords moved the palaces<sup>5</sup>. There are Ai Tu (1558-1570), Tra Bat (1570-1600), Dinh Cat (1600-1626), Phuoc Yen (1626-1636), Kim Long (1636-1687), Phu Xuan (1687-1712), Bac Vong (1712-1738), and Phu Xuan again (1738-1775) (Fig. 3). Hence, Phu Xuan is chosen two times for the palace of Nguyen Lords. This expresses that Nguyen Lords believed that Hue land is the sacred place for founding of Nguyen Dynasty. It is the crucial reason that conducted Nguyen Anh to choose Hue for his citadel afterward (Fig. 4).



**Figure 3:** Location of the eight palaces of Nguyen Lords (1558-1777)



**Figure 4:** Location of palaces in Phu Xuan periods and Hue Citadel

### 3. Transformation of Hue citadel

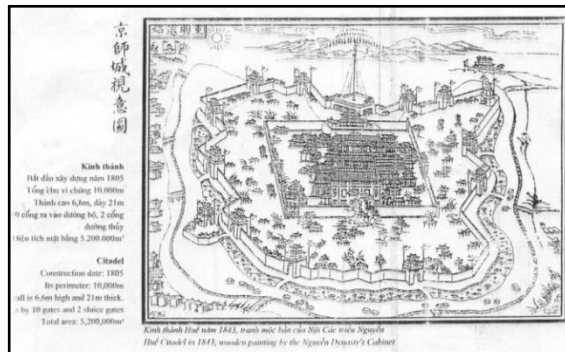
At the beginning, the area within the citadel and outside the Imperial City was divided into 95 checkerboard quarters and each quarter (with area is about 1000sq.m), maybe, is the precinct assigned by Nguyen Dynasty. In general, there are one or two royal buildings, garrisons, or temples located in each precinct. Most of royal offices are placed on the left side of the Imperial City while other entertainment buildings for royal family are scattered around. Other quarters, in which no building is constructed, are granted to mandarins and civilians for building dwelling houses. The wood-block painting of Hue citadel in 1843 by Nguyen's Cabinet also demonstrates this phenomenon (Fig. 5). On the painting, the two types of buildings can be observed. The first type is the buildings laid in outside of the citadel around the left side. These buildings could be regarded as the dwelling houses of inhabitants. The other type is the buildings, which concentrates within the citadel with bared

<sup>5</sup> Nine generations of Nguyen Lords include Nguyen Hoang (1558-1613), Nguyen Phuc Nguyen (1613-1635), Nguyen Phuc Lan (1635-1648), Nguyen Phuc Tan (1648-1687),

Nguyen Phuc Thai (1687-1691), Nguyen Phuc Chu (1691-1725), Nguyen Phuc Chu (1725-1738), Nguyen Phuc Khoat (1738-1765), and Nguyen Phuc Thuan (1765-1777).



columns. They are the public royal buildings of Nguyen dynasty.



**Figure 5:** Hue Citadel in 1843 (Source: Nguyen's Cabinet)

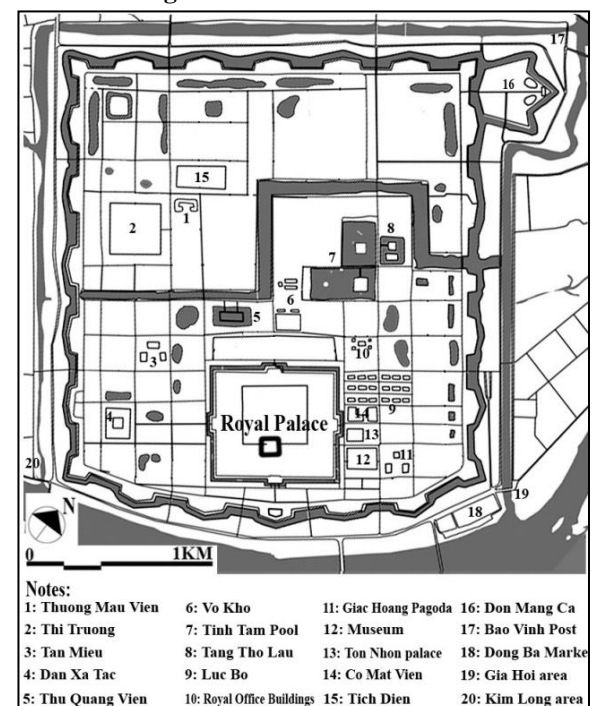
Later on, a small number of residents existed and lived in the citadel area. However, most of them are the people who worked for the royal family such as servants and guardians. They did not have the property right of the land, while the Nguyen court can take back in whenever they want. Until the middle of the 20<sup>th</sup> century, more people freely came and settled down in the area.

After the period of Tu Duc King (1847-1883), the French colony seized control of the city although there were still nine Kings of Nguyen Dynasty until 1945 but they were just nominal position. The confusion of Hue in that period gave impact on some alterations in the citadel area. On the map of 1885 (Fig. 6), the built up areas are seen on the left part of the Imperial City (Royal Palace) where most royal office buildings were located, while the areas on the right part were in opposite condition. This statement is also supported by the number of streets laid on the citadel area, all of which on the left part of the Imperial City is more complex than those on the other areas.

By 1909, the right part and the right rear part of the Imperial City still looked empty where only few royal buildings such as Dan Xa Tac, Tan Mieu, and Thu Quang Vien were erected in scattered location (Fig. 7).



**Figure 6:** Hue Citadel in 1885



**Figure 7:** Hue Citadel in 1909<sup>6</sup>

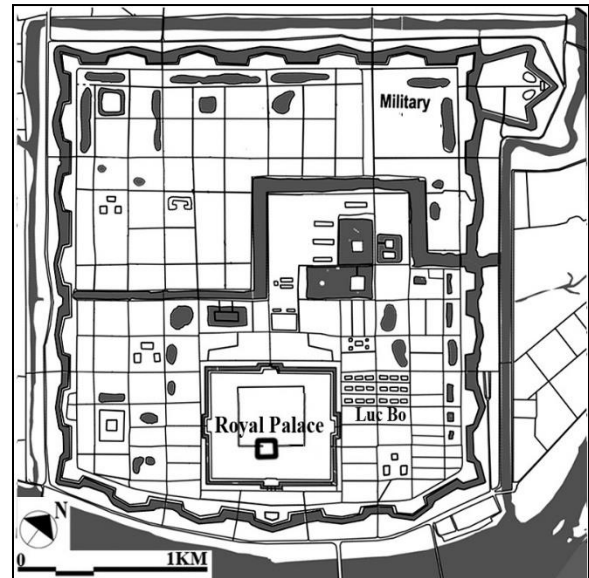
<sup>6</sup> (1) Thuong Mau Vien and (5) Thu Quang Vien were the beautiful famous gardens for recreation of royal families. (2) Thi Truong was the place for doctoral competitive

examination of Nguyen dynasty. (3) Tan Mieu, the place for worshipping Duc Duc King, was built in 1891. (4) It was the place for worshipping the Earth Genie. (6) Vo Kho was the

Fig. 7 also demonstrates that most royal office buildings, which were serviced as working spaces of Nguyen Dynasty, concentrated on the left side of the Imperial City such as Luc Bo and Co Mat Vien. While the royal buildings located in other sides were used for entertaining purposes of royal families such as Thuong Mau Vien, Thu Quang Vien and Tang Tho Lau.

From that time until the middle early 20<sup>th</sup> century, some small streets and lanes had been cut in the areas around the Imperial City (Fig. 8). However, although there were many residents, who immigrated and settled within the citadel area, the shape of the citadel area was hardly changed. In contrast, the outside area, especially the area in the south bank of Huong River had rapidly transformed by the planning of the French.

Around 1924, there were several dwelling houses around Mai Thuc Loan St built following traditional street style named Nha Pho on the left side of the Imperial City<sup>7</sup>. These houses and the market named “Qui Gia Thi” are the elements representing formation of commercial streets in the citadel area at present<sup>8</sup>. At that time, the residents could have right of their lands.



**Figure 8:** Hue Citadel in the early 20<sup>th</sup> century

In 1945, Bao Dai King (1925-1945) declared the collapse of Nguyen Dynasty. Then, Vietnam had been in the state of the war for thirty years (1945-1975). The citadel area became the place that people used for avoiding the war attacks. The fierce fighting made rapid change to the urban configuration of Hue. Many royal buildings and dwelling houses were heavily destroyed such as Luc Bo, Tan Mieu, and Thuong Mau Vien. In addition, many small roads had been cut making the land of the citadel be divided into various patterns and scales of plot of lands. The rapid alteration of Hue citadel can be

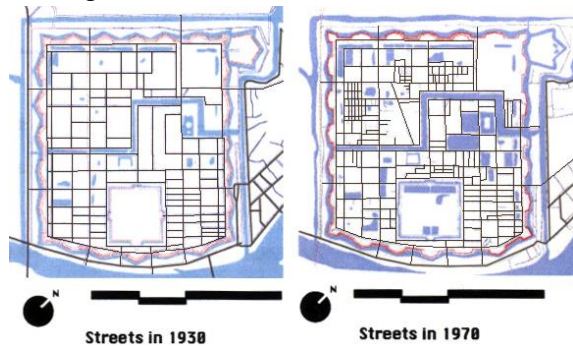
arsenals of Nguyen dynasty. It is used for tourism at present. (8) Tang Tho Lau was the archives of Nguyen dynasty. It is used for tourism at present (9) Luc Bo was the six ministries of Nguyen dynasty. At present, this area is used for government offices and residents (11) Giac Hoang Pagoda was the palace of Ming Mang King when he was the prince. Then, it was converted to the pagoda in 1839 by Minh Mang King. At present, it is the office of Hue Monuments Conservation Centre. (12) Museum was the recreation place of the princesses and princes of royal families. In 1909, it was the library office named “Long An” of Nguyen dynasty. It was converted to Khai Dinh Museum in 1923. At present, it is the museum of Hue named “My Thuat”. (13) Ton Nho Phu was a royal office building. (14) Co Mat Vien was a royal office building. (15) Tich Dien was the place that the King ploughed and worshiped the Emperor Shen Nong. (16)

Dong Mang Ca was the area of military. (17) Bao Vinh Port was replaced by the concrete bridge for connecting to Bao Vinh area, the ancient town under Nguyen dynasty. (18) Dong Ba Market is the biggest market of Hue at present. (19) Gia Hoi area was another ancient commercial town under Nguyen dynasty.

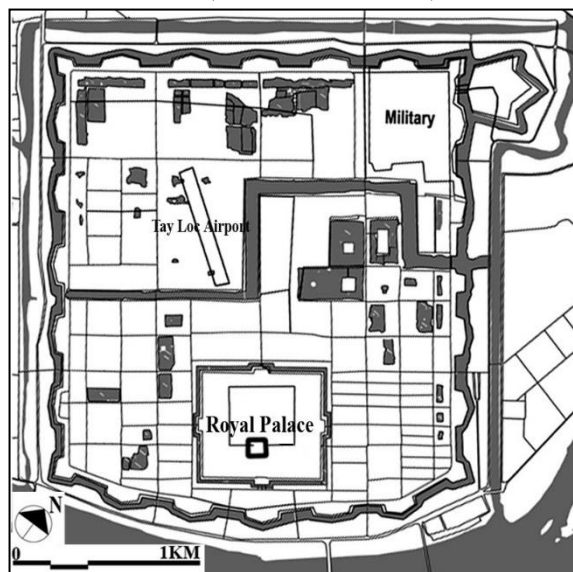
<sup>7</sup> *Nha Pho* has rectangular shape of plan and the front space is used for commercial activities, while the rear space and upper space are used for living and service.

<sup>8</sup> Hai (2002) provides evident legal document for demonstrating the formation of ancient shop houses in Mai Thuc Loan St, the most prosperous shopping streets in the present citadel area. Qui Gia Thi Market was formed during the period of Gia Long Kinh and located in Mai Thuc Loan St at present around the rampart wall of the citadel. In 1899, it was moved to Dong Ba market at present (Cadiere, 1996).

clearly observed in the street pattern in Fig. 9 and Fig. 10.



**Figure 9:** Street system of Hue Citadel in 1930 and in 1970 (Source: Satoh, 2004)



**Figure 10:** Hue Citadel in 1968

These figures show that many small roads are newly cut and they concentrate in the rear part of the Imperial City. Therefore, it can be implicated that there have a large number of immigrants came and settled in the rear area.

After Vietnam became the unified country, Hue was affected by a huge influx of immigrants, who vastly built various types of dwelling houses within the citadel and also the land on the enclosure wall making much alteration in urban configuration in the citadel area as we can observe in the present.

### Street Pattern

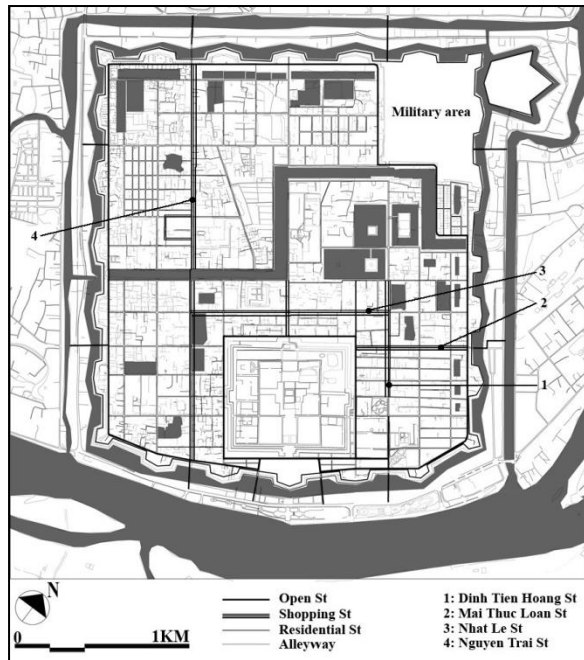
It is quite interesting that the main street pattern in the citadel area has not much changed. An area that alterations can be evidently observed is in the western part of the Imperial City where French built a domestic military airport. However, when that domestic airport was established is not clear. During the period of 1986 to 1970, the airport was collapsed. After 1975, the huge influx of immigrants was the cause making alteration in the site of that domestic airport as land for dwelling houses and farming.

Most of the streets in the citadel area are paved and their pattern could be divided into two types making the checkerboard layout of the citadel. The first type is streets running northwest – southeast axis, and the second type is streets running perpendicularly to the first type. At present, the original checkerboard plan has been broken up by the proliferation of alleyways in several areas such as the area in the western Imperial City and the area near Tinh Tam group of pools behind the Imperial City (Fig. 11).

Based on the width, townscape, and usage pattern of the streets, four types of streets can be identified: alleyways, residential streets, shopping streets, and open streets. Several basic characteristics of these types of streets are shown in table 1.

Due to the urbanization of Hue citadel, shopping streets have well established along several streets such as Nguyen Trai, Mai Thuc Loan, Dinh Tien Hoang, and Nhat Le where many Nha Pho and markets were erected. The establishment of these streets could be related to the market centers outside the citadel for the convenience of transportation, such as Dong Ba market and

Bao Vinh Commercial Street<sup>9</sup>. Dwelling houses in these streets are developed and altered to the Nha Pho styles for adapting to the commercial activities. HTGHs located in these streets are also occurred where front space of land adjoining on the street is used for commercial activities.



**Figure 11:** Street pattern in the citadel area

**Table 1:** Typology of street system in the citadel area

	Open Street	Shopping Street	Residential Street	Alleyway
<b>Width (meter)</b>	9-12	9-12	5-9	2-4
<b>Survey covering</b>	Asphalt	Asphalt	Asphalt	Asphalt + Gravel
<b>Usage</b>	Residential - official access	<i>Nha Pho</i> access	Residential-commercial access	Residential access
<b>Description of Townscape</b>	Open views of landscape and historic Monuments	Heavy traffic-modern style buildings	Hedge-garden houses and modern houses	Hedge-garden houses

<sup>9</sup> Dong Ba Market is located in the eastern part of the citadel, it is known as the biggest market of Hue at present. Bao Vinh was the ancient commercial port of Hue during the period of

Open streets are the streets laid in front of Imperial City and along Tinh Tam group of pools, where many landscapes and historical monuments appear. Most of these streets are well maintained and paved. The closed drainages are equipped along sides of the streets. Most dwelling houses and other buildings in this type of streets have garden and still keep style of local traditional architecture.

The residential streets have narrower width than the open and shopping streets (with about 5-9 meters). There are different types of dwelling houses built on their both sides. Most of these houses have spaces for small shops or stalls in the front part while the rear parts are used for living and service purpose. These houses were formed by land subdivision due to the growth of population and urbanization.

Also, alleyways were formed as the consequence of land subdivision by the huge influx of immigrants from 1975. There are various types of dwelling houses, mostly used for living purpose. In general, the width of these alley walls is less than 4 meters. Most of them are not equipped with drainage system. In these streets, local dwelling houses are the predominant structure and most of them still keep their original configurations at the first stage of construction. Most of new streets are the tertiary streets or lanes called alleyways connecting the inner areas within the quarters.

Nguyen dynasty. It was formed in the 19<sup>th</sup> Century and located in the northern part of the citadel.

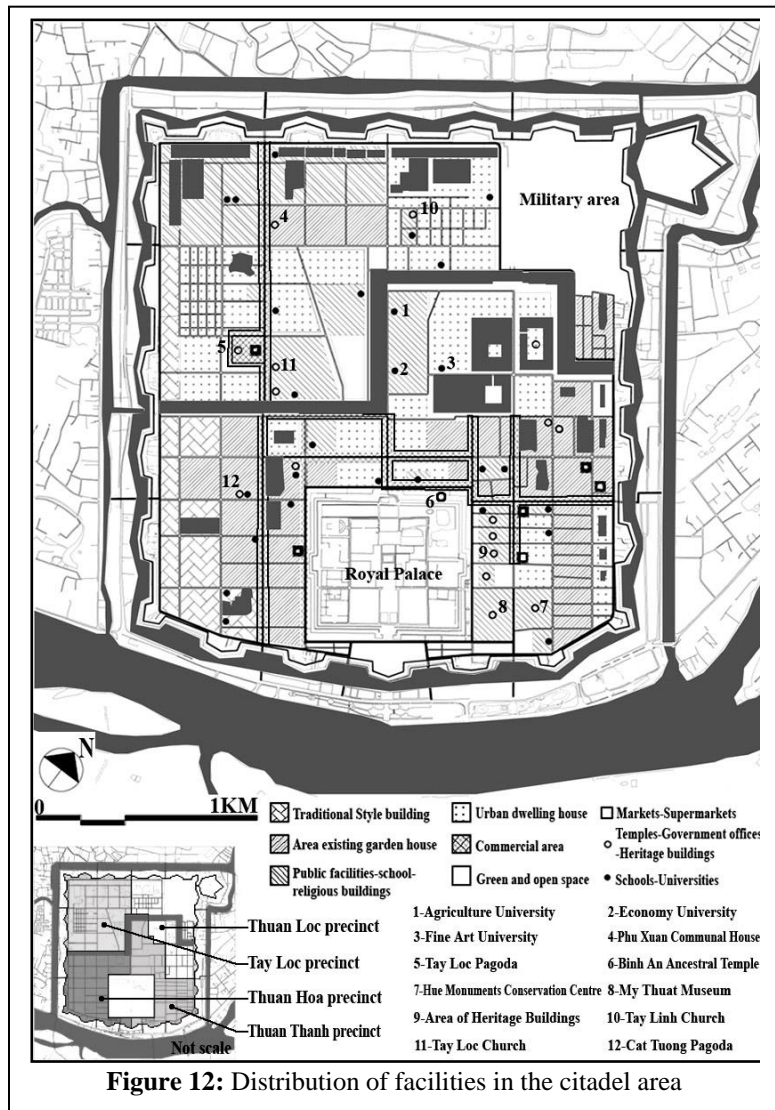


## Distribution of Facilities

The citadel area consists of four precincts, namely Thuan Thanh, Thuan Loc, Thuan Hoa, and Tay Loc. Three groups of facilities could be identified in each precinct: religious and heritage facility, education and public facility, and commercial facility (Fig. 12). Among them, heritage facilities concentrate in Thuan Thanh precinct where many royal buildings were located during the period of Nguyen dynasty such as Hue Monuments Conservation Centre, My Thuat Museum, and Binh An Ancestral Temple. At present, several heritage buildings in the area were converted into the government buildings. For example, almost buildings of Luc Bo (Royal Office Buildings of Nguyen dynasty) are converted into the factories and government buildings, while Hue Monuments Conservation Centre used to be the Giac Hoang pagoda. In addition, the religious and heritage facilities can be also found in the other precincts such as Tay Linh pagoda (Thuan Loc precinct), Tay Loc pagoda and Tay Loc church (Thuan Loc precinct), and Cat Tuong pagoda (Thuan Hoa precinct).

All nursery school, primary school, secondary school, and high schools are scattered around four precincts, while all universities concentrate in Thuan Thanh precinct. Other public facilities such as parks and open spaces are distributed along Ngu Ha River and in front of the Imperial City. At least six commercial

facilities including trading offices, garages, printing offices, grocery stores, internet shops, and stalls can be found along the shopping streets such as Mai Thuc Loan St and Dinh Tien Hoang St in Thuan Loc precinct, and Nguyen Trai St and Nhat Le St in Thuan Hoa precinct. Along these streets, most dwelling houses are built in Nha Pho



style (Shop-house fashion) where the front part is usually used for doing commercial activities, while the rear part is served for living purpose. Markets are also distributed in each precinct, and Tay Loc market located in



Nguyen Trai St of Tay Loc precinct is the biggest market in the citadel area.

### Water System

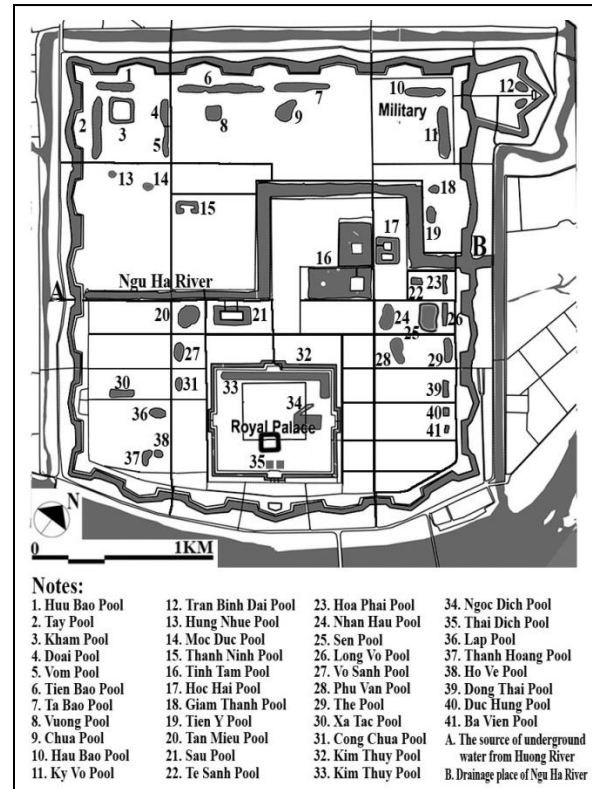
Hue is one of the places that have the highest rainfall in Vietnam. The rainy season in Hue is from October to December with annual average rainfall of 3,000mm, while the other periods are only from 300mm to 400mm. Therefore, Hue is usually threatened by the disaster of flood. That condition can be demonstrated by the pierce floods in the history such as the floods in 1953, 1985, and 1999, which had adversely destroyed many historical monuments and dwelling houses of Hue.

Due to low level of the citadel area, protection against flood is very important because the low ground level of it (Table 2).

**Table 2:** Flooding areas of Hue<sup>10</sup>

	No flooding	Minor flooding	Serious flooding
Citadel area	27%	28%	45%
Other areas	30.5%	39%	40.5%

Fig. 13 demonstrates that Ngu Ha River and 41 pools play the vital role in adjusting the water system for the citadel area. Normally, the sewage in the citadel area firstly flows to these pools before flowing to Ngu Ha River. Then, the source of underwater, which flows from Huong River to Ngu Ha River in the western part of the citadel (position A in Fig. 13), conveys the above sewage towards the eastern part by the slope of the terrain (position B in Fig. 13). Thus, Ngu Ha River plays the important role in the sewage system of the citadel area by using the source of water from Huong River.



**Figure 13:** Ngu Ha River and pool system in the citadel area

At present, inundation in the citadel area is usually occurred because of trespassing upon Ngu Ha River by local residents making connection among Ngu Ha River and those pools is blocked. The environment of the citadel is also getting worse and worse due to polluted water. The consequence of these conditions made the serious damage for the citadel area.

To conclude, from the origin of the citadel, the layout of the citadel is constructed follow the type of checkerboard pattern. The formation and urbanization of the citadel made a great impact on the formation of dwelling houses and also HTGHS located in the area. The street pattern in the citadel area could be divided into four types; open streets,

<sup>10</sup> Source: Government of the Socialist Republic of Vietnam, Swiss Agency for Development and Cooperation (1998),

*Hue Urban Development Project – Social-Economic Survey: Final Report: 24-29.*

shopping streets, residential streets, and alleyways. Shopping streets have an influence on land subdivision and alteration of dwelling houses and HTGHs located in them due to the need of space for doing business. The formation of street pattern, where various small streets had been cut, implies the growth of population. Ngu Ha River and the pool system in the citadel area play the important role in adjusting the water system for the area. However, the blocked connection among them and the low ground level of the citadel's terrain are the cause making the inundation and flood disaster, which are usually occurred in the area.

#### 4. Note

This paper is based on part of master research of the first author named "Transformation of Hue Traditional Garden Houses in Hue Citadel Area, Vietnam".

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#### 5. References

- Nguyen Ngoc Tung, Hirohide Kobayashi, Masami Kobayashi (2011), Effect of Hue Citadel on the Layout of Traditional Garden Houses Located in its Area, Vietnam, Journal of Civil Engineering and Architecture, USA. Vol. 5: 918-927.
- Nguyen Ngoc Tung (2007), *Transformation of Hue Traditional Garden Houses in Hue Citadel Area, Vietnam*, Master thesis, Chiang Mai University, Chiang Mai, Thailand.
- Phan Thanh Hải (2002), Kinh đô Bắc Kinh – Cố đô Huế: tương đồng và dị biệt (Bac Kinh Capital - Hue ancient Capital: Resemblance and Difference), *Dấu ấn Nguyễn trong văn hóa Phú Xuân*, Hue, Thuan Hoa Publisher: 338-349.
- Shigeru Satoh (2004), Information Notes of Hue, Hue, Faculty of Architecture, Hue College of Science, Hue University.
- Trần Đức Anh Sơn (2004), Hồ trong Kinh thành Huế (Pond System in Hue Citadel), *Huế - triều Nguyễn một cái nhìn*, Hue, Thuan Hoa Publisher: 151-162.
- Trần Đức Anh Sơn (2004), Tư tưởng quy hoạch Kinh thành Huế dưới triều vua Gia Long (The Concept of Citadel Planning under the Period of Gia Long King). *Huế - triều Nguyễn một cái nhìn*. Hue, Thuan Hoa Publisher: 46-65.
- Trần Đức Anh Sơn & Phan Thanh Hải (2004), Quần thể di tích cố đô Huế - hai thế kỷ nhìn lại (Heritage of Hue Ancient Citadel after Two Centuries). *Huế - triều Nguyễn một cái nhìn*. Hue, Thuan Hoa Publisher: 17-28.