Community adaptation to flood risk in urban and rural areas of Vietnam

-Case study of Thuan Thien Hue province in Central Vietnam-

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Abstract

All over the world, it has been widely witnessed that the frequency of natural disasters has been increasing, and the magnitude of its damage has gotten worse and worse. Among Asian countries that are vulnerable to natural disasters, Vietnam has its special circumstances. Thuan Thien Hue province is located in Central Vietnam, and has been suffering from floods. The recent flood events in Hue have caused devastating damages. While Hue is a flood-prone area, people in Hue have learnt experiences and wisdoms to live with floods.

The paper examines how people in Hue have coped with flood historically, aiming to explore appropriate methods of flood management for sustainable development. To learn knowledge of community adaptation to flood risk in Hue, field surveys, interviews and questionnaire surveys were conducted in historic old quarters of Hue city and a rural village, Huong Phong commune located in lagoon areas of Thua Thien Hue province; which are frequently affected by flood. Through the analysis of filed and questionnaire surveys, it found out that there are a variety of wisdoms and technologies for flood management, 1) the foundations of the houses were built more than the normal flood water level, 2) they have several oral tradition of forecasting floods, 3) most of people built higher places more than 2 meters as their flood shelters, and 4) local communities sustained through mutual assistance to reduce damages. On the other hand, under rapid urbanization, oral traditions and indigenous knowledge have been disappearing. This paper tries to pay a partial role of keeping such knowledge.

Keywords: disaster adaptation, flood management, community development, Central Vietnam

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1. Research background and objectives

All over the world, it has been widely witnessed that the frequency of natural disasters has been increasing, and the magnitude of its damage has gotten worse and worse. Among Asian countries that are vulnerable to natural disasters, Vietnam has its special circumstances. Thua Thien Hue province is located in Central Vietnam, and has been suffering from floods annually. The recent flood events in Hue have caused devastating damages. However, despite annual floods, damages from normal floods and fatalities number are not serious. This is because they have knowledge and measures of community adaptation to flood risk.

On the other hand, Vietnamese economies have been flourishing for recent decades. Just like other remaining historical districts in Asia, those of Vietnam have been going through rapid urbanization and transformation. The authors’ previous research found that the rapid urbanization impacts on traditional living environment, community linkage and indigenous knowledge on sustainable living environment.

The paper aims to clarify flood-adaptation measures, and to examine how people in Hue have coped with flood historically, aiming to explore appropriate methods of flood management for sustainable development.

2. Research Methods

To learn community adaptation to flood risk in Hue, field surveys, interviews and questionnaire surveys were conducted in historic old quarters of Hue city and a rural village, Huong Phong commune located in lagoon areas of Thua Thien Hue province; which are frequently affected by flood. The field surveys in an urban area of Hue city, the Gia Hoi area were conducted from April to July 2009 and from February 2011 to May 2011. The field surveys in Huong Phong commune located in rural areas of Thua Thien Hue province were conducted from August 2009 to August 2010.

3. Overview of the research sites

i) Urban area: Gia Hoi area of Hue city

The research site is historical quarters surrounding and inside Citadel including Chi Lang, Bach Dang, Luong Ngoc Quyen and Bao Vinh (Figure 1). Bach Dang Street is located on Phu Cat and Phu Hiep Wards, to the northeast of the Hue Citadel, starting from Chi Lang Street (contiguous with Gia Hoi bridge pier), passing through underneath Dong Ba bridge, and passing the intersection of Dieu De, Ngu Vien, Phung Khac Khoan and the Lai ancient village to the end of Dong Ba riverside.

This street appeared from the early

![Figure 1: Research site along Bach Dang Street in Phu Cat Ward, Hue City, Vietnam](image)
of the 19th, formed by digging Dong Ba River. The street was located in the Gia Hoi ancient town in 1908. Under French domination, it was named Dong Khanh Riverside. After 1945, this street was divided into two parts, named Gia Hoi town and Hang Duong town. In 1956, it was named Bach Dang street. People often call the street “Hot Mat” or “Hang Dong Street”. Gia Hoi area is one of the most historical commercial quarters in Hue with historical international residential components. Emigrated Chinese people arrived at Thanh Ha port and started to live in the Gia Hoi area of Hue in around 1794. After that, they developed business activities.

In the area, Vietnamese traditional wooden houses built in the early 1900s, over a century, still building today (Figure 3 and Figure 6). There are also the houses influenced by French colonial architecture around the mid-20th century (Figure 4). After the Doi Moi reform program, modern concrete houses have been built recently. The most obvious characteristic of this quarter is that the houses were built closely to next houses with narrow frontage from 3 m to 8 m, the great depth from 30 to 50 m, and steep roof to get light and air. Besides, in this area, there still preserves valuable cultural and historical monuments such as: Vua Ba, Trung Ban Temple, Mandarin Nguyen Dinh Hoe Church, Palace of Princess Nhu Sac (younger sisters of three Kings Dong Khanh, Kien Phuoc and Ham Nghi), Gia Hung Vuong I Palace (Palace of Nguyen Phuc Hong Luu – the eighth Prince of King Thieu Tri), Dieu De, Thuan Hoa Pagoda and

| Table 1: Profile of the respondents of the questionnaire survey in Gia Hoi area, Hue city |
|-----------------------------------------|-------------|----------------|-------------|
| Gender       | Numbers | Duration of living | Numbers |
| Male          | 63      | 6-10             | 35         |
| Female        | 47      | 6-10             | 35         |
| Age Numbers  |          |                  |            |
| 0-30          | 11      | 10-20            | 11         |
| 31-50         | 19      | 20-30            | 13         |
| 51-70         | 19      | 30-50            | 13         |
| 71+           | 30      | 50+              | 35         |
The Lai ancient Temple, etc.

A questionnaire survey in Hue city was conducted for 100 people living in Gia Hoi area. Table 1 shows the profile of the respondents.

i) Rural area: Huong Phong commune

Huong Phong commune is located 12 km from Hue City; it is surrounded by the Tam Giang Lagoon and the Huong River. This lagoon, one of the biggest in Asia, is 22,000 ha in area and is approximately 70 km in length along the coast. Nearly 300,000 inhabitants have settled around the lagoon—a total of 236 villages belonging to 32 communes—and they mainly earn their livelihoods by directly or indirectly exploiting natural resources in the lagoon (Nguyen, NTT, and De Vries, MB. 2004). Lagoon communities generally live on certain income-generating activities, such as rice cultivation, aquaculture, and fisheries (Figure 7). About half of them support their livelihood through rice production (Mai, VX, etc 2006). As mentioned, the lagoon area is flood-prone, and flooding has sometimes gravely affected the villagers’ lives. Particularly vulnerable is the Huong Phong commune, which is characterized by its flat coastal geography and an elevation of only 1–2 m

<table>
<thead>
<tr>
<th>No.</th>
<th>Village name</th>
<th>Number of villager</th>
<th>Number of household</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Thuan Hoa</td>
<td>2,780</td>
<td>510</td>
</tr>
<tr>
<td>2</td>
<td>Thanh Phuoc</td>
<td>1,750</td>
<td>340</td>
</tr>
<tr>
<td>3</td>
<td>Tien Thanh</td>
<td>820</td>
<td>180</td>
</tr>
<tr>
<td>4</td>
<td>Van Quat Thuong</td>
<td>720</td>
<td>250</td>
</tr>
<tr>
<td>5</td>
<td>An Lai</td>
<td>1,650</td>
<td>300</td>
</tr>
<tr>
<td>6</td>
<td>Van Quat Dong</td>
<td>2,850</td>
<td>520</td>
</tr>
</tbody>
</table>

Table 2. Six villages in Huong Phong commune

Figure 7: Huong Phong Commune

Figure 8: Type A-1

Figure 9: Type A-2

Figure 10: Type B

Figure 11: Type C
above sea level.

In 2006, this commune covered a total of 1,569 ha and was home to approximately 11,824 individuals in 2,125 households (i.e., 5.56 persons per household) (CARD 2007); most individuals live near the water edge, for the sake of convenience. This commune consists of six villages (Table 2), of which Van Quat Dong village has been the most affected by floods, due to the fact that it faces the lagoon and has a floodplain that is otherwise used as rice-field wetlands. For these reasons, this village was selected for the field survey.

Based on the field survey, the Huong Phong commune has four types of housing, from the viewpoint of style. The total number of 427 houses in Van Quat Dong village consists of conventional housing (Type A, 308 houses, 72.1%)(Figure 8 and Figure 9), modern housing (Type B, 98 houses, 23.0%)(Figure 10), and Temporary housing (Type C, 21 houses, 4.9%) (Figure 11). However, the compositions of main and sub-houses, earthen-floor constructions, and the spatial layout of the main houses are basically the same across all types.

4. Flood situation in Hue

i) General flood situation in Hue

Hue city has suffered from floods, which have affected people’s lives. The main season of flooding lasts from late September to early January annually. According to the monitoring record from 1997 to 2006, Huong River has an average of 3-5 floods every year. Average flood duration is around 3 to 5 days, and the longest is a week. Disastrous flooding has been reported in Thua Thien Hue province since the 1980s, particularly in October 1981, October 1983, May 1989, October 1996, and November and December 1999 (Do, B. 2002). As the Figure 12 shows, the latest and most disastrous flood, in 1999, was a memorable experience for residents in the affected area. It affected the lives of approximately one million inhabitants, including 780 fatalities; total damage was worth US$364 million (Central Committee for Flood and Storm Control 2006). The main season of flooding lasts from late September to early January annually. According to the monitoring record from 1997 to 2006, Huong River running through Hue city has an average of 3-5 floods every year. Average flood duration is around 3 to 5 days, and the longest is a week.

ii) Flood situation in Gia Hoi area

![Figure 12: The Peak of flood water level on Huong River running through the town of Hue (Tran 2012)](image-url)
Figure 13 shows the flood level in the research site. In the area, floods occur a few times per year. And the flood level for 24% of the respondents is water level covered roads and lands, and the flood level for 16% of them is water level covered above house floor. The height of the land around the end of Bach Dang street, Dong Ba Bridge and Gia Hoi Bridge pier, lower and flood level of the houses located there are bigger. Flood level rises very quickly after heavy rain, as great amount of water flows from upstream of Huong River. In only 5 hours, the water level rises around 1 meter. Therefore, after heavy raining, many people living in this area have to use boats for transportation.

Once for 10 years, the flood level is more than 1-2 meters. Especially, there were big floods causing severe damages in November 1983 and November 1999 which inundated some houses.

Figure 13: Flooding situation in rainy season in Bach Dang

Figure 14: Flood water levels at 2 houses in Bach Dang in Flood in 11/1999 and in normal flood
with the flood level of 2 meters. In the research site, 12% of the houses were inundated with the flood level of 1-2 meters. Most of them had damages of their properties washed away, and spoiled due to being soaked in the water. In particular, the traditional wooden houses had serious damages where wooden structures such as columns, beams and doors were decayed, walls were cracked and peeled, foundations sagged, and some houses were unroofed due to strong winds accompanied with floods. In addition, kitchens and toilets have more serious damages. Normally, the foundations of kitchens and toilets were built lower than the main house foundations in accordance with the traditional belief, Feng Shui concept. Therefore, when they have flood, water overflows into there first. Figure 14 shows flood water levels of two houses in Back Dang street in 1999 and in normal flood. The foundations of both houses were built above the flood water level of the normal flood (370 mm from the street), and they do not have serious flood damages. In 1999, the historical flood occurred and the ground floors were inundated completely.

iii) Flood situation in Huong Phong commune

The Huong Phong commune was also hit hard by the 1999 flood: it reported the deaths of five people, 300 cattle, and 20,000 poultry, as well as extensive damage to many houses (CARD 2007). In Van Quat Dong village, the field survey was conducted across 39 households that had
been randomly selected based on their acceptance of measurement-taking and interviews (Figure 15). According to the survey, frequent floodwater levels were measured between 5 and 135 cm from the ground (Figure 16). The average of the floodwater level in 1999 were 123 cm from the ground (Figure 17).

5. Community adaptation to flood risk

i) Urban area: Gia Hoi area of Hue city

According to the surveys, the foundations of houses in the area were built above the flood water level of the annual flood (370 mm from the street), and they do not have any flood damages from the normal flood. When they know from news that a big flood is coming, some of them lift floors. Before flooding, people build lofts or high places in their houses, and they put valuable furniture, food and drinks in the high places. During flooding, 74% of the respondents just move up to the high place in their houses, and few people move to evacuation places. The local government does not provide evacuation centers in particular. In small floods, people just use bricks to raise beds, furniture and valuable items such as refrigerators, motorcycles and so on. In big floods, lofts provide the largest space for people to shelter and store their furniture. After people know a big flood occur from news, they reinforce their houses and raise the foundations of their houses from 10 to 30 cm higher, which depends on the type of houses and the height of the road in front. Especially the foundations of the old wooden houses are lower than the height of the road in front, while the foundations of the modern concrete houses are higher. The modern concrete houses are built with two or three stories, and the residents just move up to a higher floor during floods. The old wooden houses are low-rise buildings, and there are mezzanines in the houses. The mezzanine normally hosts a small space for worship. During floods, this becomes a shelter and storage for foods and furniture. Other preparation for flooding is to dredge river to canalize sewer to reduce flood damages. People dredge rivers and drains in partnership with neighbors before and after flooding.

Besides, there are several oral traditions to forecast flood among the elderly. For example, if ants bring ant-eggs and climb on walls to a high place, big flood will occur. In the survey, 50% of the respondents talked the story. Other methods of forecasting are moving of insects such as dragonflies and cockroaches, and plants such as orchids and reeds. Thus, people in Hue have been able to forecast flood from change of native flora and fauna. Moreover, some people said that they can understand timing of floods from the lunar calendar. However, 92% of the respondents said that climate in Hue has changed, and it has been difficult to forecast floods recently.

After flooding, the local community cleans their streets (Figure 18). Cooperation of local community to cope with flood leads to enhance cohesion and empowerment of local community. According to the survey, 76 % of the residents join in their traditional community activity, “Cung Xom”\(^{(1)}\), comparing to the fact that people living a busy streets have not participated, and the number of participants is decreasing (Yoshizumi, etc 2010).

ii) Rural area: Huong Phong commune

One particular housing characteristic seen in the site is the construction of a higher-than-usual foundation. It seems that the provision of a highly elevated floor can prevent...
flooding. However, the height of the floor among the households surveyed varied from 0 to 100 cm from the ground. One of the interview questions asked villagers about the average water level during annual floods, to determine the relationship between floor elevation and floodwater; all of them related to the occurrence of frequent floodwater levels that measured between 5 and 135 cm from the ground. The space between the floor and the water level clearly expressed the villagers’ adaptation to annual flooding (Figure 16).

In the Figure 16, Group 1 includes the houses that could survive a flood with the same characteristics as that in 1999; for obvious reasons, no temporary housing is included in the group, on account of its weak structure and composition. The other groups were constructed after 1999: nine were concrete-based structures of conventional or modern housing (Group 2) and three were temporary housing (Group 3). The floor height in Group 1 was found to adapt well to annual floods. In 23 of 27 houses, the floodwater rose to within 25 cm of the floor; thus, this floodwater level did not affect their properties much. The floodwater in Group 2, stayed at comparatively lower levels compared to that in Group 1. It seemed that villagers tended to construct more highly elevated foundations than before 1999, and so their housing was made safer than it previously had been.

All the households in Group 3 reconstructed temporary housing after the 1999 flood; through the interviews, it was found that they had also lived in temporary housing prior to that flood. They reconstructed their houses in a minimal fashion, despite knowing that temporary housing would not be strong enough to survive another disastrous flood. Most within this group are within the low-income bracket and therefore cannot afford higher floors or stronger structures.

6. Conclusion

Thuan Thien Hue province located in flood-prone area is the historical area, and has historically coped with floods. Through their experiences to live with floods, people in Hue have learnt various knowledge and technologies. Through the analysis of field and questionnaire surveys, it found out that there are a variety of wisdsoms and technologies for flood management in urban and rural area in Hue, and local communities sustained through mutual assistance to reduce damages.

The foundations of the houses were built more than the normal flood water level (370 mm from the street), and they do not have any flood damages from the normal flood. When they know from news that a big flood is coming, some of them lift floors. Most of people in Hue city built higher places more than 2 meters. In Huong Phong commune, based on their experience with annual floods, the people constructed from 50cm to 150 cm high floor. Such high places are built by simply putting panels on the beams of houses, mezzanines, loft and the second floor. When a flood is coming, they put valuable furniture, electrical products, motorbikes, and foods there. During floods, most of people do not escape from their houses, and they just stay at the higher places.

The houses constructed after the 1999 flood had comparatively more highly elevated foundations than those constructed prior to 1999. It seems obvious that villagers had modified their housing as a result of having experienced the 1999 flood.

Additionally, people often cooperate with neighbors for dredging river to canalize sewer to reduce flood damages before floods, and cleaning streets after floods. For that, their community relationships have been quite robust. On the other hand, it also found out that there
is gradual loss of the knowledge and mutual assistance.

Through learning about the impact of natural disasters and local knowledge to cope with natural disasters of the inhabitants in historical quarters, the study aims to help the people be aware of the role and importance of necessary knowledge, community linkage and livelihood in order to appropriately deal and minimize the impacts of natural disasters, conserve heritage values towards sustainable development in the future.

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Notes:
(1) Cung Xom is a Vietnamese traditional community activity for worshiping. Cung Xom was originally introduced by Chinese people and Cung Xom has become one of the most important community activities for community linkage.

Reference:
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8) Tran Kim Thanh (2012). Flood in Thua Thien Hue Province and control measures, the Philippine International River Summit