Copying Mechanisms in Repeated Floods Areas: A Case Study in Ba Baong Commune in Prey Veng Province, Cambodia*

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Abstract

Vulnerable communities in Cambodia where annually experiences the repeated floods need the encouragement of their capacity mechanisms. The research study aimed to understand livelihoods of local communities experiencing repeated flooding and the building range of coping mechanisms of community based on available community resources which made the vulnerable people in the community to be able to increase their resiliency to the repeated floods in bigger scales. Approaching to the aims of study, Ba Baong commune in Prey Veng Province of Cambodia was selected for sources of information. Data collection was conducted regarding livelihoods of local people in the commune and flood patterns in relation to the coping mechanisms by document reviews, field observation, focus group discussion and interviews. The accumulated coping capacity was focused for the local management of community to minimize the flood damage at different flood stages; preparing, responding, recovering stages. The results revealed that their livelihoods were changed related with flood patterns: month starting rainy season, flood levels and flood duration. They adapted to the floods depending on utilization of available resources by the community achievement at various beneficial ends and important actions of local people adopted in order to remediate flood adverse impacts. Community capitals culturally shared among individuals by building trusts among local people in the community, motivation to work together, and self-reliance that were employed in Ba Baong community as immediate informal response to overcome hardships whereas the external supports were believed to be another crucial mechanism contributing effective flood responses. Therefore, that national policy should systematically learn the local coping capacities and mechanisms applied in a community level in order to promote the more effective informal and formal coping mechanism in a sustainable way.

Keywords*:* Repeated floods/ Community/ Livelihoods/ Copying Mechanisms/ Cambodia

1. Introduction

The high various types of coping mechanisms responding to the changes in available natural resources are often found in rural communities where have been frequently suffered from repeated floods (Bonye and Godfred, 2011; Gaillard et al., 2008; Giang et al., 2012; Komino, 2008; Mercer and Kelman, 2008). Many communities in Cambodia respond to the repeated floods with their accumulated coping capacities (Oeur et al., 2012; Sok et al., 2011) to remediate the risks of floods resulting in less adverse impacts on social and economic livelihoods (Nang et al., 2014). The coping capacities depend on their available management skills, changes of available resources, and opportunities to address, manage, and overcome adverse conditions, in which people act within the limits of existing resources and range of experiences to achieve various ends (Wisner, 2004) in the short to medium terms. The effective flood responses are accumulated from people's ability to maintain their livelihoods within the flooding situations and consequences, complementation of coping mechanisms and available resources (Alam et al., 2008). Their mechanisms remediate the disasters impacts such as the isolation from external assistance, and the limits of access to a community and to societal resources and community functions. (Paton et al., 2006). The affected communities in the repeated flood areas effectively use remained resources with their capacities to handle the critical changes of available resources by the floods (Khunwishit, 2013; Mercer and Kelman, 2008; Reganit, 2005). For example, Nakhon Sawan municipality in Thailand, during a major flooding event in 2011 was considered as a resilient community that used their own resources and coping mechanisms to respond to flood impacts (Khunwishit, 2013). Reganit (2005) revealed that adapted social and economic coping mechanisms of communities in Naga city in the Philippines to floods were influenced by driving forces such as income, access to assistance and geographical location. The coping mechanisms of community depend on specifically local factors including social networks (Scott et al., 2013; Stewart et al., 2014; Yila et al., 2013), local knowledge (Mavhura et al., 2013; Mercer and Kelman, 2008; Peters-Guarin et al., 2012), and socio-economic structures (Paul and Routray, 2010; Wickes et al., 2015). For example, villagers in Singas, Papua New Guinea applied their indigenous knowledge regarding social relationship, land management, food security, and environmental observation to reduce flood adverse effects (Mercer and Kelman, 2008). Another case study was practiced in two flood-prone villages in Bangladesh where local people used their indigenous coping strategies coupled with

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socioeconomic condition to reduce flood adverse impacts (Paul and Routray, 2010). Social, economic and environmental types of coping mechanisms are employed by the local management of community to minimize the flood damage at different flood stages; preparing, responding, recovering stages (Blaikie et al., 2004; Lindell and Perry, 1992). Due to disaster assistance from external stakeholders required a lengthy process, the flood affected people still felt that the government intervention was slower than expected (Mani Sharma et al., 2015; Reganit, 2005). An advantages of short time period of waiting for external assistance, the local coping mechanisms are optimum choices for the rural communities to control the damages from repeated floods (Alam *et al.*, 2008; Mercer and Kelman, 2008). However, the localized factors of community experience flooding regarding their household capacities and coping mechanisms available (Peters-Guarin *et al.*, 2012) are generally found in the repeated flood areas. It is; therefore, very interesting that the damages caused by floods can be remediated by fast response of localized coping mechanisms of community, so the coping capacities of vulnerable people in the risk-prone areas should be enhanced (Dixit, 2003). Specifically significant factors in different areas of Ba Baong commune in Cambodia, the research study aimed to understand livelihoods of local communities experiencing flooding and the build array of coping mechanisms of community based on available community resources (Peters-Guarin *et al.*, 2012) which made the vulnerable people in the community to be able to increase their resilient capacity to the repeated floods in bigger scales. To fulfill the aims of study, the research findings documented livelihoods of local people in the Ba Baong commune and flood patterns in the relation to the coping mechanisms in Prey Veng Province, Cambodia.

1.1.Coping mechanisms facing with floods

Having defined by World Health Organization (WHO), coping mechanisms are strategies that people use in order to deal with stresses, pain, and natural changes that they experience in life (WHO, 1999). In terms of disasters, coping mechanism were defined as manners in which people acted within the existing resources and ranges of expectations of a situation to achieve various ends (Blaikie *et al.*, 2004). Coping mechanisms are developed to protect and regain from losses and damage from effects of flood hazards. Many studies mentioned varieties of coping mechanisms that were practiced, including prevention, food storage, diversification of income sources, social network development and post-event actions (Assheuer et al., 2013; Blaikie *et al.*, 2004; Mavhura *et al.*, 2013; Reganit, 2005).

The coping mechanisms of community level was such as an interaction between structures and functions of components in a community by using their existing resources to face adverse impacts (Fabricius et al., 2007). The community structures focusing their roles in to cope with flood of this study were divided into two groups, namely leaders and followers (Black and Hughes, 2001). The leaders' functions were focused on their roles to motivate community members to work together, to disseminate information of flood situations and external/internal supports in formal and informal manners. Therefore, the formal leaders were local government authorities, and the informal leaders were religious leaders and elders. The followers were villagers who resided in the community and they encouraged assistance among individuals and participated community flood relieves.

1.2 .Study Area

The study area was in Ba Baong commune, located in Peam Ro district, Prey Veng province (Figure 1). The Prey Veng province is one of the 24 provinces in Cambodia located in the south of the country which was announced as risk-prone areas. This province, with an area of 4,883 square kilometers, has 12 districts, 116 communes, and 1139 villages. With a population growth of approximately 2% per year, this province had a population of 1.12 million from 41,975 families in 2008 (NCDD, 2009).

Ba Baong commune is located in the south of Prey Kandeang and Preaek Chrey communes in Kompong Leav district, in the east of Peam Meanchey commune, in the north of Peam Ro and Reaks Chey communes in Ba Phnom district and in the west of Theay commune in Ba Phnom district. The commune consists of 4 villages, namely Ba Baong, Chouk Chey, Doung and Ponley villages. There were 614, 246, 218 and 645 households in Ba Baong, Chouk Chey, Doung, and Ponley villages respectively in 2014. According to the National Committee for Sub-National Democratic Development (NCDD), about 93.5 % of households Ba Baong commune involved in agricultural sector in 2008 (NCDD, 2009).

2. Methodology

The review data focused to flood impacts on physical environment and on biological environment in particularly flood patterns occurring in Cambodia, and specific flood situations at Ba Baong commune that enhanced the livelihood resilience such as local foods, fiber, fuel wood, and water regulation structure. At the commune, site observation, focus group discussion and interviews were conducted. Field surveys were conducted during the early rainfall season in September, 2014 to observe physical structures and local activities interrelated to floods. During the field work, social data that derived from their experience in flood dealing were conducted in by employing a focus group of five participants, for eight focus groups. There were forty participants selected from four villages in the commune and classified into better-off and

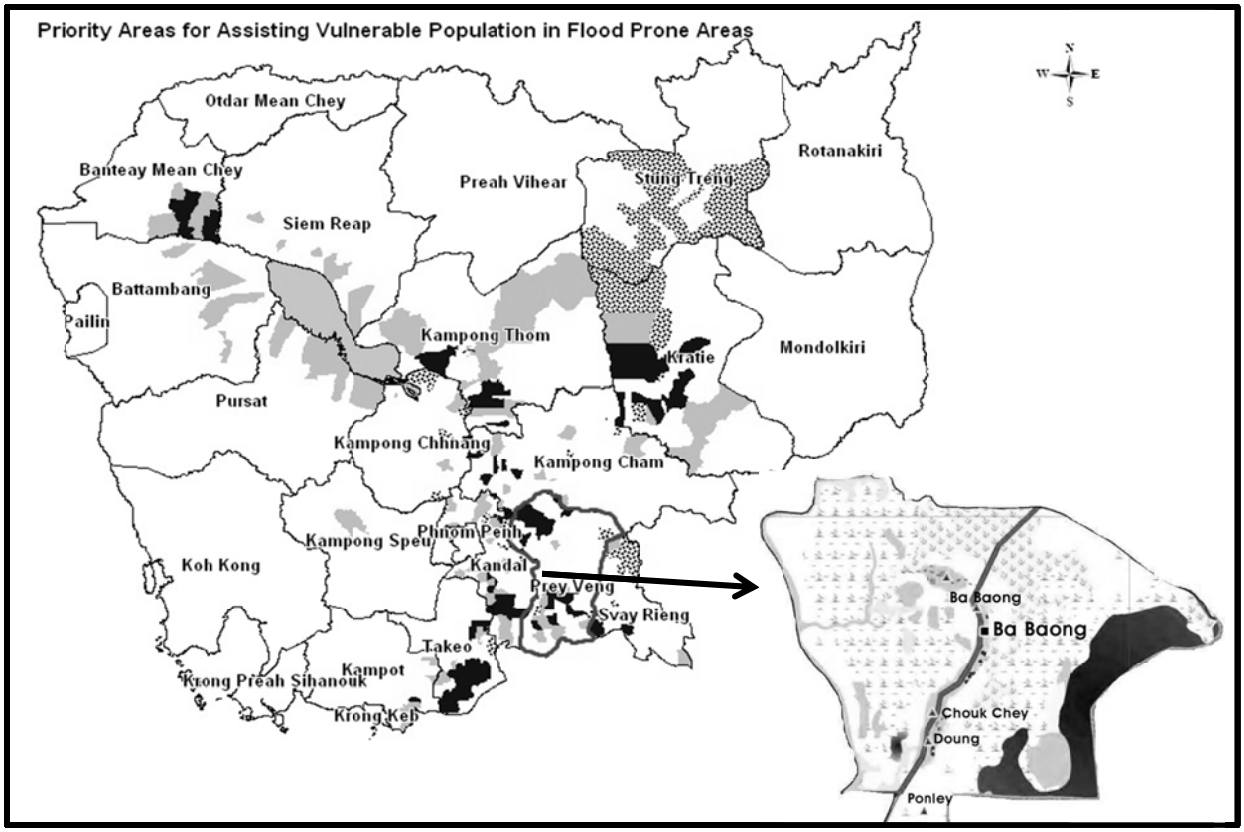

Figure 1: Location of Ba Baong commune in Prey Veng province, Cambodia.
Source: (NCDD, 2009; Wold Food Programme, 2004)

poor household groups, which have both male and female participants. Families who has equity card[1] were considered as the poor while families who did not have were the otherwise. The forty participants were introduced by village chiefs based on the equity cards. The focus groups discussed their experiences in relation with 1) floods impacts to their living, 2) their activities for coping with floods, 3) important factors that enable them to cope with the impacts, and 4) social capital employed in those villages. Each participant who joined the focus group discussions was interviewed by using a questionnaire survey (Bernard, 2013), which contented information related to their individual household concerning socioeconomic, flood preparedness, response and recovery, and their opinion on their relationship with other villagers and community leaders. In-depth interviews (Bernard, 2013) were conducted with key informants, namely the chief and commune leaders to extract information about the villages. Combination of primary data collection and secondary written documents, namely books, journals, newspapers and reports delivered of information for this research.

Qualitative data analysis was evaluated using content analysis that started from raw data such as field notes, summary records of meetings and interview texts from which salient points were extracted, the information was then classified and combined with similar material across the board. Data analysis and statistical software were conducted for quantitative data for data entry and frequency calculation.

3. Results and Discussion

3.1Available natural resources supporting coping mechanisms

The repeated floods naturally sustained available ecosystem services by functions of ecological production such as soil fertility, nutrient cycles, trophic niches to support the community utilization (Butler et al., 2003). From the field observation, farmers in Ba Baong commune utilized benefits of nutrient sedimentation during long time flood duration as an important soil nutrient input for the rice crop, especially to increase rice production. Their substantial rice crop cultivation in a dry season to avoid floods possessed fertile soil that was filled by sediment brought by floods (Fitzgerald et al., 2007; Sedara et al., 2002). The results from focus group discussions supported the evident that the flood water brought in the sediments which enriched the soil nutrients for their crops and other

[1] Equity card is a card issued by the Ministry of Planning with an objective to reduce duplication of effort and resources by different institutions and organizations in identifying their target groups for various poverty reduction interventions, and to ensure that assistance is provided to those households who most need it.

biological resources. They emphasized that benefits from floods obviously provided environmental mechanisms of commune such as a natural water retaining in a protected forest and a nutrient budget for aquatic lives. The protected flooded forest in the commune functioned as a water retention source to feed the stored water for rice crops and agricultural purposes in dry season as well as supplied nutrients within the flooded forest habitat for numerous of aquatic organisms especially fish and other commune foods such as snails, frogs, crabs and small shrimps (Figure 2).

Figure 2: A protected flooded forest in Ba Baong commune functioned as a water retention source and a habitat for numerous of aquatic organisms. (The photo was taken in September, 2014)

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3.2 Local livelihoods toward accumulated coping capacities

3.2.1The local livelihood shifts/changes by repeated flood patterns

Agricultures including rice farming and animal husbandry are major activities possessed by many people in the commune. According to the National Committee for Sub-National Democratic Development, it was 93.5% of households Ba Baong commune involved in agricultural sector in 2008 (NCDD, 2009). Among all respondents, 70% of them were a farmer, and the other 30% of them were a trader, a construction worker, a motor taxi, etc. Besides being a farmer, many people go for fishing to earn extra income and for households' source of protein. Majority of respondents especially the poor stated that they were a farmer, and they had to diversify their income sources by searching for off-farm and labour work since they could not perform rice farming during the three months of flooding period.

3.2.2Food storage and consumption during repeated flood

The participants revealed that rice and food stocks were stored in a secured place above the repeated flood level, so the commune was not severely affected. Source of proteins during the flood period was mainly from aquatic lives in flooded water drainages, waterways and rice fields. However, some limits of normal food access were revealed among the poor. The fish capture ability of poor households was limited by changes of water levels and available fishing facilities such as a palm boat and fish capture tools. Most participants responded that variety of food was changed to available fish and vegetables when the villages were flooded. For the poor households, they often had prahok (salted and fermented fish) for meals for several consecutive days. Most of participants concerned about clean drinking water. The households with wells in the lowlands and submerged in the flood used water

3.2.3 Shelter designs responding to the flood levels

Shelter designs and materials reflects mechanisms adapted to the repeated floods (Ahmed, 2005; Reganit, 2005). At Ba Baong commune, the houses were designed to build to high stilts in order to let flood water to pass through. The housing sizes in the commune were various ranged from large houses to small ones. Housing materials represented the levels of vulnerability to floods (Aid et al., 2012). The results showed that most of dwellings made from galvanized iron (47.5 %), and bamboo and thatch/leaves (35 %) (Table 1).

In addition, twenty-six respondents (65 %) reported that roof of their houses were made of galvanized iron, five (12.5 %) fibrous cement, and two (5 %) thatch/leaves/grass. Besides, thirty-five out of 40 respondents stated that bamboo strips were used to build housing floor. Only three respondents (7.5 %) constructed with wooden planks, 1 (2.5 %) concrete, and another 1 (2.5 %) ceramic tile. The poor usually owned a house which was made of bamboo, thatch/leaves or grass (Figure 3), while the non-poor possessed a house made of galvanized iron or aluminum or other metal sheets, which withstood the flood water.

3.3 Flood patterns related to livelihoods

Ba Baong commune in Prey Veng province is the floodplain area in south-eastern part of Cambodia where is a part of the Lower Mekong Basin. The rainy season occurs from May to October (Tes et al., 2014). The main cause of flooding in Prey Veng province is from the runoff from the Mekong River, but it will be worsened by combination with heavy rainfall at local area, which results in flood risk period from mid-august to mid-October (Kea et al., 2005). In 2000, the most severe flood, a flood level was reported reaching to three meters and flood duration was up to 90 days (Kea *et al.*, 2005). With information accessed from the focus group discussions, topography of Ba Baong commune resulted in slow inundated water in the low lands. The floods in the commune was mainly resulted from rising water levels in the Mekong River, coupled with heavy rainfalls at local, national, and regional

Table 1: Materials of Shelter Represent Level of Vulnerability to Floods

Primary material of the wall of the housing	Number of respondent (%)
Bamboo, thatch/leaves	14 (35.0)
Wood or logs	2 (5.0)
Plywood	4 (10.0)
Galvanized iron	19 (47.5)
Others	1 (2.5)
Total	40 (100.0)
Primary material of roof	Number of respondent (%)
thatch/leaves/grass	2 (5.0)
Tiles	7 (17.5)
Fibrous cement	5 (12.5)
Galvanized iron	26 (65.0)
Total	40 (100.0)
Primary material of floor	Number of respondent (%)
Wooden planks	3 (7.5)
Bamboo strips	35 (87.5)
Concrete	1 (2.5)
Ceramic tile	1 (2.5)
Total	40 (100.0)
Main source of drinking water	Number of respondent (%)
Hand pump/bore hole	37 (80.0)
Dug well	2 (5.0)
Rainwater	1 (2.5)
Total	40 (100.0)
Main source of lighting	Number of respondent (%)
Battery	32 (80.0)
Kerosene lamp	3 (7.5)
Others	5 (12.5)
Total	40 (100.0)
Main source of cooking	Number of respondent (%)
Firewood collected	39 (97.5)
Firewood bought	1 (2.5)
Total	40 (100.0)

Note: The percentages are in parentheses.

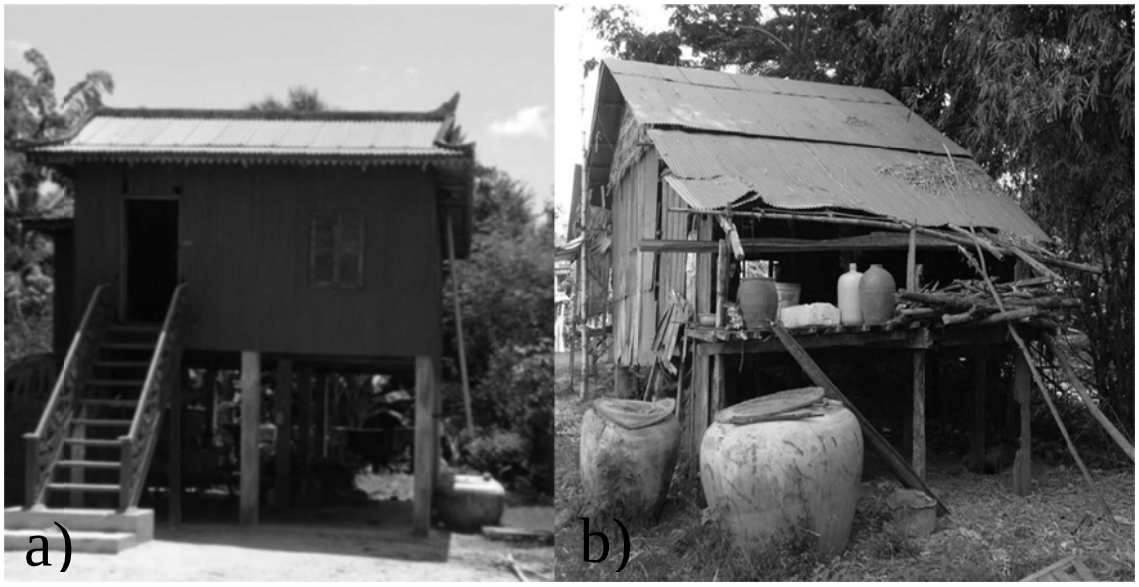

Figure 3: House construction of Ba Baong people: a) a house owned by the non-poor household and b) a house owned by the poor household.

level in the catchment of Mekong tributaries. The floods occurring at the commune was a part of large scale of extended floods of the floodplain area and the rate of rising water was increases gradually. Participants considered the floods as a severe situation when a water level in their villages was higher than one meter and stayed up to more than twenty days. After rice harvest, the rice fields of the commune were left vacant, and they can be filled in with the deposit nutrients and the recharged water brought by floods. However, when floods reached the villages and water level was high coupled with long receding duration, people could be affected. Durations of flood affected to the changes of local livelihood such nutrition source shifts from land production to aquatic organisms (Nguyen et al., 2007).

Information of flood patterns was discussed among the participants. All participants realized that information disseminated by formal and informal communication must contained information of flood period, level and duration. Moreover, they confirmed that the formal information was reliable and preferred to combine it to local observation by word of mouth.

3.4 Coping mechanisms of Ba Baong commune

Community mechanisms implemented by local people are different from place to place based on available community capitals. Abramson et al. (2015) mentioned culture, ethnicity and race were prime mechanisms for enabling and perpetuating resilience at community level. The community experienced with the disaster occurrences contributed to an accumulation of specific knowledge—"local knowledge"—that people drew on as a coping mechanism (Von Vacano and Zaumseil, 2014). The results also showed that Ba Baong commune built the community coping mechanisms to increase their coping capacity by utilizing their available community capitals such as social, natural, human, financial and human capitals.

3.4.1 Sharing of community capitals

Buckle (2006) mentioned that sharing of knowledge, experience, and resources was valuable for creating adaptive capacity. Sharing is an act of exchanging in terms of knowledge, information, food, and etc. Knowledge sharing does not mean that people have to teach other people directly, yet they learn from one another through observation (Dekens, 2007). For example, Yila *et al.* (2013) mentioned that mutual assistance provided supports such as loans, tools, shelters and labours to community members to respond and recover from flood in a community in Fuji Island. Besides using social financial and physicals capitals accessed from social capital, emotional sharing was applied in the community.

As in Ba Baong commune, villagers knew how to prepare for floods from their own family and surrounding neighbors without direct teaching. Out of all respondents, 55 % of them agreed that people in their community were willing to help one another while 28 % strongly agreed (Table 2).

Information obtained from focus group discussions, confirmed statistical data showed that people at Ba Baong commune supported one another by providing their available resources both in-case and in-kind. For instance, people were

Table 2: Number of Respondents Who could Access to Other People for Assistance

People were generally willing to help	Non-poor household (%)	Poor household (%)	Total (%)
Strongly disagree	3 (7.5)	2 (5.0)	**5 (12.5)**
Disagree somewhat	0 (0.0)	1 (2.5)	**1 (2.5)**
Neither agree nor disagree	0 (0.0)	1 (2.5)	**1 (2.5)**
Agree somewhat	14 (35.0)	8 (20.0)	**22 (55.0)**
Strongly agree	3 (7.5)	8 (20.0)	**11 (27.5)**
Total	20 (50.0)	20 (50.0)	40 (100.0)
People beyond family willing to help	Non-poor household (%)	Poor household (%)	Total (%)
No one	3 (7.5)	3 (7.5)	**6 (15.0)**
One or two	9 (22.5)	16 (40.0)	**25 (62.5)**
Three or four	5 (12.5)	1 (2.5)	**6 (15.0)**
Five or more	3 (7.5)	0 (0.0)	**3 (7.5)**
Total	20 (50.0)	20 (50.0)	40 (100.0)

Note: Percentage is in parenthesis.

allowed to borrow boats for travelling from one place to another. They, moreover, helped each other to move their belonging before flood water arrived. Loans were provided both in-case and in-kind.

3.4.2 Trust within the community

Trust is identified as one of requirements and indicators which have highest impact on social resilience of communities (Buckle et al., 2003; Khalili et al., 2015). Trust allows people in a community to work together in order to achieve their common goal. Trust is not just happen between villagers and leaders, but also between villagers and villagers. Regarding to the results of study, more than average of respondents (52.5 %) expressed their opinions that most people in their villages were generally trustable (Table 3).

Moreover, there were always someone who were willing to help the respondents when they were in trouble. Thirty-four respondents (85 %) provided positive answers. Additionally, eleven respondents (27.5 %) strongly agreed and twenty two (55 %) agreed to some extents that most people in their villages were generally willing to help one another. Based on information of Table 4 and Table 5, majority of respondents (88 %) trusted on their local leaders, which meaned that they were willing to follow the leaders to perform any assigned work.

Table 3: Trust of Non-poor and Poor Households in Ba Baong Commune

People can be trust	Non-poor household (%)	Poor household (%)	Total (%)
can't be trust	8 (20.0)	11 (27.5)	19 (47.5)
can be trusted	12 (30.0)	9 (22.5)	21 (52.5)
Total	20 (50.0)	20 (50.0)	40 (100.0)

Note: Percentage is in parenthesis.

Table 4: Levels of Trust in Local Authorities and Government Officials Between Non-poor and Poor Households

Trust on village chiefs	Non-poor household (%)	Poor household (%)	Total (%)
Believe	16 (40.0)	19 (47.5)	35 (87.5)
Not believe	4 (10.0)	1 (2.5)	5 (12.5)
Total	20 (50.0)	20 (50.0)	40 (100.0)
Trust on commune council	Non-poor household (%)	Poor household (%)	Total (%)
Believe	17 (42.5)	18 (45.0)	35 (87.5)
Not believe	2 (5.0)	2 (5.0)	4 (10.0)
Don't know	1 (2.5)	0 (0.0)	1 (2.5)
Total	20 (50.0)	20 (50.0)	40 (100.0)

Note: Percentage is in parenthesis

Table 5: Number of Respondents who Trust Religious Leaders Between Non-poor and Poor households

Trust on religious leaders	Non-poor household (%)	Poor household (%)	Total (%)
Believe	19 (47.5)	17 (42.5)	35 (87.5)
Not believe	1 (2.5)	3 (7.5)	5 (12.5)
Total	20 (50.0)	20 (50.0)	40 (100.0)

Note: Percentage is in parenthesis.

3.4.3 Disaster experience

Year-to-year experience of facing flood hazards increases a community's capacity to deal with the consequences of disasters (Khunwishit, 2013). Nang *et al.* (2014) stated that farmers created the coping mechanisms in particularly received annual river floods. Having experienced floods since old time leads these local people to notice and recognize what action should be taken in order to cope with floods (Dekens, 2007).

The field observation revealed that experiences and developed skills found in this commune were local knowledge that occurred from sharing of similar experience about floods, and thus they knew what they should prepare to survive through the flooding period. The respondents were asked if they knew how to prepare themselves for flood, and 97.5% of them provided positive responses (Table 6).

Table 6: Number of Household Who Know How to Prepare for Flood

Number of household who know how to prepare for flood	Non-poor household (%)	Poor household (%)	Total (%)
Yes	20 (50.0)	19 (47.5)	39 (97.5)
No	0 (0.0)	1 (2.5)	1 (2.5)
Total	20 (50.0)	20 (50.0)	40 (100.0)

Note: percentage is in parenthesis

3.4.4 Motivation to work together

Buckle *et al.* (2003) stated that a motivated network that was established in times of emergencies would make them recover from a disaster. Motivation from the leaders encouraged villagers to cooperate in any of phase of flood cycle. According to all respondents, 88% of them reported that they were motivated by their local leaders to work together in order to increase their coping capacity in the community (Table 7). This is one of important points, which shows that local people are willing to participate in flood response activities inspired by their local leaders..

Table 7: Number of Respondents who Agreed and Disagreed That the Leaders Motivated Villagers to Work Together

Motivation from the leaders	Non-poor household (%)	Poor household (%)	Total (%)
Yes	42.5	45.0	35 (87.5)
No	7.5	5.0	5 (12.5)
Total	20 (50.0)	20 (50.0)	40 (100.0)

Note: percentage is in parenthesis

3.4.5 Self-reliance

The position that a person ought to be self-reliant in his or her conduct of life or role fulfillment instead of depending on something or someone else (Schwarz, 2014). Self-reliance is a warning against becoming dependent on an external aid. From the case study, the non-poor households were self-reliance comparing to the poor-households since they could assess to more five capitals which were financial, physical, natural, social and human capitals.

> "*We cannot totally depend on government supports. We should make contribution to our village. I donated some money to reconstruct a dike in my village because government aid is not enough.*" Non-poor respondent in Doung village.

The poor also tried have an attitude of self-reliance. They were aware of and prepared for an upcoming flood, although, they tended to depend on external supports. Among all respondents, only one respondent did not prepare for the floods due to location of the house on high land above the normal repeated floods (Table 8).

3.4.6External supports

Community residents will be exhausted by responding to prolonged floods without assistances from outsiders when a hazard overwhelms the local capacity. The coping capacities always imply collective affectedness and the presence of or at least a need for external aids (Zaumseil et al., 2013). Regarding to the external aids available at Ba Baong commune, the respondents stated that they also received external supports from the governmental organizations, the Cambodian Red Cross (CRC) and the NGOs. Majority of assistances such as foods, water treatment kits and medicines were distributed to the poor households since they had limited ability to cope with adverse impacts (Table 9). These supports, moreover, helped to reduce burden on the poor for some period of time. Fair distribution,

however, should be considered since it can provoke feeling of envy or jealousy within the community (Von Vacano and Zaumseil, 2014).

Table 8: Households' Preparedness Before Flooding

What did household do after receiving information?	Non-poor household (%)	Poor household (%)	Total (%)
Build house protection	19 (47.5)	20 (50.0)	39 (97.5)
Design house	11 (27.5)	19 (47.5)	30 (75.0)
Prepare food/ medicine	14 (35.0)	19 (47.5)	33 (82.5)
Put household assets	1 (2.5)	1 (2.5)	2 (5.0)
Do nothing	1 (2.5)	0 (0.0)	1 (2.5)

Note: The percentages are in parentheses

Table 9: Number of Households Who Received External Assistances

Type of assistance	Non-poor household (%)	Poor household (%)	Total (%)
Food for school children	0 (0.0)	2 (5.0)	2 (5.0)
Free food ration for household	7 (17.5)	11 (27.5)	18 (45.0)
Water treatment kits	7 (17.5)	11 (27.5)	18 (45.0)
Free fodder/animal feed	0 (0.0)	1 (2.5)	1 (2.5)
Free veterinary service	1 (2.5)	0 (0.0)	1 (2.5)
Free agricultural tools	0 (0.0)	1 (2.5)	1 (2.5)
Free seeds/fertilizer	4 (10.0)	1 (2.5)	5 (12.5)
Free healthcare/drugs	4 (10.0)	4 (10.0)	8 (20.0)
Food-for-work	1 (2.5)	0 (0.0)	1 (2.5)
Cash-for-work	1 (2.5)	0 (0.0)	1 (2.5)
Plastic sheeting/tents	1 (2.5)	3 (7.5)	4 (10.0)
Cooking utensil	0 (0.0)	1 (2.5)	1 (2.5)
Clothes/blankets	2 (5.0)	6 (20.0)	8 (20.0)
Mosquito nets	2 (5.0)	6 (20.0)	8 (20.0)
Micro-credit	1 (2.5)	0 (0.0)	1 (2.5)

Note: The percentages are in parentheses

4.Conclusions

Vulnerable communities need the encouragement of their capacity mechanisms to cope with repeated floods in Cambodia because the development of their accumulated coping capacity are fast employed by the local management of community to minimize the flood damages caused by the repeated flood. The results of case study done at Ba Baong commune where was located in flood-prone area where was affected by flood water accumulated from rainfalls and the Mekong River overflows in a rainy season showed their coping mechanisms. Their livelihood activities were adapted to the repeated flood patterns, and the people adjusted their ways of living with season changing especially the flood occurring in a rainy season. The coping mechanisms adapted to the floods depends on utilization of available resources by the community achievement at various beneficial ends. The results of this study revealed that some coping mechanisms were identified as important actions local people adopted in order to remediate flood adverse impacts. Sharing of community capitals among individuals, trust within the community, motivation to work together, and self-reliance were employed in Ba Baong community as immediate response to overcome hardships. External supports, moreover, was another crucial mechanism contributing effective flood responses. This research; therefore, concluded that policy makers and non-government organizations should encourage the local coping capacities and mechanisms to apply in a community level in order to enhance their specific factors related to flood impact mitigation as self-reliance.

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6. References

Abramson, D. M., Grattan, L. M., Mayer, B., Colten, C. E., Arosemena, F. A., Bedimo-Rung, A., & Lichtveld, M. 2015. The Resilience Activation Framework: A conceptual model of how access to social resources promotes adaptation and rapid recovery in post-disaster settings. **The journal of behavioral health services & research**. 42(1) : 42-57.

Ahmed, K. 2005. **Handbook on Design and Construction of Housing for Flood-Prone Rural Areas of Bangladesh, Asian Disaster Preparedness Center, Bangkok, Thailand.**Bangladesh:Nymphea.

Aid, A., ADB, Cross, D. R., Children, S. t., unicef, & Programme, W. F. 2012. **Cambodia Post-flood Relief and Recovery Survey.**

Alam, K., Herson, M., & O'Donnell, I. 2008. Flood disasters: Learning from previous relief and recovery operations. **ALNAP Lessons Paper. ALNAP and Provention Consortium**. Retrieved from http://www.alnap.org/pool/files/ALNAP-ProVention_flood_lessons.pdf.

Assheuer, T., Thiele-Eich, I., & Braun, B. 2013. Coping with the Impacts of Severe Flood Events in Dhaka's Slums-The Role of Social Capital. **Erdkunde**. 67(1):21-35.

Bernard, H. R. 2013. **Social Research Methods: Qualitative and Quantitative Approaches**. USA: SAGE.

Black, A., & Hughes, P. 2001. The identification and analysis of indicators of community strength and outcomes. **Occasional Paper No.3.** Department of Family and Community Services:Canberra

Blaikie, P., Cannon, T., Davis, I., & Wisner, B. 2004. **At risk: natural hazards, people's vulnerability and disasters**. 2nd edition NY:Routledge.

Bonye, S. Z., & Godfred, J. S. 2011. Traditional Coping Mechanism in Disaster Management in the Builsa and Sissala Districts of Northern Ghana. **European Journal of Social Science**. 25(2):204-218.

Buckle, P. 2006. Assessing social resilience. In Paton, D., and Auld, T. (eds**.) Disaster Resilience. An Integrated Approach**. Thomas Publisher LTD, Springfield: 88–103

Buckle, P., Marsh, G., & Smale, S. (2003). **The Development of Community Capacity as Applying to Disaster Management Capability.** Research Project Report.

Butler, C., Chambers, R., Chopra, K., Dasgupta, P., Duraiappah, A. K., Kumar, P., & Niu, W.Y. 2003. Ecosystems and human well-being. **Ecosystems and Their Services**.49-70.

Dekens, J. 2007. **Local knowledge for disaster preparedness:a literature review** Kathmandu: International Centre for Integrated Mountain Development (ICIMOD).

Dixit, A. 2003. Floods and vulnerability: need to rethink flood management In M.Monirul Monirul Qader Mirza, Ajaya Dixit and Ainum Nishat (eds..) **Flood Problem and Management in South Asia.** (pp. 155-179) Kluwer.Springer.

Fabricius, C., Folke, C., Cundill, G., & Schultz, L. 2007. Powerless spectators, coping actors, and adaptive co-managers: a synthesis of the role of communities in ecosystem management**. Ecology and Society**.12(1): 29.

Fitzgerald, I., So, S., Chan, S., Kem, S., & Tout, S. 2007. **Moving Out of Poverty? Trends in Community Well-being and Household Mobility in Nine Cambodian Villages**. Phnom Penh: CDRI.

Gaillard, J.-C., Texier, P., Gaillard, J.-C., Pangilinan, M. R., Rom Cadag, J., & Le Masson, V. 2008. Living with increasing floods: insights from a rural Philippine community. **Disaster Prevention and Management: An International Journal**. 17(3): 383-395.

Giang, P. Q., Toshiki, K., Kunikane, S., & Sakata, M. 2012. Integrated water resources management in Vietnam under the challenges of climate change. **Environment and Natural Resources Journal**. 10(1): 28-41.

Kea, K., Heang, S. S., Prak, S., & Brun, J. M. 2005. **Assessment of local authorities and communities practices and information needs to face disasters**. Phnom Penh.

Khalili, S., Harre, M., & Morley, P. 2015. A temporal framework of social resilience indicators of communities to flood, case studies: Wagga wagga and Kempsey, NSW, Australia. **International Journal of Disaster Risk Reduction**. 13: 248-254. doi:.1016/j.ijdrr.2015.06.009

Khunwishit, S. 2013. **Community Resilience in Thailand: a Case Study of Flood Response in Nakhonsawan City Municipality.** (Doctoral Dissertation). University of North Texas.

Komino, T. 2008. Indigenous coping mechanisms for disaster management in Mansehra and Battagram districts, North West Frontier Province (NWFP), Pakistan. In **Indigenous Knowledge for Disaster Risk Reduction:good practices and lessons learned from experiences in the Asis-Pacific region**.

Lindell, M. K., & Perry, R. W. 1992. **Behavioral foundations of community emergency planning**. Washington:Hemisphere.

Mani Sharma, C., Raj Dangal, M., Shrestha Pradhan, N., Lama, R. K. T., & Kumar, S. 2015. Mountains and Rivers: Impacts of and Responses to Flash Flood in the Seti River in Nepal. **Jacobs Journal of Hydrology**. 1(1):005

Mavhura, E., Manyena, S. B., Collins, A. E., & Manatsa, D. 2013. Indigenous knowledge, coping strategies and resilience to floods in Muzarabani, Zimbabwe. **International Journal of Disaster Risk Reduction**. 5:38-48. doi: 10.1016/j.ijdrr.2013.07.001

Mercer, J., & Kelman, I. 2008. Living with Floods in Singas, Papua New Guinea. In **Indigenous Knowledge for Disaster Risk Reduction**:**Good**

Practices and Lesssons Learned from Experiences in the Asia-Pacific Region, edited by Rajib Shaw, Noralene Uy, and Jennifer Baumwoll, 46-51.Bangkok:United Nations International Strategy for Disaster Risk Reduction.

Nang, P., Sam, S., Lonn, P., & Ouch, C. 2014. **Adaptation Capacity of Rural People in the Main Agro-Ecological Zones in Cambodia**. Phnom Penh: CDRI Publication.

NCDD. 2009. **Peam Ro District Data Book 2009.**

Nguyen, H. N., Vu, K. T., & Nguyen, X. N. 2007. Flooding in Mekong River Delta, Viet Nam. **Human development report** 2007/2008.Human Development Report Office,Occasional paper,2007/53.New York :United Nations Development Programme.

Oeur, I., Sopha, A., & McAndrew, J. 2012. Understanding social capital in response to flood and drought: A study of five villages in two ecological zones in Kampong Thom Province. **Engaging for the Environment**. 60: 60-83.

Paton, D., McClure, J., & Bürgelt, P. T. 2006. Natural hazard resilience: The role of individual and household preparedness. In D.Paton& D.Johnston(Eds.) **Disaster resilience: An integrated approach**. (pp:105-127).Springfield, IL:Charles C.Thomas.

Paul, S. K., & Routray, J. K. 2010. Flood proneness and coping strategies: the experiences of two villages in Bangladesh. **Disasters**. 34(2): 489-508.

Peters-Guarin, G., McCall, M. K., & van Westen, C. 2012. Coping strategies and risk manageability: using participatory geographical information systems to represent local knowledge. **Disasters**. 36(1):1-27.

Reganit, M. 2005. **Analysis of community's coping mechanisms in relation to floods, a case study in Naga City, Philippines**.(Master's thesis).International Institute for Geo-Information Science and Earth Observation Enschede,The Netherlands.

Schwarz, S. 2014. The Life Conduct Dimension of Coping: Local Wisdom Discourses and Related Life Orientations In Zaumseil, M. et al. **Cultural Psychology of Coping with Disasters**.(pp. 225-244) New York: Springer.

Scott, M., White, I., Kuhlicke, C., Steinführer, A., Sultana, P., Thompson, P., &. Russell, E. 2013. Living with flood risk/The more we know, the more we know we don't know: Reflections on a decade of planning, flood risk management and false precision/Searching for resilience or building social capacities for flood risks?/Participatory floodplain management: Lessons from Bangladesh/Planning and retrofitting for floods: Insights from Australia/Neighbourhood design considerations in flood risk management/Flood risk management – Challenges to the effective implementation of a paradigm shift. **Planning Theory & Practice**. 14(1):103-140.

Sedara, K., Sophal, C., & Acharya, S. 2002. Land, Rural Livelihoods and Food Security in Cambodia. Phnom Penh, in **Cambodia: A perspective from field reconnaissance.** Working Paper 24. Phnom Penh, Cambodia Development Resource Institute.

Sok, S., Lebel, L., Bastakoti, R. C., Thau, S., & Samath, S. 2011. Role of Villagers in Building Community Resilience Through Disaster Risk Management: A Case Study of a Flood-Prone Village on the Banks of the Mekong River in Cambodia In M.A. Stewart and P. Coelanis (eds.) **Environmental Change and Agricultural Sustainability in the Mekong Delta**. Advances in Global Change Research45 (pp. 241-255) Dordrecht,the Netherlands: Springer.

Stewart, K., Glanville, J. L., & Bennett, D. A. 2014. Exploring Spatiotemporal and Social Network Factors in Community Response to a Major Flood Disaster. **The Professional Geographer**. 66(3): 421-435.

Tes, S., Roussel, J. M., Sok, S. I., Cleary, D., & Hayball,N. 2014. **Cambodian Water Resources Profile**. Phnom Penh.

Von Vacano, M., & Zaumseil, M. 2014. Understanding Disasters: An Analysis and Overview of the Field of Disaster Research and Management In Zaumseil**,** M**.,** Schwarz**, S.,** von Vacano**, M.,** Sullivan**,** G.B.**,**Prawitasari-Hadiyono**,** J.E. (Eds.) **Cultural Psychology of Coping with Disasters** (pp. 3-44) Germany: Springer.

WHO. 1999. **Emergency Health Training Programme for Africa**. WHO/EHA/EHTP: PanAfrican Emergency Training Centre, Addis Ababa.

Wickes, R., Zahnow, R., Taylor, M., & Piquero, A. R. 2015. Neighborhood Structure, Social Capital, and Community Resilience: Longitudinal Evidence from the 2011 Brisbane Flood Disaster. **Social Science Quarterly.** 96(2): 330-353.

Wisner, B. 2004. **At risk: natural hazards, people's vulnerability and disaster.** Psychology Press.

Wold Food Programme. 2004. **Priority Areas for Assisting Vulnerable Population in Flood Prone Areas and Priority Areas for Assisting Vulnerable Population in Drought Pronev Areas**.

Yila, O., Weber, E., & Neef, A. 2013. The role of social capital in post-flood response and recovery among the downstream communities of the Ba River, Western Viti Levu, Fiji Islands. **Risks and Conflicts: Local Responses to Natural Disasters. Community Environment and Disaster Risk Managemen.** 14: 79-107.

Zaumseil, M., Schwarz, S., von Vacano, M., Sullivan, G. B., & Prawitasari-Hadiyono, J. E. (2013). **Cultural Psychology of Coping with Disasters**: Springer.