SUSTAINABLE COMMUNITY MECHANISMS FOR COPING WITH FLOOD: A CASE STUDY OF A COMMUNITY IN PREY VENG PROVINCE, CAMBODIA

Miss Vimoil Ourn

A Thesis Submitted in Partial Fulfillment of the Requirements
for the Degree of Master of Arts Program in Environment Development and Sustainability
(Interdisciplinary Program)
Graduate School
Chulalongkorn University
Academic Year 2015

กลไกของชุมชนอย่างยั่งยืนเพื่อรับมือกับน้ำท่วม : กรณีศึกษาชุมชนในจังหวัดเปรเว็ง ประเทศกัมพูชา

นางสาววิมอยล์ ออน

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาศิลปศาสตรมหาบัณฑิต
สาขาวิชาสิ่งแวดล้อม การพัฒนา และความยั่งยืน (สหสาขาวิชา)
บัณฑิตวิทยาลัย จุฬาลงกรณ์มหาวิทยาลัย
ปีการศึกษา 2558

Thesis Title	SUSTAINABLE COMMUNITY MECHANISMS FOR COPING WITH FLOOD: A CASE STUDY OF A COMMUNITY IN PREY VENG PROVINCE, CAMBODIA
By	Miss Vimoil Ourn
Field of Study	Environment Development and Sustainability
Thesis Advisor	Kallaya Suntornvongsagul, Ph.D.

Accepted by the Graduate School, Chulalongkorn University in Partial Fulfillment of the Requirements for the Master's Degree

.....Dean of the Graduate School
(Associate Professor Sunait Chutintaranond, Ph.D.)

THESIS COMMITTEE

.....Chairman
(Sangchan Limjirakan, D.Tech.Sc)

.....Thesis Advisor
(Kallaya Suntornvongsagul, Ph.D.)

.....Examiner
(Carl Middleton, Ph.D.)

.....External Examiner
(Associate Professor Kansri Boonpragob, Ph.D.)

วิมอยล์ ออน : กลไกของชุมชนอย่างยั่งยืนเพื่อรับมือกับน้ำท่วม : กรณีศึกษาชุมชนในจังหวัดเปรเว็ง ประเทศกัมพูชา (SUSTAINABLE COMMUNITY MECHANISMS FOR COPING WITH FLOOD: A CASE STUDY OF A COMMUNITY IN PREY VENG PROVINCE, CAMBODIA) อ.ที่ปรึกษาวิทยานิพนธ์หลัก: อ. ดร. กัลยา สุนทรวงศ์สกุล, 151 หน้า.

ประเทศกัมพูชาถือได้ว่าเป็นประเทศหนึ่งที่มีความเปราะบางจากภาวะน้ำท่วม อย่างไรก็ตาม ความสามารถในการรับมือกับน้ำท่วมของคนในชุมชนเป็นสิ่งที่ไม่ควรมองข้าม การศึกษากลไกของชุมชนอย่างยั่งยืนเพื่อการรับมือน้ำท่วม กรณีศึกษาชุมชนบาบาว จังหวัดเปรเว็ง ประเทศกัมพูชา โดยมีจุดประสงค์เพื่อระบุถึงปัจจัยสำคัญของกลไกชุมชนที่มีอิทธิพลต่อการรับมือกับน้ำท่วมในประเทศกัมพูชา และเพื่ออภิปรายนโยบายและกรอบการทำงานที่เกี่ยวข้องกับกลไกชุมชนอย่างยั่งยืน เพื่อการรับมือกับน้ำท่วม วิธีการเก็บข้อมูลทำโดยการศึกษาค้นคว้าข้อมูลทุติยภูมิ สังเกตการณ์ภาคสนาม การสนทนากลุ่ม และการสัมภาษณ์ โดยคำนึงถึงวิถีชีวิตของคนในชุมชนและรูปแบบของน้ำท่วมที่เกี่ยวข้องกับกลไกการรับมือ

ผลการวิจัยพบว่า ลักษณะน้ำท่วมที่เกิดขึ้นในชุมชนบาบาวส่วนมากเกิดจากการน้ำไหลเอ่อตามฤดูกาลของแม่น้ำโขง และปริมาณน้ำฝนชุก ในพื้นที่ ในประเทศ หรือ ในส่วนภูมิภาคลุ่มแม่น้ำโขง ซึ่งคนในชุมชนได้รับผลกระทบจากน้ำท่วมนี้ในทางใดทางหนึ่ง และได้ใช้กลยุทธ์ต่างๆ ในการรับมือน้ำท่วม เพื่อบรรเทา เตรียมการ และตอบสนองต่อภาวะน้ำท่วม และฟื้นฟูวิถีชีวิตในคนในชุมชนภายหลังการเกิดน้ำท่วม คนในชุมชนสร้างความสามารถในการรับมือน้ำท่วมได้ ขึ้นกับการใช้ทรัพยากรที่มีอยู่ ให้บรรลุประโยชน์จากน้ำท่วมและสนับสนุนให้คนในชุมชนเองเกิดการดำเนินการเพื่อบรรเทาผลกระทบทางลบจากน้ำท่วม ทรัพยากรของชุมชนในการศึกษานี้คือทุนในการดำรงชีวิต ได้แก่ ทุนทางสังคม ทุนสำหรับมนุษย์ ทุนธรรมชาติ ทุนทางการเงิน และทุนทางกายภาพ ทุนเหล่านี้ส่งเสริมให้คนในชุมชนสามารถสร้างและยกระดับความสามารถในการรับมือกับน้ำท่วม ทุนของชุมชนบาบาว ที่มีอยู่ประกอบกับองค์ความรู้ท้องถิ่นที่ได้สั่งสมมาจากการที่คนในชุมชนประสบกับภาวะน้ำท่วมซ้ำซากส่งผลทำให้คนในชุมชนสามารถรับมือกับผลกระทบจากน้ำท่วมได้อย่างประสบความสำเร็จ อย่างไรก็ตาม การเพิ่มความเข้มแข็งโดยรัฐบาลและโดยองค์กรพัฒนาเอกชนในเรื่องการปรับปรุงแนวทางปฏิบัติสำหรับการปรับตัวเพื่อรับมือกับน้ำท่วมและเทคโนโลยีนั้น ควรนำมาประยุกต์ใช้ในระดับชุมชนโดยคำนึงถึงวัฒนธรรมและบรรทัดฐานของชุมชน เพื่อให้บรรลุถึงกลไกของชุมชนอย่างยั่งยืนเพื่อการรับมือน้ำท่วม

สาขาวิชา สิ่งแวดล้อม การพัฒนา และความยั่งยืน ลายมือชื่อนิสิต .....

ปีการศึกษา 2558 ลายมือชื่อ อ.ที่ปรึกษาหลัก .....

5587618120 : MAJOR ENVIRONMENT DEVELOPMENT AND SUSTAINABILITY
KEYWORDS: SUSTAINABILITY, COMMUNITY MECHANISMS, COPING, FLOOD, 151 COMMUNE

VIMOIL OURN: SUSTAINABLE COMMUNITY MECHANISMS FOR COPING WITH FLOOD: A CASE STUDY OF A COMMUNITY IN PREY VENG PROVINCE, CAMBODIA. ADVISOR: KALLAYA SUNTORNVONGSAGUL, Ph.D., pp.

Cambodia is considered as one of flood vulnerable countries. Local people's coping capacities, however, should not be overlooked. The study on sustainable community mechanisms for coping with flood was carried out at Ba Baong commune, Prey Veng province, Cambodia. The research study aimed to identify the important factors of sustainable community mechanisms that influence on coping with flood in Cambodia and to discuss the policies and frameworks related to the sustainable community mechanisms to cope with flood. Data collection was conducted regarding to livelihoods of local people in the commune and flood patterns in the relation to the coping mechanisms by document reviews, field observation, focus group discussions, interviews and questionnaire surveys.

The study results found that the flood patterns in Ba Baong commune was mainly caused by seasonal overflows of Mekong River coupled with heavy rainfalls at local, national, and regional levels in the catchment of Mekong tributaries. The local people received some extents of flood effects on livelihoods. They implemented many coping strategies to mitigate, prepare, respond and recover from flood adverse impacts. Their coping capacity with the repeated floods depending on the utilization of available resources to achieve beneficial ends and support important actions of local people in order to remediate flood adverse impacts. The resources available in the studied community were referred to livelihood capitals, namely social, human, natural, financial and physical capitals. These capitals supported local people to build and enhance their coping capacities to flood. The availability of community capitals in Ba Baong commune coupled with local knowledge from the repeated floods allowed people to successfully cope with adverse impacts. To achieve sustainable mechanisms; however, the supports from government and NGOs on improvement new flood-resilient practices and technologies should be applied at the community level under consideration of community's cultural and norms.

Field of Study: Environment Development and Sustainability Student's Signature .....
Advisor's Signature .....

Academic Year: 2015

ACKNOWLEDGEMENTS

Firstly, I would like to express my deepest gratitude to my thesis advisor, Dr. Kallaya Suntornvongsagul, who provided both academic and emotional supports throughout the research process and thesis writing. I strongly appreciate her priceless times and guidance contributed to this research. I also would like to thank all thesis committees, namely Dr. Sangchan Limjirakan, Chairman of the Committee; Dr. Kansri Boonpragob, External Examiner and Dr. Carl Middleton, Committee member.

Moreover, I would like to express my sincerely thank to the HARVEST Scholarship funded by USAID for providing me a scholarship to further a Master of Art in Environment, Development and Sustainability at Chulalongkorn University.

My gratitude to Dr. Tong Kimsun, a former Programme Coordinator at CDRI, who always provided me advices and technical supports. Furthermore, I would like to thank Mr. Mao Hak, Mr. Mot Sana, commune chief, village chiefs and all participants in Ba Baong commune, who made big contribution to my research.

My thanks also convey to Ms. Sudthida Wongsathapornpat, and all officers at Environment, Development and Sustainable Program for their constant supports.

Finally, I owe my gratitude to my parents, sisters, brothers, friends and CDRI colleagues who always encouraged and supported me through my best and worst.

CONTENTS

Page

Page

Page

LIST OF TABLES

Page

CHAPTER II

CHAPTER IV

Page

LIST OF FIGURES

Page

Page

LIST OF ABBREVIATIONS

AADMER	ASEAN Agreement on Disaster Management and Emergency Response
ADPC	Asian Disaster Preparedness Center
CARD	Council for Agricultural and Rural Development
CBDM	Community-Based Disaster Management
CCDM	Commune Committee for Disaster Management
CDRI	Cambodia Development Resource Institute
CFE-DMHA	Center for Excellence in Disaster Management & Humanitarian Assistance
CMDG	Cambodia Millennium Development Goals
CPRs	Common Property Resources
CRC	Cambodian Red Cross
CRED	Centre for Research on the Epidemiology of Disasters
CSD	Council for Social Development
CSES	Cambodia Socio-Economic Survey
CWS	Church World Service
DCDM	District Committee for Disaster Management
DFID	Department for International Development
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction
FAO	Food and Agriculture Organization
FGDs	Focus Group Discussions
FMMP	Flood Management and Mitigation Programme
HFA	Hyogo Framework for Action
IDE	International Development Enterprise
IDNDR	International Decade for Natural Disaster Reduction
IDPoor	Identification of Poor Households
IFRC	International Federation of Red Cross and Red Crescent Societies
IPCC-SREX	Intergovernmental Panel on Climate Change Special Report
LMB	Lower Mekong Basin
MLMUPC	Ministry of Land Management, Urban Planning and Construction

MOAFF	Ministry of Agriculture, Forestry and Fisheries
MOE	Ministry of Environment
MOEYS	Ministry if Education, Youth and Sports
MOH	Ministry of Health
MOP	Ministry of Planning
MORD	Ministry of Rural Development
MRC	Mekong River Commission
MWRAM	Ministry of Water Resources and Meteorology
NAPA	National Adaptation Program of Action to Climate Change
NBC	National Bank of Cambodia
NCCC	National Climate Change Committee
NCDD	National Committee for Sun-National Democratic Development
NCDM	National Committee for Disaster Management
NGOs	Non-Government Organizations
NPRS	National Poverty Reduction Strategy
NSDP	National Strategic Development Plan
PCDM	Provincial Committee for Disaster Management
PTG	Post Trauma Growth
SNAP-DRR	Strategic National Action Plan 2008-2013 for Disaster Risk Reduction
SPSS	Statistical Package for the Social Science
SSIs	Semi-Structured Interviews
TAC	Technical Advisory Committee
TWG-FSN	Technical Working Group for Food Security and Nutrition
UNDP	United Nations Development Programme
UNFPA	United Nations Population Fund
UNICEF	United Nations Children's Fund
UNISDR	United Nations International Strategy for Disaster Reduction
WCDRR	World Conference on Disaster Risk Reduction
WFP	World Food Programme
WHO	World Health Organization

CHAPTER I
INTRODUCTION

1.1 Problem Statement

Cambodia, a least developed country has developed to over the poverty line since 2011 to 20.5 percent (World Bank, 2013); although it has encountered the vulnerability to the extreme weather including floods, unpredicted droughts and gutty winds every year and the post-effect of civil war (UNDP Cambodia, 2013).

Cambodia is located in the lower Mekong Basin, LMB and is subjected to the risk of the disasters resulted in adverse impacts on social and economic livelihoods of the nation. The severity of flood is accounted by the losses of lives and assets per disaster which is the primary disaster in the country (Mekong River Commission [MRC], 2012). Cambodians' livelihoods are affected by flood almost every year. Those effects include loss of lives, food security, health, shelter, and education. It was estimated that flood killed about 100 people annually and cause agriculture losses of 100 to 170 million USD each year (Eng, 2009). Mainstream flooding is the main flood that causes Cambodian people at risk, which coupled with velocity, duration, water level, frequency and risk of flooding. Because of more effects from climate change, unpredicted frequency of rainfall is expected to occur and increase. The severity of flood would be worse and could put Cambodia under pressure (MRC, 2012) if there is no in-time preparedness for the flood response. Moreover, the flood which mostly effected to rural areas were influenced by three different sources: seasonal inundations, discharges from dams, high hide of the sea risings (UNDP Cambodia, 2013), so it is interesting that how the communities located in flood sensitive areas has developed their strengths getting through the change.

Over 80 percent of the population of Cambodia lives in rural areas and about 73 percent depends on agriculture for their livelihoods (MRC, Council for Agricultural and Rural Development [CARD] & Technical Working Group for Food Security and Nutrition [TWG-FSN], 2008; 2012; World Bank, 2013). Land, water, agricultural product and fishery are main sources for Cambodian livelihoods which are various by their geographical characteristics, social norm and culture.

Regarding to the geographical supporting, Cambodian communities usually settle near water courses especially the rivers to earn products from agriculture and fishery; although, they are risky to floods (Aun & Hruby, 2013). Water culture, to be able to live with flood, they build their own coping mechanisms after the civil wars such as installation of new hope, group cohesiveness and social sharing to secure their livelihood. Nonetheless, when they face with extreme floods[1], it is over their ability to cope with. Then, intervention from outsiders such as the Royal Government of Cambodia, international organizations and NGOs are called for assistances to reduce suffering within the affected communities.

The Royal Government of Cambodia represented by the National Committee for Disaster Management (NCDM) takes legal actions to provide emergency assistances such as food, shelters, blanket, safe drinking water and medicine to flood affected people during flooding. After the flood receded, the NCDM helped reconstruct access structures including roads, bridges and other infrastructures. Besides, public sectors, and NGOs also play vital role in allocating required resources to affected people (Asian Disaster Preparedness Center, 2002; Asian Disaster Preparedness Center [ADPC], 2007).

The allocations from the outsiders face natural details of community situations such as their damages of essential livelihoods capitals and effective approaches to the local needs. For instance, the Royal Government of Cambodia still have limited ability to complete their duty due to lacking of human and financial resources and limits of assessing the physical and cultural status of community learning which are adapted through community mechanisms. The government provided aids based on the general basic needs, but regardless to local needs provided to the affected peoples, thus, it is cost-ineffectiveness and not meet actual demands based on communities.

The Community-Based Disaster Management, CBDM is recognized as an fundamentally effective tool to reduce flood impacts by engaging community in a flood project, building community capacity (Shaw & Okazaki, 2004). More effectively, a

[1] Extreme flood is usually large flood that people have not yet experienced nor recorded (Davis, 2007).

running project is complied with the community mechanisms, for example, a social structure, a culture norm that function on coping with repeated floods. The affected community is seen as the main actor for coping with the floods to minimize flood effects (Khunwishit, 2013; Sok et al., 2011); although, the government and other organizations provided them assistances. Hence, the community must develop immediate mechanisms to help to community's members because of fast approach to the affected people.

The community members are crucial structure that are bound together with different levels of relationship depending on many conditions such as within family relationship (Putnam et al., 1994), and their leader positions as a chief of villages, a monk, or a teacher (Putnam et al., 1994). The acceptance of given friendships depends on phase of flood including the flood preparation, flood respond, flood post aids. For instance, R. Islam and Walkerden (2014) stated in their study on the level of relationship in a community was changed before and during an attack of Cyclone Sidr. Supports through neighbors and friends were less active during disaster since people had limited resources, and they competed for external assistance. In contrast, the relationship within family members and relatives was still strong, and people continued to support one another.

Community mechanisms for coping with the repeated floods were classified differently based on approaches of study. Twigg (2004) categorized coping mechanisms occurrence of disasters into four groups, namely social, economic, technological and cultural mechanisms. The social mechanisms were referred to mutual supports and aid from kinship and self-help. The economic mechanisms were included income diversification, food storage and other economic activities taken by households. While the technological mechanisms addressed land management systems, house and shelf construction. The cultural mechanisms focused on risk perception and religious views which determined how people react to disasters. Other studies; however, classified coping mechanisms into three categories in terms of social, economic and physical mechanisms (Dewi, 2007; Febrianti, 2010; Marschiavelli, 2008; Reganit, 2005).

The ways people respond to floods are their coping mechanisms, and they were influenced by available resources and cultures. Households in Okavango Delta, Botswana responded to extreme floods by switching their livelihood activities, temporarily relocating and seeking for external assistance (Motsholapheko et al., 2011). Households in Kanyemba, Mbire district, Zimbabwe practiced different responses to floods. They adopted income diversification through casual labour, remittances, livestock sales, and labour migration (Bola et al., 2014). In contrast, people in a community in Bangladesh responded to flood by using their cultural belief by praying to Allah since they believed that their losses were from unseen hand of Allah, and thus they just simply accepted the losses (Schmuck, 2000). In case of Cambodia, a research in two ecological zones in Kompong Thom province during flooding in 2000 revealed there was mutual supports in the San Kor Villages. Local people in the village assisted each other to move family members to safe places, to take care animals, to guard residential areas, to provide children means of transport to school, and to give both in-kind and in-case loans. Once flood water had receded, San Kor households likewise used their collective funds and labour to repair community infrastructure such as canals, water gates, culverts, schools and roads (Ang et al., 2007). In case of Prey Veng province, the province is located in flood-prone area, so it is usually hit by natural floods (inundation and intensive rainfall) in different levels of flood hazard. A case study from Sdau Kaong commune in Prey Veng province showed that people whose house with floors close to the ground were allowed to temporarily stayed with neighbors who live in better designed houses to cope with floods (Oum, 2013). From these two studies, the social capital plays important roles to minimize flood impacts on vulnerable people.

To enhance the national policies and frameworks, the relevant environmental conditions as well as social community mechanisms should be applied to all levels of decision. Community-based projects were recognized by many stakeholders as the main tool to reduce vulnerability at community level by identifying vulnerability of households, their capacity and approach of cope with disasters.

Therefore, the research focuses on the identification of significant factors that are practiced by the mechanisms that are specific to Cambodian communities when they

cope with floods. Subsequently, the factors are discussed regarding to their roles applied in decision making levels including national and community scales.

1.2 Objectives of Study

Aims of the study are to specify the effective management processes and components of coping with floods, which are available in Cambodia. Therefore, the objectives of this study are proposed.

1) To identify the important factors of sustainable community mechanisms that influence on coping with flood in Cambodia.
2) To discuss the policies and frameworks related to the sustainable community mechanisms to cope with flood in Cambodia.

1.3 Research Questions

1) What are important factors of sustainable community mechanisms that influence on coping with flood in Cambodia?
2) What are the national policies and frameworks provided by using community mechanisms to cope with flood?

1.4 Significance of Study

The study provides identification of important factors relevant to environment, economics and society that encourage the sustainable coping with flood, and reveal the community mechanisms that produce culture of safety and resilience during facing the natural disaster. The research results support the national policies of disaster management and decision making of Cambodia, and facilitate the community understanding and participation in the community mechanisms to cope with flood.

1.5 Scope of Study

The scope of study focused the flood impacts in rural areas because rural people are mostly poor and the most vulnerable to recurrence of floods. The study merely concentrated on the mechanisms developed in a community that encounters repeated floods which occur annually by the inundation of Mekong River and heavily rainfall. Moreover, the study also focused both ways of local lives adapted to the environmental

changes by the floods to gain positive effects, mitigate the adverse impacts. A representative community, Ba Baong commune in Prey Veng province and one of flood prone areas in Cambodia, was identified based on the physical and social factors that influence the coping capacity. The data was reviewed and targeted local people were interviewed to obtain the qualitative information required for the national policies and decision making process.

1.6 Plan of the Thesis

This thesis is arranged into six chapters. Chapter I is an introduction to the background, problems, objectives, and significant of the research. Chapter II defines definitions of key words and reviews impacts, factors and policies related to floods. Chapter III details of research methods for data collection and analysis. Chapter IV analyses research results in terms of introduction to study area, flood impacts, strategies involved with floods and discusses important factors that influence on community coping capacity with flood and recommended policies. Chapter V summaries of study and draw conclusions from the findings.

CHAPTER II
LITERATURE REVIEWS

Overviews of floods and their effects on livelihoods of community in Cambodia was reviewed as well as flood coping was reviewed and analyzed in the targeted communities located in repeated flooding areas and they had adapted their livelihoods to maintain the stability of assets under different flood situations. In rural areas, local people used the community mechanisms to adapt to the repeated flooding. These mechanisms that support the loss reduction caused by the repeated flooding were focused. International and national policies and frameworks were also presented in the chapter.

2.1 Terminology

2.1.1 Introduction

The clarification of key terms are important for the research results in the identifying the specificity contexts of environment and livelihoods at Ba Baong commune. The definitions of related key worlds are given covering theoretical research data from citations and narrowing to the specificity of this research conditions. Moreover, to maintain the key terms uses updated, their tendency of application in the international and national policy and frameworks on natural disasters was presented, and importantly key terms were also defined in greater specificity to research findings.

2.1.2 Definition

Sustainable Development

The Brundtland Commission defined sustainable development as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (Brundtland et al., 1987, para. 1). In the context of flooding, sustainable development was defined as “the acceptant of the inevitability of flood occurrence and uncertainty of flood impacts and developing strategies to cope with this reality” (Handmer, 2000, p. 276). In flooding areas, the natural resource utilization is limited and resulting in the changes of normal living quality, so the whole production

of natural systems serves the affected communities in different critical ways. Consequently, the development of their capacity of resource utilization can improve lifestyles and well-being in the balancing to the compromised environmental changes. Therefore, this study applied the basic principles of sustainable development among community members to maintain a specific balance between their needs to prolong feeling of well-being, and specific production of natural resources and ecosystems that eventually become cultures.

Vulnerability

Defined by the UNISDR, "vulnerability is a situation in which the characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard" (United Nations International Strategy for Disaster Reduction [UNISDR], 2009, p. 30). In case of Cambodia, vulnerability to flood is determined by the household characteristics such as low income, female head household, and approach to nearest accesses (Marchand et al., 2013). For the study, local people are vulnerable to the flood impacts that annually occurs. Their vulnerability can be provoked by severity of climate change and build environment that deplete their acceptance of flood impacts and reality. Their incomes, gender status and access approaches were evaluated.

Sustainable Coping and Coping Capacity

Coping capacity is increasingly considered as one of key components that contributes to level of vulnerability of a household or community (Few, 2003). Coping is defined by the Intergovernmental Panel on Climate Change (IPCC) as "the available skills, resources, and opportunities to address, manage, and overcome adverse conditions, with the aim of achieving basic functioning in the short to medium term" (Intergovernmental Panel on Climate Change Special Report [IPCC-SREX], 2012, p. 558). Defined by Wisner, "coping is a manner in which people act within the limits of existing resources and range of experiences to achieve various ends" (Wisner, 2004, p. 100). Thus, sustainable coping should consider about the three components of sustainable development such as environment, development and social component and

cover the three steps of coping strategy for the research in Ba Baong commune. The UNISDR gave definition to coping capacity as "the ability of people, organizations and systems, using available skills and resource, to face and manage adverse conditions, emergencies or disasters" (UNISDR, 2009, p. 8). In case of this study, the coping capacity included their ability in forming mechanisms for preventing, mitigating and monitoring flood advantages and disadvantages by using community available resources such as social, human, natural, financial and physical capitals.

Adaptation

Adaptation is defined by the UNISDR as "the adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities" (UNISDR, 2009, p. 4). Adaptation in the study was defined as mechanisms that members in a community adopted in order to reduce adverse effects and live in harmony with repeated floods.

Community Mechanisms

Based on the European Union community mechanism for civil protection, "the mechanism is a structure that aims to facilitate civil protection assistance between member states and to third counties in response to major crises, both natural and man-made disasters" (Åhman et al., 2009). However, in this research community mechanisms is defined as functions of community structures of interactions to achieve a particular goal. In the study, the goal is aimed for sustainable coping developed by community activities responding to the repeated flood. The components for the Cambodian communities include environmental, economic, and social components.

Flood

Floods are defined as "extremely high flows of river, whereby water inundated flood plains or terrains outside the water-confined major river channels" (Rossi et al., 2012, p. 4). Based on the formation mechanisms, general location and environmental implications, several main types of flooding are identified, including (Katyal & Petrisor, 2011):

- Riverine flooding is relatively predictable and occurs after heavy prolonged rains causing river flows to exceed their capacity.
- Flash floods are rapid and destructive, with little warning, and usually occur from intense storms (largely on steep slopes), landsides, a sudden ice jam break or dam break, or when runoff exceeds capacity of the drainage system.
- Coastal flooding could be caused by rising sea, sinking coasts, hurricanes/cyclones, tsunamis, and tides resulting in loss of life and property, and degradations due to salinity intrusion.
- Lake flooding occurs following intense storms and persistent wet years causing overspill to the surrounding low-lying areas (Katyal & Petrisor, 2011, p. 207).

Nevertheless, floods in this study area are a kind of riverine flooding which is slow but prolonged flooding caused by the overflow of Tonle Sap River and Mekong tributaries (NCDM & MOP, 2008). Normal or seasonal floods were considered as annual floods which people encountered every year and eventually become local cultures.

Some floods are viewed by society as harmful based on maximum water levels, velocity, debris flows and duration of flooding (Lebel et al., 2007).

- Maximum water levels: maximum depth of water during flooding.
- Velocity: speed distance of flood traversed in unit time in a given direction.
- Debris flows: flows of scattered broken piece of stone or wood in flood.
- Duration of flooding: period of flooding until it recedes.

The flood is not always result in adverse impacts, but it also provides positive effects as well such as increases in land fertility and aquatic lives. In repeated flooding areas, local farmers learn these benefits for more agricultural productivity (Soun et al., 2009). However, the flood can be transferred to a disaster depending on suddenness of flood occurring, and flood levels and duration (Middleton, 2012). Severity of flood impacts was also resulted from activities related to preparedness, early warning systems and physical structures (Lebel et al., 2007). Velocity, duration, depth and timing of flood hazards caused the largest risk for society (Kreibich et al., 2009).

The hazard in the context of flooding refers to main physical characteristics of flood such as flow velocity, flood depth, and duration (Kreibich et al., 2009). Cançado et al. (2008) identified vulnerability in terms of the potential of destruction and capacity of people to recover in the flood prone area (Cançado et al., 2008). Risk is a combination of hazard and vulnerability. People are at risk when they encounter with the hazard which refers to extreme flood, and they are not capable enough to cope or adapt with an event (IPCC-SREX, 2012).

2.2 Policies

2.2.1 International Policies

- Hyogo Framework for Action (HFA) 2005-2015 was held in 2005 in Kobe, Hyogo, Japan and focused on building the resilience of nations and communities to disasters (Basabe, 2013; UNISDR, 2005)

Five priority actions were adopted at the World Conference on Disaster Risk Reduction (DRR):

- Ensure that disaster risk reduction is a national and a local priority with a strong institutional basis for implementation;
- Identify, assess and monitor disaster risks and enhance early warning;
- Use knowledge, innovation and education to build a culture of safety and resilience at all levels;
- Reduce the underlying risk factors;
- Strengthen disaster preparedness for effective response at all levels (UNISDR, 2005, pp. 14-20).

Importance of community level is encouraged to be involved in DRR. Building the necessary capacities at the community level and creating community resilience are stated in the framework.

- After the implementation of Hyogo Framework for Action (HFA) 2005-2015, post-2015 Framework for Disaster Risk Reduction, also known as HFA2 was taken place in Geneva, Switzerland in 2013 in order to provide opportunities for all

participants to share their thoughts and suggestions on future disaster risk reduction (UNISDR, 2013). Twelve categories were identified in the discussion:

- The importance of community-level involvement;
- Targeting and including the most vulnerable populations;
- Women as leaders;
- Children and youth: new generation of opportunity;
- Health;
- Integration climate change adaptation, development and disaster risk reduction;
- The role of science;
- Knowledge-sharing and education;
- Capacity-building and education;
- Capacity-building: financing, risk assessment, preparedness and early warning;
- Private sector involvement in disaster risk reduction;
- Political will and leadership (UNISDR, 2013, p. 1).

- Sendai Framework for Disaster Risk Reduction 2015-2030 was adopted in the Third UN World Conference on Disaster Risk (WCDRR), held in March 2015 in Sendai, Japan (World Conference on Disaster Risk Reduction [WCDRR], 2015). This framework contains four priorities for actions as follow:
  - Understanding disaster risk;
  - Strengthening disaster risk governance to manage disaster risk;
  - Investing in disaster risk reduction for resilience;
  - Enhancing disaster preparedness for effective response and to "Build Back Better" in recovery, rehabilitation and reconstruction (WCDRR, 2015, p. 14).
- The United Nations Conference in Sustainable Development, entitled "The future we want", held in 2012 in Rio de Janeiro, also mentioned about disaster risk reduction in the agenda by reaffirming commitment to the Hyogo Framework for Action 2005-2015 (Ferreira, 2012). The conference acknowledges the importance of early warning system as part of effective DRR and stronger interlinkages among DRR, recovery and long-term development planning. All relevant stakeholders are called to

take appropriate and effective measures, taking into account the three dimensions of sustainable development. In Cambodia, community mechanisms can be seen as effective ways to cope with flood by using interaction of components in a community to build their own resilience. The local people in the community work together in order to minimize flood effects, and build community network for more strength.

- The ASEAN Agreement, signed in 2005 and enforced in 2009 on the Disaster Management and Emergency Response (AADMER) is to improve the more proactive framework for effective cooperation, technical supports, and resource management in all kinds of disasters by focusing on the DRR based on the purely humanitarian response and relief (ASEAN Secretariat, 2005).

- The MRC's Flood Management and Mitigation Programme (FMMP) intended to mitigate the negative impacts caused by floods as well as the local benefits consideration (MRC, 1995). The Flood Management and Mitigation Centre, regional based in Phnom Penh provided assistance on data and tools supports for four riparian countries which were Thailand, Vietnam, Lao PDR and Cambodia for flood forecast and mitigation measures across the countries.

The international and regional policies and frameworks were set up for disaster risk reduction, and Cambodia also one of the members. However, Table 2.1 shown that Cambodia was ranked 8th in 2012 when talking about high risk vulnerability (Alliance Development Work [ADW], 2012) although the Cambodian government works closely with international organizations and NGOs in order to reduce flood impacts. Actions which are mostly taken by the government are on flood relief. The government provided emergency assistances to flood victims and helped to reconstruct infrastructures after flood receding. From discussed statement above, community mechanisms should be implemented since they were view as effective ways to minimize flood impacts. Introduction of community mechanisms should be considered at international and national policy levels.

Table 2. 1 World Risk Index Overview

Rank	Country	World Risk Index	Exposure	Vulnerability	Susceptibility	Lack of coping capacities	Lack of adaptive capacities
1	Vanuatu	36.31%	63.66%	57.04%	34.17%	81.19%	55.78%
2	Tonga	28.62%	55.27%	51.78%	27.91%	81.31%	46.11%
3	Philippines	27.98%	52.46%	53.35%	33.92%	83.09%	43.03%
4	Guatemala	20.75%	36.30%	57.16%	37.28%	81.18%	53.04%
5	Bangladesh	20.22%	31.70%	63.78%	43.47%	86.84%	61.03%
6	Solomon Islands	18.15%	29.98%	60.55%	43.96%	84.26%	53.42%
7	Costa Rica	17.38%	42.61%	40.80%	21.59%	65.63%	35.19%
8	**Cambodia**	**17.17%**	**27.65%**	**62.07%**	**45.93%**	**86.68%**	**53.61%**
9	Timor-Leste	17.13%	25.73%	66.59%	52.88%	87.58%	59.32%
10	El Salvador	16.89%	32.60%	51.82%	28.92%	76.71%	49.82%

Source: Alliance Development Work [ADW] (2012)

2.2.2 National Policies

The floods was identified as a country's natural disaster as indicated in the National Poverty Reduction Strategy 2003-2005 (NPRS). They are significant drives that create and accumulate the socio-economic vulnerabilities among the rural poor communities. The floods situates loads burdens on women to cope with various flood situations in communities including the Ba Baong commune (Council for Social Development [CSD], 2002). The DRR cover expansive disaster issues including the impacts on the floods related to the changes of climate. In 2006, the Royal Government of Cambodia official approved the National Adaptation Program of Action to Climate Change (NAPA) that addressed the disaster hazard areas identification and community vulnerability to acquire an adaptation to the changes that causes severe disasters including the extreme flood situations (MOE, 2006; NCDM & MOP, 2008).

However, the reviews on The National Strategic Development Plan (NSDP) for 2006 - 2010, showed that the NPRS and the Cambodia Millennium Development Goals (CMDG), did not directly focus the DRR directly, but included the DRR in the country development issues such as social welfare, water resource management, agriculture and rural development. The DRR prioritized the rural area protection, enhancing local poor communities to develop preparedness of flood and other natural disasters and risk reduction (Eng, 2009). For the institutional and legal supports the DRR, the National

Strategic Development Plan (NSDP) for 2014 -2018 provided the revision of law, regulations and plans that stimulate and support the actions on the DRR.

Six keys of DRR components with four levels identified into the critical, first, second, and third priorities launched in the Strategic National Action Plan 2008-2013 for Disaster Risk Reduction (SNAP-DRR) in 2009 prepared by the NCDM and the Ministry of Planning (NCDM & MOP, 2008). The critical priorities were to hold the DRR into the planning, management, policy and legislation, and to strengthen the DRR coordination mechanism in national, sub-national and community levels. To stimulate the integration of DRR in all levels, decentralization of responsibilities and resources and promotion of implementation of community-based DRR programs was implemented. The SNAP-DRR proposes alignment with the National Adaptation Program of Action to Climate Change (NAPA) towards identifying and supporting common activities and projects aiming for the DRR (MOE, 2006; NCDM & MOP, 2008). Regarding the activities and projects, the National Strategic Development Plan 2009-2013 had clarified roles of Ministry of Water Resources and Meteorology (MWRAM). Many projects focuses were conducted in order to reduce the vulnerability to flood and other natural disasters. Updated weather information provided by the Meteorology Department of the MRWAW helped strengthen the coping capacity of vulnerable communities.

2.3 Floods in Cambodia

2.3.1 Hydrological Pattern in Cambodia

The geographical and ecological conditions also are determinant factors of the climate and climate variability of Cambodia (Solieng, 2013; Tes et al., 2014). This country climate is tropical climate, which is dominated by the monsoons with temperature ranging from 21°C to 36 °C and two distinct seasons, the wet season (May to October) with high humidity and dry season (November to April) when the temperature can rise up to 40 °C (Solieng, 2013). The average annual rainfall varies between 1,000 to 1,500 mm (Solieng, 2013). The mountainous areas in the east receive an annual mean rainfall from 2,000 to 3,000 mm while the mountainous area of the country in the southwest can receive an annual mean rainfall of up to 4,000 mm (Solieng, 2013). The annual

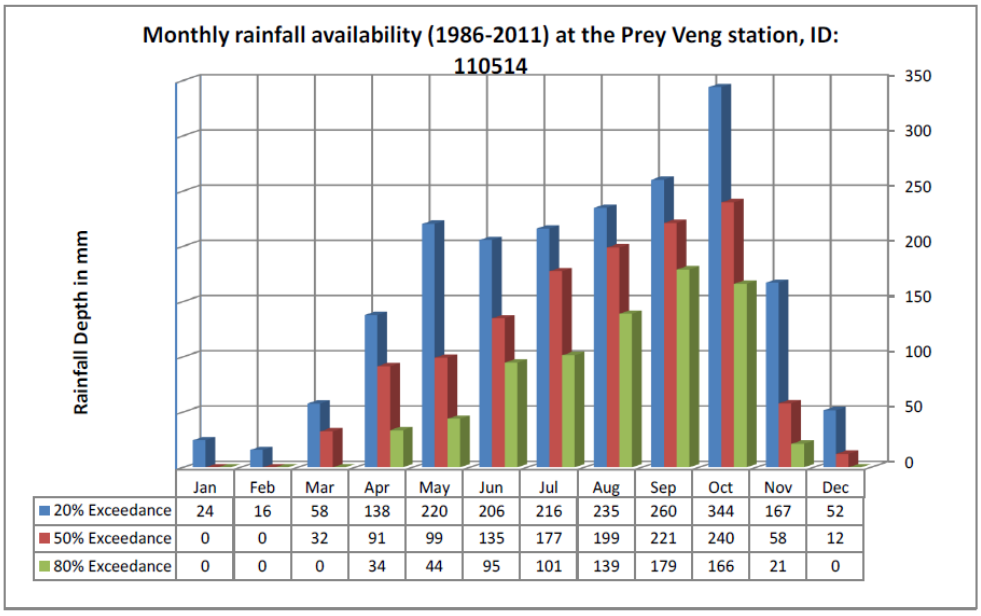
mean rainfall in the plains is about 1,400 to 1,600 mm. However, annual rainfall is changed to 40 percent higher and 50 percent lower in terms of severe flood and drought respectively (Solieng, 2013). Cambodia receives effects of monsoon rains combined with its topography, which make the country annually encounter with flood (Solieng, 2013; Tes et al., 2014). The major cause of floods in Cambodia is from the overflows of water from the Mekong flood regime and rainfall in the international, regional and local areas (Solieng, 2013).

Cambodia is divided into four zones by ago-ecological zone (Nang, 2013):

- Tonle Sap: Battambang, Kampong Thom, Kampong Cham, Kampong Chhnang, Pursat, Banteay Meanchey, and Siem Reap;
- Plateau-Mountain: Stung Treng, Mondolkiri, Ratanakiri, Preah Vihear, Kampong Speu, and Kratie;
- Delta: Svay Rieng, Takeo, Prey Veng, Kandal and Phnom Penh;
- Coast: Kampot, Koh Kong, and Sihanoukville.

2.3.2 Hydrological Pattern in Prey Veng Province

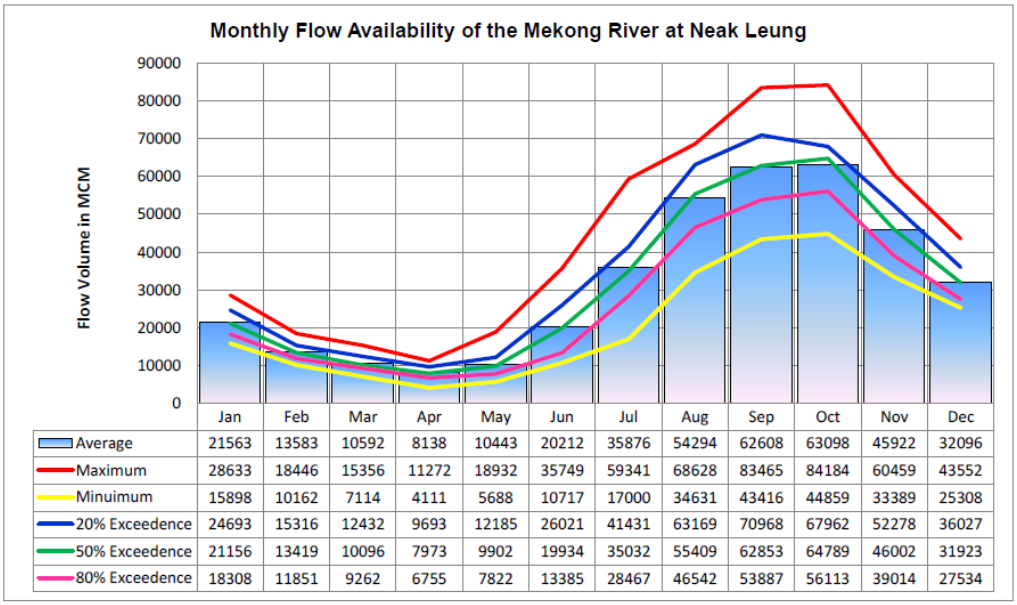
Prey Veng province is in the floodplain area in south-eastern part of Cambodia where is the Lower Mekong Basin. Due to its location on the floodplain, the province receives runoff from the Mekong River and rainfall surface water from the international river flows to the province around in October every year while the other surface water from annual rain occurs from May to October. Annual rainfall variation in Prey Veng Province is from 1,000 mm to 2,100 mm (Tes et al., 2014). Figure 2.1 shows that rain starts since May and gradually increases until October when the rainfall depth reaches the maximum level. At the same time, water availability distribution of the Mekong River is also at the highest level in this month as shown in Figure 2.2. As a result, floods are normally severe in October. 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).



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
20% Exceedance	24	16	58	138	220	206	216	235	260	344	167	52
50% Exceedance	0	0	32	91	99	135	177	199	221	240	58	12
80% Exceedance	0	0	0	34	44	95	101	139	179	166	21	0

Figure 2. 1 Monthly rainfall availability (1986-2011) at Prey Veng station.

Source: Cambodian Water Resources Profile (Tes et al., 2014)



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average	21563	13583	10592	8138	10443	20212	35876	54294	62608	63098	45922	32096
Maximum	28633	18446	15356	11272	18932	35749	59341	68628	83465	84184	60459	43552
Minuimum	15898	10162	7114	4111	5688	10717	17000	34631	43416	44859	33389	25308
20% Exceedence	24693	15316	12432	9693	12185	26021	41431	63169	70968	67962	52278	36027
50% Exceedence	21156	13419	10096	7973	9902	19934	35032	55409	62853	64789	46002	31923
80% Exceedence	18308	11851	9262	6755	7822	13385	28467	46542	53887	56113	39014	27534

Figure 2. 2 Monthly flow availability distribution of the Mekong River at Nak Loeung (1981-2011), the nearest station, 14 kilometers from Ba Baong commune.

Source: Cambodian Water Resources Profile (Tes et al., 2014)

2.3.3 Floods in Cambodia

Cambodian geographical location makes this country encounter both severe and mild floods annually. Generally, floods seem provide disadvantages, but the small flood occurring every rainy season provide beneficial impacts on agricultural lands by

increases of soil moisture and fertility, ground and surface water recharge and provide ecological benefit for fisheries (Middleton, 2012). However, these advantages can turn into critical situations when only focus economic evident showing destroyed agricultural products, community infrastructure, and livelihood of local people (Middleton, 2012). The research, therefore, revealed the community activities that understand both negative and positive impacts and the community acceptance on natural reality.

Annual rainy season commences in July, with flooding occurring between September and December. During the monsoon season, Cambodia experiences flash floods– repeated heavy rainfall in mountainous areas, which flows to streams and tributaries of the Mekong branch of river often flash floods (CFE-DMHA, 2014; Leng, 2014). These floods are swift and last only for a few days but often cause severe damage to crops and infrastructure especially in tributaries around the Tonle Sap Lake. The provinces of Battambang, Kampong Chnang, Kampong Speu, Kampong Thom, Kampot, Kandal, Pursat, Rattanakiri, Preah Vihea and Odor Meanchey are regularly hit by flash flooding (CFE-DMHA, 2014; Leng, 2014).

The second type of flood, the much slower but prolonged flooding, is caused by the overflow of Tonle Sap River and Mekong tributaries, inundating the provinces of Kampong Cham, Kratie, Kandal, Prey Veng, Stung Treng, Svay Rieng and Takeo. The flood was caused by cumulative rainfall in the upper catchments throughout the rainy season results a slow but steady rise in water levels lasting for several days (CFE-DMHA, 2014; Leng, 2014). This can be aggravated by two factors. First, when this combines with heavy rain around the lake and the southern provinces. Secondly, the most severe floods occur when heavy rains coincide with the arrival of tropical depressions and storms. Mekong river floods are common occurrences in the provinces of Stung Treng, Kratie, Kampong Cham, Prey Veng, Svay Rieng, Kandal and Takeo (CFE-DMHA, 2014; Leng, 2014).

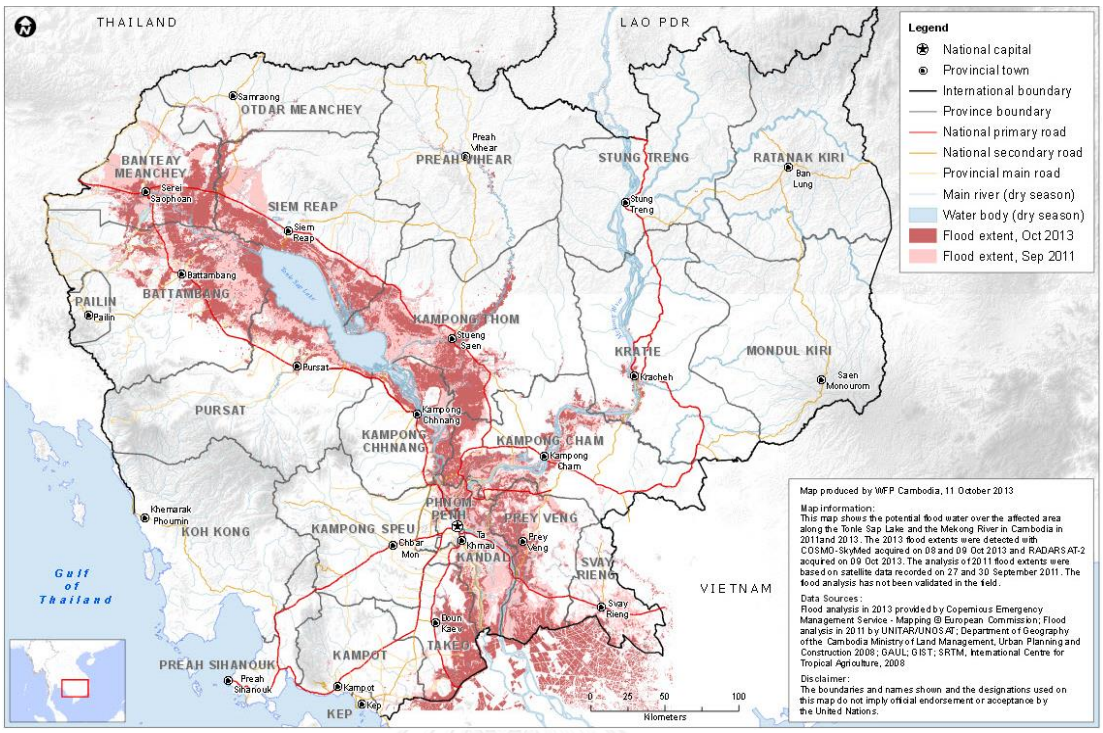


Figure 2. 3 Overview of flood extent in Cambodia, Sep 2011 and Oct 2013.
Source: World Food Programme [WFP] (2013)

2.3.4 Effects of Floods

The research study revealed both positive and negative effects caused by the floods in general. However, the reviews usually showed the negative impacts rather than the positive functions of flooding, and rarely found the information of the sustainable uses of flood advantages in policy and strategy management.

2.3.4.1 Positive Effects

Although flood is viewed as negative phenomenon, its positive effects brought by the Mekong River cannot be denied (Helmers & Jegillos, 2004; Hook et al., 2003; Middleton, 2012). The positive effects can be categorized into the following:

- Residential culture with water benefits. For instance, people who are living along Mekong River basin sustain their livelihoods by earning benefits from floods such as agricultural supports and fishery products.

- Flood brings nutrient sediment to soil. Thus, it improves soil fertility for increasing crop production and provides soil moisture for crop growth for a period after flooding.
- Flooding is intrinsic to the ecology of Cambodian fisheries, both riverine and paddy-field fisheries, and the diversity and amount of fisheries products available for food and income.
- Contributes to recharge of existing surface water sources (e.g. ponds, lakes).
- Maintain water tables.
- Prevent land subsidence by recharging water to clay soil.

2.3.4.2 Negative Effects

- Population

According to historical record of flooding in Cambodia, this country had undergone many severe floods in 1961, 1966, 1978, 1984, 1991, and 1996 (Helmers & Jegillos, 2004). However, the worst one in more than 70 years was reported as the flooding in 2000 (Helmers & Jegillos, 2004). Out of 347 dead people, 80.0 percent was announced as children. During this period, 750, 618 families (3,448,629 individuals) were affected (Helmers & Jegillos, 2004; Sokha, 2002). Eighty percent Cambodia was hit again by flood in 2001. Fourteen provinces were inundated, which resulted 429,698 families or 2,212,952 people faced the shock (Sokha, 2002). Furthermore, sixty-two people were killed, of whom 70.0 percent were children. Another flood in 2002 also caused damage on Cambodia, but it was not severe as the last two previous years (Sokha, 2002). Twenty-nine people were reported dead during flooding, while 296,234 households were affected. Seven provinces along Mekong River and Tonle Sap were flooded (Sokha, 2002).

Although flood in 2000 was noted as a serious event, flood in 2011 was more severe. Royal Government of Cambodia announced that 18 of 24 provinces/municipalities were impacted by flood (Leng, 2014). Assessment by National Committee for Disaster Management (NCDM) and Cambodia Red Cross (CRC) indicated that 1,173,489 people or 331,765 families had been affected. This is 8.8 percent of the total population and 13.0 percent of the total households in Cambodia. Whereas, recent government

figures indicated 247 people killed and 1.5 million affected. Recently, Cambodia was hit again by flood in 2013. Seventeen provinces out of 24 were affected, resulted in 200 people were killed (International Federation of Red Cross and Red Crescent Societies [IFRC], 2013).

- Shelter and Displacement

Besides taking many people's lives, floods had damaged or washed away hundreds of thousands of houses. A lot of people needed to move out from their houses to safe places as their houses were flooded or destroyed. Based on Sokha (2002), about 85,000 households (387,000 individuals) had to be temporarily evacuated during flooding in 2000. Furthermore, 317,975 houses were "damaged", while 7,068 were "destroyed". Had not recovered from 2000 flood, Cambodia encountered another flood in 2001, resulted in 2,251 houses were ruined. Although flood in 2002 was not that big as floods in 2000 and 2001, 1,082 houses were destroyed making 24,244 families equal to 102,205 individuals evacuated. Moreover, other infrastructure was affected such as 9Km of national road, 767 km of rural road, 165 bridges, and 55 temples. As of 10 October 2011, an assessment by the NCDM and the CRC reported that 143,658 people (34,234 households) were evacuated. Meanwhile, the recent figures indicated that 46,403 households were displaced. 219,971 houses were affected and 698 houses were damaged. More than 34,000 households were forced to evacuate during flood in 2013 (IFRC, 2013).

Since their houses were destroyed, many people were forced to stay in pagodas, schools and other government buildings. However, they had only few options for shelters due to the fact that other public places were inundated by flood (Helmers & Jegillos, 2004).

New houses influenced by modernization were built based on modern materials and less concern on the repeated floods. Therefore, negative impacts of flood only focused on price of housing. The public lands such as community swamps, retention ponds, watercourses and wells were excluded from information disseminated even they play important roles in fond fertility and water recharges.

- Livelihood and Food Security

Food shortage is another problem caused by floods. Millions of people had faced food insecurity especially children owing to the fact that many hectares of crop fields were destroyed. Although flood in 2001 was not considered as a very severe event, it had affected 192,284 households (945,665 people). Followed by 2002 flood, 94,922 families equal to 477,472 individuals were facing with food shortages as a result of 40,027 hectares of rice crop and 3,186 hectares of other crops were damaged (Sokha, 2002). The most severe flood in 2011 put millions of Cambodian people in food insecurity. Out of 24 provinces in Cambodia, 18 were recorded under emergency (NCDM 18/10). As estimated by Food and Agriculture Organization [FAO] (2011), six-thousand four-hundred hectares of main crops in Cambodia were destructed whilst 7.5 percent is under paddy field. As of mid-October, future food security and livelihood were affected owing to the fact that 13.0 percent of the rice harvest was considered to be at risk of being destroyed. Furthermore, the evacuees could not take sufficient food with them while stocks of food had been damaged by increasing water level (CARE, 2011). Besides, significant numbers of livestock and poultry were announced to be in harm. Out of 24 Cambodia provinces, eighteen provinces were under emergency and the level of water still remained high. Thus, thirteen percent of rice harvest was estimated to be destroyed. In 2013, Cambodia was impacted by another flood that destroyed 2000,000 hectares of rice fields, which comprise nearly 10 percent of the country's harvest (IFRC, 2013).

- Health and Nutrition

The impacts of the flooding can be seen as picture under health and nutrition. Floods accelerated a chance of catching illness, especially children as their immune system is weak, in flooded areas as a result of low access to safe drinking water and safe sanitation during flood. Flood in 2000 had caused 5.0 to 32.0 percent of affected families got sicknesses, namely diarrhea, respiratory, infections, skin rashes, fever (CARE, 2001). Concurrently, a research from CRED and NIPH emphasized that infectious disease prevalence rates were 2.68 times higher in flooded areas to the non-flooded areas (Helmers & Jegillos, 2004).

In addition to this, affected people hardly accessed to health care services or medical stores which are usually located outside the village and they needed to spend more on transportation. At the same time, the shortage of saving was spent on daily consumptions. Thus, when they met with health problem, they did not have enough money to spend on that. Mobility of women during flood period also impacted on children's health since it was difficult for women to move from one place to another during this time. Hence, they were not able to buy food and medicine to fulfill their children's needs (Helmers & Jegillos, 2004).

Since agricultural lands were destroyed by floods, many households had undergone food shortage which leads to insufficiency of nutrition.

- Education Impact

Education sector was also disturbed by floods. Schools which located at the Cambodian Lowland can be closed up to 2 months each year (Helmers & Jegillos, 2004). Based on UN News as of October 21, 2011, over 221 schools in Cambodia were affected by floods whilst around 975 schools had delayed the new academic year. Moreover, students were forced to be absent or drop out from schools. Because of floods, students were difficult to access to their schools. As mentioned in a project developed under the Advocacy and Pilot Implementation Project on the Education Sector in South East Asia (ADPC, 2008), fifty-five percent out of 92 interviewed school principals revealed that boat was the main mean of transportation for students to go to study during flooding while in the dry season, some of them used other means instead. In addition to this, students were also facing with financial problem as before they did not need to spend on transportation. Thus, some of them decided to miss the class or drop out from school.

2.4 Flood Coping

2.4.1 Vulnerable People

Based on FAO definition, "vulnerable groups are groups which would be vulnerable under any circumstances (e.g. where the adults are unable to provide an adequate livelihood for the household for reasons of disability, illness, age or some other

characteristic), and groups whose resource endowment inadequate to provide sufficient income from any available source." (FAO, 2004).

The livelihoods of Cambodia's poor were affected and vulnerable to external shocks due to public good dependency, decrease of natural resources, limited assets, less livelihood opportunities, little involvement in decision-making and lower capacity to cope with environment changes (Wingqvist, 2013). The poor adapted self-reliance mechanisms which are costly in order to cope with flood (Helmers & Jegillos, 2004). For example, the Cambodian households applied those mechanisms by reducing quality and quantity of food intake, taking loans—both in-case and in-kind, working longer hours, migrating, withdrawing children from school or increasing their pressure on natural resources, as well as limiting their consumption of food and non-food item in order to cope with shocks (Aid et al., 2012; Helmers & Jegillos, 2004; Sok & Yu, 2015; UNDP Cambodia, 2012).

According to World Bank Country Study, Cambodian poverty rate dropped from 52.2 percent in 2004 to 20.5 percent in 2011 (World Bank, 2013). However, the majority of these people escaped poverty only slightly, and thus they remain highly vulnerable even to small shocks which could quickly bring them back into poverty (World Bank, 2013). The main driver of poverty reduction were high rice prices, higher rice production, higher revenue from non-farm businesses, higher wage rate of rural workers, and growth in salaries jobs in urban area (World Bank, 2013). Many of poor people could get out of poverty due to the Improvements in health and education and the investment of the government in infrastructure, which created better condition for the poor (World Bank, 2013). Since 90 percent of Cambodia's poor lived in rural areas, and their main assets were labour and land, the government should pay attention on these assets in order to achieve maximum impacts (World Bank, 2013).

As stated above, although significant percentage of poverty was reduced, the poor are still vulnerable to even small risks. Since Cambodia is located in flood-prone area, those poor people could be pushed into poverty again at any time (World Bank, 2013).

For example, after extreme flood in 2011, the Post-Flood Relief and Recovery Survey was conducted in 2012 by covering 2,397 households in 164 villages in 11 provinces. The survey revealed that nearly half of the poorest households living in the worst affected area reported having taken out a loan as a direct result of the flood. Furthermore, nearly 20.0 percent of the poorest families were forced to leave their homes, compared to just 1.0 percent of the richest (Aid et al., 2012).

In contrast, an empirical study by using the 2007 Cambodia Socio-Economic Survey (CSES), Tong and Sry (2011) showed that flood contracted 4.0 percent of poverty rate in Cambodia due to its contribution to soil fertility and abundance of biodiversity and fish, which considered as benefit rather than risk.

2.4.2 Factors of Flood Coping

Studies on flood hazards indicated that the sustainability of a community based on its ability to access and utilize the capitals in the community (Beeton, 2006; Walter, 2004). The community capitals are defined as the resources held by and invested in the community. The sustainable livelihood framework introduced five types of capital (social, human, financial, physical and natural) which are crucial for building disaster resilience.

Beck (2004) divided community capitals into two factors, namely tangible and intangible capitals . The tangle factor is including natural, financial and physical capitals, while the intangible factor covers social and human capitals. Factors of community coping with flood are not only in term tangible factors but also intangible factors. They are built by community members who helping and sharing with each other in order to create a safe place.

Majority of rural Cambodians are poor, but they still have tendency to share with each other (Ledgerwood, 1998), but culture has been living with them for a long time even the country had undergone civil war for more than twenty years, but this culture was not washed away from them although it was reduced in time of the war (Ledgerwood, 1998). However, after the war finished, the culture started building up again (Ledgerwood, 1998). In the study on Rural Development in Cambodia: The View from

the Village (Ledgerwood, 1998), one part of the research is about the debate over villager-level social relations. Through the author's investigation by data collection 30 years ago and revisiting several times in the early 1990s, it revealed that the cooperation within village still remarkably actived in Cambodia society (Ledgerwood, 1998). Based on strong evidence accessed from the study village, local people still assisted on another in terms of financial, labour and emotional supports. The villagers cared and concerned about each other yet there restricted capacity to give money and land to others. However, due to limitation of available resources, the social circle of mutual assistance was contracted (Ledgerwood, 1998). Nevertheless, clear picture of Khmer traditional systems of mutual supports and monitoring behavior are still alive in the community (Ledgerwood, 1998).

2.4.2.1 Tangible Factors in Flood Coping

Tangible factors referred to physical capital, financial capital, and natural capital, which interact and play crucial roles in strengthening and enhancing community's capacity to cope with flood.

- International Aids

Since Cambodia is one of least developed countries, this country is provided assistances by many countries for development purposes. In case of flooding, this country is not left alone. For example, the Government of Japan donated emergency relief goods worth 32 million yen to Cambodian Government for flood relief in 2013 (Government of Japan, 2013). Beside this, other countries also provided funds. Moreover, many international organizations provides both food and non-food aid to affected people. For example, Caritas Cambodia supported by Caritas Australia distributed humanitarian assistance to flood victims in 2013. It included immediate relief packages, temporary shelters, water and sanitation, health referrals and mobile health posts, and rice and vegetable seeds (Caritas Australia, 2013).

In recovery process, international funds still play important role for flood affected people. NGOs provide construction materials because many houses were destroyed and damaged during flood. Thus, they need to be repaired. Rice seeds are also distributed

since the farmers need to replant their rice again after it was inundated by flood (Aid et al., 2012; UNDP Cambodia, 2014).

- National Aids

During flood, the government provides money, food stuffs, petroleum for boats, and some health care yet those assistances can only small portions of affected people while others are still waiting for the aids (Wee, 2011). After water receding, the government help restore wells for villagers since they are contaminated during flood.

Rehabilitation and recovery is undertaken by NCDM through reconstruction of roads, bridges, and other infrastructures (UNDP Cambodia, 2014).

There are voluntary groups from CRC and NCDM at community level (Oum, 2013). They are responsible for disseminating flood information to local people in order to prepare for flood and reporting back to district authorities about disaster loss and damage and to government and non-government institutes to make donations. They help to provide emergency aid to affected people. It gives an opportunity for community's member to work for the sake of their community and help others within it (Oum, 2013).

- Community actions

The way people cope is significantly shaped by their actual access to resources (Gutierrez-Montes et al., 2009; Nang et al., 2014). The tangible capital consists of material or physical creations that members of society make, use or share.

"The natural capital is the stock of environmentally provided assets such as soil, atmosphere, minerals, water and wetlands upon which people rely on for their survival" (Department for International Development [DFID], 1999, p. 11). Rural communities are likely to be more strongly linked to their natural resources. In rural communities land is a critical productive asset. The productivity of these resources may be degraded or improved upon by human management. Since 80.0 percent of Cambodian are farmer, accessing to water and land can provide them better living standard to cope with impacts of disasters (Nang et al., 2014).

The financial capital was defined as “the financial resources available to people, such as savings and credit” (DFID, 1999, p. 15). It includes income levels, variability over time and the distribution in terms of financial savings, access to credit and debt level. Nang et al. (2014) stated in their study that non-poor families could adapt to climate change better than the poor due to their better access to financial resources. At community level, people who had better living standard were well-prepared for flood than those people who were poor because the poor did not really care about this (V. S. Nguyen & Nguyen, 2009). They only paid more attention on their daily income, how they could survive day by day.

“The physical capital refers to basic infrastructure such as roads, bridges, irrigation systems, electricity, reticulated equipment and housing that are needed to support livelihoods” (DFID, 1999, p. 13). These kinds of infrastructure, which were resulted from the economic production, provided resources that helped people to meet their basic needs and created other assets. As reported in UNDP news, a road had been rehabilitated to with stand floods in Peam Ek commune, which facilitated villagers to be able to access hospitals, schools, markets, temples and to transport goods during rainy season. Possessing concrete house allows villagers to withstand floods.

2.4.2.2 Intangible Factors

The tangible capitals allow people to gain more capacity to adapt with hazards; meanwhile, the tangible capitals determine behavior of using resources.

“The human capital is investments in education, health and the nutrition of individuals” (DFID, 1999, p. 7). Knowledge and skills that enable villagers to diversify their income sources to cope with disasters as well as floods. The people in community use their local knowledge to cope with flood since they have been living there for long. Hence, they know what they should do in order to minimize risks.

The social capital is referred to “the formal and informal social relationship (or social resources) from which various opportunities and benefits can be drawn by people in their pursuit of livelihood” (DFID, 1999, p. 9). It is central to build other forms of capital, namely human, financial, physical, environmental, cultural, and political

capitals (Green & Haines, 2011). It plays an important role in building people's coping capacity especially in developing countries (Pelling, 2010). Besides providing material assistances during hardship time, it plays an important role in the process of healing distressed heart with supports from family, friends, and neighbors (Jeane & Zaumseil, 2014). If the social capital of a community is high and robust, the community's capacity for problem solving is also considered to be high. Yila et al. (2013) revealed vital roles of social capital in forms of practices of search and rescue, information, mutual assistance and commercial cooperation for building flood resilience at household and community levels in Fuji Islands.

Besides, a social network is a part that helps people to cope with flood. With more social network, people can easily get flood information. Thus, they can prepare themselves for that. Beside this, they also can access to any assistance during flood. If flood victims know more people, they can ask for help from those people, and also those people can be their messenger to report information to other agencies in order to provide assistance. Beside this, they can borrow money from those people instead of borrowing from money lender at high interest rate.

People in rural areas always live close to each other; hence, they can build good relationship and know everything about each other, so if there is anything happen, they are willing to help one another. For example, a case study of flood affected community in Kampong Thom province showed that when flood water approaches a village, people that have own boats are willing to bring their neighbors to safe place, and people whose houses are on high land are kind enough to accommodate those whose houses are flooded or at risk of being flooded (Oeur et al., 2012).

2.4.3 Sector Involvements

2.4.3.1 National Committee for Disaster Management (NCDM)

In 1995, through a sub-Prime Ministerial sub-decree, the National Committee for Disaster Management (NCDM) was created with responsibility for disaster preparedness, response and mitigation (Eng, 2009). The Prime Minister is the president of the NCDM with members from all ministries, as well as representatives of the Royal

Cambodian Armed Force, Cambodia Red Cross and Civil Aviation Authority. There is also the Provincial Committee for Disaster Management (PCDM) which is in charge of implementing the policies and development guidelines for disaster management, giving support to district committee, providing feedback to the NCDM, collaborating and coordinating among the NCDM's line agencies in evacuation and relief distribution. Similar structures were followed by the District Committee for Disaster Management (DCDM) and the Commune Committee for Disaster Management (CCDM).

In Cambodia, the function of the NCDM is generally concentrating on disaster preparedness and emergency relief. The responsibility during flood of the NCDM is to immediately coordinate between the line ministries and the donor communities (Fig. 2.4) based on each institution's structure and responsibility for flood risk reduction, and for restoration of damaged infrastructure.

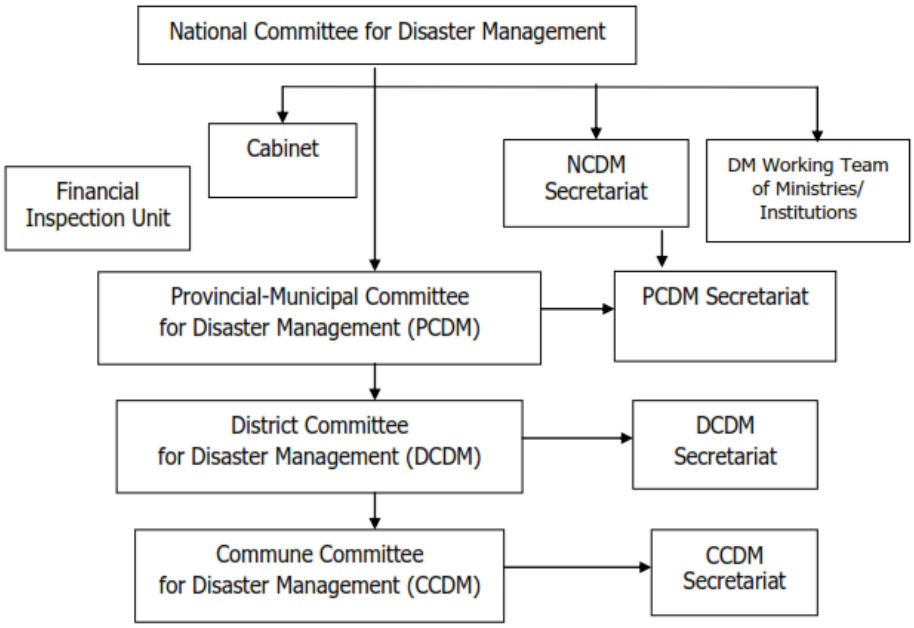


Figure 2. 4 Disaster Risk Management Coordination Mechanisms.

Source: Strategic National Action Plan for Disaster Risk Reduction (NCDM & MOP, 2008).

Other ministries that involve in disaster risk reduction:

- Disaster management is not just related to one institution in order to achieve the goals, but also collaboration from other line ministries.
- Ministry of Land Management, Urban Planning and Construction (MLMUPC);
- Ministry of Agriculture, Forestry and Fisheries (MOAFF);
- Ministry if Education, Youth and Sports (MOEYS);
- Ministry of Environment (MOE);
- Ministry of Health (MOH);
- Ministry of Rural Development (MORD).

2.4.3.2 Technical Advisory Committee (TAC)

An independent TAC consisting of experts from relevant local and international institutes, which include key disaster management, donor institutions, representatives from scientific, academic institutions and the private sector. The TAC is responsible for providing technical support and guiding in the implementation of the Action Plan for DRR.

2.4.3.3 The Cambodian Red Cross (CRC)

The Cambodian Red Cross (CRC) plays very important roles in flood relief in Cambodia (Cambodian Red Cross [CRC], 2012). The CRC has been working closely with the NCDM through its staff and volunteers at both national and branch level by providing humanitarian assistance and evacuation to the most effected people. During flooding in 2013, the CRC has helped 21,769 households to evacuate to safer areas and donated both food and non-food items such as rice, instant noodles, canned fish, fish sauce, soy sauce, mosquito nets, blankets, clothing, tarpaulins, tents and chlorine tablets to 11,000 families (IFRC, 2013). However, not all affected families could be provided humanitarian assistance due to the fact that infrastructure at some areas was destroyed by flood and there were not enough boats to get to the communities. Thus, the CRC could not make an access to bring donation to the households in those areas. Besides working on flood emergency, the CRC also worked with other organizations on flood

early warning systems, community-based disaster preparedness, small scale mitigation projects, safe area development and disaster response and relief (CRC, 2012).

2.4.3.4 UN Agencies

Roles of UN agencies are very important in disaster reduction in Cambodia (UNDP Cambodia, 2012, 2014). They have provided both technical and financial assistances to Cambodia and also helped to build up capacity of both national and community levels. Those agencies are UNDP, FAO, WFP, WHO, UNICEF and UNFPA. For example, WFP (World Food Program) plays crucial role in emergency relief by providing food assistance to flood affected families, principally through food for work programs. Its role in the post disaster recovery phase through repair and rehabilitation of damaged infrastructure is often critical in getting thing up and running again.

2.4.3.5 Non-Government Organizations (NGOs)

There are many NGOs working disaster in Cambodia (ADPC, 2007) such as CARE, CWS, World Vision, Oxfam-UK and Oxfam-Australia. They have implemented a bottom-up model for flood management: community-based disaster preparedness planning; community-based flood risk management programme; and community-based first aid in pilot communes. Main activities of these projects include:

- Capacity building of local authority and villagers on disaster preparedness, community leadership, gender and disaster risk reduction, rescue and relief, awareness on flood early warning, health and sanitation (ADPC, 2007);
- Capacity building on community-based disaster risk management strategies and practices (ADPC, 2007);
- Establishment of village committee for disaster management and saving groups (ADPC, 2007);
- Establishment of early warning systems in the community; and prepared flood risk mitigation and emergency relief responses (ADPC, 2007).

2.4.4 Community Mechanisms

In the old time, top-down and command-and-control approaches were often used to manage the consequences of disaster. This approach was based on perception of higher authority to make decision on the needs of the situation. However, this approach was proven to be ineffective since there was no participation from community level who witnessed disasters. Thus, it led to failure to fulfill the appropriate and vital humanitarian needs, and it was also cost inefficiency (Pandey & Okazaki, 2005).

On the other hand, communities cannot be left alone to cope with disasters without any intervention from external actors (government, NGOs, and other organizations) since they have limited resources to insure their livelihood in case of disasters especially the poor who earn their income for just day-to-day living (V. S. Nguyen & Nguyen, 2009).

Finally, the CBDM was initiated by incorporating a top-down and bottom-up approach (Shaw & Okazaki, 2004).

- Local population of a disaster prone area, due to exposure and proximity, are potential victims and assume more of the responsibilities in coping with effects of disasters;
- Local population have local knowledge of their vulnerabilities and are repositories of any traditional coping mechanisms suited for their own environment;
- Local population respond first at times of crisis and the last remaining participants as stricken communities strive to rebuild after a disaster (Shaw & Okazaki, 2004, pp. 6-7).

The CBDM was believed to be valuable and cost beneficial because community has participated in all processes which lead to clear targets of what community's needs. However, the CBDM does not look deeply into community's structure, activities, norms and cultures; as a result, community mechanisms fill in those missing points. Hayami (2009, p. 106) defined community as "a group characterize by intensive social interaction among its members to such as extent that, whatever action a community member decides to take, he has to take into consideration how other members may look

at his action". On the other hand, the community is the mechanism that leads its members to volunteer in any activities created in the community concerning intensive social connections. The community commonly provides local public goods including the provision of social safety nets for preventing community member from succumbing to subsistence crisis. For example, during flooding in 2000 in Kompong Thom province, households in the San Kor Village applied many mechanisms by reducing quality and quantity of food intake, taking loans—both in-case and in-kind, working longer hours, migrating, withdrawing children from school or increasing their pressure on natural resources, as well as limiting their consumption of food and non-food item (Ang et al., 2007). Through these actions, we can see that the community members were working together in order to reduce flood impacts on other members. Without this assistance, some families would be severely affected.

Furthermore, community mechanisms will also focus on motivational and attitudinal characteristics of communities. Since Cambodia had undergone more than two decades of war and the excesses of the Khmer Rough regime (genocide happened in Cambodia between 1975-1979), many rural adults were typically exposed to trauma (Helmers & Jegillos, 2004), which resulted them to be often stressed and concerned about fulfilling their basic consumption from day to day. These conditions have an effect on the coping capacity of people to respond to flood. However, their situation can be changed by people around them, namely family, relatives, neighbors, and other people in a community.

Based on a group therapy introduced by Yalom (1998), this therapy was believed to make therapeutic change by following twelve therapeutic factors (Table 2.2). The twelve factors are crucial components to heal community members who are suffering from trauma and turn them back to be active. Group therapy assisted community member to feel less threaten and severe since they did not encounter flood hazard alone, and thus the members shared similar story which made them to be less traumatic. They, moreover, could share and learn from each other's experience that they practiced in order to cope with floods, and thus their behavior could be changed toward flood responses.

Table 2. 2 Twelve Factors that Facilitate Positive Change via Group Therapy

Term	Definition
Installation of hope	The members start hoping by contacting with other members who have trod the same path and improve their lives.
Universality	The members think they suffer alone but when they know other also meet the same problem via group treatment then they start finding out solutions.
Imparting information	Members receive useful information which helps them to solve their problems more effectively.
Altruism	Members at times interchange roles and become the helper for someone else/
The collective recapitulation of the primary family group	Group treatment facilitates members' gaining a better understanding of traumatic family experiences that occurred in the past.
Development of socializing techniques	Members receive social feedback from other members about their strength and the challenges they need to work on.
Imitative behavior	Group leaders and other group members model constructive behavior that is often imitated by members having issues in these areas.
Catharsis	Group treatment provides members with an opportunity to ventilate and share to the poor more than the non-poor.
Existential factors	Members learn that there is a limit to the guidance they can get from others and that they bear the ultimate responsibility for their lives.
Group cohesiveness	The positive changes in members are much more likely to occur when the treatment atmosphere creates trust, warmth, empathetic understanding, and acceptance.
Interpersonal learning	Group treatment often facilitates learning to communicate more effectively with others, to be more trusting and honest with others, and to learn to love.
The group as social microcosm	The group gradually becomes a microcosm of the world the participant member live in.

Source: The Therapeutic Factors: What It Is That Heals (Irving D. Yalom (1998) cited in Charles H. Zastrow (2009, pp. 360-361)).

The group therapy is important for community mechanisms since it provides positive change to community members, which results in trust and solidarity within the community (Kaniasty & Norris, 1999). As a result, it can lead to successful community coping since the people in the community will together in order to minimize flood impacts. Flint and Luloff (2005) raised therapeutic community as a response to natural risk and a significant corrective to the disaster myth, which people develop spontaneous feeling of solidarity with one another.

In conclusion, the National Committee for Disaster Management is the main actor in disaster management. Although NCDM has clear structure, the limitation of their capacity and finance is still questioned. NCDM does not have its own national budget, human resources and material to respond to disasters. The insufficiency of communication between upper and lower levels is a problem. In contrast, international Organizations and NGOs have sufficient human resources, financial resources and technology. They can help reduce effects of flood on local people by building their capacity, providing funds, and sharing technology. They also play an important role during flood through donating emergency aid and assisting communities in recovering process. However, those organizations cannot work alone without cooperation from government who acts as a guide to villagers. Moreover, humanitarian assistance is needed to arranged accordingly to the most affected or needed areas and ensured that people in need can be accessed to since there is duplicate of aid to the same area. Besides, community level cannot be ignored because they are the people who face directly with flood. Considering about their needs is the way to provide efficient assistance. Households' coping is also influenced by their community's culture/norm. Besides, motivational and attitudinal characteristics of communities can affect on coping capacity of communities with flood. Nonetheless, not many studies have focused on these points. As a result, this study would like to identify the important factors of community mechanisms that influence the sustainable coping with flood, and discuss the policies and frameworks provided for sustainable coping with flood in communities in Cambodia.

CHAPTER III
RESEARCH METHOD

3.1 Research Overview

The Cambodian communities have their specific capability to resist to the losses influenced by variety of components localized in the areas that face the repeated floods. Hence, the study aimed to identify important factors in environmental, social and economic components that drove sustainable community mechanisms to coping with the repeated floods. The coping mechanisms that were focused for this study were the flood impacts before approaching to erosive coping or permanent harm happened. The components for this study were defined for the Cambodian communities in different periods including before, during and post flooding.

3.1.1 Environmental Components

Environmental components generally refer to those activities related to environment that influences coping mechanisms such as geographical location, flood magnitude, ecological services, and etc (Dewi, 2007; Reganit, 2005). The environmental components in context of Cambodia are the available natural resources in a community for affected people using to cope with the repeated floods. For example, villagers use palm tree trunks to build boats, so they can evacuate to safe place or travel to other areas during flooding.

3.1.2 Social Components

Social components normally cover the areas of activities and/or social relationships and networks among the communities and local government sectors to minimize the flood losses and damages. Social coping mechanisms were identified such as financial assistance from relatives and friends, health consultation, labour supports and participation in community activities. Moreover, the mechanisms were also included continue guarding the neighborhood and assisting other members which is an important capital to adapt to the negative impacts of flood (Dewi, 2007; Reganit, 2005). A sense of community helps to bring everyone in a community together since they share the same common of interest toward their community. In this study, the social capital

mainly focused on local social functions or activities available in a community relative with flood situations. This social capital helped the vulnerable villagers such as the poor, elders, children, and female household head to minimize their impacts from floods. For instance, villagers whose house are on high hill are willing to provide place to other people whose houses are flooded in order to live temporarily there.

3.1.3 Economic Components

Economic components comprise of the economic activities and their diversification, which cover those mechanisms of the community related to material goods and resources. For example, income diversification is one of the important components of economic coping mechanisms (Dewi, 2007; Reganit, 2005). In the study areas, the villagers shared some donation to their community to use during disaster periods. They could use the money to buy basic needs for affected community members when there is flood.

As those three components interrelated specifically to the community, the scope of this study analyzed their functions in building and enhancing community's capacity in flood management phases such as mitigation, preparedness, response and recovery. Each component played different roles yet they contributed to coping capacity of the community. The objective 1, as a result, identified functions of each component and their interrelations. Since community had a limited ability to cope with floods within period of time, external involvement and supports outsiders such as from the governmental agencies and international NGOs were included. Thus, the objective 2 discussed the policies and frameworks related to the sustainable community mechanisms to cope with flood in Cambodia (Fig. 3.1).

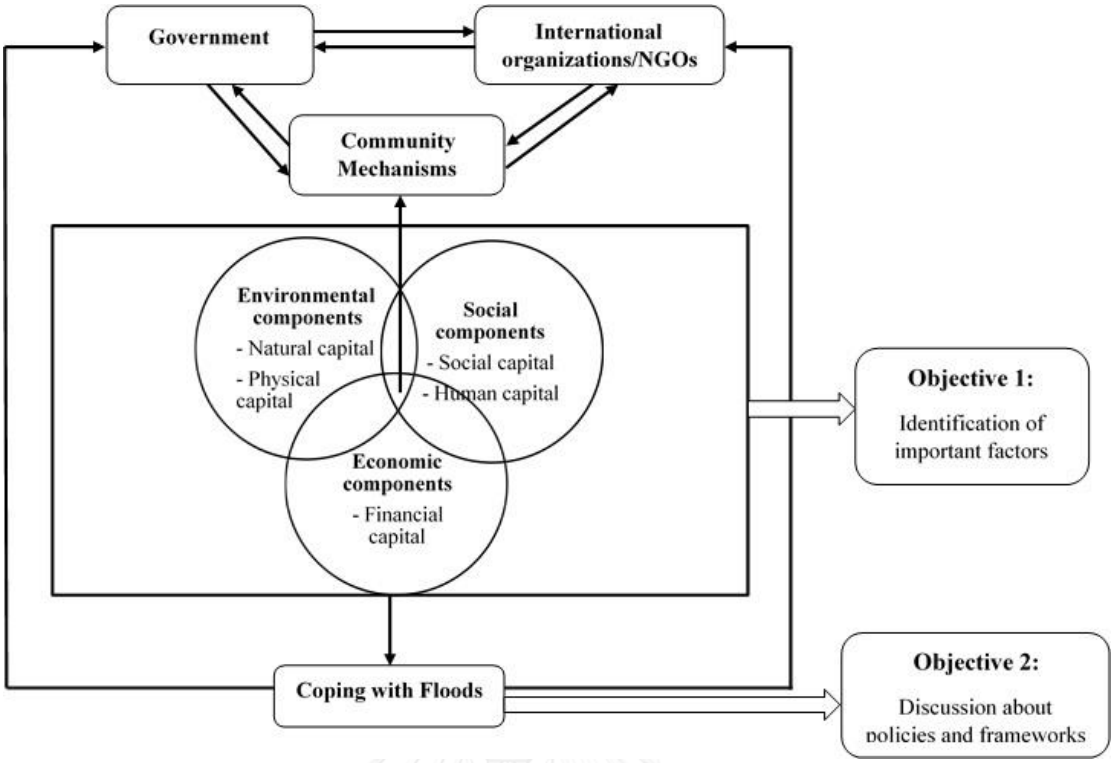


Figure 3. 1 Conceptual framework of study.

3.2 Research Location

Ba Baong commune, compost of Chouk Chey village, Doung village, and Ponley village, and Ba Baong village, was selected to be a study area because the commune presented the development of activities for the repeated floods which was known as flood-prone area in Prey Veng province (Fig. 3.2). The commune was vulnerable to floods from the rising water level in the Mekong River, following by heavy rainfall at local, national and regional level in the catchment of Mekong tributaries. Regarding to the records of annual rainfall for 25.years, the average annual rainfall ranges between 1,400 and 2,000 mm per year in this province (Tes et al., 2014).

The commune activities showed their potential in using the advantages of flood to increase crop products. For instance, based on the study on poverty of nine communities including Ba Baong village, farmers increased rice yields even when the village was affected by flood. (Fitzgerald et al. (2007). In fact, the all four villages learned ways to increase the rice crop from the repeated flood even though, the commune was effected by the severe flood in 2011 (Aid et al., 2012) which covered 16 provinces of Cambodia. Moreover, a survey employed by the Cambodia Development Resource Institute

(CDRI) in this commune affected by the sever flood in 2011, focusing on one of those four villages with 123 respondents of Ba Baong villages, reported no crop and other damages due to the flood. From these studies, it can be concluded that Ba Baong commune presented remarkable activities in order to cope with floods.

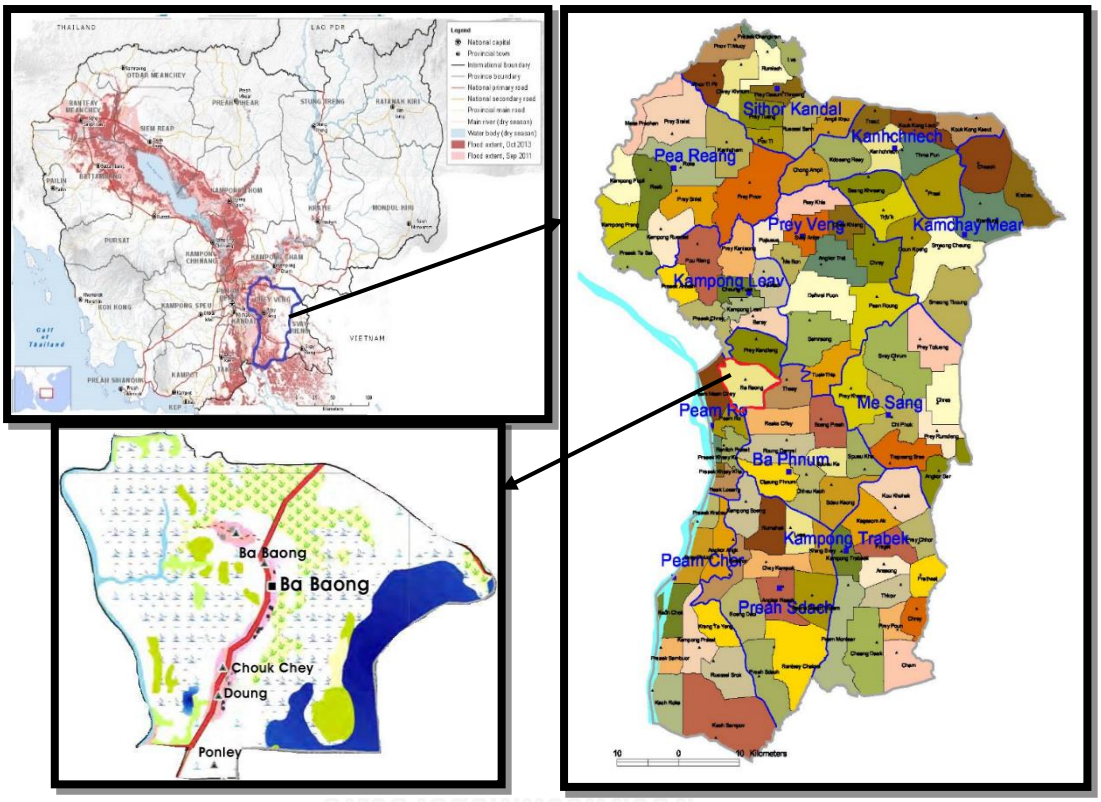


Figure 3. 2 Maps of study area.

Source: National Committee for Sun-National Democratic Development [NCDD] (2009); World Food Programme [WFP] (2013).

3.3 Research Design

The research design in this study was based on participatory approach which could provide answers to the objectives of the study by involving villagers in a discussion in order to extract information of a situation, behavior of people, their relationship, and activities of coping with flood.

3.4 Data Collection

The study used both primary and secondary data in order to obtain information which answers the objectives. Both primary and secondary data collection was conducted in

order to fulfill research objectives. Primary data collection was used fieldwork to process data, while secondary data was based on previous relevant studies and documents. Primary data mainly involved with qualitative data which used focus group discussions (FGDs), semi-structured interviews (SSIs), and field observation; meanwhile, quantitative data was related to survey questionnaires and existing statistics research.

3.4.1 Primary Data

The primary data was conducted by using focus group discussions (FGDs) and questionnaire surveys with villagers. Semi-structure interviews were applied with community leaders and external stakeholders. Field observation at the study areas was also adopted.

- Sampling size and sampling technique

The non-probability sampling was employed in this study by using purposive sampling for selecting target people. Morse (as cited in Bernard, 2013) recommended 30-50 interviews for ethnographic studies and grounded theory studies. Thus, forty villagers from four villages in Ba Baong commune were chosen for the FGDs depending on their socioeconomic status including gender, age, level of education, and well-being status since these criteria influenced on their coping capacity with the repeated floods. Participant selection was conducted under discussion with village chiefs based on the criteria. Participants who met the criteria were informed and invited to gather at specific places and time in order to conduct FGDs. The FGDs averagely was conducted for an hour.

- Focus group discussions (FGDs)

In August, 2014, focus group discussions were conducted with villagers in order to receive information focusing on the repeated flood influencing their living conditions including socioeconomic condition, their coping mechanisms and important factors behind their coping options. Moreover, the information of flood related to situations and flood impacts in the study areas were discussed among the group members. The questions were also arranged to gather general information of participants or institutes that indirectly influenced their capacity of coping with the repeated flood. Regarding to

community mechanisms applied for flood preparation, response and recovery, the questions were implemented to extract the factors of components that influence coping sustainability responding to their environmental and social changes. The villagers invited from four villages in the Ba Baong commune participated in the activities arranged during the FDGSs. Those villages were Ba Baong village, Chouk Chey village, Doung village and Ponley village.

This study conducted eight group discussions. Two focus group discussions were taken place in each chosen village. Participants were divided into non-poor household group and poor household group with five members in each group. Households who had IDPoor[2] were considered as poor while families who did not have were otherwise. Non-poor household groups and poor household groups were interviewed separately. Each group discussion was not limited to gender, age, education and occupation. Male and female participants were considered equal rights to express their opinions. During every discussion, members of the group were encouraged to participate in the discussion in order to obtain various opinions.

- Questionnaire surveys

The field surveys were conducted in August, 2014 to meet local people in the studied areas. Information of questionnaires was designed in four terms of 1) socioeconomic backgrounds, 2) disaster experiences, 3) coping strategies, and 4) relationships within villages. There were forty respondents invited from the four villages, namely Ba Baong village, Chouk Chey village, Doung village and Ponley village. Their family living conditions were classified by IDPoor to be poor and non-poor households. This criteria was taken in to account to report conditions of individual household when their life influenced by the changes during the before-, during- and after-flooding time periods.

[2] The Identification of Poor Households (IDPoor) programme is led by the Ministry of Planning with the collaboration of the Ministry of the Interior with financial support of Germany, European Union, AusAID, UNICEF, and the government of Cambodia with technical assistance of Deutsche Gessellschaft Fűr Internationale Zusammenarbeit (GIZ). The purpose is to identify the individual poorest households in order to target services and development assistance. Several variables including housing condition, productive land area and tools for earning income, animal raising, electronic and durable assets, means of transportation, accessing to rice and ratio of dependency are scored to determine household poverty level, also considering shock or crisis effects on households.

- Semi-structured interviews

The semi-structured interviews were deployed for extracting information from provincial government, commune chiefs and NGOs staffs. The targets for the interview were divided into three groups as follows:

- Department of Water Resources and Meteorology was interviewed in term of information related to the trend floods, and a record of climatic data. Frameworks and strategies which were put in practices at the affected areas to reduce and mitigate the impacts of floods on local people.

- NGOs staffs experienced in flood projects for more than five years were targeted for their actions related to the aids contributed to the studied areas and other affected areas. The required information obtained from this group was the objective and process for projects implementation for aids and the factors they considered in order to take action. The Save the Children Organization only responded for the study since this organization implemented the projects and activities related to flood emergency responses in Prey Veng province since 2010. The organization, however, had been working in Prey Veng province since 2005 on child protection projects. The director program implementation of the Save the Children kindly and actively responded to the request for face-to-face interview.

- Chief of commune and chiefs of villages were interviewed as the organization was because they were the people who faced with flood directly, so they knew clearly related to severe flood causes factors which enable them to cope with flood, and their coping strategies.

- Field observation

This study conducted observation at study area in order to learn about local people's livelihood and their daily activities as well as infrastructures in the commune such as roads, canals and high ground, which can affect on coping capacity of communities.

3.4.2 Secondary Data

Secondary data was obtained by making desk reviews via books, journals, news, and other sources to search for relevant information or data that can be used for analysis. Making reviews on previous researches could provide basic knowledge on what had been done on this topic, and they could be used as fundamental information for making comparison with this new finding whether it was on the same track or not or if the author explore new thing.

In order to understand about international policies and frameworks related to disaster management, some policies and frameworks were reviewed namely, the Hyogo Framework for Action 2005–2015, and the ASEAN Agreement on Disaster Management and Emergency Response (AADMER).

Moreover, Cambodia national policies related to disasters were reviewed and analyzed. The national policies were such as the country's National Poverty Reduction Strategy (NPRS), the Cambodia Millennium Development Goals (CMDG), the National Strategic Development Plan (NSDP) and the National Adaptation Program of Action to Climate Change (NAPA).

3.5 Data Analysis

Data analysis is a crucial component of the research reflecting obtained data quality. Regarding to the subjective study, crosschecking of the obtained information between primary and secondary data was emphasized in order to ensure its validity and reliability for both the data itself and translation will be made by the researcher.

The content analysis was used in the study. Data collection such as field notes and interview texts were extracted for information then coding was applied. Codes were transformed into category and sorted to identify similar phrases, patterns, and commonalities or disparities. Identified patterns were considered based on previous research and theories (Bernard, 2013).

Quantitative data from questionnaires which were used to add more information on the study was entered in computer software, SPSS version 20 for coding and using Stata program version 13.0 and Microsoft Excel 2010 to generate results.

3.6 Limitation

There was difficulty in accessing to information from a public sector since it was not publicly distributed. Effective translation was needed since the interviews were conducted in Cambodian language. Maximum quality of translation was needs to be obtained in order to convey right information. Hence, pretests and local expert consulting were conducted before the field data collection.

Season and day time period limited the information approaches. Data collection was performed in raining reason, so it was difficult for villagers to join the FGDs.

Political issues caution restricted freedoms of expression related to good governance in flood mitigation measures and aids. Making interviews with normal residents were not a major concern; however, when it happened to a policeman, communications and questions must be very clear that the purpose of interviews was only for the academic research, not to cause misunderstanding in the subject of political issues.

CHAPTER IV
RESEARCH FINDINGS AND DISCUSSIONS

4.1 Overview Information

It is well recognized that community capitals were important resource capable of strengthening and enhancing community capacities to cope with disasters including flood (Callaghan & Colton, 2007; Dynes, 2002; Stofferahn, 2012; Walter, 2004). The community capitals namely human, social, natural, financial, and physical capitals contribute significant roles to sustainable livelihoods (Callaghan & Colton, 2007; Gutierrez-Montes et al., 2009) in coping with disasters (Mayunga, 2009; Nang et al., 2014; Stofferahn, 2012). Many studies stated that resilience of people or application of coping strategies to natural disasters, specifically floods were based on their access to livelihood capitals (Mayunga, 2009; Stofferahn, 2012) which were particular to a community settings.

The studied area covered four villages which were namely, Ba Baong village, Chouk Chey village, Doung village and Ponley village where are the case study for the sustainable community mechanisms by developing their specific capacities to balance of natural resources, societal components and socio-economic elements in community level. Therefore, the capacities of community of the study areas was collected from the case study to reveal the factors of relevant capitals that support the community mechanisms. The factors were collected by the FGDs and the interviews among samples who were from the four villages where sharing the repeated flood experience by their geographical location.

4.1.1 Geography, Access, Facility and Public Services in Ba Baong Commune

- *Geography*

The study area is in Ba Baong commune, located in Peam Ro district, the southwest plain of Prey Veng province. Ba Baong commune consists of four villages, namely Ba Baong village, Chouk Chey village, Doung village and Ponley village. This commune is bordered by Prey Kandeang commune and Preaek Chrey commune in Kompong

Leav district to the north, Peam Meanchey commune to the west, Peam Ro commune and Reaks Chey commune in Ba Phnom district to the south and Theay commune in Ba Phnom district to the east (NCDD, 2009). Ba Baong commune is about 14 kilometers from the Neak Loeang market, half way to Prey Veng provincial town, on the national road.

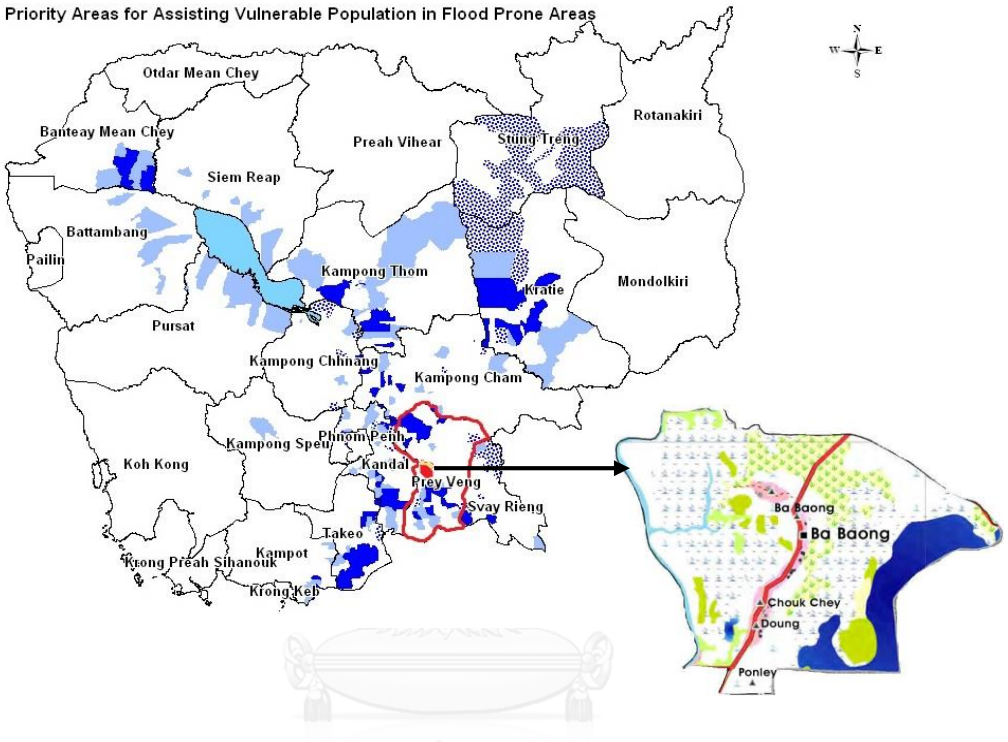


Figure 4. 1 Location of Ba Baong commune in Prey Veng province

Source: Wold Food Programme [WFP] (2004); National Committee for Sun-National Democratic Development [NCDD] (2009)

- *Access*

There are also accessible dirt roads in the villages nearby the national road N^{o} 11. Among the four villages, only Doung village constructed dike to protect the area from flood.

Figure 4. 2 Dike and Access Road at Doung village at Ba Baong commune in Prey Veng province.

- *Infrastructure and public services*

There are one health center, four temples, four primary schools, and one secondary school are present in Ba Baong Commune. There are village doctors: three doctors in Ba Baong village, one doctor in Chouk Chey village, one doctor in Doung village and four doctors in Ponley village. The villagers usually use a service at the health centre and the village doctors when they get little sick. They will to go a district or a provincial hospital, a public hospital in Phnom Penh when they encounter with severe symptoms. The four temples in the commune are two temples in Ba Baong village, one temple in Chouk Chey village and one temple in Ponley villages. Besides, a small church is in Ponley. In flooding period, they are a sanctuary for the affected people.

Based on the data obtained from the FGDs, the temples were normally on high ground, so they were used as a temporary shelter. Most people in Ba Baong village moved to stay a temple during flooding, while people in other three villages usually move to temporarily base along the national road.

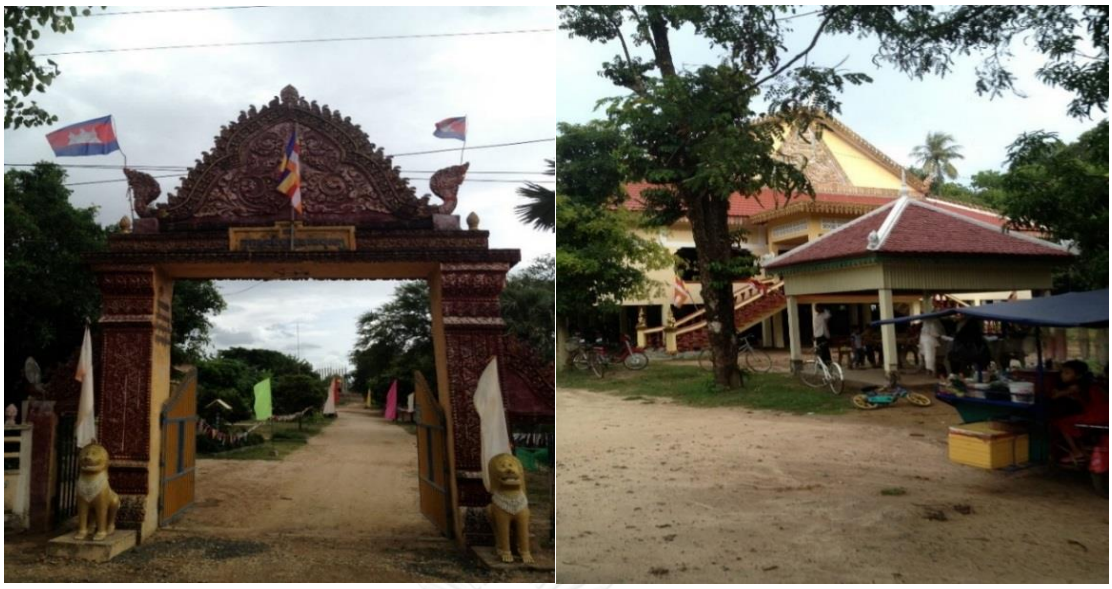


Figure 4. 3 Put Sthan Toul Mean Bon temple's compound that villagers used for evacuation in Chouk Chey village.

4.1.2 Population and Livelihoods

- *Population*

According to interviewed data collected from chiefs of four villages, households in 2014 were 614, 246, 218 and 645 households in Ba Baong village, Chouk Chey village, Doung village, and Ponley village, respectively (Table 4.1). Their poverty had reduced. Based on a study by National Committee for Sub-National Democratic Development (NCDD, 2009) stated that households living in poverty in this commune were 33.6 percent in 2004 and 28.8 percent in 2009 (NCDD, 2009).

Table 4. 1 Population of Villages in Ba Baong Commune in 2014

Village	Total Population	Total Household
Ba Baong	2569	614
Chouk Chey	1045	246
Doung	1023	218
Ponley	2580	645
Total	**7217**	**1723**

Source: Village data books from the interviews with the village chiefs.

- *Livelihoods*

The NCDD (2009) revealed that 93.5 percent of total households in Ba Baong commune involved in agriculture in 2008, 0.2 percent in craft, 4.4 percent in service and 1.9 percent in non-specific area respectively. Rice cultivation was the main source of income for people living in the commune following by fishing. Dry season rice was the only rice growing in this area. The rice growing in a dry season could yield 3 tonnes of rice per hectare, and cultivated dry season rice area was 1,261 hectares in 2008. Majority of households living in the commune were farmers who depended on rice cropping. They grew rice only in dry season and used short-term variety rice to avoid the flood impacts on the crop productivity. Percentage of farmers with less than one hectare of rice land was 44.2 percent, meanwhile the other 4.6 percent did not have a rice crop. There were 315 rice threshing machines, 3 tractors and 38 power-tillage in the commune.

The sixty-nine percent of total families in the commune could access to irrigation by the Boeng Sne and Touch rivers. There were 179 wells, but among them there were 174 wells owned by individual household.

4.1.3 Background Characteristics of Respondents

Demographic information of respondents included the set of gender, age, education, income, and socioeconomic that effects on the data quality relevant with the communities mechanisms found in the studied areas. The data were collected using survey questionnaires forty (40) respondents who were from twenty (20) respondents of non-poor and the another twenty (20) respondents from poor households classified by the IDPoor. The classification of respondents was based on the IDPoor related to the available resources for household processes and their coping capacity (ISDR, 2009). Their incomes and assets have a close link to coping strategies and capacity (M. Islam et al., 2013).

Among all respondents, 30 (75.0 percent) were household head while 10 (25.0 percent) were otherwise (Table 4.2). Although the other 25.0 percent were not household head, they were wives of household heads, who believed to provide similar information to

household heads because most male household heads worked outdoor during the survey. The questionnaire survey was conducted by paying a visit to each respondent's house to make them feel convenience to participate as they stay at own place.

Table 4. 2 Gender of Household Head

Household head	**Number of respondent (%)**
Household head	30 (75.0)
Not household head	10 (25.0)
Total	**40 (100.0)**

Note: The percentages are in parentheses.

- Gender

Table 4.2 shows that out of forty respondents, nineteen (47.5 percent) are male and twenty one (52.5 percent) are female. Both female and male respondents equally participated in the survey. The respondent responded to the questions depending on their available time at home such as looking after their children and working outside the house. Normally, female respondents asked their husbands to response to questionnaires when both of them were interviewed. As these local social functions, most female respondents were interviewed during the survey. Moreover, the capitals collected from each household was not a sensitive to gender issue, so the women openly expressed their ideas.

- Age

Nyakundi et al. (2010) indicated in a study on community perception and response to flood risks in Western Kenya that participants who were over 33 years old had more traditional knowledge on flood prediction since they lived in flood-prone area for long. Out of forty (40) respondents, 31 (77.5 percent) are between 35 and 64 years old (Table 4.3). People between these ages provided more detailed information since they have been living in study area for long and experiencing many events in term of floods and community institution. Fifteen percent of respondents are between 25 and 34 years old, and 7.5 percent are above 65 years old. The older respondents are easy to access, yet their ability to communicate is constraint.

- Education

Level of education has impacts on quality of obtained information (Roose et al., 2002). Majority of respondents (52.5 percent) attended primary school, meanwhile only 10.0 percent and 5.0 percent attended lower and upper secondary school respectively (Table 4.3). Another 32.5 percent of respondents have no education. Higher educated respondents are more careful and considerate before answering questions, whereas non-educated people are reluctant to answer and tend to agree with the questions. Besides, level of education also has impacts on coping capacity of people. More educated people tend to have more chances to diversify their income and access to early warning information (M. Islam et al., 2013). Since more than half of all respondents are age between 30 and 48 years old, it means that they were born just a few years before civil war[3] and genocide[4], which caused them lower or none education.

- Occupation

Roose et al. (2002) stated that occupational category has positive effects on behavior of participants. People with different occupation provide different perception on flood risks (Nyakundi et al., 2010). Based on the NCDD (2009), 67 percent of households in Ba Baong commune in 2008 were involved in agriculture as their main occupation. Table 4.3 presents that 70.0 percent of respondents are farmer, while another 30.0 percent are involved in non-farm activities. Farmers' responses toward questions related to floods are more detail on questions relevant to agriculture since agriculture is more dependent on weather. Furthermore, each occupation gets different impacts from floods.

[3] During 1970-1975 was fought between the Lon Nol government and Khmer Rouge (Kubota, 2013).

[4] Genocide was happened during the Khmer Rouge regime from 1975 to 1979, which caused approximately between 1.5 and 2 million Cambodians were killed.

Table 4. 3 Background Characteristics of Respondents

Characteristics of respondents	Number of respondent (%)
Gender	
Male	19 (47.5)
Female	21 (52.5)
Age[5]	
25-34	6 (15.0)
35-44	12 (30.0)
45-54	11 (27.5)
55-64	8 (20.0)
Over 65	3 (7.5)
Education[6]	
No education	13 (32.5)
Primary school	21 (52.5)
Lower secondary school	4 (10.0)
Upper secondary school	2 (5.0)
Occupation	
Farmer	28 (70.0)
Construction worker	3 (7.5)
Trader	3 (7.5)
Policeman	1 (2.5)
Motor taxi	1 (2.5)
Housewife	1 (2.5)
Elder	3 (7.5)

Note: The percentages are in parentheses.

[5] According to World Health Organization (World Health Organization [WHO], 1982), age classification in term of household head was categorized such as under 25 years, twenty-year groups 25-64, and above 65 years. Moreover, majority of respondents in the survey are household heads, and the youngest respondent is 25 years old, so age classification in this research is divided based on this classification. In addition, people coping capacity is also affected by wars they had undergone through. In the Cambodia context it is commonly recognized that rural people of adult age have typically been exposed to trauma through years of war and the excesses of the Pol Pot regime. This makes them feel stress and worried about meeting their basic needs from day to day (Helmers & Jegillos, 2004). People who were born between 1980 and 1989 are age between 25 and 34 years old in 2014. Thus, they were born after genocide period (1975-1979). Meanwhile, people whose ages are within 35 to 44 years old were born during civil war and the Khmer Rouge regime (1970-1979). Furthermore, a study on community perception and response to flood risks in Western Kenya that participants who are over 33 years old have more traditional knowledge on flood prediction since they lived in flood-prone area for long (Nyakundi et al., 2010). As a result, their levels of coping capacity with floods are different in accordance with their ages.

[6] System of general education in Cambodia is 6+3+3, which means primary school level (Grade 1-6), lower secondary level (Grade 7-9) and higher secondary level (Grade 10-12) (Ministry if Education, 2014).

4.1.4 Descriptive Statistics

Land ownerships are very crucial to farmers in the commune (NCDD, 2009). According to Table 4.4, seven respondents (17.5 percent) reported that they did not own any piece of land for crop productivity. However, sixty respondents (40 percent) possess less than 1 hectare of land, while seventeen respondents (42.5 percent) own more than 1 hectare. Owning more lands allows people to generate more income from agricultural productivity. Thus, they can make more saving to be used during floods and possess more durable assets that contribute to their coping capacity.

Table 4. 4 Size of Crop Land Ownership

Size of crop Land ownership [7]	**Number of respondent (%)**
Landless (land=0)	7 (17.5)
< 1 ha	16 (40.0)
>=1 ha	17 (42.5)
Total	**40 (100.0)**

Note: The percentages are in parentheses.

- House ownership

Among all participated household, only one household who said that they did not own a house but stayed there without any payment since the house is belonged to their parents and they did not have ability to build their own (Table 4.5). These answers mean that all respondents do not need to spend money on house renting, so they can use it on other purposes.

- Housing materials

The houses in the commune range from large house to small one. Housing materials represent level of vulnerability to floods. Nineteen respondents (47.5 percent) own dwellings with galvanized iron wall, 14 (35 percent) bamboo, thatch/leaves, 4 (10 percent) plywood, 2 (5 percent) wood or logs, and 1 (2.5 percent) others (Table 4.6). In addition, twenty-six respondents (65 percent) reported that roof of their houses were made from galvanized iron, 5 (12.5 percent) fibrous cement, and 2 (5 percent)

7 One hectare of rice land is the borderline that produce a bare minimum of rice sufficient for consumption by one household of five, assuming the whole produce can be kept for consumption (Sophal, 2008).

thatch/leaves/grass. Besides, thirty-five out of 40 respondents claimed that bamboo strips were used to build housing floor. Three respondents (7.5 percent) constructed with wooden planks, one (2.5 percent) concrete, and another one (2.5 percent) ceramic tile. Poor families usually own the houses which are made of bamboo, thatch/leaves or grass (Fig. 4.4), while non-poor household possessed houses which built from galvanized iron or aluminum or other metal sheets, which withstand flood water (Fig. 4.5).

Figure 4. 4 Poor household's dwelling.

Figure 4. 5 Non-poor household's dwelling.

- Drinking water

The main source of drinking water in the commune is a hand pump wells (92.5 percent) while only two (5.0 percent) and one (2.5 percent) are from dug well and rainfall respectively (Table 4.6). This information explains high access to safe drinking water, which deals with people's health.

- Main source of light

There is no electricity available in this community. Thus, eighty percent of respondents said that they used battery for lighting, meanwhile 7.5 percent used kerosene lamp, and 12.5 percent used other sources such as sola lamp (Table 4.6). Due to consuming batteries as the main source of light, it is inconvenience to get the batteries recharged during flooding.

- Main source of cooking

Collecting firewood for daily cooking is common in the commune. All respondents said that firewood was consumed for cooking while 97.5 percent collected by themselves and 2.5% bought from others (Table 4.6). The respondents said that it was difficult to fine firewood while flooding. Thus, firewood preparation was needed to fulfill daily consumption.

Table 4. 5 Ownership of the Household Dwelling

Ownership of the household dwelling	**Number of respondent (%)**
Owned by household	39 (97.5)
Not owned but no rent	1 (2.5)
Total	**40 (100.0)**

Note: The percentages are in parentheses.

Table 4. 6 Materials for the Housing, Sources of Drinking Water, Light and Cooking

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)**

Table 4. 6 Materials for the Housing, Sources of Drinking Water, Light and Cooking (Continue)

Primary material of roof	**Number of respondent (%)**
thatch/leaves/grass	2 (5.0)
Tiles	7 (17.5)
Primary material of roof	**Number of respondent (%)**
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 (92.5)
Dug well	2 (5.0)
Rainwater	1 (2.5)
Total	**40 (100.0)**
Main source of light	**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.

Assets are essential in minimizing flood effects on households (Berman et al., 2014; M. Islam et al., 2013). Table 4.7 presents mean of assets possessed by participated households. Less than half of respondents owned radios, but 50 percent of them had televisions, and all respondents possess at least one phone in average. This allowed people to access to early warning information and other useful information that deals with their daily life. Most of respondents owned bicycle. Nevertheless, minority of them possessed motorcycle and car, and none of them had a cart. Owning those assets made

villagers' travelling and transportation more convenience. Rowing and motor boats were used during floods and way to earn income by using fishing net. However, not many respondents occupied these assets. Hand tractors assisted villagers to complete their planting faster and increase agricultural productivity, yet the tractors were only belonged to non-poor respondents. In average, respondents owned at least two water tanks per household. Water tanks were for storing water for consuming during flood period. The survey revealed that non-poor families had more ability to occupy almost all mentioned assets, meanwhile poor families could not own some assets such as motorcycle, car, generator, motor boat, cart, and hand tractor. It can be concluded that non-poor households possess durable assets which contribute to their farming activities and coping capacity.

Table 4. 7 Mean of Assets Possessed by Participated Households

Assets	$\bar{X}(SD)$
Radio	0.42 (0.50)
Television	0.52 (0.55)
Desk phone/cell phone	1.25 (1.29)
Bicycle	0.87 (0.69)
Motorcycle	0.35 (0.58)
Car/jeep/van	0.10 (0.50)
Batteries	1.00 (0.51)
Generator	0.13 (0.40)
Rowing boat	0.35 (0.48)
Motor boat	0.05 (0.22)
Cart (pulled by animal)	0.00 (0.00)
Hand tractor	0.25 (0.44)
Fishing net	0.33 (0.66)
Water tank	2.13 (1.42)

$\bar{X}$ is mean.

SD is Standard Deviation

4.1.5 Flood Situation in Ba Baong Commune

From the study results, the flood in the study area is mainly caused by rising water levels in the Mekong River and overflow to the commune, coupled with heavy rainfalls at local, national, and regional level in the catchment of Mekong tributaries. This

situation commonly occurred in the area of Mekong River banks (Kea et al., 2005). The floods were found recurring over this flood plain area where were used for growing rice, natural watercourses and community forest. They were scaled as different perspectives of flood hazard with the slow steady rate of water raising. Other research supported this phenomena that affected to local people when the maximum rate of water level increase per night is forty centimeters (Kea et al., 2005). Generally the rate of current increased more rapidly only if flood control infrastructures collapsed.

The study results showed that the low hazard of flooding recurred in the commune every year. Rice fields in this area were always inundated (Kea et al., 2005) consequently, nutrients brought by floods to deposit in the fields, and floods provided natural irrigation for rice paddies (Fitzgerald et al., 2007). However, when flood water reached the commune with high water level coupled with long receding duration, people were affected.

Level of flood water reached to three meters at the village site in 2000 which reported as the most severe flood. Duration of flood varies up to ninety days, with an average estimation of the flood duration of seventeen days (Kea et al., 2005). Based on focus group discussions with participants from the commune, villagers considered floods as severe when the water level in their villages was one meter up and stay for more than thirty days. The information was agreed by sixty percent of them. The commune encountered with flood every year since it located nearby the river and received overflow onto adjacent watercourses, rice farms and community forests. The local people in the commune accumulated their experience in the different flood situations and develop their own coping capacity. Thus, they were used to the seasonal floods and just simply lived with flooding water and used many benefits from them. Nevertheless, the local people needed to raise their capacity upon flood hazard level encountering in each season especially in the year with a severe flood.

4.1.6 Local Livelihoods Related to Seasonal Floods

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. With information accessed from the FGDs, topography of Ba Baong commune resulted in slow inundated water in

the low lands adjacent to the main river banks. Livelihoods of people living in Ba Baong commune depended on water and natural resources, which were influenced by flood recurring. The local people, however, learnt from their experience and adapted to the seasonal changes in the water levels. Based on an interview with the Director of Department of Hydrology and River Works, the coping capacity of local people in Prey Veng province was acknowledged to cope with seasonal floods in different ways depending on the flood situation that the local people who resided in this area were able to manage and to earn benefits from repeated floods and reduce adverse impacts of floods on their livelihood.

- Income generating activities

The FGD participants stated that their villages were not completely inundated during seasonal floods only low lands in the villages. Their rice fields, however, were submerged by flood water. As a result, their daily activities were still performed normally excepted farmers who were available from farming activities due to inundated rice fields. After rice harvest, the rice fields of the commune were left vacant, and they could be filled in with the deposit nutrients and the recharged water brought by floods. Moreover, farmers in the commune managed to store flood water in their wells in the rice fields to be used during farming season in case there was not enough water from canals. Farmers mostly depended on their savings and credits during flood period. Being available from farming, some households went for finishing in order to earn alternative income and fulfill their daily food consumption. Some households involved in labour wage temporary migrated to nearby commune, Prey Veng city or Phnom Penh city to earn their living.

Figure 4. 6 Daily lives of people in Ba Baong village.

- Income and food consumption

According to FGD participants, they said that they had to carefully spend their money during flooding especially reducing their unnecessary expenses. 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. Participants whose houses were located in the lowlands and submerged in the flood concerned about safe drinking water, and thus they used water treatment kits or boiled water before consuming.

- Shelter design

Normally shelters in Ba Baong commune were built on high stilts in order to let flood water pass through. However, landfill was a new practice that local people recently adopted.

Ba Baong people did not view seasonal floods as their threats but benefits which could increase their rice productivities. The local people expressed more concern when there was not enough water for their rice plantation. However, extreme floods result in adverse impacts on local people's livelihoods.

4.2 Impacts of Floods

This section detailed about impacts of floods which took placed in Ba Baong commune based on data obtained information from FGDs and questionnaire surveys on sections about flood impacts. A study on coping with the impacts of severe flood events in Dhaka's slums analyzed severe flood impacts concerning on human, financial, physical and social capitals (Assheuer et al., 2013). Musah and Akai (2014) discussed effects of flood disasters on livelihood coping mechanism regarding to livelihood of people and environment. Flood impacts in this study were identified in terms of community capitals including social, human, natural, financial and physical impacts.

Floods have two-face consequences, both good and bad. Mekong River Commission [MRC] (2010) revealed that mainstream floods had both advantages and disadvantages but flash floods. This kind of flood provided benefits such as water supply, sedimentation deposit, and productivities of fishery to people. Ba Baong commune is located in flood-prone area which is annually inundated by flood water. Villagers could earn benefits from floods since majority of them are farmers. Based on an interview with the Director of Department of Hydrology and River Works, he acknowledged coping capacity of local people in Prey Veng province to cope with seasonal floods. He added that people residing in this area could manage to earn benefits from repeated floods and reduce adverse impacts on their livelihood.

4.2.1 Social Capital

Assheuer et al. (2013) analyzed impacts of floods on social capital by focusing on relationship of affected people during flood period in Dhaka's Slums, Bangladesh and showed that there was no significant impacts on social capital beside high disappointment of the people with their government and NGOs. Similarly, the obtained data from the FGDs in Ba Baong commune revealed that the social capital was not remarkably affected although several participants, especially the poor, disappointedly

reported that they received limited assistances from their neighbors. Meanwhile, a few non-poor participants expressed dissatisfaction with the poor who could access to more emergency aid. The above mentioned answers were asked in case of severe floods. However, annual seasonal floods did not cause tension on social capital since the floods were not extreme in condition which put pressures on their livelihood. As community level, the social capital reflects the institutions and household functions during flooding. The local government facilitated early warning before flooding, emergency response preparation such as providing an evacuation plans, and functioned as information center of aid distribution. Households' relationship among the poor and non-poor can be said in positive actions such as aid sharing distribution to the poor as priority and the social practices between the non-poor to the poor during flooding. For example, they shared the fish that was caught from the river or snails from the rice fields.

4.2.2 Human Capital

4.2.2.1 Impacts on Food Security

Based on definition from FAO, "food security exists when all people, at all times, have physically and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life". Food security was discussed in relation to floods by focusing on food availability, food access and food utilization (Helmers & Jegillos, 2004).

- Food availability

Based on the focus group discussions with villagers, they said that most of vegetables and herbs grown around their houses were not damaged during repeated flooding since their villages were not submerged, so they could still access to their homegrown vegetable for daily consumption. Moreover, there was not big impact on their rice crop, and thus they still could enjoy some amount of rice for eating during this period.

- Food access

People were still able to access to markets during flood season even though it was a bit difficult comparing to normal time. Local people, however, decided to buy from local sellers who bought vegetable and meat from Nak Loeung market to sell in the villages

with higher price which is only affordable for the rich. Nevertheless, poor families managed to get fish and snails for their daily consumption since they could access to these common property resources during flooding.

- Food consumption

Mostly people ate only meat or fish when the villages were flooded. Poor households sometimes had Prahok (salted and fermented fish) for meals for several consecutive days. Some part of the villages which are low, the main source of drinking water—hand pump wells were submerged while some still could be used but the water was polluted by flood.

Among the non-poor, food availability in the commune was not severely affected by floods because they have some amounts of rice to consume. Similarly, the poor found enough main diet of rice, but limited in vegetables, meats during the flooding.

4.2.2.2 Impacts on Physical and Emotional Health

Based on the FGDs with villagers, cold was mentioned as the most occurred illness, followed by diarrhea and fever especially for children. Besides, skin irritation and dengue fever were also found during flooding. However, people who were more affected were the people whose houses were located at the outskirt of the villages since those areas were inundated. Presented by statistical data, 90.0 percent of all respondents said that their family members were sick during this period, and the most mentioned disease is cold with 91.7 percent of respondents (Fig. 4.7). Moreover, they needed to deal with sanitation even households possessed toilets since their toilets were submerged as they placed outside the houses. Walking or rowing a boat to field or street was the only considered choice for local people.

Concerning question related to emotional health, 39.0 percent of respondents expressed their concern about their income especially for poor families who have little capacity to diversify their income. Since some households mostly stayed at home during flooding, they said that they felt a bit stress because they found nothing to do. In contrast, other participations showed no sign of emotional health problems because they considered floods as natural disaster they yearly encountered.

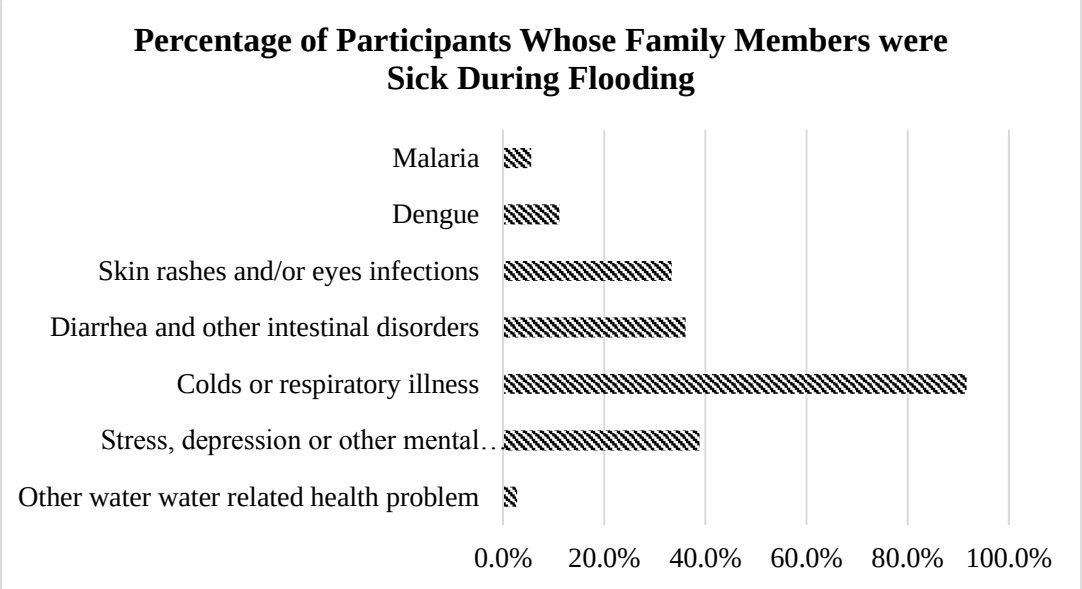


Figure 4. 7 Percentage of respondents whose family members were sick during flooding.

4.2.2.3 Impacts on Education

Seasonal annual floods had no bad impacts on education in Ba Baong commune since schools were normally constructed on higher ground, and thus there was no effect on the buildings. Moreover, new academic year of primary and secondary schools were started in October which floods had already receded. Furthermore, only some outer part of the villages were mildly submerged. As a result, students could still access to schools during flood period.

4.2.3 Natural Capital

4.2.3.1 Agricultural Land and Soil Fertility

Rice crops are the main production of farmers in this commune. No big destruction of rice productivity was reported since local people normally grow rice during dry season. Seasonal repeated floods did not result in adverse impacts on agricultural land yet without these floods, farmers would encounter with water shortage for their rice plantation, and thus more money need to be spent on gasoline and service for pumping water into their rice fields. More fertilizer and pesticide were utilized to kill pests and support rice growing stage.

> "*Seasonal floods had no bad impacts on my village since my village is protected by dykes, and thus village land was not submerged by floods. Our rice fields, however, were covered by flood water from the nearby river. It was good to allow our rice fields to be inundated since floods brought sedimentation to fill in the fields and also reduced number of mice and insects*." A participant in Doung village.

Small amount of rice, however, used to be damaged as the floods came early than normal, and some farmers could not manage to harvest on time. The flood effects on agricultural lands are not remarkably severe in this commune, yet villagers do not underestimate the consequences of floods which could result in adverse impacts in the future. Although households who did not have any piece of land did not get any impact on land asset, they revealed that without land, their livings were worse off comparing to households who occupied lands.

4.2.3.2 Livestock and Poultries

Besides growing rice, animal husbandry is another way to generate income for people in Ba Baong commune. Cattle and chickens are the most popular livestock raised in this area while cattle are raised for general or labour purposes (Table 4.8).

Table 4. 8 Percentage of Households Raising Livestock/Poultries/Fish

Livestock/Poultries/ Fish	**Cattle**	**Pigs**	**Chickens**	**Ducks**	**Fish**
Percentage of households	55%	2.5%	62.5%	30%	2.5%

Note: The percentages are in parentheses.

Normally, livestock and poultries are kept nearby villagers' houses unless big farms were adopted. Cattle are released at pasture lands for their meals, whereas pigs, chickens and ducks are fed. Fish ponds are located in the village lands. The main difficulty related to livestock is that there were not enough food to feed them due to inundated pasture lands. Moreover, foot and mouth disease affected on livestock was mentioned by FGDs participants.

Figure 4. 8 Pasture land for cattle in Chouk Chey village.

4.2.4 Physical Capital

4.2.4.1 Other Household Domestic Assets

Houses which are belonged to non-poor families did not encounter serious problem since they were strong and well-built enough to withstand floods while poor households' were partly damaged by floods associated with wind as they were constructed from leaves/thatch. Although a few respondents raised about mildly damage or destruction of non-land assets such as televisions, radios, desk/mobile phones, etc., the damage was not directly caused by floods.

4.2.4.2 Community Infrastructures

There was no significant report of the flood impacts on community infrastructures such as roads, bridges, schools, healthcare centers, and temples. Village roads were partly damaged since they were constructed from dirt. National Road, however, still remarkably functioned, which connected people to markets, schools, and healthcare centers. Other constructions including schools, healthcare centers, and temples were

not affected by flood because they were built on high ground, which only their surroundings were submerged yet still accessible.

4.2.5 Financial Capital

4.2.5.1 Impacts on Income Generation

Income generation of non-poor farmers was not affected by annual floods since they were normally available during flood period as they only grew dry season rice varieties which took place from October to July yet this period was different from one household to another based on their plantation calendar. The farmers made saving from their rice products to be used during this period. Some poor households, however, were affected by flood in terms of income generation since they were involved in wage labour which was unavailable after harvest season. As a result, some households chose to migrate to nearby commune or cities to earn their living in labour work. In addition, some household could diversify their income from fishing products with available fishing tools.

4.3 Coping Strategies

4.3.1 Flood Mitigation

People in these villages of Ba Baong commune were found that they have created their own coping strategies in order to survive in flooding area since they were born. A flood measure and prevention was adopted in housing construction. Among all interviewed families, there were 35 percent of non-poor families building their house to withstand floods, whereas the other 30 percent of poor family were found could not afford for it. Furthermore, households were aware that they were protected during the flooding. The respondents in FGDs described that they filled up the house foundation and installed a stilt house to level habitable floor of the house above the flood level. As the local management of flood risk, their dwelling in the flood hazard area will not be inundated by flood water. However, their behavior on the housing construction did not respond to the flood behavior changed by the climate change.

Table 4. 9 Number of Households Who Own Flood Resisted Dwelling

Was your house built to withstand floods?	**Non-poor household (%)**	**Poor household (%)**	**Total (%)**
Yes	14 (35.0)	8 (20.0)	**22 (55.0)**
No	6 (15.0)	12 (30.0)	**18 (45.0)**
Total	**20 (50.0)**	**20 (50.0)**	**40 (100.0)**
Reason	**Non-poor household (%)**	**Poor household (%)**	**Total (%)**
Can't afford it	2 (11.1)	10 (55.6)	**12 (66.7)**
No risk of flooding	2 (11.1)	2 (11.1)	**4 (22.2)**
Others	2 (11.1)	0 (0.0)	**2 (11.1)**
Total	**6 (33.3)**	**12 (66.7)**	**18 (100.0)**

Note: The percentages are in parentheses.

4.3.2 Flood Preparedness

Disaster preparedness activities are those that are undertaken to protect human lives and property in conjunction with threats that cannot be controlled by means of mitigation, o from which only partial protection can be achieved (Lindell & Perry, 1992).

- Early warning information

Accessing to flood information is very important as people can manage to prepare themselves. Using their own observation is one way to notice water level of river. Flood in this commune is not flash flood, yet flood water increases steadily. Early warning information from radio, television, village and commune leaders, and words of mouth was shared within the villages. Majority of respondents revealed that radio and television are the main sources of flood information with 70 percent and 60 percent respectively (Table 4.10).

Table 4. 10 Sources of Flood Information

Sources of flood information	Non-poor household (%)	Poor household (%)	Total (%)
Own observations	9 (22.5)	10 (25.0)	**19 (47.5)**
Radio	13 (32.5)	15 (37.5)	**28 (70.0)**
Relatives	7 (17.5)	4 (10.0)	**11 (27.5)**
Television	14 (35.0)	10 (25.0)	**24 (60.0)**
Village chief	6 (15.0)	12 (30.0)	**18 (45.0)**
Word of mouth	7 (17.5)	9 (22.5)	**16 (40.0)**
Neighbors/friends	12 (30.0)	14 (35.0)	**26 (65.0)**
Commune council	4 (10.0)	4 (10.0)	**8 (20.0)**
Information board	1 (2.5)	1 (2.5)	**2 (5.0)**
Loud speakers	2 (5.0)	1 (2.5)	**3 (7.5)**
NGOs	0 (0.0)	1 (2.5)	**1 (2.5)**

Note: The percentages are in parentheses.

- Food and medicine storage

In order to meet daily consumption during flood, 82.5 percent of interviewees reported that they prepared rice, prahok (salty fermented fish), cooking ingredients, medicine and firewood upon learning about water rising information. Some families attended in FGDs, nevertheless, claimed that they chose not to prepare medicine in advance since they did not know type of medicine and expired date clearly.

- Housing structure

Furthermore, 97.5 percent of non-poor households mentioned that they designed their houses to withstand flood effects by applying supported wood because their dwellings could not resist flood water (Table: 4.11). Besides, livestock's feed was stored due to inundated grazing land. Dwellers also built shelves to protect their belongings from water and keep their livestock and poultries in guard. Among 40 participants, only a person did not take any action before flooding because her house is located on high ground.

Table 4. 11 Households' Preparedness before Flooding

What household did 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.

4.3.3 Flood Respond

Disaster response activities are those conducted during the time period that begins with detection of the event and ends with the stabilization of the situation following the impacts (Lindell & Perry, 1992).

Local people had adopted variety of actions in order to adjust themselves to flood situation. According to information accessed from questionnaire, villagers practiced many actions as mentioned in Table 4.12.

Table 4. 12 Households' Response during Flooding

How did you survive during flooding?	Non-poor household (%)	Poor household (%)	Total (%)
Borrowing money	8 (20.0)	18 (45.0)	**26 (65.0)**
Consuming crops already for harvest or just harvested	1 (2.5)	1(2.5)	**2 (5.0)**
Evacuation and rescue	1 (2.5)	6 (15.0)	**7 (17.5)**
Migration	0 (0.0)	1 (2.5)	**1 (2.5)**
Reducing the quality and quantity of food intake	8 (20.0)	5 (12.5)	**13 (32.5)**
Seek temporary help from friends or relatives or a government	1 (2.5)	5 (12.5)	**6 (15.0)**
Selling healthy animal at reduce value to buy food	4 (10.0)	1 (2.5)	**5 (12.5)**
Slaughtering livestock	3 (7.5)	0 (0.0)	**3 (7.5)**
Spend cash or gold reserves to meet needs	15 (37.5)	11 (27.5)	**23 (65.0)**
Others	4 (10.0)	1 (2.5)	**5 (12.5)**

Note: The percentages are in parentheses.

- Saving and loan

Two noticeable strategies were adopted by respondents, including borrowing money (65 percent) and spending reserved cash or gold (65 percent) (Table 4.12). The first option was mostly chosen by the poor. In contrast, non-poor families preferred second choice while 30.8 percent of them said that their savings were enough for expense during flood period (Table 4.13).

Table 4. 13 Number of Households Who Made Saving

Saving before flooding	**Non-poor household (%)**	**Poor household (%)**	**Total (%)**
Yes	15 (37.5)	11 (27.5)	**26 (65.0)**
No	5 (12.5)	9 (22.5)	**14 (35.0)**
Total	**20 (50.0%)**	**20 (50.0)**	**40 (100.0)**
Enough saving	**Non-poor household (%)**	**Poor household (%)**	**Total (%)**
Yes	8 (30.8)	2 (7.7)	**10 (38.5)**
No	7 (26.9)	9 (34.6)	**16 (61.5)**
Total	**15 (57.7)**	**11 (42.3)**	**26 (100.0)**

Note: The percentages are in parentheses.

- Consumption adjustment

During flooding, daily food consumption was changed especially for poor families to cope with the situation. As mentioned in previous section, home-grown vegetables were destroyed, people had to cut down their amount of daily consumption, yet rice was the only food they did not reduce since it was a basic diet for Cambodian people. Some poor households bought rice on credit from rice merchants then paid back after they harvested their rice in the next season. Talking about water, in order to get safe drinking water, local residents had to row a boat to the river if the hand pump wells were submerged. Water treatment kits or boiling water before drinking was practiced in order to protect themselves from diseases. These actions showed a good sign that people knew how to drink healthily. Households who possess fishing tools could go to the river for fishing, but they have to be aware of weather. If the weather is windy, they will not go out because they will be in trouble or losing their lives.

Although statistical data did not include spending adjustment, FGD participants mentioned that this measure was adopted.

"*I have to be aware of family's spending during flooding period because I need to save money for spending on emergency things, i.e. illness. I reduce spending on non-essential consumption."* A participant in Doung village.

- Evacuation

Evacuation was applied to households whose houses are located at low land and not resistant to floods as they were built from thatches, leaves or grasses. This kind of house is mostly belonged to poor families. Table 4.14 shows that 22.5 percent of respondents evacuated to stay along national road or temporary live with relatives or neighbors who own better dwellings while some families evacuated to temple. Although no data accessed from questionnaire interview mentioned about evacuation to temple, participations in FGDs raised this point up, mainly people in Ba Baong village as there are two temples in the village.

"*My family evacuated to temple since my house was in poor condition that we cannot stay. Some families temporary reside along the national road in case there is no place available at the temples.*" A participant in Ba Baong village.

Table 4. 14 Number of Households Who Evacuated during Flooding, Place to stay and Duration

Evacuate	**Non-poor household (%)**	**Poor household (%)**	**Total (%)**
Yes	1 (2.5)	8 (20.0)	**9 (22.5)**
No	19 (47.5)	12 (30.0)	**31 (77.5)**
Total	**20 (50.0)**	**20 (50.0)**	**40 (100.0)**
Place to stay	**Non-poor household (%)**	**Poor household (%)**	**Total (%)**
National road	1 (11.1)	7 (77.8)	**8 (88.9)**
Relative's house/neighbor	0 (0.0)	1 (11.1)	**1 (11.1)**
Total	**1 (11.1)**	**8 (88.9)**	**9 (100.0)**
Duration	**Non-poor household (%)**	**Poor household (%)**	**Total (%)**
Between 1 and 3 weeks	1 (11.1)	1 (11.1)	**2 (22.2)**
Between 3-6 weeks	0 (0.0)	5 (55.6)	**5 (55.6)**
More than 6 weeks	0 (0.0)	2 (22.2)	**2 (22.2)**
Total	**1 (11.1)**	**8 (88.9)**	**9 (100.0)**

Note: The percentages are in parentheses.

- Income diversification

Some actions were applied in order to diversify income, namely fishing, wage labour and migration (Table 4.15). Households who possessed fishing tools could go to the river to catch fish for selling or family consumption. Meanwhile, some villagers chose seasonal migration to Phnom Penh city, nearby provinces or neighboring countries.

Table 4. 15 Households' Income Diversification during Flooding

Income diversification	Non-poor household (%)	Poor household (%)	Total (%)
Fishing	7 (17.5)	7 (17.5)	**14 (35.0)**
Daily wage	1 (2.5)	4 (10.0)	**5 (12.5)**
Migration	0 (0.0)	1 (2.5)	**1 (2.5)**
Others	2 (5.0)	0 (0.0)	**2 (5.0)**

Note: The percentages are in parentheses.

4.3.4 Flood Recovery

Disaster recovery comprises actions taken to repair, rebuild, and reconstruct damaged properties and to restore disrupted community social routines and economic activities (Lindell et al., 2001).

After floods receding, eighty percent of interviewed household started new growing season by fixing their paddy fields which were damaged by floods, whereas another 25 percent took various actions including continuing their business or selling labour (Table 4.16). Besides, 40 percent, especially the poor stated that they needed to reconstruct their houses. Villagers' livelihood started to recover day by day. Among all respondents, 85 percent of them reported that they could recover their livelihood with an average period of 61 days (Table 4.17).

Table 4. 16 What Non-poor and Poor Families Did after Flood Receding

What people did after flooding	Non-poor family (%)	Poor family (%)	Total (%)
Replanting crop	16 (40.0)	16 (40.0)	**32 (80.0)**
Reconstruct house/road	4 (10.0)	12 (30.0)	**16 (40.0)**
Migrate	0 (0.0)	1 (2.5)	**1 (2.5)**
Others	4 (10.0)	6 (15.0)	**10 (25.0)**

Note: The percentages are in parentheses.

Table 4. 17 Number and Percentage of Recovery Household

Recovery	Non-poor household (%)	Poor household (%)	Total (%)
Yes	15 (37.5)	19 (47.5)	**34 (85.0)**
No	5 (12.5)	1 (2.5)	**6 (15.0)**
Total	**20 (50.0)**	**20 (50.0)**	**40 (100.0)**

Note: The percentages are in parentheses.

4.4 Community Capitals for Coping with Flood

Activities that were found as normal response to flood measures contained environmental, economical and social structures and functions. For example, the local people in Ba Baong commune confined the inundation of flood in their rice farm lands, natural watercourses and community forest by using their knowledge which have been obtained from their accumulation experience. By the certain types of flood recurring at a commune, they learn to utilize the benefit services of flood situation. Many researches revealed that community capitals (social, human, natural, financial and physical capitals) were essential factors to build community capacities to cope with disasters including flood (Callaghan & Colton, 2007; Dynes, 2002; Stofferahn, 2012; Walter, 2004). The community capitals play important roles in building coping capacity of local people in order to take action in each phase of flooding. The five capitals are interrelated, which one capital helps to build another capitals to cope with changes and hazards. For example, Green and Haines (2011) stated that social capital is central to build other forms of capital, namely human, financial, physical, environmental, cultural, and political capitals. The interaction of all components in a community created sustainable community mechanisms. Fey et al. (2006) stated that the all capitals were classified as capital focus and decapitalized interconnected. (Flora et al., 1992). When all capitals are available in the commune, they contribute to capacity of people to cope with floods. The availability of all capitals is not at the same stage. There is always at least one capital play more functions than another. For example, the temporally vacant rice fields, watercourses and community forests of the commune environmental retain the flooded water and changed the services of land use to be a source of freshwater during dry season. The environmental and social capitals were types of capital emphasized over all of others.

In case of Ba Baong village, (Fitzgerald et al., 2007) and the other three villages of the commune, security and stability coupled with fertile land and water resource in the village contribute to accumulation of financial and physical capitals.

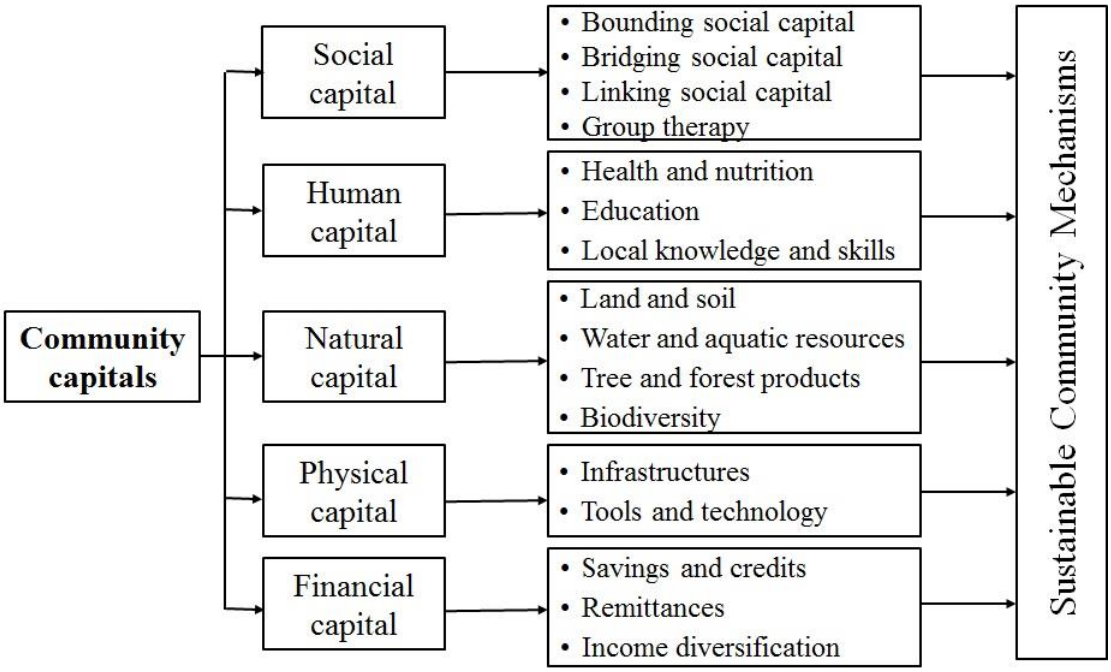


Figure 4. 9 Community capitals for sustainable community mechanisms.

For example, the Ba Baong village (Fitzgerald et al. (2007) was identified as a strongly performing village according a study conducted by to identify factors that influenced on trend of communities' well-being and household mobility. Earlier peace dividend achieved in the Ba Baong commune after breaking down of Pol Pot regime encouraged villagers to focus on earning their livelihood, and it was also an important reason that attracted development assistances from both government and NGOs to support commune development which contributed to better living standard of the people. Trust within the community between villagers and villagers, and villagers and local leaders motivated villagers to participate in community's activities. Participated in village or commune meeting allowed them to update any information happen in their community.

The commune, moreover, was location along national road, which facilitated local people to travel conveniently for longer distances, and thus villagers could migrate to Prey Veng province and Phnom Penh for employment opportunities. Roads also

facilitated access to services such as health and education that may not be available locally, which contributes to greater use of and participation in health and education by most households.

Land and water were very important natural capitals for Ba Baong people since majority of them were farmers. Good soil and irrigation systems in the commune allowed farmers to produce significant amount of rice comparing to poorly and moderately performing villages that depended more on common property resources with poor soil and limit irrigation systems (Fitzgerald et al., 2007). The commune, furthermore, equipped with modern farming practices and inputs, and thus the commune still could achieved good and high rice yield despite of flood and drought effects. Fishing was another main source of income for villagers. In addition, households in the commune also raised livestock as a form of saving and income generation. Access to rural credits both formal and informal sources. Households in more accessible communities are also able to take up new employment opportunities outside the village. The five community capitals play important roles in building the community's capacity to cope with floods. Following information provided details of each capital related to flood coping.

4.4.1 Intangible Assets

4.4.1.1 Social Capital

Social capital is an interaction among social components derived from local people in the commune to use available benefits or opportunity (DFID, 1999). It is central to build other forms of capital, namely human, financial, physical, environmental, cultural, and political capitals (Green & Haines, 2011). It plays an important role in building people's coping capacity especially in developing countries (Pelling, 2010). Besides providing material assistances during hardship time, it plays an important role in the process of healing distressed heart with supports from family, friends, and neighbors (Jeane & Zaumseil, 2014). In Cambodia, several capital is an essential capital applied to achieve or promote the adaptation of the local people in a community to the climate changes (Va et al., 2013). However, Colletta and Cullen (2002) stated that most forms of social capital was destroyed during Khmer Rouge regime in Cambodia since entire villages were relocated, and families lost their homes and possessions. In case of Ba Baong

commune, the social capital was taken place after breaking down of Khmer Rouge (McAndrew, 1998). It was gradually restored since people who were relocated to other areas returned to the commune. Ledgerwood (1998) stated that villages in the central and southern plains had lived in peace since 1979 because those villages were rehabilitated primarily of original people who came back to their residences after forced relocation, and thus their leaders were chosen from the original residents who have resided there for decade. Based on statistical data from a survey conducted by Cambodia Development Resource Institute (CDRI) on the social capital in Ba Baong village with 200 respondents, more than 60.0 percent of them stated that they lived in the village more than 30 years while another 20.0 percent lived between 21 to 30 years (Inada, 2013). Michael Young identified length of residence as one factor that creates sense of community, focusing on social connection and trust within a community which were crucial structures of capacity development. Roles of social capital for building capacity to cope with floods were categorized into bonding, bringing and linking social capital. Uphoff (2000) grouped those social capitals into the collective actions (bonding and bridging social capital) and the collective action facilitation (linking social capital).

- **Bonding social capital**

It explains the cohesion among various groups of individuals in a community such as the relationship of kinship, close friends, partners and the religious member or neighborhoods (Putnam, 2001). R. Islam and Walkerden (2014) studied about contribution of bonding and bridging networks to disaster resilience and recovery on the Bangladesh coast in case of Cyclone Sidr. It showed that the bonding social capital plays an important role by offering supports such as emotional care, food, clothes, cash, shelter, building materials and labour during crisis time. Bonding social capital is strong in Cambodia (Baromey et al., 2012). There is a Cambodia's old saying which is said that "*Kat toek men dach kat sach men ban*, which means that water cannot be cut as well as our flesh." No matter what family members do, parents and other members still forgive them even in the hardship time. It means that Cambodia culture give important value to the family relationship. The study on the social capital in Ba Baong village indicated that villages tended to turn to bonding social capital for supports, especially their family members and relatives in the events of risk in life or disasters (Inada, 2013;

Murakami, 2013). The degree of dependence on social relationships with family and relatives were extremely high in Cambodia.

All participants in focus group discussions said that they believed in their families and would turn to them first before seeking for help from other people in case they have enough capacity and strength. Family talk and discussion, moreover, were mentioned during the FGDs. Participants reported that they usually discussed with their husbands/wives about their family situation especially during flood period in order to take appropriate actions.

> *"I usually discuss with my husband how to earn more income since we are poor. […] I stay at my parents' house during flooding because their house was built on higher poles so it was not inundated."* A participant in Ba Baong village.

Mutual assistance, however, also goes beyond family groups. Exchanging labour with neighbors and friends was taken place in Ba Baong village, and they could borrow rice without interest from each other until the next harvest (McAndrew, 1998). Neighbors and friends helped to build houses for one another, acted as caretakers of each other's cows, and informed each other of opportunities in migration labour.

From the FGDs, participants revealed that people in the villages always assisted one another when they were facing any difficulty. When the villages were hit by repeated floods, people who had more ability to cope with flood provided assistances to vulnerable people by sharing food or money. At emergency time such as sickness, villagers could borrow some money from their neighbors to go to health center. Not only financial support was shared but also labour support was given to each other. Besides that, households who owned boats were willing to share their boats with households who did not own any mean of transportation. Information was also shared within the villages, so it allows other people who missed the information to prepare in advance.

> *"My family is poor. During flooding, I helped other families to lift their belongings up from water or move to temple, so they gave me around $1 to $2.5 for buying my meal as sympathy."* A participant in Ba Baong village.

Even though bonding social capital significantly contribute to coping capacity to local people, depending on this one type of social capital is not strong enough to make long-term adaptive coping with floods.

- **Bridging social capital**

The bridging social capital is defined as embedded forms of social capital or the strong ties with connections between heterogeneous groups (Granovetter, 1973). R. Islam and Walkerden (2014) emphasized importance of the bringing social capital after the bonding social capital to recover from Cyclone Sidr. Bringing social capital was in a form of exchanging of mutual supports, namely food, cooperative works, loan, and emotional and spiritual supports with neighbors and friends.

- *Relationship among villagers*

The bridging social capital which remains in Ba Baong village between local people are used as coping mechanisms and to prevent outright starvation (Fitzgerald et al., 2007). For example, relationship between villagers was mentioned by a participation in Ba Baong village that villagers would not allow any people to die from hunger in their village especially elderly people who had nobody to look after them. In the focus group discussions, some participants stated that solidarity and cooperation were took place in their community

> *"People in our village were unity since we were willing to help each other and participate in any of our village activity. For instance, we shared some money for constructing a dike to protect our village, and the poor contributed labor. Finally, we could achieve the dike to prevent our village from being severely submerged."* A participant in Doung village.

Out of 40 respondents, 29 of them (72.5 percent) said that they knew everyone in their villages, whereas 11 of them were otherwise with a reason that there were many people in the next generation, so they could not recognize everyone especially younger people (Table 4.18). Although there was high percentage of knowing everybody in the villages, 19 respondents (47.5 percent) expressed their opinion that most people in their villages were not generally trustable. In contrast, a positive sign that showed there was always someone who was willing to help respondents whom were in trouble. Thirty-four

respondents (85.0 percent) provided positive answers. Additionally, eleven respondents (27.5 percent) strongly agreed and 22 (55.0 percent) agreed to some extent that most people in their villages were generally willing to help one another, meanwhile five of them strongly disagreed, one disagreed somewhat and one was neutral. Furthermore, three respondents (7.5 percent) revealed that more than four people beyond close relative they could borrow money for family expense for whole week. This answer was found only in non-poor households. Besides, six respondents (15.0 percent) could turn to three or four people while the other 6 of them reported no one. Majority of them responded that there were one or two people they could turn to. These questions showed that local people could still access to informal assistances when they are in crises, namely floods.

Table 4. 18 Bridging Social Capital between Non-poor and Poor households in Ba Baong Commune

Do you know everyone in the village?	**Non-poor household (%)**	**Poor household (%)**	**Total (%)**
Yes	13 (32.5)	16 (40.0)	**29 (72.5)**
No	7 (17.5)	4 (10.0)	**11 (27.5)**
Total	**20 (50.0)**	**20 (50.0)**	**40 (100.0)**
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)**
Anyone is willing to help	**Non-poor household (%)**	**Poor household (%)**	**Total (%)**
Yes	17 (42.5)	17 (42.5)	**34 (85.0)**
No	3 (7.5)	3 (7.5)	**6 (15.0)**
Total	**20 (50.0)**	**20 (50.0)**	**40 (100.0)**
People are 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 dis	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)**

Table 4. 18 Bridging Social Capital between Non-poor and Poor households in Ba Baong Commune (Continue)

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: The percentages are in parentheses.

- *Local government authorities*

Level of trust in local government authorities was still high in Ba Baong commune. Among 40 respondents, 35 of them trusted their village and commune chiefs (Table 4.19). It can be inferred that the local government authorities have remarkably fulfilled their obligation, which can gain their people's trust. The finding is consistent with a study conducted by Fitzgerald et al. (2007), which indicated that local people trusted on their local authorities because they believed that the authorities paid more attention on people's welfare and shared similar interests. Local people, moreover, were invited to participate in development planning.

Local government authorities play crucial roles in helping their people to survive during severe floods. They disseminated early warning information and informed villagers to prepare for the floods. They sought for assistances to help vulnerable families and notified them if there was any aid donated. In addition, 32 out of 40 respondents revealed that the local government authorities had done something to protect the community from floods, and 35 said that they encouraged solidarity within the commune (Table 4.20). Besides that, leader of the commune said that he had to be well-managed to control situations and find solutions which could help villagers. For example, he collected information related to number of households who owned the boats, and thus he could ask them for assistances in favor of evacuating vulnerable people and transport any aid.

Table 4. 19 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)**
Trust on district government officials	**Non-poor household (%)**	**Poor household (%)**	**Total (%)**
Believe	9 (22.5)	7 (17.5)	**16 (40.0)**
Not believe	2 (5.0)	3 (7.5)	**5 (12.5)**
Don't know	9 (22.5)	10 (25.0)	**19 (47.5)**
Total	**20 (50.0)**	**20 (50.0)**	**40 (100.0)**
Trust on provincial government officials	**Non-poor household (%)**	**Poor household (%)**	**Total (%)**
Believe	7 (17.5)	6 (15.0)	**13 (32.5)**
Not believe	2 (5.0)	2 (5.0)	**4 (10.0)**
Don't know	11 (27.5)	12 (30.0)	**23 (57.5)**
Total	**20 (50.0)**	**20 (50.0)**	**40 (100.0)**
Trust on national government officials	**Non-poor household (%)**	**Poor household (%)**	**Total (%)**
Believe	12 (30.0)	9 (22.5)	**21 (52.5)**
Not believe	2 (5.0)	0 (0.0)	**2 (5.0)**
Don't know	6 (15.0)	11 (27.5)	**17 (42.5)**
Total	**20 (50.0)**	**20 (50.0)**	**40 (100.0)**

Note: The percentages are in parentheses.

Table 4. 20 Respondents' Opinions on Local Authorities between Non-poor and Poor Households

Protect community from floods	**Non-poor household (%)**	**Poor household (%)**	**Total (%)**
Yes	15 (37.5)	17 (42.5)	**32 (80.0)**
No	5 (12.5)	3 (7.5)	**8 (20.0)**
Total	**20 (50.0)**	**20 (50.0)**	**40 (100.0)**

Table 4. 20 Respondents' Opinions on Local Authorities between Non-poor and Poor Households (Continue)

Encouragement to work together	Non-poor household (%)	Poor household (%)	Total (%)
Yes	17 (42.5)	18 (45.0)	**35 (87.5)**
No	3 (7.5)	2 (5.0)	**5 (12.5)**
Total	**20 (50.0)**	**20 (50.0)**	**40 (100.0)**

Note: The percentages are in parentheses.

- *Religious leaders*

Buddhism and temple have a very close connection with Cambodian culture. All of respondent in Ba Baong commune are Buddhist, yet only thirty-five respondent (87.5 percent) believe in religious leaders (Table 4.21). In 2001 under fund raising from the leaders of Ba Baong community fisheries in collaboration with the temple committee, village roads which connect to a national road were constructed (Fitzgerald et al., 2007). Consequently, villagers can access to easier, faster and cheaper transport and communications. Participants in the FGD in Doung village indicated that religious leaders offered supports to development of the village.

> *"During renovation of village dike, religious leaders provide some food for people who were working at the dike."* A participant in Doung village.

Table 4. 21 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: The percentages are in parentheses.

The temples are sanctuary places for the poor in Cambodian society. In the FGDs, a participant revealed that she washed dishes for a temple during *Pchum Ben* (one of religious ceremony which is celebrated for 15 days) to get some food and money to support her family. Beside this, a participant in the FGD in Ba Baong village said that

his family received help from the religious leaders. Since this kind of assistance was limited, only small number of households were provided.

> *"My family received assistants from monks such as dish, plate, frying pan, kettle, soy sauce, fish sauce and rice. The aid is not for everyone, but for households who are most vulnerable."* A participant in Ba Baong village.

It is consistent with information from village chiefs who stated that there were assistances from the temples to the most vulnerable families with older adults. With these donations, poor families were less in disaster hardship. In addition, the temples played significant role as sanctuary places for evacuated families while there was no available public safety hill available in the villages.

- *Other groups or associations*

Many associations and groups were established in the commune, namely fishery community, saving groups, religious groups, funeral associations, etc. in order to gather people to work together and share benefits (Table 4.22). For instance, funeral association was created to help villagers who encounters financial problem in order to arrange a funeral ceremony. Villagers whose family member passed away could request for money which they gradually saved every month with specific amount from the association. New members, however, could ask for money to be used first and return the money later. This activity makes people who are in sorrow to be less suffered since they have already lost their family member and need to look for money to arrange the ceremony. Data accessed from questionnaire survey did not include funeral association, yet it was mentioned during an informal interview with an old lady in Ba Baong village. Outstanding group which was chosen by nineteen (19) respondents was related to religious group followed by credit and saving group with six (6) respondents. Three (3) respondents were members of economic activities (eg. farming, fishing, trade, etc.) groups, three (3) political group, two (2) education issue group and one others. The more groups or associations people get involved, the more opportunities and networks they can access.

Table 4. 22 Number and Percentage of Respondents Who Are Involved in Following Groups or Associations

Groups/associations	Number of respondents	Percentage
Economic activities	3	7.5
Credit or saving	6	15.0
Education issues	2	5.0
Politic	3	7.5
Religion	19	47.5
Others	1	2.5

Note: The percentages are in parentheses.

- *Cambodia Red Cross Volunteers*

Cambodia Red Cross volunteers were trained by Cambodian Red Cross (CRC) in order to assist villagers, collect flood information for disseminating to people, and make a report to upper level. There are two CRC volunteers in each village. In case of emergency, they also helped to distribute aid to villagers.

- **Linking social capital**

It is the relationships from outsiders such as government, NGOs and private agencies to develop the knowledge and the capabilities of individual for the management of all resources (Granovetter, 1973). The linking social capital can support building the knowledge and capabilities of community members, to be able to create their own futures and successfully manage their economic, human, physical and natural resources. Interviews with village and commune chiefs revealed that there are many presents from government agency and NGOs in Ba Baong Commune. For example, Chettor Organization trained the farmers about agricultural techniques such as how to plant vegetable and raise fish in the farms. Many microfinance institutions were introduced to this commune, which allowed people to make saving and have more sources of loans. Fitzgerald et al. (2007) identified that since the early to the mid of 1980s, Ba Baong village welcomed numbers of government and NGO development intervention, namely agricultural production, irrigation, credit services, clean drinking water, health care and schools. Due to peaceful situation and convenient accesses, the assistances primarily focused on early development.

Remarkable government present contributes to development of the commune and creates good relationship. For example, Peam Ro Provincial Council helped to rehabilitate a canal in purpose of biodiversity conservation, irrigation and transportation in 2011 in Ba Baong community, and in 2013 Fisheries Administration of Ministry of Agriculture, Forestry and Fisheries released small fishes and shrimps into fishing lodges as public benefit to Ba Baong fishery community. Moreover, Chan and Acharya (2002) conducted a research on land conflicts in "Facing the Challenge of Rural Livelihood: a Perspective from Nine Villages in Cambodia" including Ba Baong village revealed that there was no record of land conflicts between local people and the authorities/soldiers/powerful officials in Ba Baong village, whereas other five villages raised one case in each village.

Political supports provided opportunities for Ba Baong commune to seek for assistances when it is hit by repeated floods. The leader of the commune revealed that he sometimes asked for supports from a political party to assist villagers. This information was consistent with information obtained from informal interviews with two experts who have experience on flood in Cambodia. The first person was a former International River Mekong Program Coordinator, and another person was a program coordinator and researcher at Cambodia Development Resource Institute (CDRI). They mentioned about benefits from good relationship with political parties could reduce burdens on flood affected people.

Most of external assistances provided to the commune were distributed to most vulnerable households in the commune. Majority of aids were transferred by the CRC according to respondents. Among all respondents, eighteen (18) of them claimed that they received free food ration for household and water treatment kits (Table 4.23**)** This means that emergency reliefs are more focused on food security and health. A healthcare is a very crucial issue which required more attention during flood period which people can attach to any disease.

Table 4. 23 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.

According to both chiefs and respondents, the commune was assisted by the CRC, World Food Organization, Chettor Organization, etc. during severe flood in 2011. The poor families were their target people to reduce burden on them for period of time. Vigorous relationship with the government authorities and the NGOs contributes to development of community capitals in the commune and capacity of people to cope with floods.

- **Group therapy**

Based on a group therapy introduced by (Irving D. Yalom, 1998), this therapy helps to heal community members who are suffering from trauma and turn them back to be active. The group therapy was applied in treatments of Cambodian refugee women who survived from the Khmer Rouge regime with diagnosis of post-traumatic stress disorder, and currently stay in the United States (Dubus, 2009). A result from the study indicated that participants expressed relief and felt they were not alone, and thus trust was built within the groups, which helps to heal the trauma. The concept of group therapy was applied within the villages after destruction of the Khmer Rouge regime although it was not formally arranged. People, however, received some informal supports from other villagers to heal their distressed hearts.

West (2000) indicated individual, and community resources influenced on development of post trauma growth (PTG), positive change created from difficult circumstances. It is linked to group therapy which helps are provided and shared within the group, and each group member also needs to depend on individual in order to heal trauma. In addition, Uy (2014) discussed in his dissertation that people who experienced PTG gained significant development of themselves in respected to increase of appreciation of life, new priorities and goals, relational intimacy, personal strength, and effective leadership. Similar result was mentioned by the leader of Ba Baong commune. He claimed a positive change as he compared the Khmer Rouge period and current living situation.

> *"People lived in unfavorable conditions, and we were afraid of the leaders of the village. Oppositely, we live in better situation in which we have more freedom, and thus I, as a leader, must set a good example to my people to follow."* The leader of Ba Baong commune.

Cantor-Graae et al. (2014) conducted a study on long-term psychiatric consequences of exposure to trauma in Cambodia by using household surveys with 3,200 respondents, aged between 18-60 years in four (4) provinces, namely Prey Veng, Svay Rieng, Battambang and Banteay Meanchey. The study identified that psychiatric morbidity and functional disability were more strongly related to current perceived stress than to trauma exposure in Prey Veng and Svay Rieng due to shorter length of conflict exposure, longer recovery period and other factors. It can be assumed that people in Prey Veng pay more attention on current living situation rather than post trauma.

The expression and opinion learnt from the leaders of Ba Baong commune about living condition during the Khmer Rouge period (1975-1979) described this period as a nightmare for every villager. Entire villages were forced to relocate to other areas. People had no right on their own assets. Everything was belonged to *Angkar* (the Khmer Rouge organization). People lived in unfavorable conditions—overworked, underfed, limited mobility, and terrorized by fear of being executed.

After destruction of the Khmer Rouge in 1979, people greeted the change with relief although they were still frightened. New hope was installed among villagers. Social capital started to reemerge in the villages (Colletta & Cullen, 2000; McAndrew, 1998). Villagers knew that everyone in the villages were suffered from the Khmer Rouge, and thus they share similar or the same story with one another, which made them feel that they were not alone. *Krom Samaki* (solidarity groups) were created in 1979 as a collective farm work, which members shared the harvest productivities based on the number of household members and their participation in the labour force (McAndrew, 1998). Nonetheless, the *Krom Samak*i broke down in 1986, and thus villagers were offered plots of land according to number of their household members. People started to build their livelihood with mutual supports from their family, relatives, and neighbors such as labour for rice plantation, non-interest loans, and other materials (McAndrew, 1998). People acknowledged that other villagers were willing to help them, but others also need to build their own future after the Khmer Rouge, so they need to depend on themselves to build their livelihood again and recover from trauma.

Ba Baong commune primarily rehabilitated of original residents who knew each other before the Khmer Rouge period. Leaders of the villages were selected from the original residents while leaders in some villages were selected from outside of the villages (Ledgerwood, 1998). Hence, their level of trust between each other was gradually rebuilt, which caused security in the community, and thus welcomed development assistances from external stakeholders.

Nee and Healy (1995) claimed that local people did not learn from theory, yet they learned from experience which they refined and made their own theory. Past experience people got during the Khmer Rouge regime leaves big scars and trauma for Cambodian people, which they do not want to remind. This experience, however, explains that people who survived after the Khmer Rouge had strong capacity to adapt to the most severe event. Comparing floods which local people yearly encounter to this traumatize experience, it not the most extreme event that can break people down even though it sometimes severe. In addition, flood in Ba Baong commune is not flash flood which suddenly happens. In contrast, it gradually increases within period of time, which can provide advance information to villagers to be prepared. Living in seasonal flood-prone

area for generations, people create their own coping strategies to prepare, respond and recover. Local adaptation coupled with new emerged strategies allows people to survive despite of flood disasters (Kimkong & Paradis).

4.4.1.2 Human Capital

It is a capital which supports local people to achieve their focus with different livelihood strategies, so it can be local knowledge and specific skills accumulated from their experience of flood situations recurring in the commune (DFID, 1999). Human is among the most important determinants of resilience because it can increase or decrease the efficiency of the other types of capital in resilience-building efforts by providing access to a skilled and trained workforce for economic development and capacity building (Frankenberger et al., 2013).

- **Health and nutrition**

As reported in District Data Book (NCDD, 2009), 97.2 percent of people living in Ba Baong commune used water from pump or mixed well while only 2.6 percent from pond and 0.1 percent from ring well. Mostly poor families were allowed to share the wells with non-poor households. The book, moreover, addressed percentage of families who using safe water sources in the dry season is 97.5 percent. Before drinking water, 25.1 percent of total households used water filter and 43.6 boiled water regularly. Water-borne disease and related morbidity are small as people can access to clean water.

A health center is available in Ba Baong commune. Villagers, however, usually prefer going local medical service to commune health centre in case of mild sickness. There are three village doctors in Ba Baong village, one in Chouk Chey village, one in Doung village and four in Ponley village respectively. When local people encounter with severe diseases, they will to go district or provincial hospitals, or sometimes patient are sent to public hospitals in Phnom Penh instead.

The main source of drinking water in the commune is from hand pump wells (92.5 percent) while only 2 (5.0 percent) and 1 (2.5 percent) are from dug well and rainfall respectively. Information from the questionnaire surveys show that only 17.5 percent

out of 40 respondents answered they did not know how to prevent their family from diseases, whilst other 82.5 percent responded that they drank clean water and banned children from contacting with flood water and rain during flood period. Health issues will be deducted when local people can access to clean water and know how to treat water before consuming. Majority of non-poor families said that they boiled water or used filter because drinking it, while poor families sometimes consumed water from well or river without killing bacteria. It can be assumed from FGDs that majority of participants understand that consuming safe drinking water can prevent them from being sick.

> *"Water from river or well is treated by boiling or filtering before drinking. I do not want any of my family members to get sick because we will spend more money if we are ill."* A participation in Doung village.

- **Education**

Four primary schools and one lower secondary school were constructed in Ba Baong Commune. Illiteracy rate among 15 to 60 years old people in the commune is 6.5 percent made up by 3.5 percent of women and 3.0 percent of man in 2008 (NCDD, 2009). Based on this information, it can be interpreted that villagers have higher percentage of receiving and understanding any information they get, and thus they are possible to take any action. Majority of respondents (52.5 percent) attended primary school, meanwhile only 10.0 percent and 5.0 percent attended lower and upper secondary school respectively. Another 32.5 percent of respondents have no education. Out of 40 respondents, however, 36 of them said that they could understand the news which announced early warning flood information at least 50.0 percent.

- **Local knowledge and skills**

Defined by FAO (Dekens, 2007), "local knowledge is a collection of facts and relates to the entire system of concepts, beliefs and perceptions that people hold about the world around them. This includes the way people observe and measure their surroundings, how they solve the problem and validate new information. It includes the process whereby knowledge is generated, stored, applied and transmitted to others".

Local people in Ba Baong commune used their own local knowledge to predict flood information. The FGDs participants mentioned several ways to observe flood water. For example, an old lady in Ba Baong described how she observe cloud pattern in order to predict when to start rice plantation. If the cloud tended to the south, it meant that flood water would not come again, so she could grow her rice. Beside this, traditional agriculture techniques were also applied in this community. In order to earn benefit from flood water, farmers used their wells in rice fields to store water during flooding, and thus they could use the water for their rice plantation after flood receding. Farmers, however, chose to utilized water from river or pond nearby their rice fields for the first one or two months before using water from wells.

Fox and Ledgerwood (1999) studied about rice in the Mekong Delta emphasized that receding-rice had been practiced long time ago in Cambodia since local people understand their geological location which was inundated by floods. People, moreover, retained floodwater in bounded areas for supporting their rice plantation which is located below swamps. This technique was also adapted in Ba Baong commune. The FGD participants said that planting rice in dry season was one coping strategy to avoid flood water since it can reduce probability of being destroyed by floods. Farmers grew only short-term flood recession rice because it takes only 3 months to yield crops, and people are able to plant another round.

- **Food and medicine storage**

In order to meet daily consumption during flood, 82.5 percent of respondents reported that they prepared rice, prahok (salty fermented fish), cooking ingredients, medicine and firewood upon learning about water rising information. Some families attended in FGDs, nevertheless, claimed that they chose not to prepare medicine in advance since they did not know type of medicine and expired date clearly.

- **Consumption adjustment**

Food intake adjustment is a common coping mechanism that many flood affected people applied including in Cambodia (Gaillard, 2015; Helmers & Jegillos, 2004; Opondo, 2013). During flooding, daily food consumption was changed especially for poor families to cope with the situation, yet rice was the only food they did not reduce since it was a basic diet for Cambodian people. Some poor households bought rice on

credit from rice merchants then paid back after they harvested their rice in the next season. Households who possess fishing tools could go to the river for fishing, but they have to be aware of weather. If the weather is windy, they will not go out because they will be in trouble or losing their lives. Although statistical data did not include spending adjustment, FGD participants mentioned that this measure was adopted.

> "*I have to be thoughtful about my family's spending during flooding period because I need to save money for spending on emergency things, i.e. illness. I reduce spending on non-essential consumption."* A participant in Doung village.

4.4.2 Tangible Factors

4.4.2.1 Natural Capital

Natural capital is referred to natural resource stocks from which resource flows and service useful for livelihoods are derived. Natural capital includes land, forest, trees, water, and biodiversity. Frankenberger et al. (2013) discussed in Community Resilience: Concept Framework and Measurement Feed the Future Learning Agenda that natural capital has close relationship with resilience of a community. People in Ba Baong commune are less reliant on common property resources (CPR) such as fisheries and forests. Non-poor families earn their income from agriculture and self-employment, while poorer households tend to reliant on wage labour. However, some of them still go fishing to earn extra money.

- **Land and soil**

The participatory poverty assessment of the Tonle Sap region conducted by the Cambodia Development Resource Institute in collaboration with the National Institute of the Statistics and the Asian Development Bank reported that land is the most import asset for livelihood of Cambodian rural people. Land holding is very crucial asset for Ba Baong people as they entirely depend on rice cultivation (Chan & Acharya, 2002). The more land they own, the better living they have. With land, villagers can grow rice to support their livings since this area has favorable condition such as productive land and water systems. Soil in this commune is fertile due to flooding from lower Mekong River that brings sediments to cover rice fields.

From the questionnaire surveys, they showed that among all respondents, 82.5 percent of them occupy land used for crop production while 48.5 percent owned less than a hectare of land. The NCDD (2009) revealed that 44.3 percent of farmers in Ba Baong Commune owned less than one hectare of rice land and 4.6 percent were landless in 2008. Thus, more than 50.0 percent of farmers had more than one hectare of land. Cultivated dry season rice area was 1,261 hectares, and average dry rice yield was 3 tonnes per hectare in 2008, yet some farmers could achieve up to five or six tonnes per hectare with the support from chemical fertilizers and modern farming tools. This data is consistent with a finding of Fitzgerald et al. (2007) who described rice productivity in Ba Baong village, which farmers could harvest average of three tonnes per hectare for wet season rice and up to five or six tonne for dry season rice. The achievement of high rice yields allows people to produce more surplus which creates more income and saving to be use during flood period.

- **Water and aquatic resources**

Prey Veng province has groundwater resources that can be assessed relatively easy through simple flush-bored wells and diesel pumps (International Development Enterprise [IDE], 2009). In the past, wells have been used mainly for domestic water supplies, but there appeared to be a rapid and unregulated growth of ground water irrigation in districts where groundwater is most accessible (IDE, 2009). Farmers adapting these techniques revealed encouraging productivities of crop yield and increasing income. The farmers were able to manage local control over the time of application and rate of pumping, and over operation and maintenance of these irrigation systems. This information is emphasized with data accessed from an interview with an old lady in Ba Baong village that the village farmers installed wells in their rice field for water supply in the dry season. The lady stated that farmer in the studies area let the overflow water from the river recharge into the wells at the early of flood period and stored the water in the wells by covering with a concrete lid. They, however, would utilize the water from nearby canals first for early rice plantation before accessing well-water. The respondents claimed that only 6.5 percent of households growing rice said they did not access to enough water while another 93.5 percent could have water for their farms from ponds, channel, river and other sources. The farmers in

this commune did not totally rely on rainfed farming since there were many sources of irrigation from Boeng Sne, Touch River and underground water.

As the commune is located near the river, villagers were able to catch fish from the river for their living and making prahok for family's consumption. Fishing also generated income for households even during flooding because large floods increased numbers of fish (Soun et al., 2009). Other aquatic lives such as snails could be used as food for some poor families.

- **Trees and forest products**

Prey Veng comes from words Prey (forest) and Veng (long). This province used to be covered by forest; however, deforestation was happened due to population growth. Nevertheless, there is a conservative flooded forest—Prek Chamnar which provides fish productions to villagers. A project funded by UNDP in 2012 was employed in Ba Baong village. Rehabilitation of canal and 3000-tree plantation at conservative area benefited many people in the village. After the canal was rehabilitated to be deeper, coupled with reforestation, people claimed to earn more fish. The information is consistent with the interview with the leaders of the village and the commune. They stated that rehabilitation of canal and reforestation of flooded forest increased amount of fish and contributed to irrigation water. Majority of people, moreover, participated in conserving this area although small numbers might break the role by illegally fishing.

All respondents said that they used firewood for cooking. They got firewood from gathering from trees around the houses and the villages. Because during flood period it is hard to seek for firewood, villagers normally prepare it in advance to be used at that time. Some also collected firewood more in order to sell to earn extra income.

- **Biodiversity**

Raising livestock and poultries is another way to earn extra income. Some families raise cattle or buffalo for general or labour purposes. Local people preferred to raise cattle and chickens to other animals as shown in Figure 4.10 .It was difficult to manage livestock and poultries before flooding. However, those animals could help to fulfill families' daily consumption by slaughtering or selling

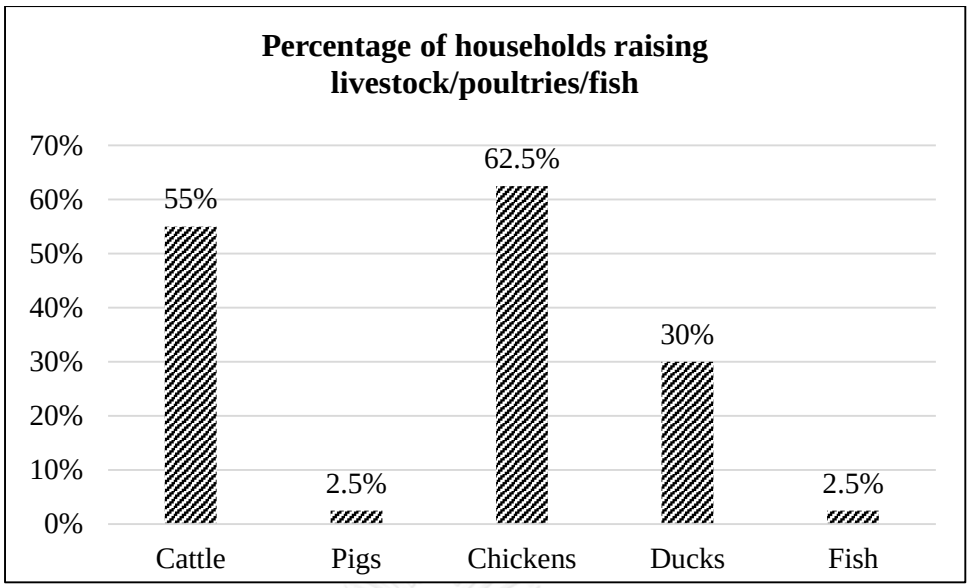


Figure 4. 10 Percentage of households raising livestock/poultries/fish.

Besides fishing, several families also go out to search for snails, crabs, frogs and mice from the rice fields. Villagers could find those snails, crabs, frogs and mice in every season, but less accessible during flooding. Fifteen percent of respondents collected snails and crabs during flooding, and 7.5 percent collected frogs and mice. From the FGDs, the participants stated that they slaughtered some of their animals for fulfilling daily consumption. Natural capital has a significant contribution to provide better living for villagers in the commune such as fertile land, accessible sources of water, and other CPRs.

Based on questionnaire surveys, 27.5 percent of all respondents planted variety of fruits in their yard for households' consumption while 15 percent grew vegetable, 2.5 percent lotus, 2.5 percent cassava and 2.5 percent others (Fig. 4.11). However, lotus and cassava plantation is commercial purpose.

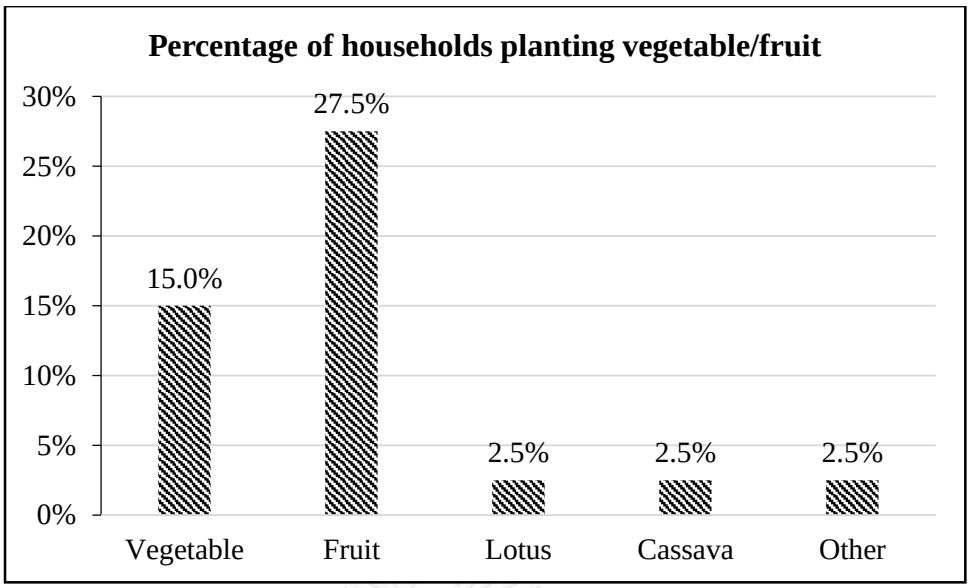


Figure 4. 11 Percentage of households planting vegetable/fruit.

4.4.2.2 Physical Capital

Physical capital including the basic infrastructure and producer goods (or tools and equipment) used to function more effectively (DFID, 1999, p. 13).

- **Infrastructure**
  - **Transportation**

Roads and bridges

Ba Baong commune is located along national road; as a result, people are able to access to health center easily in case they get sick. The road also plays important role because it can be used as evacuated place for both human and animal. Only flood in 2000 caused destruction to the road, but if we flashed back to that time, the national road 11 had not been constructed yet, which means the road condition at that time was not good (Fitzgerald et al., 2007). In contrast, upon asphalt road was constructed, no report on road devastation was announced. Respondents and local government authorities gave the same statement that the main road in the commune was rarely damaged by floods. As a result, local people still could access to health center, hospital and market during flooding. Village roads were also built while some were constructed under village funds. A bridge was recently built in Ponley village, and thus water was released from the villages during flooding. Respondents in Ba Baong village, however, voiced their

concern over other nearby villages which could be affected from released water since those village farmers grew raining season rice.

Mean of transportation

Not many people in the villages own means of transport such as car, motorbike, bicycle, or boat. Out of 40 respondents, 73 percent of them possess bicycles, 30 percent motorbike and 5 percent car (Fig. 4.12). Mostly people walk to each other in the villages. If they want to go to Nak Loeung, they will take Reumork (tri-cycle motor) which costs them 2,000 riel ($0.5)8 single way. Going to Phnom Penh is not difficult since there are many private vans with the price started from 8,000 riels ($2). In addition, 65 percent of respondents owned boats, which majority made from palm tree. Owning the boats helps to facilitate their traveling during flood period and also go fishing, yet palm boats are not strong enough to withstand big wind.

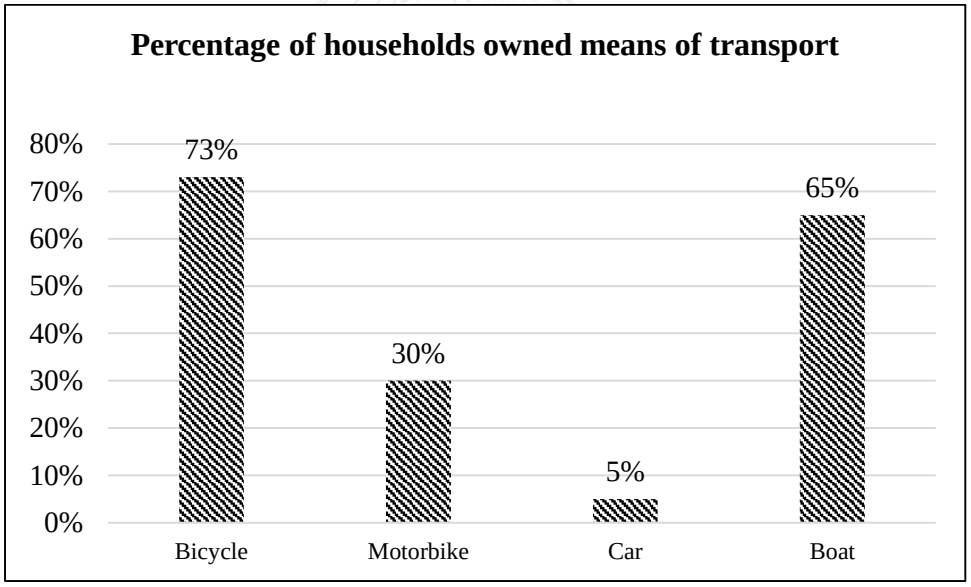


Figure 4. 12 Percentage of households owned means of transport.

- **Security shelters**

Among all respondents, only one family who said that they did not own their house but stayed there without any payment since the house is belonged to their parents and they did not have ability to build their own dwelling. Moreover, majority of them (65.0

8 $1=4073 riel in September 2014 (National Bank of Cambodia [NBC], 2014)

percent) owned the houses made from galvanized iron, wood, plywood and others, whereas 35.0 percent owned bamboo/thatch/leaves houses (Fig. 4.13).

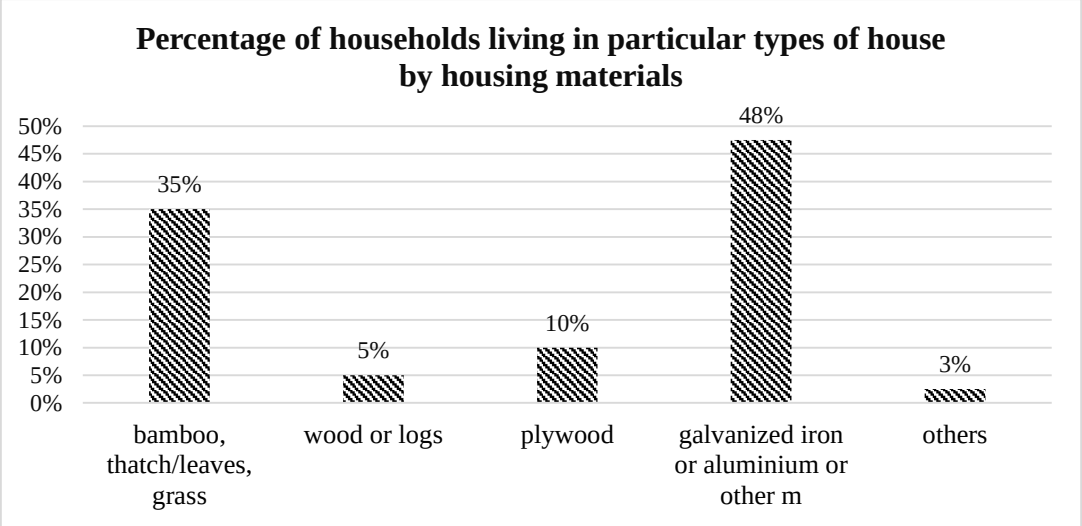


Figure 4. 13 Percentage of households living in particular types of house by housing materials.

Flood prevention was adopted in form of constructing houses which were able to resist to floods. Among all interviewed families, 35.0 percent of non-poor families built house to withstand floods, whereas 30.0 percent of poor family did not with main reason that they could not afford (Table 4.24). Furthermore, respondents in FGDs described that they raised their house land to be high. As a result, their dwellings would not be inundated by flood water.

Table 4. 24 Number of Households Who Own Flood Resisted Dwelling

Was your house built to withstand floods?	**Non-poor household (%)**	**Poor household (%)**	**Total (%)**
Yes	14 (35.0)	8 (20.0)	**22 (55.0)**
No	6 (15.0)	12 (30.0)	**18 (45.0)**
Total	**20 (50.0)**	**20 (50.0)**	**40 (100.0)**
Reason	**Non-poor household (%)**	**Poor household (%)**	**Total (%)**
Can't afford it	2 (11.1)	10 (55.6)	**12 (66.7)**
No risk of flooding	2 (11.1)	2 (11.1)	**4 (22.2)**
Others	2 (11.1)	0 (0.0)	**2 (11.1)**
Total	**6 (33.3)**	**12 (66.7)**	**18 (100.0)**

Note: The percentages are in parentheses.

Furthermore, 97.5 percent of non-poor households mentioned that they designed their houses to withstand flood effects by applying supported wood because their dwellings could not resist flood water (Table 4.25). Besides, livestock's feed was stored due to inundated grazing land. Dwellers also built shelves to protect their belongings from water and keep their livestock and poultries in guard. Among 40 respondents, only a person did not take any action before flooding because her house is located on high ground.

Table 4. 25 Households' Preparedness before Flooding

What household did 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.

- **Water supply and sanitation**

Wells were the main source of drinking water in four villages, yet not all households had ability to own the wells. As reported in District Data Book (NCDD, 2009), 97.2 percent of people living in the commune used water from pump or mixed well while only 2.6 percent from pond and 0.1 percent from ring well. Moreover, the book addressed percentage of families who using safe water sources in the dry season is 97.5 percent. Before drinking water, 25.1 percent of total households used water filter and 43.6 boiled water regularly.

Mostly poor families were allowed to use the wells with non-poor households. Water-borne disease and related morbidity were small as people could access to clean water. Not all households in the villages could owned latrines in their houses. Among 40 respondents, only 12 of them reported that they had toilets, while 2 were built inside the houses and other 10 were outside (Fig. 4.15).

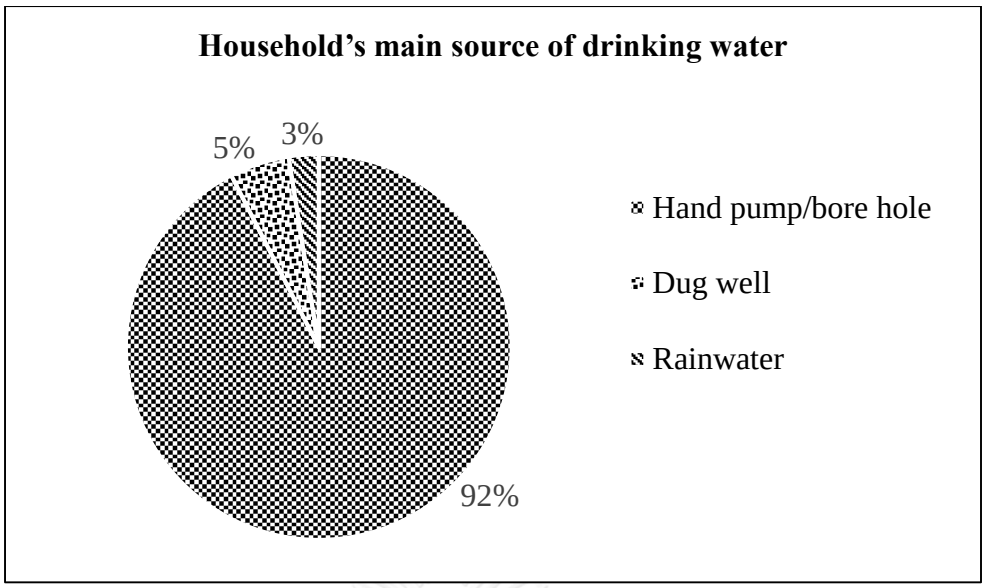


Figure 4. 14 Percentage of households by main source of drinking water.

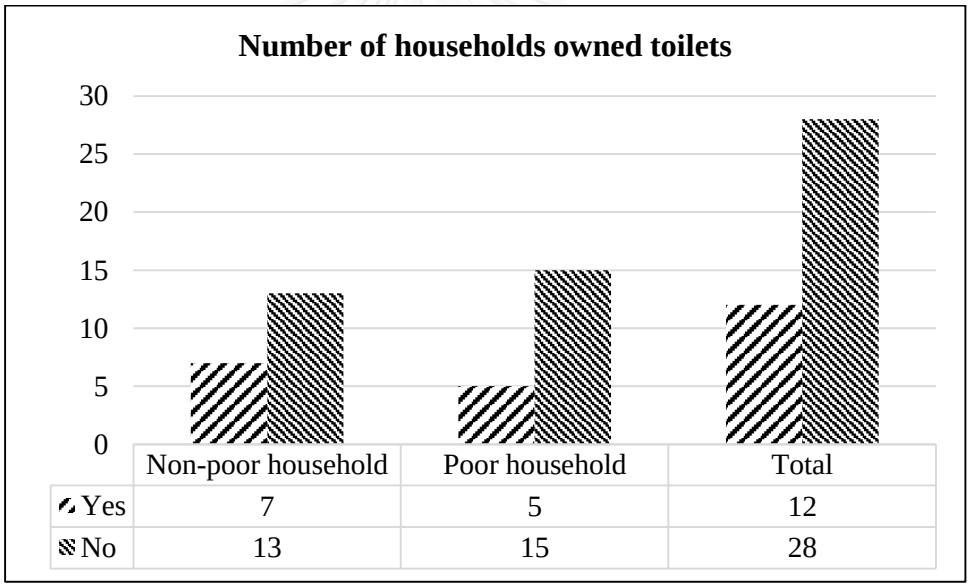


Figure 4. 15 Number of households owned toilets.

- **Energy**

Although electricity is not available in this area, people use battery instead in order to light their houses, and televisions. The survey conducted by NCDD in 2008 revealed that 88 percent of households in Ba Baong commune lighted their houses with battery. The report is consistent with this research survey which showed eighty percent of interviewed households responded that they used battery for lighting their house, 7.5 percent used kerosene lamp, and 12.5 percent used solar lamp.

Firewood is the most common energy source used for cooking. From the questionnaire surveys, all the respondents stated that they used firewood for cooking while 97.5 percent used own collected firewood for their cooking and only 2.5 percent who were from non-poor household bought firewood.

- **Access to information**

Owning telecommunication media such as radio, television and phone shows high possibility of receiving information which can be about livelihood opportunity and flood information. Among all respondents, 75 percent of them owned desk or mobile phones. Word of mouth is the most significant communication mean rural people used (Table 4.26).

Based on the survey, 70 percent of respondents stated that they received flood information from radio while 60 percent from television (Fig. 4.16). Even though 57.5 percent and 50 percent of respondents said they did not occupy radio and TV respectively, they were still able to get an announcement because people in rural area usually shared radio or TV with one another. For example, during movie time, a household who did not possess any TV would go to their neighbor's house who own one. The NCDD (2009) reported higher percentage of families who had television in their houses is 76.6 percent in Ba Baong commune in 2008. Most people in the villages did not use desk/mobile phones since they were living close to each other. They usually accessed to news from word to mouth.

Table 4. 26 Number of Households Who Have Radio, TV and Desk/Mobile Phone

Asset	Radio (%)	TV (%)	Desk/mobile phone (%)
Have	17 (42.5)	20 (50.0)	10 (25.0)
Don't have	23 (57.5)	20 (50.0)	30 (75.0)

Note: The percentages are in parentheses.

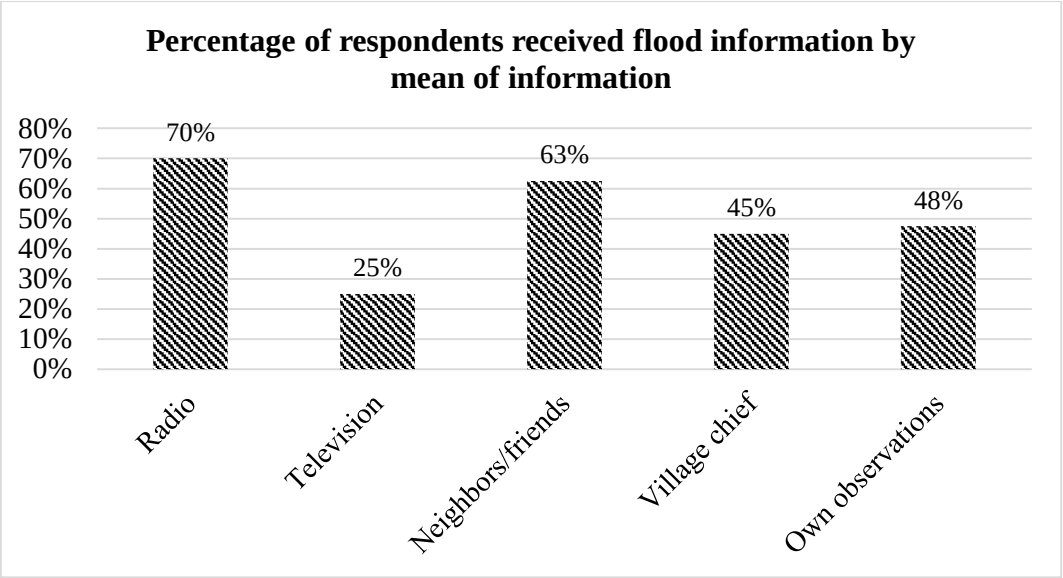


Figure 4. 16 Percentage of respondents received flood information.

- **Tools and technology**
  - **Tools and equipment for production**

Farmers changed their rice cultivation techniques by not totally depending on rainfed agriculture. Construction of well was applied in this area in order to provide water for dry season rice growing. As a result, productivity increases, and rice will not be destroyed by water shortage. Villagers can gain benefit from seasonal flood by storing water in the wells to be used during dry season. Besides, twenty five percent out of 40 respondents owned tractor for rice plantation, which resulted higher yields. Even though some families do not have any tractor, rent service was provided by tractor owners to faster rice planting, which facilitates harvest.

  - **Seeds, fertilizers and pesticides**

People in Ba Baong commune did not grow wet season rice, but flood recession rice since they knew that their rice would be risky to flood if they grew during raining season. Flood recession rice was grown after flood receding, and it took only around 3 months to yield fruits, which reduced a chance of being damaged by flood. Due to short-term rice, 29 percent of respondents could grow two times per year, whereas 71 percent could do only one time. This practice was adapted by farmers themselves based on their own observation and exchanges experiences from farmer to farmer from village to village (Soun et al., 2009). Recently some institutions conducted researches related to

rice varieties in order to make them strong enough to resist flood water at exact period of time.

The FGD participants who worked in the farms said that they used fertilizers and pesticides during plantation. Some added that they used to grow rice naturally, but rice productivity was not that much comparing to applying fertilizers which they could produce up to 3 to 5 tonner per hectare. Amount of fertilizer applied is depended land size. The habit of using fertilizers and pesticides was introduced by fertilizers and pesticides traders who came to advertise in the villages. Large amount of fertilizer and pesticide consumption, however, resulted in health problems and reduction of CPRs and soil quality (Fitzgerald et al., 2007). According to the leader of the commune, he indicated that there were NGOs come to the commune to introduce natural fertilizers to villagers in order to reduce the impacts from chemical fertilizers. Some villagers, as a result, followed the instruction as they think about long-term impacts while some still kept their old practices.

4.4.2.3 Financial Capital

Financial capital is the resources that support self-resilience, namely savings, loans and remittances (DFID, 1999, p. 15). Financial capital play an important role in supporting community resilience in terms of financial service and by sustaining households' economic (Frankenberger et al., 2013). It increases the ability and the capacity of individuals, groups, and communities to absorb disaster impacts and speed up the recover process.

- **Savings**

Local people said that they made some savings to be used during flooding since this commune was always flooded. Sixty-five (65) percent of respondents stated that they had saving to be used during flood period (Table 4.27). Only 38.5 percent, however, responded that their savings were enough for affording their households' living while 61.5 percent did not make enough. Table shows that there is not much difference between number of poor and non-poor households on saving both in cash and jewelry before flooding. Nonetheless, when asking if their saving is enough for affording their households' living during flooding, 53.3 percent of non-poor families who made saving

provided positive answers; meanwhile, only 18.2 percent of poor families agreed with the question. Being able to make saving in advance allows respondents to reduce impacts of floods on food consumption and health. Moreover, respondents were able to recover faster comparing to families who had no saving.

Table 4. 27 Number of Households Who Were Able to Make Saving

Has your household been able to save?	**Non-poor household (%)**	**Poor household (%)**	**Total (%)**
Yes	15 (37.5)	11 (27.5)	**26 (65.0)**
No	5 (12.5)	9 (22.5)	**14 (35.0)**
Total	**20 (50.0)**	**20 (50.0)**	**40 (100.0)**

Note: The percentages are in parentheses.

- **Credit/debt (formal and informal)**

As reported by village leaders, there are many microfinance institutions in these villages. Nevertheless, fifty percent of loans in-cash or in-kind were taken from informal money lenders since it was easy to borrow and pay back especially for households who owned pieces of land. Among credits lent by money lenders, 68.4 percent were for buying food (Fig. 4.17). Loan assessment provides an opportunity for respondents to fulfill their daily consumption and health treatment in hardship period. Besides, villagers can use borrowing money to invest in their business to create more assets.

During flooding, loans were mostly taken place in form of in-kind. People borrowed rice from rice traders or village leaders who run this business when they faced rice shortage. They decided to get loans from this source because they did not need to pay interest every month. Total loan plus interests would be calculated upon payment after rice harvesting. It was difficult for poor family to take any kind of credit since they could earn little income and had no any mortgage. They, however, still could get small amount of money from their relatives or informal money lenders in order to support their lives during hard times.

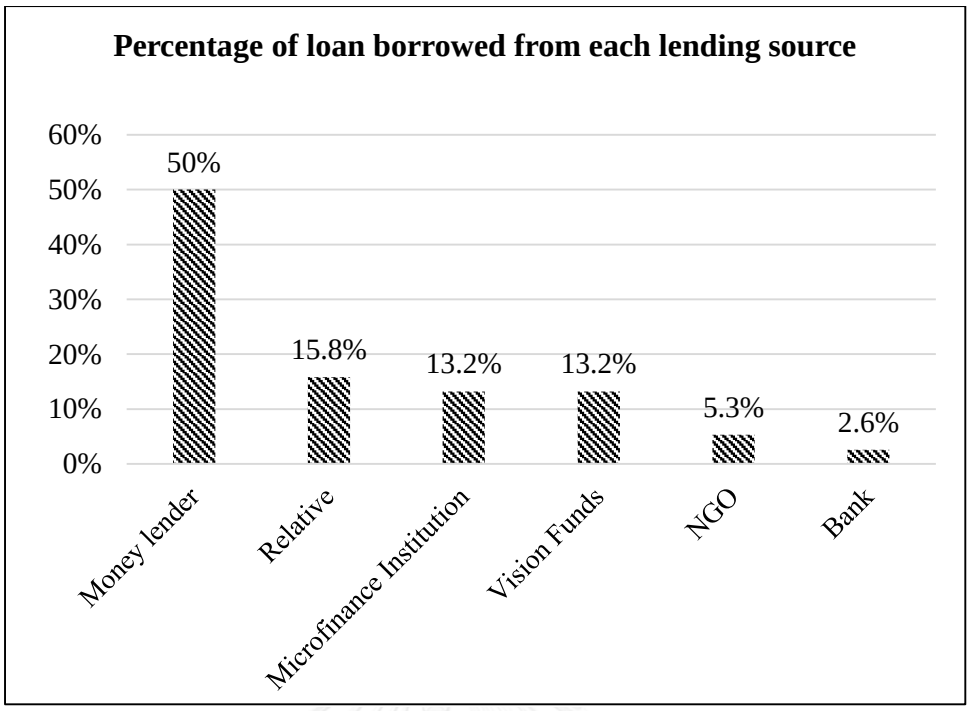


Figure 4. 17 Percentage of loan borrowed from each lending source.

- **Flow of remittance**

Lim (2007) found out that remittances made livelihood of rural Cambodian people more stable, and they contributed to positive economic impact on sending communities by creating a new small trade and increasing household consumption. In addition, they contributed to households' income and resilience. For instance, financial supports sent from garment workers assisted the vulnerable households to recurring floods to be able to afford for rice consumption and other needs such as physical treatment, new crop preparation, and debt liquidation. Number of young rural migrants in Cambodia did not effect on shortage of labour for farming since there is no evidence to prove that (Lim, 2007).

Almost every province in Prey Veng province migrated both internally and externally. As stated in District Data Book, there are 421 people migrated to other provinces or abroad in 2008 in Ba Baong commune (NCDD, 2009). While 357 people worked in companies or factories, other 64 people had uncertain job. It means that majority of migrants are involved in decent jobs which provide them stable income and improve family's living.

Since people in Ba Baong Commune grow only dry season rice, most of them are available during raining season. Consequently, some villagers migrate to find job outside their commune. Among all respondents, 8 of them received remittances from their family members or relatives (Table 4.28).

> "*I went to Mondulkiti Province to pick up peanut for 24 days then came back because of heavy rain there. I could earn 5 dollar per day. The money that I could save from this migration was used for consumption during flooding in my village*." A participant in Chouk Chey village.

Table 4. 28 Number of Households Who Received Remittance

Remittance receiving	**Non-poor household (%)**	**Poor household (%)**	**Total (%)**
Yes	6 (15.0)	2 (5.0)	**8 (20.0)**
No	14 (35.0)	18 (45.0)	**32 (80.0)**
Total	**20 (50.0)**	**20 (50.0)**	**40 (100.0)**

Note: The percentages are in parentheses.

- **Income diversification**

According to all respondents, 22 percent of them mentioned that they could diversify their income during flooding. Some actions were applied in order to diversify income, namely fishing, wage labour and migration (Table 4.29). Households who possessed fishing tools could go to the river to catch fish for selling or family consumption. Meanwhile, some villagers chose seasonal migration to Phnom Penh city, nearby provinces or neighboring countries.

Table 4. 29 Households' Income Diversification during Flooding

Income diversification	**Non-poor household (%)**	**Poor household (%)**	**Total (%)**
Fishing	7 (17.5)	7 (17.5)	**14 (35.0)**
Daily wage	1 (2.5)	4 (10.0)	**5 (12.5)**
Migration	0 (0.0)	1 (2.5)	**1 (2.5)**
Others	2 (5.0)	0 (0.0)	**2 (5.0)**

Note: The percentages are in parentheses.

It can be concluded that those available capitals in the commune build and enhance local people to capacities to cope with floods. Local people have adopted many measures concerning flood risk reduction. Their ability, nevertheless, were still limited since flood patterns keep changing from year to year, which cause current practices not applicable. Hence, intervention from government and NGOs on improvement new flood-resilient practices and technologies should be penetrated to local implementation combining with their own existing knowledge.

4.5 Policy Discussions and Recommendations

Both international and national levels created policies and frameworks related to disaster management. This section discussed policies concerning on disaster risk reduction. Regarding international disaster management framework, the HFA 2005-2015, and the Sendai Framework for Disaster Risk Reduction 2015-2030 that continue work under the HFA, the flood hazard in the community level has not been assessed for the flood hazard mapping and the management on flood risk reduction. The priorities for action focused on the reduction of disaster risk operated on institutional basis which contains major components of institutional and legislative framework, allocation of resources and participation of community. Moreover, the Framework approaches to circumstances and capacities to reduce the disaster risk. In flood-prone area, the Ba Baong commune has develop the community capability by the accumulated experience of recurred floods by using local knowledge, but has not been implemented the Cambodia national framework for risk reduction. In addition, the flood risk management at studies site are needed to enhance the available coping capacity to cope with various flood conditions supported by intuitional and legislative basis.

The limits of understanding of flood hazard and risks, Lacks of networking among relevant stakeholders and financial supports under the legal supports were found at the Ba Baong commune. This is in correspondent with challenges indicated in the Post-23015 Framework on the HFA for Action2 was organized by the NCDM and partner organizations in the DRR. The commune applied their own basic knowledge in applying the five available capitals to get through the flood period. However, the external assistances contributed to the commune during flooding did not meet the priority of local needs. Regarding to the real needs of local people that is changed by

the period of flooding, the encouragement on long-term investment in the DRR measures should be proceeded under the local participation. Meanwhile, in Sendai Framework for Disaster Risk Reduction 2015-2030, local knowledge was mentioned as one of important factor that should be considered in combination with scientific knowledge. The Framework Culture and norms of local people were not stated. This can be inferred that both local knowledge were recognized as crucial factors which contributed to disaster risk reduction. Moreover the study results show that local cultures which are derived from the local knowledge related to community mechanisms cannot avoid the important aspects of local culture in the social captital and interactions among the other four capitals.

Cambodia as members of many international organizations related to disaster risk reduction and climate change has developed and issued both policies and legislations based on the international frameworks to apply them to the country situation (NCDM & MOP, 2008). For example, Hyogo Framework for Action 2005-2015 was adopted in Strategic National Action Plan for Disaster Risk Reduction 2008-2013 (SNAP-DRR) (NCDM & MOP, 2008). However, there are limitations in policies and frameworks which were created based on the five capitals that are available in a community. The following points are summarized.

- There was limited conclusion of local knowledge in existing national policies and frameworks on disaster risk management. For example, Cambodia Climate Change Strategic Plan 2014-2023 mentioned about local knowledge in strategic objective 5 which was about improve capacities, knowledge and awareness for climate change responses (National Climate Change Committee [NCCC], 2013). Nevertheless, there was no detail related to the local knowledge was stated.

- Culture and norms of local people were not mentioned in the existing national policies and frameworks on disaster risk management, which shown the lack of the integration of other fields which influenced on disaster risk reduction.

Moreover, based on reviews of disaster management policies and strategies, the Royal Government of Cambodia should consider following crucial suggestions:

4.5.1 Social Capital

- Culture and social norms

The importance of culture, social norms of different locations were not mentioned in Cambodian disaster policies and frameworks. Culture and social norm of communities must be considered in every stage of project implementation for the sake of successful operation. This recommendation was support by Jones and Diepart (2015) who stated that externally-imposed mechanisms without considering cultural and social norms of local communities resulted in less resilient social-ecological systems.

- Building trust at community level

Trust building at community level was very crucial as it contributes to the success of the program implementation. Using existed organization structures in communities helps implement any community project effectively. For instance, flood coping program which was taken place in Kompong Cham province encountered challenges at the first stage since villagers were not familiar with donors (ADPC, 2002).

4.5.2 Human Capital

- Local or traditional knowledge

Local or traditional knowledge which was developed by the communities should be taken into account. Community best practice allows government and NGOs to learn from the experience conducted by local people and use it as base to develop future measures to cope with changes of flood patterns. This recommendation was consistent with a finding by Fletcher et al. (2013) who stated that traditional coping strategies significantly contributed to the understanding of external organizations about local practices in order to provide appropriate supports and humanitarian responses. Jones and Diepart (2015) mentioned that the Royal Government of Cambodia and international organizations missed to incorporate the communities' local knowledge which contributed to resilient measures, and applied only options advocated by the state and external donors. Hence, formal collection of local knowledge at community level should be conducted by local government authorities and villagers as basic information for both next generation and external stakeholders whose targets are to assist the communities.

- Capacity building training

Capacity building trainings should be provided to local people on how to make use of disadvantage things to be useful. For instance, mimosa pigras which was found in the rice fields after water receding and normally thrown away can be used for cooking instead of firewood, and its wood ash is for fertilizer. This recommendation was supported by a finding (Rijal & Cochard, 2015) . It is better to strengthen people's capacity to live in harmony with floods rather than avoiding them since floods provide double-edges consequences, both benefits and harms. For example, a case study in the Vietnamese Mekong River Delta revealed that households achieved resilience to floods via three properties including households' in securing food, income, health and evacuation, households' confidence in housing structure, and households' willingness to learn new things (K. V. Nguyen et al., 2013). The authors also indicated that households could earn benefits from floods by collecting fish, crabs and snails, growing prawns, fish, eels and vegetables. Similar case was also occurred in Thailand during flood period in 2011. Community members in Nakhonsawan city municipality grew vegetable in foam floating pots, which could fulfill their daily consumption.

- Social protection

The government and development partners should promote social protection such as health care services, and cash transfer program which can assist the local people's burden for a period of time. Moreover, the implementation of these programs should be conducted with accountability and transparency.

4.5.3 Natural Capital

- Monitoring of chemical fertilizer use

The monitoring and controlling of amount of used chemical fertilizers should be conducted by the government in order to remediate adverse impacts from the substances that threaten to aquatic lives in the rice fields which local people can consume to sustain their lives during difficulties. Moreover, chemical fertilizers are harm to human health. The farmers should be encouraged to use natural fertilizers which maintain soil quality.

- Community plan for water use

Community plan for water use and common hydrological knowledge should be introduced to the communities, and thus they can learn how to manage and use available water in sustainable way.

- Identifying potential and available crops

Identifying potential and available crops in every community provides information to the local people what kind of crops they should focus on. Furthermore, the local people should be encouraged and engaged in flooded forest conversation since the implementation contribute to livelihoods of both current and next generation people.

4.5.4 Physical Capital

- Vulnerable map

The development of community flood vulnerable map assisted government and NGOs to identify priority areas. Land use and flood pattern maps should be created at community level to identify vulnerable areas which are sensitive to floods and need urgent assistances, and thus local government authorities can take appropriate actions in order to help people to evacuate.

- Dissemination of warning information

Disseminate timely and accurate early warning information to community level, and thus they can take action to prepare for emergency risks. Common terminology, moreover, should be used to facilitate the understanding of the information.

- New agriculture technology

The government and NGOs should introduce new agriculture technology and flood resistant rice varieties to the farmers in order to grow their rice and other crops to resist to flood water and avoid being destroyed by floods. The improvement of irrigation systems promotes farming activities to achieve higher productivity.

4.5.5 Financial Capital

- Specification of exact needs

Specification of exact needs of flood affected people should be considered in advance before handing assistances to them since specific supports can heal specific people.

External assistances cannot fulfill all requirements of flood affected people, and thus effective management need to be taken place in respected to aid allocation. Distribution of emergency assistances could help to minimize adverse impacts during flooding. This measure, however, should be applied in case of extreme floods which are over capacity of the people. The government is better to focus more on building capacity of the people before flooding, which allows them to be self-reliance rather than waiting for outside support.

- Financial services

The accessibility to financial services and effective ways for using these services should be provided to local people in order to create more opportunities for them to build their capacity and increase their income. Although there were more present of micro financial institutes in rural areas, higher interest rates were still the main obstacle for villagers to access to financial resources, and thus lower interest rates and longer loan repayment periods should be implemented.

CHAPTER V
CONCLUSION

This research was conducted to identify the important factors of sustainable community mechanisms that influence on coping with flood in Cambodia and to discuss the policies and frameworks related to the sustainable community mechanisms to cope with flood. The study can concluded as follows.

5.1 Flood Situation and Coping Strategies in Ba Baong Commune

Ba Baong commune was located in flood-prone area, which was yearly inundated by floods. Floods in this study area were caused by overflow water from the Mekong River coupled with local heavy rain. Level of flood water could reach to 3 meters in the village site in 2000 which reported as the most severe flood. Duration of flood varies from 0 to 90days, with an average estimation of the flood duration of 17 days. Villagers, however, considered floods as severe when water level in their villages is 1 meter up and stay for more than 30 days.

Local coping strategies were developed and applied within the community. Early warning information was accessed via radio, television, own observation, word of mouth, etc. Flood preparedness was employed by villagers in order to reduce some adverse impacts. Food and medicines were stored, and shelves were built to place belonging away from flood water. Flood resistant houses were constructed. Village dike was created in Doung village. Flood response was adopted by using many strategies such as evacuation to safe places, taking loans, food consumption adjustment, fishing, daily wage, and receiving emergency aid from external institutions. Recovery was taken place after flood receding. Rice plantation, house reconstruction and labour work were practiced by local people to recover from floods.

5.2 Community Capitals

Community capitals (social, human, natural, financial and physical) played important roles in strengthening and enhancing coping capacity of local people to apply flood mitigation, preparedness, response and recovery. To achieve effective coping, local people applied the combination of all capitals.

Table 5. 1 Summary of the Research Finding

Community capitals	**Mechanism indicators**	**Summary details**
Social capital	- Bonding social capital - Bridging social capital - Linking social capital - Group therapy	- Sharing food, knowledge and information - Motivating community members - Development assistances - Emergency supports - Financial supports - Reducing impacts from civil wars - Creating positive changes - Focusing on their current situation
Human capital	- Health and nutrition - Education - Local knowledge and skills	- Accessing to information - Predicting flood information - Preparing for flood - Rice growing techniques
Natural capital	- Land and soil - Water and aquatic resources - Tree and forest products - Biodiversity	- Providing daily food intake and income - Increasing agricultural productivity - Source of energy (firewood)
Physical capital	- Infrastructures - Tools and technology	- Accessing to hospitals, markets, and etc. - Supporting rice productivity - Reducing the negative flood impacts - Accessing to information - Sanctuary places during flooding
Financial capital	- Savings and credits - Remittances - Income diversification	- Supporting daily consumption - Accessing to both land and non-land assets - Creating alternative sources of income - Investing in income generating activities

5.2.1 Social Capital

The social capital in this study was classified into three main categories, namely bonding, bridging and linking social capitals. The bonding social capital was the most important capital that every household turn to when they were in difficulties in order to access to food or financial supports. The bridging social capital is the next step of capital that local people could access to. Solidarity, cooperation, and participation from villagers created remarkably measures to marginalize impacts of floods. The strong leadership and high responsibility of local leaders encourage people to follow and gather as a group to reduce adverse impacts. Furthermore, the linking social capital with external stakeholders Ba Baong brought both development and emergency assistances to Ba Baong people.

5.2.2 Human Capital

Human capital focused on health, education, skills of people, which were resources for people to cope with floods. Limited choices of food were resulted from floods, which caused villagers to adjust their eating habit. Health impacts were presented concerning diseases, sanitation and safe drinking water. Cold was the most mentioned illness during flooding. However, the accessibility of Ba Baong people to safe drinking water could reduce health problems in the community during flooding. Local knowledge of villagers learnt from their past experience was the based knowledge for them to prepare and adjust themselves to live with floods. Villagers spontaneously developed their coping strategies in order to better cope with floods. Learning from past experience combined with own observation enabled villagers to improve their coping capacity. There was no remarkable impact of repeated floods since schools were constructed on high grounds, and new academic year was generally started in October, which means that students were still on vacation during flood period.

5.2.3 Natural Capital

Ba Baong farmers viewed seasonal flood as their benefits since they could access to more water and sedimentations which were brought by flood for their rice plantation. Availability of the fish also increased. The study area was favored by enrich soil fertility coupled with available ground water. This potential allowed farmers to produce high

yields, which increased their income. The current conservative flooded forest benefited local people by increasing numbers of fish, and thus the people could rely on the flooded forest to earn income and fulfill daily protein.

5.2.4 Financial Capital

Financial capitals, namely saving, loan, and remittance were very crucial to support villagers during flood period since income generation was affected by floods. Villagers made saving in advance to be used in difficulty time, and took out loan when the saving was not enough to fulfill their daily consumption and emergency expense. Remittances from family members or relative helped to relief some burdens of households during hardship.

5.2.5 Physical Capital

Noteworthy physical capital in the commune contributed to coping capacity of local people. Accessible roads facilitated transportation during both normal and flood period. People were connected to schools, markets and hospitals by the National Road 11 in normal time and could be reachable by external assistances during flooding. Commune irrigation systems supplied water to farmers to grow their rice in dry season to avoid being damaged or destroyed by floods. Housing materials coupled with construction on poles indicated flood resistant structure that local people had been applying for long time ago, and they recently adapted another flood mitigation measure by raising up their housing land to be higher.

Since majority of people living in this community are farmers, floods played vital roles in terms of providing fertilizers to soil and water for irrigation, and reducing insects. Soun et al. (2009) indicated that villagers living in lowland area in Prey Veng province preferred big flood rather than small one since it increased numbers of fish, improved soil fertility, and reduced pests. Instead of solely focusing on physical structures to protect flood hazards, develop of local people's capacity to cope with floods should be paid more attention.

5.3 Policy Recommendation

Policy makers and Non-Government Organizations should consider following points the five community capitals in their future projects and implementations in order to sustain and create effective manners. The following points were recommended:

- Social capital: local culture and norms should be clearly studied and understood before taking actions. Trust building at community level, moreover, was very crucial as it contributes to the success of the program implementation.
- Human capital: local knowledge, furthermore, provided basic information about what level of coping capacity local people. In addition, training people on how to live in harmony and earn benefits from floods provided long-term mechanisms rather than focusing on only physical measure. Social protection should be promoted since it can benefits to the poor who is vulnerable.
- Natural capital: potential and available crops in each community should be studied. A community plan for water using should be created coupled with monitoring and controlling the mount of used chemical fertilizers.
- Physical capital: development of community flood vulnerable map, dissemination of timely and accurate early warning information, and introduction of new agricultural technologies should be considered in order to minimize flood impacts.
- Financial capital: Specification of exact needs of flood affected people should be studied before providing assistances. Creating financial services and effective ways for using should be introduced to communities.

The five capitals suggested to the policies are summarized in the following table.

Table 5. 2 Summary of Five Capitals Suggested to the Policies

Community capitals	**Policies**
Social capital	- Considering cultural and social norms of local communities - Building trust at community level
Human capital	- Adopting community best practice - Local or traditional knowledge - Promoting social protection
Natural capital	- Identifying potential and available crops - Monitoring and controlling of amount of used chemical fertilizers - Making a community plan for water using
Physical capital	- Developing of community flood vulnerable map - Disseminating timely and accurate early warning information - Introducing new agriculture technology
Financial capital	- Specifying exact needs of flood affected people - Creating financial services and effective ways for using

The DRR policies and frameworks should consider about the five community capitals which are important factors strengthen and enhance local communities' capacity to adapt to floods. The important factors of sustainable community mechanisms that influence on the community coping capacity should be considered in flood risk assessment and management.

5.4 Future Research Recommendation

While this study contributes fruitful detail of sustainable community mechanisms in Ba Baong commune, there are still rooms for future researches, and thus further suggestions are provided. The study on the connection of natural disasters such as drought and flood in the community level since Cambodian farmers have encountered the recurrence of natural disasters both floods and droughts.

Community-based participation, moreover, should be applied in order to gain more information and knowledge about local people's practices by fully engaging them in any discussions.

Future research should focus on the criteria of disaster risk assessment and sustainable management that can be applicable in the local scale. The capitals which are available in a community and contribute to community capacity development should be documented.

REFERENCES

Åhman, T., Nilsson, C., & Olsson, S. (2009). The community mechanism for civil protection and the European Union solidarity fund *Crisis Management in the European Union* (pp. 83-107): Springer.

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

Alliance Development Work [ADW]. (2012). World Risk Report 2012.

Ang, S., Oeur, I., & McAndrew, J. (2007). Understanding Social Capital in Response to Floods and Droughts (Vol. 11, pp. 9-12): Cambodia Development Review.

ASEAN Secretariat. (2005). ASEAN Agreement on Disaster Management and Emergency Response: Vientiane.

Asian Disaster Preparedness Center. (2002). Mitigating Flood Risk in Cambodian Communities: Empowering Communities to Manage Disaster Risk. Retrieved March 1, 2014, from http://www.adpc.net/igo/contents/Publications/publications-Details.asp?pid=202&t=Safer%20Cities%202:%20Coping%20with%20Flood%20in%20Cambodian%20Communities#sthash.Imfvq9O2.dpbs

Asian Disaster Preparedness Center [ADPC]. (2002). Mitigating flood risk in Cambodian communities Empowering Communities to Manage Disaster Risk. Pathumthani: The Asian Disaster Preparedness.

Asian Disaster Preparedness Center [ADPC]. (2007). Kingdom of Cambodia: Community self-reliance and flood risk reduction (Vol. 37290): Asian Development Bank.

Asian Disaster Preparedness Center [ADPC]. (2008). A study on impact of disasters on the education sector in Cambodia. *Asian Disaster Preparedness Center, Bangkok*.

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.

Aun, P., & Hruby, D. (2013, October 2). Floods a Yearly Trial for Those Living Along Mekong, *The Cambodia Daily*. Retrieved from http://www.cambodiadaily.com/archives/floods-a-yearly-trial-for-those-living-along-mekong-44143/

Baromey, N., Ol, R. S., & Pellini, A. (2012). Social Capital Definitions, Characteristics and the Relevance for CBNRM in Cambodia. *Engaging for the Environment*, 14.

Basabe, P. (2013). Hyogo Framework for Action 2005–2015 *Encyclopedia of Natural Hazards* (pp. 508-516): Springer.

Beck, F. D. (2004). Rural Communities: Legacy and Change, by Cornelia Butler Flora and Jan L. Flora with Susan Fey. *Rural Sociology, 69*(4), 576-578. doi: 10.1526/0036011042722796

Beeton, R. (2006). Society's forms of capital: a framework for renewing our thinking'paper prepared for the 2006 Australian State of the Environment Committee, Department of the Environment and Heritage, Canberra. *Department of the Environment and Heritage, Canberra*.

Berman, R. J., Quinn, C. H., & Paavola, J. (2014). Identifying drivers of household coping strategies to multiple climatic hazards in Western Uganda: implications for adapting to future climate change. *Climate and Development*(ahead-of-print), 1-14.

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

Bola, G., Mabiza, C., Goldin, J., Kujinga, K., Nhapi, I., Makurira, H., & Mashauri, D. (2014). Coping with droughts and floods: A Case study of Kanyemba, Mbire District, Zimbabwe. *Physics and Chemistry of the Earth, Parts A/B/C, 67*, 180-186.

Brundtland, G., Khalid, M., Agnelli, S., Al-Athel, S., Chidzero, B., Fadika, L., Hauff, V., Lang, I., Shijun, M., & de Botero, M. M. (1987). *Report of the World Commission on Environment and Development: Our common future*: United Nations.

Callaghan, E. G., & Colton, J. (2007). Building sustainable & resilient communities: a balancing of community capital. *Environment, Development and Sustainability, 10*(6), 931-942. doi: 10.1007/s10668-007-9093-4

Cambodian Red Cross [CRC]. (2012). Celebrating the 149 Anniversary of the World Red Cross Red Crescent Day, May 8th Under Theme "Youth on the Move". (4).

Cançado, V., Brasil, L., Nascimento, N., & Guerra, A. (2008). *Flood risk assessment in an urban area: Measuring hazard and Vulnerability.* Paper presented at the 11th International Conference on Urban Drainage. Edinburgh, Scotland.

Cantor-Graae, E., Chak, T., Sunbaunat, K., Jarl, J., & Larsson, C. A. (2014). Long-term psychiatric consequences of exposure to trauma in Cambodia: A regional household survey. *Social Science & Medicine, 123*, 133-140.

CARE. (2001). Risk Mitigation and Disaster Management in Rural Communities of Cambodia.

CARE. (2011). CARE Responds to South East Asia Flooding. Retrieved July 11, 2013, from http://reliefweb.int/report/cambodia/care-responds-south-east-asia-flooding

Caritas Australia. (2013). Emergency Aid for the 2013 Floods in Cambodia. Retrieved January 12, 2014, from http://www.caritas.org.au/learn/newsroom/news-detail?ID=c877d688-d78f-4988-9b3c-93dc3539a785

CFE-DMHA. (2014). *Cambodia Disaster Management Reference Handbook*.

Chan, S., & Acharya, S. (2002). Facing the challenge of rural livelihoods, a perspective from nine villages in Cambodia. *Cambodia Development Resource Institute Working Paper, 25*.

Charles H. Zastrow. (2009). *Social Work with Groups: A Comprehensive Workbook*. USA: Brooks/Cole.

Colletta, N. J., & Cullen, M. L. (2000). *Th Nexus Between Violent Conflict, Social Capital and Social Cohesion: Case Studies from Cambodia and Rwanda*: World Bank, Social Development Family, Environmentally and Socially Sustainable Development Network.

Colletta, N. J., & Cullen, M. L. (2002). Social capital and social cohesion: case studies from Cambodia and Rwanda. *The Role of Social Capital in Development: An Empirical Assessment*, 279-309.

Council for Agricultural and Rural Development [CARD], & Technical Working Group for Food Security and Nutrition [TWG-FSN]. (2008). *Strategic Framework for Food Security and Nutrition in Cambodia 2008-2012 (SFFSN)*. Phnom Penh: Council for Agricultural and Rural Development (CARD).

Council for Social Development [CSD]. (2002). *Cambodia National Poverty Reduction Strategy 2003-2005*. Phnom Penh: Ministry of Planning.

Davis, D. W. (2007). *Is the current approach to managing flood threats in the united states sustainable?* Paper presented at the Proceedings ASCE World Environmental and Water Resources Congress, Restoring Our Natural Habitat.

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

Department for International Development [DFID]. (1999). Sustainable livelihoods guidance sheets. *UK DFID Department for International Development: London*.

Dewi, A. (2007). *Community-based analysis of coping with urban flooding: a case study in Semarang, Indonesia.*

Dubus, N. (2009). Professional/paraprofessional team approach in groupwork with Cambodian refugee women. *Groupwork, 19*(2), 46-62.

Dynes, R. R. (2002). *The importance of social capital in disaster response*: University of Delaware, Disaster Research Center Newark, DE.

Eng, R. (2009). *Cambodia: mainstreaming flood and drought risk mitigation in east Mekong delta.* Paper presented at the The expert group meeting on innovative strategies towards flood resilient cities in Asia-Pacific.

Febrianti, F. (2010). Flood Risk Perception and Coping Mechanism of Local Community: A Case Study in Part of Surakarta City, Central Java Province, Indonesia. *Unpublished master's thesis, Gadjah Madah University & University of Twente, Yogyakarta & Enschede*.

Ferreira, V. F. (2012). The future we want. *Journal of the Brazilian Chemical Society, 23*(5), 795-796.

Few, R. (2003). Flooding, vulnerability and coping strategies: local responses to a global threat. *Progress in Development Studies, 3*(1), 43-58.

Fey, S., Bregendahl, C., & Flora, C. (2006). The measurement of community capitals through research. *Online Journal of Rural Research & Policy, 1*(1), 1.

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.

Fletcher, S. M., Thiessen, J., Gero, A., Rumsey, M., Kuruppu, N., & Willetts, J. (2013). Traditional coping strategies and disaster response: Examples from the South Pacific region. *Journal of environmental and public health, 2013*.

Flint, C. G., & Luloff, A. (2005). Natural resource-based communities, risk, and disaster: An intersection of theories. *Society and Natural Resources, 18*(5), 399-412.

Flora, C. B., Flora, J. L., Spears, J. D., & Swanson, L. E. (1992). *Rural communities: legacy and change*: Westview Press.

Food and Agriculture Organization [FAO]. (2004). Glossary. Retrieved March 7, 2014, from http://www.fao.org/ag/wfe2005/glossary_en.htm

Food and Agriculture Organization [FAO]. (2011). Southeast Asia Flood Update. Retrieved July 11, 2013, from http://reliefweb.int/report/thailand/southeast-asia-flood-update

Fox, J., & Ledgerwood, J. (1999). Dry-season flood-recession rice in the Mekong Delta: two thousand years of sustainable agriculture? *Asian Perspectives*, 37-50.

Frankenberger, T., Mueller, M., Spangler, T., & Alexander, S. (2013). Community Resilience: Conceptual Framework and Measurement Feed the Future Learning Agenda. *Rockville, MD: Westat*, 1.

Gaillard, J. (2015). *People's Response to Disasters in the Philippines: Vulnerability, Capacities and Resilience*: Palgrave Macmillan.

Government of Japan. (2013). Emergency Assistance to Cambodia in Response to the Flood Disaster. Retrieved March 24, 2013, from http://reliefweb.int/report/cambodia/emergency-assistance-cambodia-response-flood-disaster

Granovetter, M. S. (1973). The Strength of Weak Ties. *American Journal of Sociology, 78*(6), 1360-1380. doi: 10.2307/2776392

Green, G. P., & Haines, A. (2011). *Asset building & community development*: Sage.

Gutierrez-Montes, I., Emery, M., & Fernandez-Baca, E. (2009). The sustainable livelihoods approach and the community capitals framework: The importance of system-level approaches to community change efforts. *Community Development, 40*(2), 106-113.

Handmer, J. W. (2000). *Flood Hazard and Sustainable Development*.

Hayami, Y. (2009). Social capital, human capital and the community mechanism: Toward a conceptual framework for economists. *Journal of Development Studies, 45*(1), 96-123.

Helmers, K., & Jegillos, S. (2004). Linkages between flood and drought disasters & Cambodian rural livelihoods and food security. *Phnom Penh, International Federation of Red Cross and Red Crescent Societies and the Cambodia Red Cross Society*.

Hook, J., Novak, S., & Johnston, R. (2003). Social atlas of the Lower Mekong basin. *Mekong River Commission, Phnom Penh, 154*, 1727-1800.

Inada, J. (2013). Analysis of the Survey on Social Capital in Cambodia. *The Senshu social capital review: exploring social capital towards sustainable development in East Asia, 4*, 161-189.

Intergovernmental Panel on Climate Change Special Report [IPCC-SREX]. (2012). *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation: Special Report of the Intergovernmental Panel on Climate Change*: Cambridge University Press.

International Development Enterprise [IDE]. (2009). Strategic Study of Groundwater Resources in Prey Veng and Svay Rieng (Phase 2). Phnom Penh.

International Federation of Red Cross and Red Crescent Societies [IFRC]. (2013). Information bulletin Cambodia: Floods [Press release]. Retrieved from http://www.ifrc.org/docs/Appeals/rpts13/KHfl17101301.pdf

Irving D. Yalom. (1998). *The Therapeutic Factors: What It Is That Heals*. New York: Basic Book.

ISDR, U. (2009). UNISDR terminology on disaster risk reduction. *Geneva, Switzerland, May*.

Islam, M., Hasan, T., Chowdhury, M., Rahaman, M., & Tusher, T. (2013). Coping techniques of local people to flood and river erosion in char areas of Bangladesh. *Journal of Environmental Science and Natural Resources, 5*(2), 251-261.

Islam, R., & Walkerden, G. (2014). How bonding and bridging networks contribute to disaster resilience and recovery on the Bangladeshi coast. *International Journal of Disaster Risk Reduction, 10*, 281-291.

Jeane, A. I., & Zaumseil, M. (2014). Suffering, Healing, and the Discourse of Trauma *Cultural Psychology of Coping with Disasters* (pp. 267-284): Springer.

Jones, R. W., & Diepart, J. C. (2015). Learning Towards Resilience. In J. C. Diepart (Ed.), *Learning for Resilience Insights from Cambodia's Rural Communities*: The Learning Institute.

Kaniasty, K., & Norris, F. (1999). The experience of disaster: Individuals and communities sharing trauma. *Response to disaster: Psychosocial, community, and ecological approaches*, 25-61.

Katyal, A. K., & Petrisor, I. G. (2011). Flood Management strategies for a holistic sustainable development. *Environmental Forensics, 12*(3), 206-218.

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.

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

Kimkong, H., & Paradis, S. impacts of social-ecological change on farming practices in the Stung Chreybak catchment, Kampong Chhnang province. *Learning for resilience*, 51.

Kreibich, H., Piroth, K., Seifert, I., Maiwald, H., Kunert, U., Schwarz, J., Merz, B., & Thieken, A. (2009). Is flow velocity a significant parameter in flood damage modelling? *Natural Hazards and Earth System Science, 9*(5), 1679-1692.

Kubota, Y. (2013). *Armed Groups in Cambodian Civil War: Territorial Control, Rivalry, and Recruitment*: Palgrave Macmillan.

Lebel, L., Sinh, B. T., Dore, J., Daniel, R., & Koma, Y. (2007). Politics of floods and disasters. *Democratizing water governance in the Mekong region*, 37-54.

Ledgerwood, J. (1998). Rural development in Cambodia: the view from the village. *Cambodia and the International Community*, 127-147.

Leng, H. A. (2014). Country Report of Cambodia Disaster Management. Kobe, Japan: National Committee for Disaster Management (NCDM).

Lim, S. (2007). *Youth Migration and Urbanisation in Cambodia*: Cambodia development resource institute (CDRI).

Lindell, M. K., & Perry, R. W. (1992). *Behavioral foundations of community emergency planning*: Hemisphere Publishing Corp.

Lindell, M. K., Tierney, K. J., & Perry, R. W. (2001). *Facing the Unexpected:: Disaster Preparedness and Response in the United States*: Joseph Henry Press.

Marchand, M., Sarin, C., Monichoth, S. I., & Sareivouth, T. (2013). Assessing social flood vulnerability in the Mekong floodplain, Cambodia, using household survey and district statistics.

Marschiavelli, M. I. C. (2008). *Vulnerability assessment and coping mechanism related to floods in urban areas: a community-based case study in Kampung Melayu, Indonesia.* Gadjah Mada University.

Mayunga, J. S. (2009). *Measuring the measure: A multi-dimensional scale model to measure community disaster resilience in the US Gulf Coast region.* Texas A&M University.

McAndrew, J. P. (1998). *Interdependence in household livelihood strategies in two Cambodian villages*: Cambodia Development Resource Institute in collaboration with United Nations Research Institute for Social Development Phnom Penh.

Mekong River Commission [MRC]. (1995). The MRC Flood Management and Mitigation Programme.

Mekong River Commission [MRC]. (2010). State of the basin report 2010. Vientiane, Lao PDR: Mekong River Commission.

Mekong River Commission [MRC]. (2012). The Impact & Management of Floods & Droughts in the Lower Mekong Basin & the Implications of Possible Climate Change Retrieved April 20, 2014, from http://www.mrcmekong.org/assets/Publications/basin-reports/FMMP-working-paper-110820.pdf

Middleton, C. (2012). The'nature'of beneficial flooding of the Mekong River. *Social Science Journal, 42*(2), 180-208.

Ministry if Education, Y. a. S. M. (2014). *Education Statistics & Indicators 2013-2014*. Phnom Penh: EMIS office.

Ministry of Environment [MOE]. (2006). *National Adaptation Programme of Action to Climate Change (NAPA).* Phnom Penh: Ministry of Environment (MOE) Retrieved from unfccc.int/resource/docs/napa/khm01.pdf.

Motsholapheko, M., Kgathi, D., & Vanderpost, C. (2011). Rural livelihoods and household adaptation to extreme flooding in the Okavango Delta, Botswana. *Physics and Chemistry of the Earth, Parts A/B/C, 36*(14), 984-995.

Murakami, S. (2013). Social Capital in Vietnam, Cambodia and Laos. *The Senshu social capital review: exploring social capital towards sustainable development in East Asia, 4*, 65-110.

Musah, B., & Akai, C. (2014). Effects of flood disasters on livelihood coping mechanism in Tolon/Kumbumgu district of northern region of Ghana. *International Journal of Agricultural Policy and Research, 2*(1), 33-40.

Nang, P. (2013). *Climate Change Adaptation and Livelihoods in Inclusive Growth: A Review of Climate Change Impacts and Adaptive Capacity in Cambodia*: CDRI Pub.

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.

National Bank of Cambodia [NBC]. (2014). Exchange Rate. Retrieved May 06, 2015, from http://www.nbc.org.kh/english/economic_research/exchange_rate.php

National Climate Change Committee [NCCC]. (2013). *Cambodia Climate Change Strategic Plan 2014-2023*. Phnom Penh.

National Committee for Disaster Management [NCDM], & Ministry of Planning [MOP]. (2008). *Strategic National Action Plan for Disaster Risk Reduction*

2008-2013. Phnom Penh: National Committee for Disaster Management (NCDM) and Ministry of Planning (MoP) Retrieved from www.adrc.asia/.../Plan/Cambodia_SNAP-DRR_2008-2013_Eng.pdf.

National Committee for Sun-National Democratic Development [NCDD]. (2009). *Peam Ro District Data Book 2009*.

Nee, M., & Healy, J. (1995). *Towards restoring life: Cambodian villages*: JSRC.

Nguyen, K. V., James, H., & James, H. (2013). Measuring household resilience to floods: a case study in the Vietnamese Mekong River Delta. *Ecology and Society, 18*(3), 13.

Nguyen, V. S., & Nguyen, D. C. (2009). Study on Local Community Institutions to Cope with the Flood Situation of the Mekong Region: Mekong Delta Development Research Institute.

Nyakundi, H., Mogere, S., Mwanzo, I., & Yitambe, A. (2010). Community perceptions and response to flood risks in Nyando District, Western Kenya. *Jàmbá: Journal of Disaster Risk Studies, 3*(1), 346-366.

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.

Opondo, D. O. (2013). Erosive coping after the 2011 floods in Kenya. *International Journal of Global Warming, 5*(4), 452-466.

Oum, S. (2013). *Keeping ahead of floods and droughts: a case study of Sdau Kaong Commune, Cambodia*.

Pandey, B., & Okazaki, K. (2005). Community-based disaster management: empowering communities to cope with disaster risks. *Regional Development Dialogue, 26*(2), 52.

Pelling, M. (2010). *Adaptation to climate change: from resilience to transformation*: Routledge.

Putnam, R. D. (2001). *Bowling alone: The collapse and revival of American community*: Simon and Schuster.

Putnam, R. D., Leonardi, R., & Nanetti, R. Y. (1994). *Making democracy work: Civic traditions in modern Italy*: Princeton university press.

Reganit, M. P. (2005). *Analysis of community's coping mechanisms in relation to floods, a case study in Naga City, Philippines.*

Rijal, S., & Cochard, R. (2015). Invasion of Mimosa pigra on the cultivated Mekong River floodplains near Kratie, Cambodia: farmers' coping strategies, perceptions, and outlooks. *Regional Environmental Change*, 1-13. doi: 10.1007/s10113-015-0776-3

Roose, H., Waege, H., & Agneessens, F. (2002). *Response Behaviour in Audience Research: A Two-stage Design for the Explanation of Nonresponse*: Steunpunt re-creatief Vlaanderen.

Rossi, G., Harmanciogammalu, N. B., & Yevjevich, V. (2012). *Coping with floods* (Vol. 257): Springer Science & Business Media.

Schmuck, H. (2000). " An Act of Allah": Religious Explanations for Floods in Bangladesh as Survival Strategy. *International journal of mass emergencies and disasters, 18*(1), 85-96.

Shaw, R., & Okazaki, K. (2004). Sustainable community based disaster management (CBDM) practices in Asia: A user's guide. *Disaster Management Planning*

Hyogo Office, United Nations Center for Regional Development (UNCRD), Kobe.

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 *Environmental Change and Agricultural Sustainability in the Mekong Delta* (pp. 241-255): Springer.

Sok, S., & Yu, X. (2015). Adaptation, resilience and sustainable livelihoods in the communities of the Lower Mekong Basin, Cambodia. *International Journal of Water Resources Development, 31*(4), 575-588. doi: 10.1080/07900627.2015.1012659

Sokha, K. (2002). Country Report 2002: Disaster Management in Cambodia. Retrieved July 10, 2013, from http://www.adrc.asia/countryreport/KHM/KHMeng02/Cambodia_CR.htm

Solieng, M. (2013). World Geographical Dictionary On Cambodia.

Sophal, C. (2008). Impact of high food prices in Cambodia. *CDRI Policy Brief, 2*, 1-6.

Soun, S., Lim, S., Chay, K., & Lim, S. (2009). Local Adaptation to Climate Change: What do floods take from and bring to community people living in flood affected areas? : CENTDOR.

Stofferahn, C. W. (2012). Community capitals and disaster recovery: Northwood ND recovers from an EF 4 tornado. *Community Development, 43*(5), 581-598.

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

Tong, K., & Sry, B. (2011). *Poverty and Environment Links: The Case of Rural Cambodia*: CDRI Pub.

Twigg, J. (2004). *Disaster risk reduction: mitigation and preparedness in development and emergency programming*: Humanitarian Practice Network, Overseas Development Institute.

UNDP Cambodia. (2012). Livelihood Recovery Needs Assessment and Anction Plan for Selected Areas Affected by the 2011 Cambodia Flood. Phnom Penh: United Nations Development Programme.

UNDP Cambodia. (2013). Case Study in Cambodia Community Based Adaptation: Two Examples from Rural Affected Communities. Retrieved April 20, 2014, from http://www.undp.org/

UNDP Cambodia. (2014). Post-Flood Early Recovery Need Assessment Report. Phnom Penh: United Nations Development Programme.

United Nations International Strategy for Disaster Reduction [UNISDR]. (2005). *Hyogo framework for action 2005-2015: building the resilience of nations and communities to disasters.* Paper presented at the Extract from the final report of the World Conference on Disaster Reduction (A/CONF. 206/6).

United Nations International Strategy for Disaster Reduction [UNISDR]. (2009). *UNISDR terminology on disaster risk reduction*. Geneva, Switzerland: United Nations International Strategy for Disaster Reduction.

United Nations Office for Disaster Risk Reduction [UNISDR]. (2013). *Post-2015 framework for disaster risk reduction (HFA2): report from 2013 global platform consultations*.

Uphoff, N. (2000). Understanding social capital: learning from the analysis and experience of participation. *Social capital: A multifaceted perspective,* 215-249.

Uy, K. K. (2014). *Reassembling a shattered life: A study of posttraumatic growth in displaced Cambodian community leaders.* Alliant International University.

Va, D., Regan, M., Taplin, R., & Bajracharya, B. (2013). The role of social capital and local institutions in coping with climate stresses: The case of Krapum Chhouk commune in rural Cambodia. *Asian Journal of Agriculture and Development, 10*(1), 61-78.

Walter, J. (2004). *World disasters report 2004: Focus on community resilience*. Geneva: Switzerland: International Federation of Red Cross and Red Crescent Societies (IFRC).

Wee, K. B. (2011). *The Duality of Flood in Cambodia: Has the Government Helped the Villagers?* (Master), Swedish University of Agricultural Sciences Uppsala.

West, C. D. (2000). Pathways of Thriving and Resilience: Growth Responses to Adversity and Trauma in Two Cambodian Communities: A Comparative Study between Lowell, Massachusetts and Phnom Penh, Cambodia.

Wingqvist, G. Ö. (2013). Cambodia Environmental and Climate Change Policy Brief. *Sida's Helpdesk for Environment and Climate Change, Swedish International Development Cooperation Agency*.

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

Wold Food Programme [WFP]. (2004). Priority Areas for Assisting Vulnerable Population in FloodvProne Areas and Priority Areas for Assisting Vulnerable Population in Drought PronevAreas.

World Bank. (2013). *Where Have All The Poor Gone? Cambodia Poverty Assessment 2013*: World Bank.

World Conference on Disaster Risk Reduction [WCDRR]. (2015). Sendai Framework for Disaster Risk Reduction 2015–2030. *Australian Journal of Emergency Management, 30*(3).

World Food Programme [WFP]. (2013). Overview of flood extent in Cambodia, Sep 2011 and Oct 2013. Retrieved March 01, 2014, from http://reliefweb.int/map/cambodia/overview-flood-extent-cambodia-sep-2011-and-oct-2013

World Health Organization [WHO]. (1982). Provisional Guidelines on Standard International Age Classification. *Department of International Economic and Social Affairs. Series M*(74).

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 Management, 14*, 79-107.

APPENDICES

APPENDIX A

HOUSEHOLD QUESTIONNAIRE

Questionnaire Number	

Sustainable Community Mechanisms for Coping with Floods Survey Questionnaire

Geographical Information

Village Name: _____

Interview Information

Name of interviewee: _____ Sex: ☐ Male ☐ Female

Date of participation (dd/mm/yy): _____

Time started: _____ Completed: _____

Phone number: _____

I. Household Information:

Household head: _____ Sex: _____ Age: _____

Marital status: _____ Level of Education: _____

Main occupation: _____ Ethnicity: _____ Religion: _____

Household member: _____

Relationship with household head	Age	Level of Education	Occupation
1. _____	_____	_____	_____
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
6. _____	_____	_____	_____
7. _____	_____	_____	_____
8. _____	_____	_____	_____
9. _____	_____	_____	_____
10. _____	_____	_____	_____

II. Housing Conditions, Household Amenities and Durable Assets:

A. Housing Conditions

1. Indicate your ownership of the dwelling?
   - ☐ 1. Owned by household
   - ☐ 2. Not owned but no rent is paid
   - ☐ 3. Rented
   - ☐ 4. Others _____
2. What is the primary material of the wall of the housing occupied by your household?
   - ☐ 1. Bamboo, thatch/leaves, grass
   - ☐ 2. Wood or logs
   - ☐ 3. Plywood

☐ 4. Galvanized iron or aluminium or other metal sheets
☐ 5. Others _____

3. What is the primary material of the roof of your house?
   ☐ 1. Thatch/leaves/grass
   ☐ 2. Tiles
   ☐ 3. Fibrous cement
   ☐ 4. Galvanized iron or aluminium
   ☐ 5. Concrete
   ☐ 6. Others _____
4. What is the primary material of the floor of your house?
   ☐ 1. Earth, clay
   ☐ 2. Wooden planks
   ☐ 3. Bamboo strips
   ☐ 4. Concrete
   ☐ 5. Ceramic tile
   ☐ 6. Others _____
5. Was your house built to withstand flooding? ☐ 1 = Yes ☐ 2 = No
6. If no, why?
   ☐ 1. Can't afford it
   ☐ 2. Don't like appearance
   ☐ 3. No risk of flooding
   ☐ 4. Others_____

B. Water, electricity, energy and food

1. What is your household's main source of drinking water?
   ☐ 1. Piping system
   ☐ 2. Hand pump/bore hole
   ☐ 3. Dug well
   ☐ 4. Pond/steam
   ☐ 5. (Big) river
   ☐ 6. Rainwater
   ☐ 7. Others_____
2. What is your household's main source of lights?
   ☐ 1. Public/private company-provided electricity
   ☐ 2. Generator
   ☐ 3. Battery
   ☐ 4. Kerosene lamp
   ☐ 5. Others_____

3. What type of fuel does your household use for cooking?
   ☐ 1. Firewood collected
   ☐ 2. Firewood bought
   ☐ 3. Charcoal
   ☐ 4. Gas
   ☐ 5. Others _____

C. Sanitation

1. Do you have a toilet?
   ☐ 1 = Yes ☐ 2 = No
2. If yes, where is it?
   ☐ 1. In the house ☐ 2. Outside the house

3. If yes, what type of toilet?
   - ☐ 1. Flush toilet
   - ☐ 2. Latrine
   - ☐ 3. Others_____

D. Land assets

1. Do you own a land where is used for crop production?
   ☐ 1 = Yes ☐ 2 = No
2. How many hectares for your crop production? _____ha
3. Which rice season does your household plant?
   - ☐ 1. Dry rice season
   - ☐ 2. Rainy rice season
   - ☐ 3. Both
4. How many times do you grow rice in a year?
   1. 1 time (specify the months_____)
   2. 2 times (specify the months_____)
   3. 3 times (specify the months_____)
   4. Others_____
5. Did you have access to water for irrigation before floods?
   ☐ 1 = Yes ☐ 2 = No
6. If yes, what kind did you access to?
   - ☐ 1.Private ponds
   - ☐ 2.Community ponds
   - ☐ 3.Irrigation channel
   - ☐ 4.River
   - ☐ 5.Others_____
7. Were these irrigation sources damaged or destroyed during the floods?
   ☐ 1 = Yes ☐ 2 = No
8. Do you use fertilizer for your crops?
   ☐ 1 = Yes ☐ 2 = No
9. Is the rice enough?
   - ☐ 1. Enough for family eating and have surplus to sell
   - ☐ 2. Just adequate
   - ☐ 3. Enough for 7-10 months; have to buy some
   - ☐ 4. Enough for 3-6 months; have to buy a lot
   - ☐ 5. Enough for less than 3 months; have to buy
   - ☐ 6. Entirely dependent on buying rice

E. Livestock and poultry

Has your household raised any livestock and/or poultry?

No	Livestock/Poultry	Total number of livestock/poultry own
1	Cattle	
2	Buffalo	
3	Pigs	
4	Chickens	
5	Ducks	

F. Other Non-Land Assets of the Household

Please fill in the information on the quantity of assets owned by a household below.

No	Item	Quantity
1	Radio	
2	Television	
3	Desk phone/cell phone	
4	Bicycle	
5	Motorcycle	
6	Car/jeep/van	
7	Batteries	
8	Generator	
9	Rowing boat	
10	Motor boat	
11	Cart (pulled by animal)	
12	Hand tractor	
13	Fishing net	
14	Water tank	

G. Sources of Household's Income

No	Sources of income	1 = Yes 2 = No	Amount
1	Farming		
2	Livestock and poultry		
3	Fishing		
4	Pension		
5	Remittance (from relatives or friends)		
6	Transfer from NGO		
7	Interest from lending money		
8	Salary (teacher, health staff….ect)		
9	Wage from selling labour or service (agriculture, transportation,…ect)		
10	Profits from trade, handicrafts and other businesses, ect.		
11	Rental from land/house/animal/agricultural tools		

III. Flood condition

1. What are causes of floods in your village?
   - ☐ 1. Heavy rainfalls
   - ☐ 2. Overflow from the river
   - ☐ 3. Dams
   - ☐ 4. Inundated water
   - ☐ 5. Accumulation
   - ☐ 6. Bad drains
   - ☐ 7. Land use changes
   - ☐ 8. Obstruct water drain
   - ☐ 9. Others_____

	At rice field	In a village
2. How deep was the water that you consider as severe floods?		
3. How fast did water level increase that you consider as severe floods?		
4. How long did floods stay that you consider as severe floods?		

5. When do severe floods often occur in your village?
   - ☐ 1. June
   - ☐ 2. July
   - ☐ 3. August
   - ☐ 4. September
   - ☐ 5. October
6. How often do floods happen in your community?
   - ☐ 1. Very less often
   - ☐ 2. Less often
   - ☐ 3. Often
   - ☐ 4. More often
   - ☐ 5. Very often

IV. Effects of floods

A. Effects on economic/wealth

1. Was your house destroyed by floods? ☐ 1=Yes ☐ 2=No
2. Was your house damaged by floods? ☐ 1=Yes ☐ 2=No
3. How severe was damage?
   - ☐ 1. Not severe
   - ☐ 2. least severe
   - ☐ 3. severe
   - ☐ 4. most severe
4. How did flood effect on your monthly income?
   - ☐ 1. Increased income
   - ☐ 2. No change
   - ☐ 3. Reduced income
5. Please fill in the information on the quantity of assets affected by floods

No	Asset	Destroyed	Partly Damaged	Stolen	None	Quantity
1	Crops					
2	Livestock					
3	Poultry					
4	Radio					
5	Television					
6	Desk phone/cell phone					

No	Asset	Destroyed	Partly Damaged	Stolen	None	Quantity
7	Bicycle					
8	Motorcycle					
9	Car/jeep/van					
10	Batteries					
11	Generator					
12	Rowing boat					
13	Motor boat					
14	Cart (pulled by animal)					
15	Hand tractor					
16	Fishing net					
17	Water tank					

B. Education

1. Are there any education facilities in your village?
   ☐ 1=Yes ☐ 2=No
2. Was there any damage to school infrastructure due to floods?
   ☐ 1=Yes ☐ 2=No
3. Is there any member in your household going to school?
   ☐ 1=Yes ☐ 2=No
4. Was there any disruption in attendance the class during floods?
   ☐ 1=Yes ☐ 2=No
5. If the answer to question number 4 is yes, why?
   ☐ 1. Road impassable
   ☐ 2. Bridge culvert washed away or submerged
   ☐ 3. School submerged/surrounded by water
   ☐ 4. Others_____

C. Health

1. What diseases normal occur?
2. How do your household prevent?
3. Are there any health facilities in your village?
   ☐ 1=Yes ☐ 2=No
4. Was there any damage to health facilities due to floods?
   ☐ 1=Yes ☐ 2=No
5. Was there any disruption in access to health services due to floods?
   ☐ 1=Yes ☐ 2=No
6. Did anyone of your household member get sick during floods?
   ☐ 1=Yes ☐ 2=No

7. How many household members experienced the following related health problems in the last flood?

No	Direct impact	How many member?
1	Malaria	
2	Dengue	
3	Skin rashes and/or eyes infections	
4	Diarrhea and other intestinal disorders	
5	Colds or respiratory illness	
6	Stress, depression or other mental problem	
7	Other water related health problem	

8. Was the main source of your household's drinking water affected by floods?
   ☐1=Yes ☐ 2=No
9. What is the main source of drinking water during floods?
   ☐ 1. piping system
   ☐ 2. hand pump/bore hole
   ☐ 3. dug well
   ☐ 4. pond/steam
   ☐ 5. (big) river
   ☐ 6. rainwater
   ☐ 7. others_____
10. Was your household's sanitary facility affected by floods?
    ☐ 1=Yes ☐ 2=No
11. If yes, where did you use? _____

V. Coping strategies with severe floods

A. Early warning information

1. Do you get any early warning information about flood?
   ☐ 1=Yes ☐ 2=No
2. How did you receive the important information for your household about floods?
   ☐ 1. Own observations
   ☐ 2. Television
   ☐ 3. Radio
   ☐ 4. Walkie-talkie
   ☐ 5. Loud speakers
   ☐ 6. Information board
   ☐ 7. Word of mouth
   ☐ 8. Others_____
3. Whom did the important information come from?
   ☐ 1. Village chief
   ☐ 2. Commune council
   ☐ 3. NGOs
   ☐ 4. Cambodia Red Cross
   ☐ 5. Relatives
   ☐ 6. Neighbors/friends
   ☐ 7. Others_____

4. How many percent do you understand the information?
   - ☐ 1. 0-25%
   - ☐ 2. 26-50%
   - ☐ 3. 51-75%
   - ☐ 4. 76-100%
5. Among all selected sources of information, which one is the most reliable?
   _____
6. If you did not receive any information, why?
   - ☐ 1. Live isolate
   - ☐ 2. Did not pay attention
   - ☐ 3. No radio or TV

B. Before floods

1. After receiving information, what do you do?
   - ☐ 1. Do nothing,
   - ☐ 2. Prepare food/ medicine
   - ☐ 3. Design house
   - ☐ 4. Build house protection
   - ☐ 5. Put household assets up from water
   - ☐ 6. Others_____
2. Do you know how to prepare for flood? ☐ 1 = Yes ☐ 2 = No
3. If yes, where did you learn from?
   - ☐ 1. Village chief
   - ☐ 2. Commune council
   - ☐ 3. NGOs
   - ☐ 4. Cambodia Red Cross
   - ☐ 5. Relatives
   - ☐ 6. Neighbors/friends
   - ☐ 7. Others_____
4. Has your household been able to save (in cash or jewelry) before floods?
   ☐ 1 = Yes ☐ 2 = No
5. Is the saving enough for affording your household's living during floods?
   ☐ 1 = Yes ☐ 2 = No

C. During floods

1. How did you survive during floods?
   - ☐ 1. evacuation and rescue
   - ☐ 2. borrowing money
   - ☐ 3. migration
   - ☐ 4. consuming crops already for harvest or just harvested
   - ☐ 5. spend cash or gold reserves to meet needs
   - ☐ 6. selling healthy animal at reduce value to buy food
   - ☐ 7. slaughtering livestock
   - ☐ 8. reducing the quality and quantity of food intake
   - ☐ 9. seek temporary help from friends or relatives or a government
   - ☐ 10. others_____
2. Can you diversify your income? ☐ 1 = Yes ☐ 2 = No

3. How do you diversify your income?
   - ☐ 1. Fishing
   - ☐ 2. Dry season rice
   - ☐ 3. Home garden
   - ☐ 4. Daily wage
   - ☐ 5. Migration
   - ☐ 6. Others_____
4. Did you evacuate to safe place during flood? ☐ 1 = Yes ☐ 2 = No
5. If yes, where did you evacuate to?
   - ☐ 1. Safe hill
   - ☐ 2. Temple
   - ☐ 3. School
   - ☐ 4. Road
   - ☐ 5. Relative's house/neighbor's house
   - ☐ 6. Others_____
6. How did you evacuate there?
   - ☐ 1. Ferry
   - ☐ 2. Boat
   - ☐ 3. Car
   - ☐ 4. Cart
   - ☐ 5. Bicycle
   - ☐ 6. Motorbike
   - ☐ 7. Others_____
7. How long?
   - ☐ 1. Less than 1 week,
   - ☐ 2. Between 1 and 3 weeks,
   - ☐ 3. Between 3-6 weeks,
   - ☐ 4. More than 6 weeks
8. If no, why?
   - ☐ 1. House is high and strong enough
   - ☐ 2. Risk of looting
   - ☐ 3. Others_____

D. After floods

1. How did you recover your living after floods?
   - ☐ 1. Replanting crop
   - ☐ 2. Reconstruct house/roads
   - ☐ 3. Migrate
   - ☐ 4. Others_____
2. Can your household return to previous condition before floods?
   ☐ 1 = Yes ☐ 2 = No
3. How long did it take to return to previous condition before floods? - _____day/week/year

VI. Access to common property resources

		Did you collect the following items? Please record appropriate code: 1= yes 2 = no		
1	**2**	**3**	**4**	**5**
		Before floods	During floods	After floods
1	Firewood			
2	Timber			
3	Fish			
4	bamboo/canes			
5	animal grazing			
6	fruits/tubes/vegetables			
7	wild animals			
8	Birds			
9	snails, crabs and oysters			
10	crickets and other insects			
11	Frogs			
12	Mice			
13	Resins			
14	materials for mats			
15	other			

VII. Assistance

	Type of assistance	**Did you receive any assistance?** 1 = Yes 2 = No	**From whom?**						
1	Food for school children		1	2	3	4	5	6	7
2	Food for young or malnourish children or for PLW		1	2	3	4	5	6	7
3	Free food ration for household		1	2	3	4	5	6	7
4	Water treatment kits		1	2	3	4	5	6	7
5	Free fodder/animal feed		1	2	3	4	5	6	7
6	Free veterinary service		1	2	3	4	5	6	7
7	Free agricultural tools		1	2	3	4	5	6	7
8	Free seeds/fertilizer		1	2	3	4	5	6	7
9	Free healthcare/drugs		1	2	3	4	5	6	7
10	Infant formula		1	2	3	4	5	6	7
11	Food-for-work		1	2	3	4	5	6	7
12	Cash-for-work		1	2	3	4	5	6	7
13	Cash transfers		1	2	3	4	5	6	7
14	Plastic sheeting/tents		1	2	3	4	5	6	7
15	Cooking utensil		1	2	3	4	5	6	7
16	Clothes/blankets		1	2	3	4	5	6	7
17	Mosquito nets		1	2	3	4	5	6	7
18	Micro-credit		1	2	3	4	5	6	7
19	Other _____		1	2	3	4	5	6	7

Code:
1 = National Committee for Disaster Management
2 = Cambodian Red Cross
3 = Local authority
4 = Political party
5 = Temple
6 = Local NGOs
7 = International NGOs

VIII. Loan

Did you borrow money?	1 = Yes 2 = No	Borrowing purposes and codes										
1. Before floods		1	2	3	4	5	6	7	8	9	10	11
2. During floods		1	2	3	4	5	6	7	8	9	10	11
3. After floods		1	2	3	4	5	6	7	8	9	10	11

Code:
1 = pay back original loan, 2 = buy food for household,
3 = buy agricultural input, 4 = pay school/education costs,
5 = buy/rent land, 6 = pay for ceremonies,
7 = business development, 8 = cover health expense,
9 = repair/reconstruct house, 10 = solve household conflicts
11 = other

4. Who did you borrow from?
   - ☐ 1. Bank
   - ☐ 2. Microfinance Institute
   - ☐ 3. Relative
   - ☐ 4. Friends/neighbors
   - ☐ 5. Saving groups
   - ☐ 6. Private money lender
   - ☐ 7. NGOs
   - ☐ 8. Others_____
5. Why did you choose to borrow from them (money lenders)?
   - ☐ 1. No interest
   - ☐ 2. Low interest rate
   - ☐ 3. Easy to borrow
   - ☐ 4. No mortgage
   - ☐ 5. Others_____

IX. Social capital

A. Networks

Now I would like to talk to you about the groups or associations, networks, and organizations to which you or any member of your household belongs. These could be formally organized groups or just groups of people who get together regularly to do an activity or talk about things.

	To how many groups or associations do you or any member of your family belong that	1 = Yes 2 = No	Have you benefited from groups or associations? 1 = Yes 2 = No
1	Relate to your main economic activity (for example, farming, fishing, trade, manufacturing, etc)?		
2	Deal with finance, credit or savings?		
3	Deal with health or education issues?		
4	Are political groups or associations?		
5	Are religious groups or associations?		
6	Other? (please specify……)		

7. Do you know everyone in the village? ☐ 1 = Yes ☐ 2 = No
8. If you are in trouble, is there anyone in the village willing to help you?
   ☐ 1 = Yes ☐ 2 = No
9. If you suddenly needed a small amount of money *(enough to pay for expenses for your household for one week)*, how many people beyond your close relatives would be willing and able to provide this money?
   - ☐ 1. No one
   - ☐ 2. One or two people
   - ☐ 3. Three or four people
   - ☐ 4. Five or more people
   - ☐ 5. Don't know

B. Trust

In every community, some people get along with others and trust each other, while other people do not. Now, I would like to talk to you about trust and solidarity in your community.

1. Generally speaking, would you say that most people in your community can be trusted?
   - ☐ 1. People can't be trusted
   - ☐ 2. People can be trusted
2. In general, do you agree or disagree that most of people in this village are willing to help each other?
   - ☐ 1. Strongly disagree
   - ☐ 2. Disagree somewhat
   - ☐ 3. Neither agree nor disagree
   - ☐ 4. Agree somewhat
   - ☐ 5. Strongly disagree

3. How much do/did you trust?

		1 = Believe 2 = Not believe 3 = Don't know
1	Village chief	
2	Commune councils	
3	District government officials	
4	Provincial government officials	
5	National government officials	
6	Religious leaders	

C. Local authorities

1. What are responsibilities of community leaders?
   - ☐ 1. Disseminate information,
   - ☐ 2. Provide consultation and try to solve villagers' problems
   - ☐ 3. Taking care of the villagers
   - ☐ 4. Road construction
   - ☐ 5. Building irrigation
   - ☐ 6. Building school/pagoda
   - ☐ 7. Building health center
   - ☐ 8. Create market for agricultural production
   - ☐ 9. Provide agricultural extension and new opportunity
   - ☐ 10. Provide job
   - ☐ 11. Providing suitable services
   - ☐ 12. Security
   - ☐ 13. Providing opportunity to people to get their livelihood
   - ☐ 14. Not so responsible for people
   - ☐ 15. Selfish
   - ☐ 16. Corruption
   - ☐ 17. Irresponsibility
   - ☐ 18. Partilism
   - ☐ 19. Don't know

2. Have your community leaders done anything to protect the community from floods?

   ☐ 1 = Yes ☐ 2 = No

3. Do you get any assistance from community leaders (before, during and after floods)?

   ☐ 1 = Yes ☐ 2 = No

4. Do village leaders encourage/motivate villagers to work together to cope with floods?

   ☐ 1 = Yes ☐ 2 = No

APPENDIX B

FOCUS GROUP DISCUSSION QUESTIONNAIRE

Date: ……..…… Starting time: …… Finishing time: …….....
Province: ……. District: …….. Commune: ……...…. Village: …….

Household Member (Household Head)

N^0	Question	1	2	3	4	5
1	Name					
2	Age					
3	Gender					
4	Education level					
5	Relationship with household head					
6	Main occupation					
7	Daily wage					
8	Monthly wage					
9	Number of household member					
10	Employed household member					
11	Household member under 5 years old					
12	ID Poor					
13	Housing condition					
14	Source of drinking water					
15	Toilet (Yes/No)					
16	Land assets (Ha)					

1. Flood situation		
1.1. What are the main causes of floods in your village?		
1.2. How deep was the water that you consider as severe floods?	Rice fields	
	Village	
1.3. How fast did water level increase that you consider as severe floods?	Rice fields	
	Village	
1.4. How long did floods stay that you consider as severe floods?	Rice fields	
	Village	
1.5. When do severe floods often occur in your village?		
1.6. How often do floods happen in your community?		

2. Flood impacts			
2.1. Food intake	How was your daily food consumption (food/drinking water)?		
2.2. Assets	House		
	Land		
	Livestock/poultries		
	Other assets		
2.3. Education			
2.4. Health	Diseases		
	Hygiene/sanitation		
3. **Flood coping mechanisms**			
3.1. Before flooding	What are sources of flood information you received?		
	Among all sources of flood information, which one is the most trustable?		
	What did you do for flood preparedness?		
3.2. During flooding	What did you do to respond to flood?		
3.3. After flooding	What did you do for flood recovery?		
4. **Factors influenced on coping capacity**			
4.1. Do you think what factors that influenced on your coping capacity to flood?			
4.2. What are differences of flood impacts on non-poor and poor households?	Non-poor household		
	Poor household		
4.3. What kind of assistances did you receive during flood period? From whom?	During flooding		
	After flooding		
4.4. What do you think about relationship among people in your community during flood period?			
4.5. What did community leaders assist your family during flood period?			
4.6. What should be done to reduce flood adverse impacts in the future?	Household level		
	Community level		
	National level		

APPENDIX C
KEY INFORMANTS' QUESTIONNAIRES

- **Chief of Ba Baong village**

1. How long have you been the chief of this village? How you are selected?
2. How many people and households in this village?
3. What are the three main sources of income for most households in this village?
4. Does the village have all weather roads? How many kilometers away from an all-weather road is this village?
5. How far is this village to national road?
6. Is there any school in this village? How many schools are there in this village? Where are they? Which level of education the school provides?
7. Was there any damage to school infrastructure due to floods?
8. What medical services do villagers normally use? Where are they?
9. Was there any damage to health facilities due to floods?
10. How many religious institution (temple, church..) are there in this village? Where are they? How long have they been built?
11. Are there any safety hills in this village? How many? Where are they? How big are they?
12. What percentages of households in this village have public or private electricity, including generators but not include batteries?
13. Were these sources of electricity disturbed by floods?
14. What is the major source of drinking water for most people in this village?
15. Was this major source affected by floods?
16. What is the major source of drinking water for most people in this village during floods?
17. Is there presently and project functioning in this village?
    - Agricultural development (e.g. land development, seed distribution, fishery, animal health, irrigation)
    - Infrastructure development (e.g. road development)
    - Education/adult literacy programme
    - Health

- Water project (bore wells, tanks, dams)
- Village development committee
- Others (specified)

18. How many NGOs working in your village? What are their focuses?
19. Current situation of floods (magnitude, duration, speed of onset)
20. Trend of floods (frequency, historical performance, probability)
21. Hydrological situation
22. Statistics/data related the damages (people, goods, infrastructures, and environment)
23. Adaptation options that people have done so far to deal with the disasters; suggestions and recommendations for improvement
24. Who are the most vulnerable group?
25. What do you think are causes of vulnerability on the village?
26. Village chief's roles and responsibilities before, during, and after floods
27. What are policies for aids distribution to flood victims?
28. Have you organized villagers to make plan around coping with floods and submitted to commune council for consideration? Why?
29. Any ideas about the future assistance from commune council itself and other development agencies working in this village to really address people's difficulties from floods? How?

- **Chief of Ba Baong Commune**

1. Have people in Ba Baong commune perceived about floodh risks? How?
2. What are your roles and responsibilities before, during, and after floods?
3. How often you visit each village? Mostly when and for what purpose?
4. Have you taken any actions in responding to the difficult conditions of floods in Ba Baong commune? Why?
5. What are policies of CRC to distribute assistances to flood victims?
6. Do you have plan to help villagers in Ba Baong commune to cope with floods? What and how?
7. How do you work with your lower and upper levels?

8. Any ideas about the future assistance from commune council itself and other development agencies working in Ba Baong commune to really address to people's difficulties from floods? How?

- **Department of Hydrology and River Works**

1. Hydrological pattern in Cambodia and Prey Veng
2. Current situation of floods (magnitude, duration, speed of onset)
3. Trend of flood (frequency, historical performance, probability)
4. What are the main flood impacts on local people?
5. What do you think about adaptation capacity of villagers?
6. What are factors that make them able to cope with flood?
7. Organization's roles and responsibilities before, during, and after the disasters
8. How does your institution work with other ministries and NGOs?
9. Relevant policies, regulation frameworks, agreements

- **Save the Children Organization**

1. How long has your organization presented in Prey Veng Province?
2. How many district that your organization had been working with in Prey Veng Province? What are they?
3. What are your organization's roles and responsibilities in this province?
4. Why does your organization focus on humanitarian response in Prey Veng Province?
5. What do you about coping capacity of a community for coping with floods?
6. How did your organization assist villagers in case of flooding?
7. How did your organization approach villagers?
8. Has your organization monitored or evaluated the effectiveness of those provided assistances? How?
9. How did you help children, families and communities build their capacity for disaster preparedness and risk reduction?
10. What are your organization's achievements in this province?
11. Do you think what organization is working on is enough to build resilience community?
12. How does your organization work with upper level?

13. Any ideas about the future assistance from your organization working in Prey Veng Province to really address people's difficulties from floods? How?

VITA

Miss Vimoil Ourn earned her Bachelor's Degree in Economic Development from the Royal University of Law and Economics (RULE) in 2009. She also completed a B.A of Arts in English for Translation and Interpreting at the Institute of Foreign Language (IFL) in 2011.

After graduating, she worked for Smart International Consultant as a Managing Director assistant. In 2011, she made a move from private company to research institute. She worked as a programme assistant at Cambodia Development Resource Institute (CDRI).

She won a fully fund scholarship to study Master's Degree in Environment, Development and Sustainability at Chulalongkorn University.