Re-visiting Cyclone Nargis of Myanmar: vulnerability, resiliency and the dynamics of recovery in the Ayeyarwady Delta

A dissertation submitted

to the Australian National University in partial

fulfillment of the requirements for the

degree of Doctor of Philosophy

by

Myint Zaw

April 2017

Declaration of originality

I, Myint Zaw, declare that this thesis, submitted in fulfillment of the requirement for the award of Doctor of Philosophy, in the Crawford School of Public Policy, College of Asia and the Pacific, the Australian National University, is wholly my own work unless otherwise referred or acknowledged. This thesis has not been submitted for qualification at any other academic institutions.

Acknowledgements

I would like to thank to Dr. Helen James for bringing me to the finish-line with comments, suggestions and care. I am also grateful to Dr. Megan Poore who brought me back to track whenever I wavered in this PhD process. May I also say thanks to my supervisor Dr. Daniel Cornell who accompanied me in various endeavors of my academic journey.

For a pleasant time in the Stanner Building of Crawford School and Graduate House, I would like to thank Ma Nilar Aung, Ma Khaing Khaing Soe, Thin Pyie Oo, Su Lay Nyo and Ma Su Su Lin.

For my field work and data collection, my thanks go to Nyan Thar, Ma Mi, Ma Su Nandar Lwin, Ko Zu Gyi and Pho Naw as well as people from Paung Ku. I also thank to all the villagers and community-based organizations from 45 villages from the Delta. The research is as much of their contribution as mine.

My thanks also go to Mr. Trevor Wilson who helped me in final process of thesis. For professional copy-editing support, I also say my sincere thanks to Ms. Karin Hosking.

Without the Australia award scholarship, this research and academic journey could not have happened. Thanks to DFAT for its generous support. My appreciation also extends to Ms. Billie Headon, Ms. Ngan, Ms. Ida and Ms. Aishah from the Crawford School for their kind support.

I am fortunate to receive much love and support from my mother – Daw Myint Myint, Ko Thet Hlaing, Daw Tin Tin Win (Ju), Saya Tar, Saya Kyaw Thu and Kay. It is my hope and inspiration that my work will reflect their *Mettā* (love) and *Pyinnya* (wisdom) as in indication of my gratitude to them.

Abstract

In 2008, Cyclone Nargis devastated the low-lying Ayeyarwady Delta and more than 150,000 people died during the storm. It was the worst natural disaster in Myanmar's history and globally it was one of the deadliest cyclones of all time. This thesis assesses the implications of Cyclone Nargis for the human security of delta communities in the past and the future.

Using Cyclone Nargis as the focus event, the research investigates multiple dimensions of pre-existing vulnerability, strengths and weaknesses in the early warning and emergency response systems, and the dynamics of post-impact recovery. It argues that the roots of vulnerability and resilience were situated in the history of the national political regime in place at the time of the cyclone. The research is based on community narratives collected in 45 villages from three different marginal zones of the Ayeyarwady Delta.

This study argues that disaster risk reduction and the promotion of human security in the Delta requires the expansion of community-based processes focusing on building community resilience and the better utilization of locally relevant physical assets for improved safety. These lessons from Cyclone Nargis should be incorporated into the national DRR framework. More broadly, beyond Myanmar this place-based study of rural communities should inform the connected issues of development, governance and disaster risk reduction.

Acronyms

ASEAN	The Association of Southeast Asian Nations
APBU	Asia-Pacific Broadcasting Union
BBC	British Broadcasting Corporation
BSPP	Burma Socialist Programme Party
CDMA	Code division multiple access
CHS	The Commission on Human Security
CIA	Central Intelligence Agency
DaLa	Damage and Loss Assessment
DFAT	Department of Foreign Affairs and Trade
DFID	The Department for International Development, United Kingdom
DMH	Department of Hydrology and Meteorology, Myanmar
DRR	Disaster risk reduction
Eco-DRR	Eco-system based disaster risk reduction
EWS	Early warning system
FAO	Food and Agriculture Organization
FEMA	Federal Emergency Management Agency
GAD	General Administration Department
GFDRR	Global Facility for Disaster Reduction and Recovery
GIS	Remote Sensing and Geographic Information Systems
GTS	Global Telecommunication System

HFA	Hyogo Framework for Action
ICT	Information and Communications Technology
IDSN	International Dalit Solidarity Network
INFORM	Index of Risk Management
IHLC	Integrated Household Living Condition
JICA	Japan International Cooperation Agency
MDRRWG	Myanmar Disaster Risk Reduction Working Group
MHA	Ministry of Home Affairs
MICS	Multiple Indicator Cluster Survey
MIMU	Myanmar Information Management Unit
MOI	Ministry of Information
MTSAT	Multifunctional Satellite Images
MSWRR	Ministry of Social Welfare, Relief and Resettlement
NGO	Non-governmental Organization
PAR	Pressure and Release
PONJA	Post-Nargis Joint Assessment
PONREPP	Post-Nargis Recovery and Preparedness Plan
R2P	Responsibility to Protect
RMSC	Regional Specialized Meteorological Center
RSMC	Regional Specialized Meteorological Centre
SPDC	State Peace and Development Council

SLORC	State Law and Order Restoration Council
TCG	Tripartitie Core Group
UN	United Nations
UNDP	United Nations Development Programme
UNESCAP	The Economic and Social Commission for Asia and the Pacific of the United Nations
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UN-Habitat	United Nations Human Settlements Programme
UNICEF	United Nations International Children's Emergency Fund
UNISDR	United Nations International Strategy for Disaster Reduction
UNTHS	UN Trust Fund for Human Security
VDRMC	Village disaster risk management committee
VTA	Village Tract Assessment
WFP	World Food Programme
WMO	World Meteorological Organization

Table of Contents

List of Figures

List of Tables

List of Boxes

Chapter 1

Introduction

The main objective of this dissertation is to analyze Cyclone Nargis in its three phases: pre-impact vulnerability, impact (storm emergency) and the post-impact recovery. Events along this horizontal timeline are investigated within the vulnerability, resilience and human security dimensions of the rural communities in the Ayeyarwady Delta of Myanmar. This empirical study, based on Cyclone Nargis's exposure to the 45 villages of the Delta, explores the community's experience of struggle, survival, and revival along with the community's vertical linkages to national governance, and different political regimes.

I started this research with the simple question 'Why was Cyclone Nargis so deadly?' Then the question expanded to 'Which assets' and 'What processes' helped individual survival and that of the community? Recognition of the importance of assets for people's wellbeing is common in various livelihood studies (Ellis 2000; DFID 1999). In a village, assets appear as natural- and physical-disaster resilient features within the community. Nunan (2015) described the role of assets as not just being used but which 'give people capability to be and to act. Assets can be a source of power' (p.112). A 'process' refers to an action or a series of actions of a community to attain and maintain these safety assets and capabilities. In this study, community-based resilience knowledge that focuses on assets and process was drawn from three heavily impacted areas of the Ayeyarwady Delta.

Cyclone Nargis not only ushered in dynamic civil society as a resilience aspect but also exhibited the tragic vulnerability of the people. More than 150,000 people were lost in the storm. In this introductory chapter, I will explain why the vulnerability, resilience and recovery aspects of Cyclone Nargis in remote villages were prioritized as crucial areas to examine. These explanations will be in the problem statement, followed by the significance of the research, research objectives, and research questions. Then, I will provide a brief background to Cyclone Nargis and a profile of the Ayeyarwady Delta.

1.1 Statement of the problem

In comparison with cases of other mega-disasters, many aspects of Cyclone Nargis have not yet been explored due to restricted access to the Delta under the military regime that ruled the country from 1988 to 2010 before it handed over power to the semi-civilian government of President Thein Sein after the 2010 election. Currently, in a less-restrictive time of political transition, led by the National League for Democracy party which won a majority of seats in the parliament in 2015, Cyclone Nargis has become a nearly decade-old story and started to fade from collective memory. The purpose of this study is to revisit one of the deadliest disasters in history to locate community resilience and human security implications.

When U Thein Sein, the President of Myanmar from 2011 to 2015, left office, he claimed that a series of spontaneous reforms had contributed to the political stability and economic progress of the country (Chongkittavorn 2017). In the five years of his administration, he named some positive indicators of reform – such as the spread of communication technology, higher political freedom, ease of restrictions on the censorship, economic performance and lowering national poverty, as 'remarkable achievements'. While this progress is encouraging compared to the dismal state of affairs under the previous military regime (1988-2010), deep-rooted vulnerability and development challenges still exist.

From 2006 to 2016, Myanmar experienced two major earthquakes, three severe cyclones, floods and other smaller scale hazards (OCHA 2016). According to the UN risk model, Myanmar is ranked number one as the 'most at risk country' among other Asian and Pacific counterparts (OCHA 2016). In 2016, Myanmar ranked second out of 187 countries in the Global Climate Risk Index and nine out of 191 countries in the Index of Risk Management (INFORM 2017). Myanmar also has a high likelihood of medium-to-large-scale natural disasters occurring nearly every two years (Peer 2013). While several structural adjustments have been underway in disaster risk reduction policies (DRRWG 2013) in parallel with the ongoing political transition of the country, the vulnerability level for natural hazards is still high and critical areas of disaster risk

reduction, preparedness and adaptation still need to be significantly enhanced. In this regard, Cyclone Nargis could offer many lessons.

The historical memory of Cyclone Nargis itself is fading as time passes on. Yet, questions such as, 'What contributed to the disaster apart from the biophysical aspect of cyclone hazard?' and 'What do we need to do to prepare for future hazard scenarios?' still need detailed explanation. Blaikie et al. (2004) stated that disasters are 'a complex mix of natural hazards and human action' (p.5). In the context of Cyclone Nargis, human actions in terms of national political regimes and policy impacts to communities' vulnerability still need to be examined in detail, and still need to go beyond casual reference to linkages as much as possible.

Impacts and implications of the military regime's policies on several aspects of Myanmar, such as health, education and the economy, were already under scrutiny in various studies. But the impacts of policy on the specific geography of the Delta and the people living there in the context of Cyclone Nargis still need to be explored further. This study attempts to do that by revisiting Cyclone Nargis in multiple dimensions and situations of vulnerability, resiliency and recovery in national political context.

The lack of human security was a critical issue affecting the people of Myanmar for decades and was most visibly revealed in the aftermath of Cyclone Nargis's landfall when the government tried to block aid to the Delta. The core meaning of human security is stated in the UNDP 1994 report as 'protection from sudden and hurtful disruptions in the patterns of daily life – whether in homes, jobs or in communities' (UNDP 1994, p.23). The current political transition raises hope of progressing towards a more secure and prosperous Myanmar. Myanmar, in this particular time of change, needs to configure the implications of frequent disasters to poverty, human development, and human security. Observation of community processes and assets for resilience under different political regimes, past and present, can inform policy formulation for human security. As Blaikie (2004) notes, disasters inhibit societal progress in many ways (Blaikie et al. 2003).

Two gaps were noted here as regards Cyclone Nargis. The first gap is difficulty in getting community narratives, especially from the people who lived there, experienced the storm, and have been enduring the post-impact phase. Until the recent political changes their voices were not fully heard, and community aspects before and after Cyclone Nargis have not been fully incorporated into disaster risk reduction knowledge. Especially for early warning systems, community aspects are crucial for the effectiveness of the system. Cyclone Nargis identified issues and areas that could undermine early warning processes and did not effectively help to save people lives.

The second gap comes from the challenge of connecting and studying different marginal areas of the Delta due to geographical barriers of complex waterways. As Bankoff (2003) noted, no disaster has the same impact on everyone. In this context, marginality and aid inequality happened after Cyclone Nargis with continuing impacts on the recovery process. The differences among social structures and the different geographical entities in the regions affected by Cyclone Nargis need to be analyzed for effective humanitarian and developmental work in Myanmar and beyond.

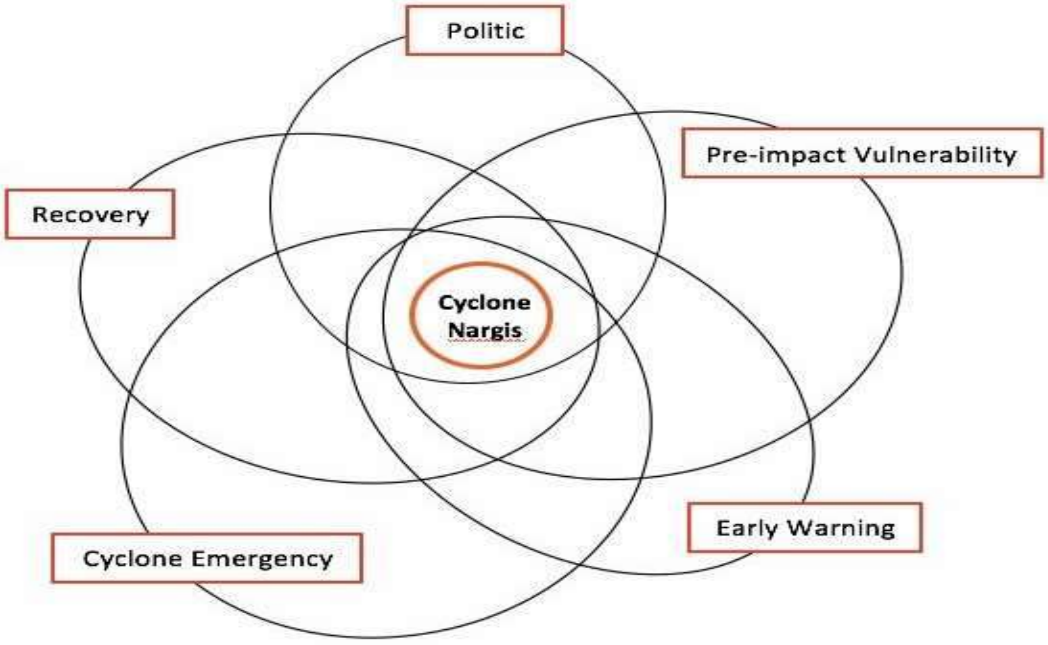

Figure 1 **Dimensions of Cyclone Nargis focused on in this study**

Thus, this study assumes that the dynamics of community in the context of Cyclone Nargis will shed light on various factors that could build or undermine human security and resilience. As shown in Figure 1, this research will explore Cyclone Nargis from pre-impact vulnerability, early warning system, cyclone emergency and recovery aspects while impacts and influences of national political regimes will be analyzed along with community experience.

The disaster revealed vulnerability as well as the resilience of the community. Community resilience exists in various ways even under difficult situations. In the Delta, as in most parts of Myanmar, village community is the smallest administrative unit; there are 63,860 villages in the whole country. It is these small-unit communities that have to grapple with the consequences of disasters and development that often originate beyond their domain. Community resilience is often exhibited in the form of collective community efforts in these villages. Cyclone Nargis offers a deeper understanding of what contributes to local communities' resilience in struggle, survival and recovery from disaster. Few of these aspects have been explored so far and they can provide strategy to enhance resilience and long-term human security.

1.2 Research objectives

The general aims of this study are:

(1) To capture multidimensional disaster vulnerability and resilience in the pre-impact phase in communities of the Delta in the context of Cyclone Nargis.
(2) To identify crucial aspects of early warning, evacuation and coping capacity in the storm emergency or impact phase of Cyclone Nargis from the perspective of community as well as the government and other institutions.
(3) To assess the capital, capabilities and resilience process of communities and to explore human security linkages to socio-political and environmental change factors.
(4) To understand the factors that contribute to recovery, resilience and disaster preparedness in the post-impact phase, which is characterized by changes in civil society and the national-level policy framework.

1.3 Research questions

The research questions to provide guidance to the whole process of examining the three regions of the Delta are as follows:

(1) What are the conditions that caused vulnerability in the Delta community before Cyclone Nargis and how have these conditions been changing over time under different political regimes in Myanmar?
(2) What contributed to the differential impacts of the early warning and evacuation processes of the different communities against the backdrop of the actions or inactions of the government and institutions to ensure human security?
(3) How do the village communities assess their recovery processes and outcomes in the three research zones and how do their assessments identify issues in the resiliency and human security of community?

1.4 Scope of the research

This study traces back to the dynamics of resilience along the horizontal timeline of the pre-impact, impact (storm emergency), and post-impact phases in the community's experience in the three selected research zones. Using primary sources from the village narrative as the basic research component, additional content from expert interviews, and secondary sources such as media content and official documents were incorporated into this research.

Besides the justification that village selection was made based on geographical positions at the margin of the Delta, the three different zones for the research were constructed based on the time scale of the landfall of the cyclone at each place. Zone I was the very first area where the cyclone made landfall and the storm path passed directly through it. Then the cyclone track passed near the Zone II area. It then continued to the upper Northeastern part of the Delta and affected Zone III. All three zones were highly impacted areas and suffered from the storm surge with high loss of life and property. The field studies in the three different zones permitted me to compare similar or differing experiences in each phase of the cyclone time line.

There are several limitations regarding the scope of the study. Firstly, exploration of pre-existing vulnerability needs the research to trace back to historical accounts and policy literature whenever impacts on the Delta are implied. Vulnerability indexes or quantified indicators of the Delta before Cyclone Nargis are very rare. This limitation partly comes from the difficulties of collecting data under a military government for decades. Yet, some socio-political analysis is available to identify causal links to vulnerability.

Another limitation of this research comes from the limited focus on individual and household levels because the data were collected mostly in focus group discussions representing the village level. As the community's initiatives and experiences are at the center of this inquiry, the field study intended to provide village-level information rather than for household and individuals. Although this approach allows collective narratives to emerge and instant verification of accuracy in a village community setting, household-level dynamics and measurements could not be provided in this research.

Finally, as stated in the analysis on the recovery phase, disaster risk reduction aspects can only be covered in the recovery phase with a focus on community's processes and safety assets regarding disaster preparedness. This limitation comes from overlapping boundaries between relief, reconstruction, short-term and long-term recovery. As human security focus in the context of disaster is central theme in this research, a narrower scope of the study was formulated to look at the whole recovery process with a focus on disaster risk reduction. In this regard, the dynamics of changes within the community are explored to locate possible opportunities, and missed opportunities to build community resilience and reduce vulnerability.

1.5 Significance of the research

Regardless of remarkable economic growth in recent decades, inequality is still rising and too stubborn to be alleviated in Asia. As Bankoff (2003) argued, 'the most vulnerable are the poorest; that billion or so of humanity whose extreme poverty leaves them little choice but to continue living in marginal urban and rural areas most at risk from these hazards' (Bankoff 2003, p.18). An estimated 500 million people remain

trapped in extreme poverty (UNESCAP 2016). In the current climate change context, ordinary citizens living in unevenly vulnerable areas have increasingly been suffering from the climate-induced disaster. Especially in Southeast Asian countries where the temperature is predicted to rise about 3 to 4°C over the next 80 years, economic loss in these countries is likely to hinder the effectiveness of poverty reduction policies and programs. As Special Advisor to the Secretary-General on Human Security, Ms. Mehrnaz Mostafavi, Chief of the United Nations Human Security Unit stresses,

> When seriously thinking about all of the dimensions of DRR, measures similar to the human security approach naturally come to the forefront. But I believe that by making the human security approach more explicit in our disaster risk reduction efforts, we will be able to better plan and prepare for disaster prevention without leaving the most vulnerable people behind. (Speech at Tohoku University, Miyagi, Japan on 17 March 2015)

This study which revealed a pattern of human vulnerabilities and resilience in the disaster-affected region of one of the poorest Asian countries explains that human security approach has much potential to contribute to disaster risk reduction policy-making in impoverished part of Asia that needs a variety of coping strategy. Understanding emergency risk management in the authoritarian state with a very weak DRR institution also carries lessons about the danger of top-down decision-making that undermines the safety of the people.

The existing body of literature on Cyclone Nargis is concentrated on the following issues:

(1) Responsibility to protect (APCFR2P 2008; Barber 2009; Bellamy and Beeson 2010; Haacke 2009; Junk 2016; Kovach 2013; Özerdem 2010)
(2) Political impacts of Cyclone Nargis on future democratization (Cheesman et al. 2010; International Crisis Group 2008)
(3) Human rights violations at the time of Cyclone Nargis and politics of aid (Belanger and Horsey 2008; Grey 2009; Human Rights Watch 2010; Lwin 2015; Martin and Margesson 2008; Sari 2012; Seekins 2009a; Seekins 2009b; Selth 2008; Stover and Vinck 2008; Than 2009)

(4) Disaster diplomacy and the role of ASEAN from an international relations perspective (Amador 2009; Haacke 2008; Kapucu 2011; Lateef 2009; Roberts 2014)
(5) Role of civil society (Center for Conflict and Peace Studies 2009; Kramer 2011)
(6) Public health (Htut 2015; Guha-Sapir and Vogt 2008; Kim et al.2010; Shwe et al. 2013)
(7) Environment and forestry (Aung et al. 2013; Driel and Nauta 2014; Fritz et al. 2009; Theilen-Willige and Pararas-Carayannis 2009; Leake 2013; Lin et al. 2009; Pattanaik 2009; Saito et al. 2010; The Global Facility for Disaster Reduction and Recovery 2013; UNEP 2009)
(8) Science of Cyclone Nargis (Casey 2008)
(9) Impacts and social vulnerability (South et al. 2011)
(10)Recovery experience (James and Paton 2015; Wai 2015; Win et al. 2011).

While many studies have focused on particular issues related to Cyclone Nargis within a given timeframe, this study moves along the timeline of Cyclone Nargis and attempts to consider little-known areas of early warning and analysis on the community struggle at storm emergency. This knowledge is expected to enhance disaster risk reduction work in Myanmar. Short-term and long-term recovery phases were also analyzed from the perspective of the community's safety and human security to understand resilience and vulnerability of the present-day Delta.

This research tries to add new knowledge on Cyclone Nargis, the Delta region and disaster risk reduction of Myanmar in two ways: (1) The study brings marginality aspects and explores the village communities situated at the edge of the Delta to discover how the issues of vulnerability and resiliency are constituted, and (2) the study attempts to link a micro narrative of the local communities and a macro narrative of national regimes and institutions. Together with other studies on Myanmar, this research is expected to serve in advancing community resilience and human security.

1.6 Background to Cyclone Nargis

On 2 May 2008, the day started as normal for many of the residents of the Delta even while they kept hearing news of a storm over the Bay of Bengal. As it was around the onset of the monsoon, the farmers started to work in the fields for the rice-growing season and the fishing folks were winding down at the end of the summer fishing season. Internal migrant workers on the salt production farms also worked in the field to complete their annual seasonal jobs.

A mother left her three children at home and followed her husband who had already gone to the paddy field to live there temporarily for a time-bound harvest. The farm hut was far from the village and other farmers from the village were also reaping the yield of summer paddy in the field. They were believed dead as survivor friends saw them struggle before drowning by drifting along the storm wave. Their three surviving children found themselves orphans on the very next morning of 3 May 2008.

In a Karen village called Sar Chat from Ngapudaw, a group of church-based volunteers and university students who were regarded as the brightest and most trusted in their village set out with a boat to go to another Christian village to join a social gathering. Apart for one student, the whole boat perished in the cyclone. The storm surge deprived the village of its potential leaders. All the hope and energy of almost two dozen families also disappeared.

In less than 24 hours after the initial landfall in the Delta, more than 150,000 people died and 2.4 million out of 4.7 million survivors living in townships were severely affected (Mathieson 2009). While several thousand lives abruptly ended overnight, millions of survivors were in distress, struggling to live and rebuild their shattered lives. Since 1990, Cyclone Nargis was the second deadliest storm in the world after Cyclone Gorky in Bangladesh in 1991 (Doocy et al. 2013).

Cyclone Nargis started out as a low-pressure system that formed in the Bay of Bengal on 27 April. The India Meteorological Department declared that the low-pressure system had strengthened to a tropical depression and later upgraded it to cyclone status, which is equivalent to a Category 1 hurricane, on 28 April 2008. On that day, the

cyclone remained stationary over the warm Bay of Bengal with a higher intensity due to high pressure ridges to the northwest and southwest.

On the morning of 29 April, there was wind of 100 mph (161 km/h) which is the equivalent of a Category 2 hurricane. Later on that day, it later weakened and began to move in the northeast direction. It was also downgraded to a tropical storm (NASA 2008). On 1 May, it began to intensify rapidly and tracked back to the east while returning to cyclone status. By 2 May, it reached peak intensity with winds of 135 mph (217 km/h), which is the equivalent of a Category 4 hurricane. With the same or greater intensity, Cyclone Nargis made landfall in the Southwest of Myanmar on 2 May 2008. When the storm moved inland, it remained strong especially when it passed along the coast of the Ayeyarwady Delta. This is a normal pattern that can be exhibited by a cyclone as it moves over land. When it reached Yangon in the late night of 2 May and the early morning of 3 May, the wind speed was still 80 mph (129 km/h, Category 1). After moving inland in a northeast direction, the system dissipated on 3 May 2008 (Hurricane Science 2008).

After the cyclone's landfall, the following issues appeared in media headlines around the globe:

- Deadly impacts of the cyclone
- Questioning if the government failed to warn its people
- The military government's blockage of aid from foreign countries and initial restrictions upon the movement of civil society inside the country
- Proposition of the forced delivery of aid according to the principle of the 'responsibility to protect' and positioning of US and French naval ships along the Myanmar coast but, later the proposal was withdrawn
- Flurry of disaster diplomacy involving the United Nations, United States of America, the European Union and the Association of Southeast Asian Nations (ASEAN)
- High profile visit of the UN Secretary General to urge the military regime to open a normalized aid channel

- Remarkable efforts of civil society inside Myanmar to help the disaster survivors in the Delta
- Agreement with ASEAN to form a coordination body for humanitarian aid and recovery of the Delta.

1.7 Background to the Ayeyarwady Delta

The Ayeyarwady (Irrawaddy) River is Myanmar's largest river (about 2,170 km long) and the country's most important commercial waterway, with a drainage area of about 411,000 km^2 (Kravtsova et al. 2009). The Ayeyarwady River starts in Kachin State, at the confluence of the Mali Hka and N'Mai Hka Rivers, and bisects the country from the north to the south. The Delta branches into several mouths forming an extensive alluvial plain and empties into the Andaman Sea. Kravtsova et al. (2009, p.247) discuss that the Ayeyarwady Delta was formed some 6,000 years ago, and has prograded since then. The head of the Ayeyarwady Delta is located 40 km downstream of the town of Myan Aung and 30 km upstream of the town of Hinthada. Being rich with alluvial plains and marine deposits, the Delta extends to cover an area of 31,000 km (Brichieri-Colombi 1983) that is as wide as 204 km from west to the east on a straight line and as long as 290 km from north to the south (Simmance 2013). Hedley et al. (2010) cited Aung (2003) that the tidal influence extended up to 300 km inland with penetration of saline water around 100 km upstream.

Administratively, most of the Delta falls into the Ayeyarwady Region (until 2011 'Regions' were called 'Divisions'; that is why the old name was 'Ayarwaddy Division'). The Ayeyarwady Region alone is composed of 26 townships and the capital, formerly known as Bassein, is now called Pathein (Seekins 2006). In the whole Ayeyarwady Delta, the rivers and creeks are interwoven and most of the villages, towns, farmland and forests are flat except for some low hills (Volker 1964). The river's sedimentation together with seasonal flooding is important for rice growing and it has made the Delta one of the world's major rice production areas (Than 2001).

Due to its fertile soil for agriculture, the population density of 85 people capita per square kilometer in 1964 was more than three times higher than the country average at that time (Volker 1964). In comparison with the 3.5 million population size of the

whole Delta in 1964 (Volker 1964, p.4), the population nowadays is two times higher (Department of Population 2015). Today, the Region alone has 6.17 million people according to the 2014 census. The Ayeyarwady Delta, combining the Ayeyarwady Region and the Yangon Region, remained the most populated area in the census. With both regions combined, over 16 per cent of Myanmar's population lives in the Delta. In terms of gender ratio, the female population is higher than the male population in the Delta. Although the Ayeyarwady Region is densely populated, over 86 per cent of the people live in rural areas. In the Ayeyarwady Region, rural population is correlated with agriculture and fishing as the whole region has very little industrial-based manufacturing. The rural population in the Ayeyarwady Region is even higher than the national average rate, equivalent to 70 per cent (Department of Population 2015). A list of the villages participated in this research are shown in Appendix 1.

1.8 Chapter overview

Chapter 1 Introduction

This chapter justifies why Cyclone Nargis in Myanmar in 2008 needs revisiting for the purpose of inquiring into human security and resilience. In comparison with other mega-disasters, the number of past studies on Cyclone Nargis is still limited, partly due to limited access to Myanmar under the long military rule. This chapter explains the objectives of the study and reasons for the framing of the problems in the context of the past- and present-day Delta in relation to vulnerablity and resiliency. This chapter also provides a brief outline of Cyclone Nargis, the Ayeyarwady Delta and its socio-economic background for easy reference when research progresses in the next chapters.

Chapter 2 Literature review

This chapter situates Cyclone Nargis research in human security concepts. It makes the case that state security under the previous military regime weakened the human security of citizens as illustrated during Cyclone Nargis and in its aftermath. This chapter analyzes the current state of knowledge of human security, linking the concepts of vulnerability and resilience in the context of disaster. The chapter also

assembles existing literature on Cyclone Nargis to update and locate existing gaps so far in fields related to disaster research and other disciplines that emphasize the impact of the storm on communities in the Ayeyarwady Delta.

Chapter 3 Research methodology

This chapter explains the choice of theory, method and design, and data analysis tools linked with outcomes in the findings. Primarily, it justifies the use of a qualitative approach for disaster research using a case study method. It outlines the organization of field trips while reasoning for the selection of research sites to retrieve community narratives from villages at the different edges of the Delta. This chapter also explains how the C Model of Quarantelli (1987) and process tracing were applied to data collection and, in the next step, data organization and data analysis. The use of secondary data such as media, academic literature, government reports, and other types of documents is also explained in the data triangulation process to validate the results of the field research. Geographical profiles of the three research zones (spread out in four townships) are provided in this chapter.

Chapter 4 Road to vulnerability

This chapter examines Myanmar in general and the Delta society in particular under different political regimes in order to explain existing vulnerability before Cyclone Nargis made landfall. Relying mostly on historical accounts in combination with historical community experience, this chapter makes the case for national policy impacts on the vulnerability of communities, weakening people's capital. It emphasizes the roots of the pre-existing vulnerability that weakened the human security of people when a hazard, in the form of Cyclone Nargis reached land. An increase of vulnerability in the Delta throughout the ages is also analyzed with an emphasis on the environmental decline attributed to weak natural resource governance in the 20 years before Cyclone Nargis.

Chapter 5 Revisiting the early warning system

Early warning is a major component of a community's disaster resilience. This chapter revisits debate over whether the Myanmar government took sufficient action to warn

the public about the approaching Cyclone Nargis. As can be seen from the huge loss of life (more than 150,000), the early warning system was obviously not functioning to save lives. This chapter examines how these shortcomings ended in disaster and how the community responded to the early warning system. The function of the early warning system is analyzed in its vertical order of information flows from the national institutional level, which involved institutions and political stakeholders, to the community level. After Cyclone Nargis the early warning system has been updated. This chapter gives an emphasis to the need for human capital and community initiatives at the receiving end of warnings so as to make the system successful.

Chapter 6 Community resilience and vulnerability in storm emergency

At Cyclone Nargis's landfall, the chaotic response of the former military regime resulted in a global outcry. The news about the initial blockage of aid and the debate over relief efforts on the international stage were in media headlines all over the world. The struggle and survival of local people during the storm were mostly drowned out in the urgent need for relief and reconstruction. Nevertheless, this chapter argues there is much to learn from the community's struggle during the impact phase (emergency during cyclone landfall). Based on the community narratives, this chapter identifies two aspects of the community crucial in emergency situations: assets for safety, mostly in the form of physical structures that are used as refuges to resist wind and storm surge, and processes for safety, mostly in the form of a community's sequences of actions to evacuate and support each other during the storm. Emergency response is discussed as a social process that supports crucial elements for safety while a shortage of stronger structures put limits on chances of survival.

Chapter 7 Dynamics of recovery

This chapter presents the results so far from the recovery process (long-term recovery which is assumed to still be ongoing). As the attention from the national government, and humanitarian and development organizations, mostly shifted to other areas and issues of Myanmar, the current state of the Delta is explained in the context of safety and sustainability, which directly correspond to disaster resilience. Recovery processes and an outcomes framework are utilized to assess the changes in a village community

while a comparison of the recovery outcomes in the three research zones outlines the factors that make a difference. The community's social networks for resource mobilization and engagement with the outside in the form of linking and bridging social capital were among determinants for reconstruction and recovery. The findings in this chapter show that local participation and ownership are the main attributes for building long-term resilience.

Chapter 8 Conclusion

Based on the results shown in the previous chapters that discuss the pre-impact, the impact and the post-impact phases of Cyclone Nargis, this final chapter synthesizes the findings from the aforementioned chapters and underlines the lessons that Myanmar needs to incorporate for disaster risk reduction in the Delta and Myanmar. This chapter also stresses that a community-based approach in early warning, disaster preparedness, and recovery is essential. However, the resistance of deep-rooted vulnerability can only be curbed when bottom-up initiatives of the people can bridge with the national disaster risk management policy framework that is committed to providing resources and knowledge. Enabling an environment for community members to enhance community processes and assets for resilience and human security is also highlighted in the conclusion.

Chapter 2

Literature review

2. Introduction

In a disaster, impacts can be mitigated when the human factors are carefully considered. Although hazards caused by 'nature' are often inevitable, 'the impact of natural disaster can be significantly mitigated by the right kind of human anticipation and policy, and significantly exacerbated by the wrong kind of human action' (Bacon 2014, p.36). Than (2007, p.177) recalls Myanmar's government position on security around the time of Cyclone Nargis as Myanmar's 'overwhelmingly state-centered national security perspective'. While national sovereignty, territorial integrity and national unity were the top agenda of the state, human security had been jeopardized in many ways (Than 2007). As Blaikie et al. (2004) noted, 'Disasters are a complex mix of natural hazards and human action' and the disaster event triggered by the 'natural' mechanisms, 'has often been complicated by human action – both by efforts to palliate the effects of disaster and by the social causation of vulnerability' (Blaikie et al. 2004, p.5).

The drivers of disaster vulnerability and resilience in the pre-impact phase, impact phase and post-impact phase of Cyclone Nargis in this study are examined in light of human security theory. Also, marginality is highlighted; as Suhrke (1999) noted 'if the essence of human security is reduced vulnerability, policies to this end could be aggregated into a 'human security regime' (p.273). Cyclone Nargis is set as one of the examples of the former regime's failure to incorporate a human security component in disaster risk management (Than 2009; Seekins 2009). In this study, people-centered and protective values of a human security approach (UN 2009) are applied to further investigate ways to reduce disaster vulnerability and increase resilience to disaster among the Deltaic communities. Conceptual links between human security and resilience, and the recovery process after Cyclone Nargis are explored in this chapter.

2.1 Human security

Human security is a concept that has been much contested since it was championed in the 1994 Human Development Report (UNDP 1994). At the end of the Cold War, the human security perspective emerged as a new way of looking at security by which people's lives are placed at the center (Acharya 2007; Matthew et al. 2009; Sen 2014). The human security approach has broadened 'the scope of security analysis and policy from territorial security to the security of people' (Gómez and Gasper 2013, p.2). In the context of the human security discussion, approaches to and understanding the security of the people have reoriented from being free from physical violence to the incorporation of other imminent threats that people are facing (Bacon and Hobson 2014b). Liotta and Owen (2006) argued,

> In ethical terms, human security is both a 'system' and a systemic practice that promotes and sustains stability, security, and progressive integration of individuals within their relationships to their states, societies, and regions. In abstract but understandable terms, human security allows individuals the pursuit of life, liberty, and both happiness and justice. (p.40)

The relationship between the state and the people was redefined by the introduction of the human security approach. Human security as a concept has been successful in challenging the predominant view of treating a military security structure as meeting national security priorities. Sen (2014), argues twenty-first censutry presents 'both the challenges to security and its protectors' in a much higher level of complexity (Sen 2014, p.27). Reflecting the realities, Sen concludes that 'The state remains the fundamental purveyor of security. Yet it often fails to fulfill its security obligations – and at times has even become a source of threat to its own people' (Sen 2014, p.27).

When human security was introduced by the Human Development Report of the UN, it clarified that human security cannot be equated with human development (UNDP 1994). In terms of definition, human development is defined as 'a process of widening the range of people's choice' while the people who live with human security 'can exercise these choices safely and freely' and 'they can be relatively confident that the opportunities they have today are not totally lost tomorrow' (UNDP 1994, p.23). In this report, the UNDP designates human security into seven categories: 'economic

security (freedom from poverty), food security (access to food) , health security (access to health care and protection from disease), environmental security (protection from such dangers as environmental depletion and pollution), personal security (physical safety from things such as torture, war, criminal attacks, domestic violence, drug use, suicide and traffic accidents), community security (survival of traditional cultures and ethnic groups as well as the physical security of these groups), and political security (enjoyment of civil and political rights, and freedom from oppression)'(UNDP 1994, pp. 23-33).

Thakur (1997) elaborated a broader meaning of human security as follows:

> Human security refers to the quality of life of the people of a society or polity. Anything which degrades their quality of life – demographic pressures, diminished access to or stock of resources, and so on – is a security threat. Conversely, anything which can upgrade their quality of life – economic growth, improved access to resources, social and political empowerment, and so on – is an enhancement of human security. (Thakur 1997, p.53)

In more than two decades, human security has expanded its space in terms of concept and policy applications. UNESCO called it a 'paradigm in the making' (UNESCO 2008, p.3). Helen James also stresses the space of civil society in the making of human security, saying: 'The human security discourse creates a special space in civil society-state relations in which state performance can be monitored and assessed' (James 2006, p.10).

2.2. Human security debates

In the context of global climate change, the human security problems coming from disasters are obvious downside risks, indicating that the safety and normal routine of daily life in many countries are disturbed by disaster than armed conflicts (Bacon and Hobson 2014b; Purvis and Busby 2004). In the definition of the Canadian government, human security means 'freedom from pervasive threats to people's rights, safety or lives' (UNESCO 2008, p.xx). While the UNDP and Japanese references to human security emphasize security from fear and want, the Canadian focus is on life-threatening threats and situations that constitute fear (Konrad 2006). The Canadian

approach is viewed as a narrower interpretation of human security, preventing physical violence and protecting civil rights only (Hobson 2014; Ewan 2007). The rule of the Responsibility to Protect (R2P) is primarily a tool that is developed out of the narrow version of human security according to the Outcome Document of the 2005 United Nations World Summit and the Secretary-General's 2009 Report (A/63/677) (UNGA 2009).

In the R2P principle, the UN recognized that the state carries the primary responsibility for protecting populations from genocide, war crimes, crimes against humanity and ethnic cleansing. If a state is obviously failing to protect its population, the international community must be prepared to take collective action to protect the population, in accordance with the Charter of the United Nations (UNSC 2015). Hubbard et al. (2011) argue that the human security approach in R2P can be misunderstood by some countries as justification for intervention. Moreover, R2P can only handle cases of human security in the form of threats of violence. As 'R2P still requires state-based and supranational response', it contrasts with a more holistic human security approach that brings engagement with multiple stakeholders including individual citizens, NGOs and all levels of government (p.338).

The Canadian approach and the Norwegian approach, which also favors protection of civil rights as an action of human security (Tadjbakhsh and Chenoy 2007), and the UN Trust Fund for Human Security expand the principle of human security in policy making that aims 'to protect the vital core of all human lives in ways that enhance human freedoms and human fulfilment' (UNTFHS 2009, p.5). It is noted that the limiting of human security to a narrower definition such as freedom from war or conflict is possible, yet does not reflect the yearning of people for security not only from the perspective of freedom from fear but also freedom from want (Acharya 2001).

However, there has been criticism for taking extensive fields of people-related issues, which Buzan calls 'normal politics' into the security agenda (Buzan 2004; Krause 1998; Mack 2004; MacFarlane and Khong 2006). Buzan (2004) rejects the idea of securitizing social and political issues as human security claiming that 'The idea also risks mixing up the quite different agendas of international security, on the one hand, and social security and civil liberties' (p.370). Critics also pointed to the vagueness of

the concept and its applicability to the policy realm (Ewan 2007; James 2014). An influential work by MacFarlane and Khong (2006) also criticizes the purpose of the human security concept for its applicability:

> Analysts who have examined the effectiveness of this instrumental use of the notion are doubtful whether it has been successful in persuading states to divert significant resources from military security to items associated with human security. (p.236)

When MacFarlane and Khong (2006) stressed the possible pitfalls of the human security concept, they pointed out that the concept extends to almost every threat that can undermine the wellbeing of the individual citizen, and it is likely that stakeholders will pick up the wrong priority among many other items calling for attention. Prioritizing the right issue at the right time is not easy, especially when all the threats may also mutually interact and create a series of complex outcomes when their causes and effects 'lump' together (MacFarlane and Khong 2006, p.241). They also argue that military measures will be installed everywhere if too many issues are put into a security platform (MacFarlane and Khong 2006).

The UN ruled out the potential of problem-solving for every human security issue with arms by clarifying the meaning of the human security approach in October 2012. Articles (c) and (d) of Resolution (66/290) of the General Assembly of the UN described the meaning of human security as:

> (c) Human security recognizes the interlinkages between peace, development and human rights, and equally considers civil, political, economic, social and cultural rights
> (d) The notion of human security is distinct from the responsibility to protect and its implementation
>
> (e) Human security does not entail the threat or the use of force or coercive measures. Human security does not replace State security. (UNGA 2012, p.2)

The critics of MacFarlane and Khong (2006) have also been counterchallenged by several proponents of human security (Owen 2014; Gasper 2010). Owen (2014) counterclaims that these two authors' proposal is to defend the place of old-fashioned (state) security studies:

> They aim to reserve the term 'protection' only for the protection of life against violent attack, as if protection of health, and protection of anything else against anything else, is not 'protection'. Security claims are claims of existential threat, meant to justify priority response. Attempts to limit such prioritization to one type of threat, such as threats of physical damage from physical violence, and/or one type of referent/target such as the state, are arbitrary. (Owen 2014, p.34)

After two decades of debate on conceptualizations of human security, a few authors have attempted to clarify the human security concept for applicability purposes by putting more emphasis on its protection-based policy orientation (James 2014; Owen 2014). Owen (2014) distinguished human security from 'neighboring concepts' such as human development and human rights. He also proposed that a broad definition that is used by the UN is the best so far for conceptual integrity but a new definition is also needed for policy relevance. His new definition of human security is 'the protection of the vital core of all human lives from critical and pervasive environmental, economic, food, health, personal and political threats' (Owen 2014, p.63). James (2014) defined human security in the context of disaster risk reduction policy, emphasizing- 'the sustainable protection and provision of the material conditions for meeting the embodied needs of people, and the protection of the variable existential conditions for maintaining a dignified life' (p.87).

Thomas (2000) agrees with this comprehensive approach in the pursuit of human security. The material needs of people such as food, shelter, education and healthcare must to be fulfilled but the non-material aspects of human security are not negligible. She insists,

> The qualitative aspect of human security is about the achievement of human dignity which incorporates personal autonomy, control over one's life and unhindered participation in the life of the community. Emancipation from oppressive power structures, be they global, national or local in origin and scope, is necessary for human security. (Thomas 2000, p.6)

Human security in this broader scope has a three-dimensional agenda as it encompasses security, development, and rights that are essential points in protecting individual human life and dignity (Tadjbakhsh and Chenoy 2007; UNTFHS 2009).

2.3 Human security in disaster risk management

In Amartya Sen's view, the challenge of development can be overcome only when deep poverty is eliminated and people can resist sudden and severe hardship (Sen 1999). Tadjbakhsh and Chenoy (2007) caution about development, saying 'development itself holds the seed of the raison d'être of human security' (p.99). These authors also add that 'sudden downturns can erase development gains' (p.115). Moreover, if governments fail to give timely responses to human security issues, hazards can also lead to political disaster: 'failure to deal with hazards that have a direct impact on the safety, security, and wellbeing of millions of people could endanger the legitimacy of their regimes, triggering political unrest' (Gerstl and Helmke 2012, p.136).

Disasters with potential to halt human development were discussed in the 1994 UNDP human development report as an integral part of environmental insecurity. Since disaster frequency has not abated in the last few decades but rather increased, the use of a human security approach in disaster risk reduction is now more widely discussed (Futamura et al. 2011). O'Brien and Barnett (2013) note that 'the prospects for human security are deeply affected by local and global processes of environmental change' (p.4).

The Japanese government has been promoting disaster risk reduction with a human security approach as an essential part of its foreign policy. The Japan International Cooperation Agency has promoted the human security approach in disaster risk reduction for its added value:

- The human security approach can emphasize the necessity of investing not only in hard infrastructure such as sea walls, earthquake resilient buildings, floodways, and early-warning systems, but also in soft infrastructure that make social systems more responsive and resilient. Planning and preparation for a disaster should include the understanding of the complexity of a society, such as ethnic composition and local history
- The people-centered aspect of human security could shed light on the needs of the most vulnerable in disaster affected areas. The elderly,

women and people with disabilities often suffer disproportionately in major natural disasters. In providing goods and facilities to disaster-affected areas, it is important to take into consideration gender and the needs of the most vulnerable. Otherwise, this well-intended humanitarian aid runs the risk of being of little use to these groups or even negatively affecting human dignity. Vulnerable individuals who are likely to be the most adversely affected by disasters should be given the opportunity to actively participate in the planning and preparation against disasters

- The human security approach can also encourage DRR activities to consider the importance of survivors' human security (Tanaka 2015).

In the context of Cyclone Nargis in Myanmar, human rights abuse and the failure of development were accounted as factors in increasing vulnerability and insecurity. When a powerful natural hazard in the form of Cyclone Nargis reached land, these vulnerabilities and insecurities resulted in human tragedy and disaster while the state-centric security agenda failed to protect people. Also, cyclone damage brought human insecurity to millions of people and the livelihood assets of people or relative wealth accumulation of families diminished, further linking human security issues and the disaster.

2.4 The human security in the context of Myanmar

At the regional level, ASEAN has made frequent reference to a people-oriented ASEAN and adopted it as a direction of association (Gerard 2014). Nevertheless, many countries in the region have been known to compromise human security for the sake of state security priorities (Nishikawa 2010). Acharya (2001) challenges the concept of 'comprehensive security' (p.443) that is often mentioned in the ASEAN context that focuses on economic development and social stability while the dignity of humans as individuals is largely discounted (UNESCO 2008). Most of the Southeast Asian governments claimed that human security is not something to be rejected. Nevertheless, there are some areas of tension between national security approach and state security in Southeast Asian countries (Acharya 2007). In 2005, Surin Pitsuwan, a former Thai Minister of Foreign Affairs and member of the Commission on Human Security told Acharya (2007) in a personal communication that:

> Where is human security in Southeast Asia: not very far? If there is any region that is suspicious of external involvement or jealous of the concept of sovereignty, it is Southeast Asia. The concept of sovereignty is still very sacred here. ASEAN is yet to adopt human security. (p.21)

In a long history of military dominance in Myanmar, regime security in the guise of state security is the main agenda of the military and ruling generals (Steinberg 2010). When Surin Pitsuwan called on the ASEAN community in 2000 to put human security at the center of policy-making in both development and international relations of member states, Myanmar was widely criticized for lacking concern for the security of ordinary people (Zaw 2000). At the time, at the ASEAN level meeting, Surin said, 'One cannot have support for human security and effectively pursue people-centered development if one is unable to ensure that people are protected from abuse, suffering, and deprivation.' Myanmar in 2000 was far from the concept of people-centered development that lies at the foundation of human security (Zaw 2000).

In the context of Myanmar before Cyclone Nargis, Ni (2007) called on the international community to reposition its engagement strategy and to move the Myanmar policy debate in a direction that could address both national and human security issues. Reflecting the paradox of the military government's worries about state security and people lacking human security, Ni asserted that,

> Burma is a national security state and its rulers are most acutely concerned about issues of security, personal, institutional and regime as a whole. Until and unless the threat, perceived or real, has been addressed effectively, the chances of addressing the broader – and pressing – issues of human security that affect highly negatively 50 million ordinary citizens of all ethnic, religious and class backgrounds are pretty slim. (Ni 2007, p.211)

In the Myanmar-focused studies of Helen James (James 2005; James 2006), a more comprehensive picture of Myanmar was shown when the world's focus was mainly on the political tension between military and opposition groups. James (2006) delved into the delicate issue of competing priorities in engagement with Myanmar in terms of development and politics, and suggested that,

> The question of which comes first – political reform or economic development

> –in order to enhance human security, is an 'egg and chicken' question. Burma/Myanmar has been waiting over 50 years to have a future and the societal problems are now so entrenched that it is immoral from one perspective, and impracticable from another, to put the future of over 50 million people on hold pending resolution of the political impasse. Freedom from want and freedom from fear are two aspects of the same issue; both must be satisfied if human security is to be enhanced. (James 2006, p.7)

Both Zarni (2005) and James (2006) attempted to shed light on the military government's focus on state-centric security policies, and at the same time they challenged the dominant view of the international community that emphasized less the people aspect and its associated freedom from want. In the context of rethinking the engagement policies of the west as regards Myanmar, the authors' call for human security contributed to bringing attention to the vulnerability of people caught between an oppressive government and the disengagement of the international community.

2.5 Human security issues in the study of Cyclone Nargis

At the time of Cyclone Nargis, Myanmar's military government was criticized for showing little concern over the surviving people in a humanitarian crisis (Than 2010; Thuzar 2015; Seekins 2008). Seekins (2008) argues that 'The junta has generally displayed little interest in the human security of the population, no matter where they live or what ethnic group they belong to'. Steinberg (2010) believes Cyclone Nargis expanded the existing 'crisis of human security' in Myanmar, which already suffered from poverty and growing disparity (p.11). Than (2010) asserts that the regime was the cause of chronic human security problems when he analyzed the socio-economic status of Myanmar before Cyclone Nargis. He also reminds us that the immediate situation after Cyclone Nargis was a 'chronic emergency' (p.140). Thuzar (2015) argues that 'the importance of human security in several of its dimensions was driven home to the military regime when the 2008 Cyclone Nargis struck Myanmar's delta area – the country's rice-bowl' (p.6). Again, Sari (2012) questioned, 'Did the government adopt the human security approach in the immediate response to the Cyclone Nargis or prioritize helping the disaster victims?' Sari considers that for Myanmar's military regime, human security concerns are slight and 'half-hearted' (p.118).

As indicated in these descriptions, the human security dimensions in Cyclone Nargis were mainly concentrated on the Myanmar government's handling of the disaster after Cyclone Nargis's landfall, when they put more efforts into blocking internal and external assistance for the disaster than into finding ways to help survivors in the devastated Ayeyarwady Delta.

2.5.1 Human security and R2P

Cyclone Nargis triggered debate around whether R2P should be applied to Myanmar in the context of a disaster (APCR2P 2008; Junk 2016; Weiss 2010). When the Myanmar government's response to the humanitarian crisis caused by Cyclone Nargis was delayed, the French foreign minister proposed to invoke R2P to force humanitarian assistance for survivors of the storm. However, France minister's proposal was rejected on the ground that the junta's restriction against relief supplies did not 'constitute a prima facie breach of one of the four crimes that the Responsibility to Protect applies to: genocide, war crimes, crimes against humanity and ethnic cleansing' (APCR2P 2008, p.3). The Asia-Pacific Centre for the Responsibility to Protect refused the use of R2P in the Myanmar case, contending that more life-saving actions could be achieved through other possible collaborative means with Myanmar and ASEAN governments rather than the misapplication of R2P. Özerdem (2010) instead proposed humanitarian diplomacy at the macro and micro levels as an alternative strategy (p.693).

The argument for R2P in Cyclone Nargis also came from Caballero-Anthony and Chng (2008). The authors argued that a strict interpretation of the R2P principle should be avoided in the case of an emergency, where the primarily responsible stakeholder, the state neglects taking action. They propose a more realistic R2P approach called, 'R2P-Plus'. In their definition, R2P-Plus is 'an approach that is responsive to different types of humanitarian crises, allowing for humanitarian assistance without resorting to military action' (p.138).

Selth (2008) also reminded us that international community must be realistic and the rhetoric of forced entry into a country on humanitarian grounds also needs caution in the context of Myanmar's military fear of invasion throughout its long history. Selth

reasons that only then could an effective strategy to help people and a country in crisis be formulated without negative consequences.

Nevertheless, Junk (2016) and Badescu and Weiss (2010) believed that the R2P debate has reached a new level of conceptual milestone for the norm development of R2P in the international arena, due to Cyclone Nargis.

2.5.2 Community security

Among the limited number of Cyclone Nargis studies, the personal security aspect of struggle and survival was small compared to the disaster diplomacy and political aspects. The empirical account of South et al. (2011) conveyed vivid pictures of devastated communities which were struggling at the time of the emergency. South et al. (2011) described the situation of local communities and their response strategies during Cyclone Nargis, and for several months afterward. Unlike many other studies that focus on the state's actions and inaction after Cyclone Nargis, their study reached out to the people and retrieved the voice of 'local agency' (South et al. 2011, p.113). It also discusses the multidimensional vulnerability that came out from the impact of Cyclone Nargis and the role of the local community in the disaster response. The focus on local voices is described as:

> There is not one local (grassroots) voice, but rather a variety of interests and identities, types of resource, and opportunities for and constraints on action and expression, at the community or village level. It is necessary to unpack these positions, in order to appreciate the complexity and richness of local agency and 'voice' (p.11).

Similarly to South et al. (2011), this study also tries to unpack the positions of communities, but the time scale of the study covers pre-impact, impact and post-impact phases of Cyclone Nargis with an intention to extend further by exploring diverse experiences and initiatives. In this way, the dynamics of local resilience, and sources of vulnerability, can be revealed in the perspective of community security and broader human security.

2.5.3 Recovery, social capital and human security

A few studies have examined short-term recovery and the social processes of communities. These studies have demonstrated that social capital has helped the short-term recovery phase of communities in various ways. Through social networks, affected communities acquired resources and capital to rebuild their lives. Moreover, bonding social capital has helped people recover from the traumatic experience of Cyclone Nargis in many ways (Ayers 2014; James and Paton 2015).

Ayers (2014) investigates the state of social capital in six places including villages and the ward from Pyapon town. Ayers (2014) tries to examine the impact of local faith communities on social capital and their role in the production of resilience to disasters and recommends that development and humanitarian practitioners should integrate social capital appraisal into disaster recovery planning and implementation. A similar finding is also presented in a study by Calkin and Win (2013). Assistance from NGOs, development organizations, and the government has contributed to the recovery of affected people to some extent. However, this research reminds us of the negative impacts of aid operations to the social capital of communities. They said, 'We have further determined that the impacts of a natural disaster tend to strengthen social capital; while assistance and aid, if poorly administered, can undermine it' (p.91).

James and Paton (2015) note that social capital exists in different levels at different locations in Cyclone Nargis-affected areas. They indicate potential implications of inadequate social capital in failures to take precautionary measures, as shown in the case study of Bogale township where the locals are not strongly linked to another township (Labutta) in their region, which was devastated a few hours earlier. They assert that weak social links with other townships made them less prepared when the storm was moving toward them.

2.5.4 Freedom and human security

As Bacon and Hobson (2014a) argues, no disaster is completely natural. They state that 'human behavior and social structures shape the way they unfold' (p.4). A significant feature of Cyclone Nargis was the restriction imposed on the people by the

military rulers of Myanmar. At that time, freedom from fear and freedom from want were limited for the people. Although not an academic study, a popular book by Emma Larkin (2010) documents eyewitnesses' accounts of survivors and their struggle. She conveys the story of Cyclone Nargis to a global audience and highlights the ineptitude of the military government in the title of her book, *No Bad News for the King*, directly referring to the military elite's lack of concern for the people and the authoritarian structure that restricted bad news from reaching higher-up authorities.

In another assessment of the reasons behind the government's problematic response, Belanger and Horsey (2008) offer some views in the article 'Negotiating humanitarian access to cyclone-affected areas of Myanmar: a review'. These authors argued that four factors are impediments to a smooth relief operation in the emergency phase: (1) The 'self-reliance' doctrine of the Myanmar government produced isolationist tendencies in Cyclone Nargis, (2) the Myanmar government had limited familiarity with international disaster response and feared an influx of international aid workers, (3) The prevailing domestic political context was very sensitive because Cyclone Nargis struck one week before the voting day of a national referendum, and (4) The suspicions of senior military leaders about the motives of donors.

2.5.5 ASEAN's facilitation, the Tripartite Core Group and human security

Leake (2013) attempts to link natural resource management and risk reduction by highlighting general conditions of environmental degradation. His study's reliance on the data from various reports of the Tripartite Core Group (a humanitarian mechanism which was composed of representatives of the UN, ASEAN and the Myanmar government to facilitate the delivery of aid to the cyclone-affected area) leads to more discussion regarding the function of humanitarian aid mechanisms, and assessments over aid effectiveness. Leake's discussions are mainly based on assessment reports that were published between 2008 and 2011 according to the three-year plan of post-Nargis recovery and preparedness, and the study provides the progress of the rehabilitation process in chronological order.

The Post-Nargis Joint Assessment (PONJA) was historically important as it was the first collaboration in many years between the UN, ASEAN, NGOs, and the Myanmar government. It contained data from two rapid assessments called the Village Tract Assessment (VTA), which identified vulnerabilities and capacities in the worst-hit areas, and the Damage and Loss Assessment (DaLa), which estimated the economic impact of the storm to infrastructure (TCG 2008a). At that time, the government was still restricting local media from reporting about the cyclone-affected Delta. But they did not reject the contents of reports prepared by TCG. Nevertheless, they asserted their power as revealed in a leaked cable from the US embassy dated 29th July 2008:

> UN U/SGY (Under-Secretary-General for Humanitarian Affairs and UN Emergency Relief Coordinator) for Humanitarian Relief John Holmes told diplomats during a July 23 meeting that the GOB (Government of Burma) did not challenge the VTA and DaLa teams' findings and allowed them to be published with little editing. Resident Emergency Coordinator Dan Baker admitted later that in exchange for accepting the teams' analysis with little revision, the GOB requested that the UN/ASEAN teams not edit the chapter on the government's cyclone relief efforts (Wikileaks 2008a).

This restricted environment around the time of Cyclone Nargis and the difficulty in accessing information in the context of political maneuvers, prompted me to revisit the experience with Cyclone Nargis for a fuller understanding of human security implications in this study[1].

[1] From the middle of May 2008 to end of 2009, I was fully involved as senior program officer in the humanitarian aid projects that focus on education and livelihood recovery of people form Kungyangone, Labutta, and Ngapudaw townships. Another voluntary initiative was supporting 81 orphans from the rural villages of Kungyangone areas which could continue until 2012 thanks to the help of international and local friends. As putting orphans in the government orphanage created a more vulnerable position for children at that time, we observed that living with extended families was a better option. To reduce child-raising burden of extended family who was also survivors of the cyclone, monthly support was provided 8000 Kyat (8USD) per month. Although the amount was modest, it enabled these children to continue schooling. These first-hand experiences made me aware of the existing vulnerabilities and brought me motivation to find the ways of reducing risk and enhancing resiliency.

2.5.6 Cyclone Nargis as a catalyst for furthering human security

Disaster as a catalyst for social and political change is noted in several studies (Birkmann et al. 2010; Birkland 2006; Wisner et al. 2012). Bankoff (2012) argues why the disaster should be considered as 'agent of change':

> Considering disaster as an historical process allows its impact to be evaluated as more than only a destructive event, at best a bane to be prepared for as well as possible and, at worst, one to be simply endured. While not trying to minimize the destructive consequences of disasters in terms of human suffering, they are also simply agents of change in their broadest perspective. (p.38)

Pelling and Dill (2006, p.10) elaborated that the political and social change is likely to happen when people are not secured.

> The socio-political and cultural dynamics set into motion at the time of catastrophic 'natural' disasters create the conditions for potential political change – often at the hands of a discontented civil society. A state's incapacity to respond adequately to a disaster can create a temporary power vacuum, and potentially a watershed moment in historical trajectories. (p.10)

After Cyclone Nargis in Myanmar, social and political transition also occurred and some studies tried to verify Cyclone Nargis's role in ongoing changes in Myanmar. Than (2009) posed the question 'Should Nargis be considered more than a Storm?' According to Than, 'the 'imperfect storm' of 2008 physically destroyed much-needed human and material assets of Myanmar but failed to loosen the junta's grip over Burma's polity or reorient political change in a direction favored by the opposition' (p.216). Nevertheless, major changes in the post-Cyclone Nargis period provided more space for civil society in both services and advocacy to influence changes, and more open and expanded engagements with the international community. International organizations with a focus on conflict resolution also laid down engagement options after Cyclone Nargis, and suggested that it was time to normalize aid relations because of growing human insecurity. For instance, the International Crisis Group urged the international players to consider the human security perspective as below:

> Growing impoverishment and deteriorating social service structures have pushed millions of households to the edge of survival, leaving them acutely

> vulnerable to economic shocks or natural disasters. If not addressed, the increasing levels of household insecurity will lead to further human suffering, and could eventually escalate into a major humanitarian crisis. (p.i)

After Cyclone Nargis, media freedom has gradually expanded and local opinions and advocacy on human security have also appeared in the local media from time to time (Mizzima 2011; Seng Raw 2015; The Irrawaddy 2015, Zin 2013; Than 2009; Thuzar 2015).

Referring to the ASEAN experience, Acharya (2007) analyzes that democratic transitions in Southeast Asian regional countries created an environment that encouraged more acceptance of the principle of human security. In the region, Acharya (2007) argues,

> Some of the governments of these states have also championed the human security concept more openly as a way of distancing themselves from their authoritarian predecessors, enhancing their international legitimacy and attracting development assistance. (p.26)

In 2011, Myanmar's military chief referred to human security as the security agenda for a country in a public speech (RFA 2015; Aung 2014). While waging civil wars with ethnic armed groups, such a stance is difficult to interpret as more than a rhetorical reference but at least human security ideas reached the public domain after Cyclone Nargis. Human security rhetoric is not used by the military chief alone. Human security as a policy orientation is often used in the speech of the former President, U Thein Sein. The excerpt of a speech on 3 November 2015 is one example. Reflecting the reform, U Thein Sein's claimed, 'We must unwaveringly continue to work on reforms to improve the delivery of people-centered services, healthcare, education, job opportunities, individual freedoms, and human security' (Sein 2015).

In the current political transition, a deeper understanding of society's vulnerability, sources of resilience and dimensions of human security are needed in the context of Myanmar to move towards a more practical human security agenda. Cyclone Nargis offers such understanding as the intersection of social vulnerability and natural hazards in the context of broader human insecurity. Human roles in the Cyclone Nargis disaster still need to be highlighted for future implications in enhancing human security. As

Bacon and Hobson (2014a) noted, one of the advantages of the human security approach for studying natural disasters is its emphasis on 'the direct and immediate role people play in creating, exacerbating or reducing vulnerability and risk' (p.3).

2.6 Disaster vulnerability, resilience and human insecurity

2.6.1 Vulnerability

According to a definition in the International Strategy for Disaster Reduction (UNISDR), vulnerability is 'a human condition or process resulting from physical, social, economic and environmental factors, that determines the likelihood and scale of damage from the impact of a given hazard' (UNDP 2004, p.11). Also, capacity can be defined as a 'The combination of all the strengths, attributes and resources available within an organization, community or society to manage and reduce disaster risks and strengthen resilience' (ISDR 2009).

Anderson (1995) elaborates a classification of the sources of vulnerability. In his view, vulnerability can be primarily caused by three factors: (1) nature (2) cost (3) human (pp.43-46). Among these three, Anderson (1995) argues that nature as a cause is the oldest form of analysis in vulnerability studies. People who live in areas that are prone to various types of natural hazard such as volcano eruptions, cyclones, earthquakes, and floods are vulnerable because hazards are not preventable in these areas and they are vulnerable because they happen to be there. Preston et al. (2011) also describe the vulnerability caused by nature as biophysical determinants: 'They are the physical, biological and ecological factors that influence the potential for harm. Such factors might include climatic conditions, natural hazards, topography, land cover, or primary productivity' (Preston et al. 2011, p.183). The importance of the biophysical environment of a place is emphasized in the view of Hewitt (1997). He argues that 'the state of any society's physical environment and the attitude it holds towards resource use and management is closely related to the occurrence of hazard and disaster' (p.59).

Zakour and Gillespie (2013) referred to biophysical vulnerability of place as 'hazards of place' or geographical location. By citing Cutter et al. (2003) and Borden et al.

(2007), Zakour and Gillespie (2013) used three types of risks to specify hazards of places:

> (1) biophysical risk estimated as the historical frequency of disasters from the physical hazards in geographical locations, multiplied by the severity of those hazards
>
> (2) risk from the built environment reflected in the age, deterioration, and structural weakness of buildings and infrastructure
>
> (3) social risks manifest in the challenges related to getting and using the resources needed to absorb the shock of disaster and recover from it (p.103).

In the case of Cyclone Nargis, biophysical vulnerability needs to be briefly noted here as the scientific aspects of tropical cyclones have established the fact that ocean surface temperature contributes to storm formation (NASA 2009). Although human society is the main focus in people-centered research in vulnerability, questions are also raised around whether human vulnerability can be adequately characterized without considering simultaneously the vulnerability of the surrounding ecosphere (Fenton et al. 2007; Maguire and Cartwright 2008; Turner et al. 2003).

In the context of Cyclone Nargis, man-made environmental destruction such as mangrove forest depletion compounded the storm hazard in a tragic way. A UNEP (2009) report on the state of environment in the Delta stated that environmental degradation and resource depletion had been exacerbating the driving force of economic development that led to corruption and sustainability problems (UNEP 2009). The environmental aspects of the Delta impacting vulnerability and resilience still demand more detailed study for human security implications.

From a technological standpoint, a second key to the analysis of vulnerability is ‘cost’ (Anderson 1995). In this aspect, vulnerability can be reduced with the help of technologies, but costs do matters. Mitigation could be possible but it may be expensive for places where poverty prevails. In such cases, the level of vulnerability is determined by choices accessible to society; when and how to use technologies to mitigate the effect of hazards. Hewitt (1995) argues that in certain situations, a lack

knowledge and preparedness is to blame, but looking deeper, the unaffordability of costly technology might be the cause of vulnerability although it is already available.

Similar to Anderson (1995), many contemporary social scientists, policy advocates and activists also consider humans to be playing a central role in manufacturing vulnerability and multiple variables must be considered in a definition of vulnerability (Birkmann 2006; Cutter and Finch 2008; Fuchs et al. 2012; Morrow 1999; Stiglitz 2014). Nature is not the sole source of vulnerability; other variables such as economic, social and political indicators such as lack of freedom, deep poverty and lack of options for survival and poor resources also play a role. Preston et al. (2011) called these socioeconomic determinants of vulnerability: 'They are the social, economic or cultural factors that influence the potential for harm. Such factors might include demography, poverty, trade, employment, gender, or governance' (Preston et al. 2011, p.183).

From a socio-economic point of view, the impact of a natural event in any given community does not randomly happen. The effect on any particular household, therefore, results from a complex set of social interactions in the community (Blaikie et al. 2004). Some conditions have to do with the dwelling, and still others with the social and economic characteristics of the people who are living there (Hewitt 1983; Quarantelli 1987, 1995; Bates and Peacock 1987).

According to Cannon (1994), socio-economic systems are in fact the root causes of unequal access to opportunities and unequal exposures to risk. Regarding the concept of social vulnerability, Cannon et al. (2003) describe social vulnerability as a set of characteristics that includes a person's: 'Initial wellbeing (nutritional status, physical and mental health), livelihood and resilience (assets and capitals, income and qualifications), self-protection (capability and willingness to build a safe home, use a safe site), social protection (preparedness and mitigation measures), and social and political networks and institutions (social capital, institutional environment and the like)'(p.5).

2.6.2 Resilience

The UN defines resilience as 'the ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions' (ISDR 2009). As a concept, 'resilience' has strong roots in environmental studies. Holling (1973), focusing on the stability of ecological systems, defined resilience as a 'measure of the persistence of systems and of their ability to absorb change and disturbance and still maintain the same relationships between populations or state variables' (Holling 1973, p.14). Later disaster research studies adopted the concept of resilience and Timmermann (1981) is known as one of the earliest scholars who used resilience in disaster research. Timmerman (1981) tries to locate resilience in the context of vulnerability. He clarified the concept of resilience in the disaster context by citing Holling's definition of resilience:

> If we accept …that resilience has to do with the persistence of a system vulnerability and resilience are by no means simple reciprocals. There are many 'woundings' that do not affect the persistence of a system at all, but merely require either extra effort on the part of the system, or the elimination of freely expendable units. Resilience is just one of the vulnerable characteristics of a system. But – and this is critical-resilience is the one characteristic of a system which, when it is impaired, also impairs the persistence of the system. (p.21)

Although resilience is generally focused on from the aspects of both 'engineered system and social system' (Cutter et al. 2008, p.600), it is widely debated that characteristics of resilience in social structures cannot be the same as that of ecological and engineering aspects because resilience as a social process involves 'issues of agencies and power' (Greijn et al. 2015, p.12). As happens in ecological systems, numerous identification measures for resilience devised so far try to look at the social phenomenon of resilience in system approaches. In the IPCC's definition, resilience is stated as the 'ability of a system and its component parts to anticipate, absorb, accommodate, or recover from the effects of a hazardous event in a timely and efficient manner' (IPCC 2012, p.3). Gall (2013) argues resilience can be studied as 'a system' or a 'system of systems'. In terms of an assessment approach, Gall (2013) views

resilience as a 'self-regulating system – or cluster of systems' operating with a self-correcting manner through feedback: 'such complex adaptive systems that create resilience share synergies, linkages and interactions across spatial and temporal scales' (Gall 2013, p.18). It was also agreed that a system approach helps one understand the different types of interactions between systems as well as the thresholds of different types of system (Constas et al. 2014). When the 'systems approach' is used in a rural setting, observing the social-ecological interactions is necessary to get a clear view of 'the links between human system, ecosystem, and shocks and trends' (Constas et al. 2014, p.23).

Although the system approach has been proven to be highly applicable in technical science, Stojanovic et al. (2016) argue that systems approaches are not currently dominant in the social sciences because 'defining social aspects in systemic ways has proven challenging'. While defining functions in the social domain' is problematic (p.2), Stojanovic et al. (2016) claim 'certain elements of society are less amenable to conceptualization as systems, and therefore undertheorizes social entities and processes' (p.12) as system approach is rooted in studies of 'relationships between interacting parts, feedbacks, boundaries, emergent properties, self-organization, and hierarchies' in 'areas of complexity science' (Stojanovic et al. 2016, p.2).

In order to capture the social dynamics of resilience in the three phases studied as regards Cyclone Nargis, this study tries to approach resilience from a 'capacity' perspective. Since the launch of resilience as a concept in disaster research, all definitions of disaster resilience have been associated with the capacity aspect (Greijn et al. 2015; Mayunga 2007; Winderl 2014). de Weijer and McCandless (2015) state that resilience is 'associated with the capacity of individuals, groups and society as a whole to cope, adapt, and transform in the face of man-made and natural shocks' (p.4). Béné et al. (2012) divided resilience capacity into three components: 'absorptive capacity, adaptive capacity, and transformative capacity' (p.21) as shown in Figure 2.

Figure 2 **3D resilience framework (Béné et al. 2012, p.21)**

Absorptive coping capacity, at least, helps disaster-affected people 'to resist' and 'absorb its impacts without consequences' for their 'function, status, or state' (Béné et al. 2012, p.21). A working definition of ActionAid specifies: 'Absorptive capacity is the ability to prevent, prepare for or mitigate the effects of negative events, through coping mechanisms that focus on essential basic structures and functions' (p.10).

When absorptive capacity is exceeded, adaptive capacity will be required for various adjustments that result in incremental change in people's lives. Béné et al. (2012) argue,

> These incremental adjustments and changes can take many forms (e.g. adopting new farming techniques, change in farming practices, diversifying livelihood bases, engaging in new social networks, etc). These adaptations can be individual or collective, and they can take place at multi-level (intra-household, groups of individuals/households, community, etc). (p.22)

ActionAid (2016) offers several examples of adaptive capacity that include 'diversification of livelihoods, adopting flood-resistant farming techniques, training community elders and local authorities on resolving tensions and conflict within and between communities regarding access to water or land, or adapting curriculums for health professionals to train them in how to deal with outbreaks of epidemics' (p.8).

Assets are fundamental in increasing adaptive capacity (Béné et al. 2012; Vincent 2007). However, assets alone cannot make the community capable of effective adaptation; Béné et al. 2012 argue as regards the determinant of adaptive capacity as follows:

> Successful adaptation depends to a large extent on the capacity of individuals, societies or communities to coordinate decision-making, to act collectively, foster innovation and experimentation, and exploit new opportunities. All those relate to strong social fabric established during periods of stability – highlighting the strong relation and synergy between absorptive resilience and adaptive resilience. (Béné et al. 2012, p.24)

Increasing the community's capacity to transformative level requires structural changes in ecological, economic and social structures that can uplift people from poverty traps, repeated disasters and an unsustainable environment (Béné et al. 2012). ActionAid claims that only by transformative capacity, can people move to 'cultural change, institutional reforms and behavioral shifts' for disaster resilience (ActionAid 2016, p.8).

In the Cyclone Nargis affected areas, absorptive coping capacity, adaptive capacity and transformative capacity at village community level are also linked to these three types of capacity at the national level. Since 2008, several steps for disaster risk reduction have been laid down for resilience and human security. Myanmar's action plan for disaster risk reduction was also adopted in 2012 based on the 'Hyogo framework for action 2005-2015'. The Hyogo Framework for Action notes that knowing vulnerability is critical for building resilient society:

> The starting point for reducing disaster risk and for promoting a culture of disaster resilience lies in the knowledge of the hazards and the physical, social, economic and environmental vulnerabilities to disasters that most societies face, and of the ways in which hazards and vulnerabilities are changing in the short and long term, followed by action taken on the basis of that knowledge. (ISDR 2005, p.7)

A culture of disaster resilience can be enhanced only if the community gains an opportunity to shift from absorptive capacity to adaptive and transformative capacity. According to Béné et al. (2012), a move from the stage of 'persistence' by merely resisting the impact of disaster to the stage of flexible adjustment always involves transitional costs. It is likely that the bigger the intensity of change, the higher the transitional cost incurred. Brown (2016) also reminds us of the importance of dynamics of power in social and ecological system changes. Brown (2016) argues we

should not ‘underestimate the extent to which transformations in socio ecological systems and governance actually require transformations of power and concerted political struggle’ (p.103).

2.7 The state of community insecurity: examining vulnerability

In this study of a storm hazard in the Delta community, the focus is on dynamic interactions between vulnerability and resilience. A major challenge in resilience and vulnerability research is that ‘not only are people different, but they are changing continuously, both as individuals and as groups. This constant change within the human system interacts with the physical system to make hazard, exposure, and vulnerability all quite dynamic’ (Mileti 1999, p.119).

Ribot (1995) argued for vertical relations between community level and state level policies; this research reflects this in examining how vulnerability and resilience have impact on the safety aspect of village communities from the Delta. For conducting comparative studies in three different corners of the Ayeyarwady Delta, Ribot’s view on vulnerability is also integrated into the research design:

> The vulnerability is shaped by ongoing political–economic processes of extraction, accumulation, social differentiation, and marginalization, within a given set of property relations (ownership and access) shaped by relations among various groupings within society. These relations are mediated by state policies (such as land conversion, economic development, and resettlement). Different social groups have differing assets as well as differing patterns of access to productive resources. Their assets and access are critical aspects of their vulnerability. (Ribot 1995, p.120)

With reference to the previous studies of Cutter et al. (2003), Perry et al. (2001), Putnam (2000) and Blaikie et al. (2004), Cutter (2006) identified some of the factors that largely influence social vulnerability. These factors include ‘lack of resources (including information knowledge and technology); limited access to political power and representation; lack of social capital, building stock and age; frail and physically limited individuals; and type and density of infrastructure and lifelines’ (p.117).

Moreover, it is also common to find that social vulnerability can change over space and time (Cutter and Finch 2008). For instance, 'population change and population density' of a community have a strong influence when 'social vulnerability' is measured on a 'temporal scale' (Cutter and Finch 2008, p.2304). Vogel and O'Brien (2004) discuss the key three features of vulnerability: it is 'multi-dimensional and differential (varies across physical space and among and within social groups)', 'scale dependent regarding time, space and units of analysis such as individual, household, region, system', and 'dynamic, having the characteristics and driving forces can change over time' (cited in Birkmann 2006, p.13).

There are many ways to measure social vulnerability. Some of them focus on studying the underlying forces that cause vulnerability. For example, 'the pressure and release model' (PAR) and the access to resource models offer operationalization tools to analyze the 'intersection of social vulnerability and hazard exposure' (Blaikie et al. 2004). The Pressure and Release (PAR) model assumes risk explicitly as a 'function of the perturbation, stressor, or stress and the vulnerability of the exposed unit' (Perdikaris 2014, p.42). PAR directs its attention to the conditions that make exposure unsafe, lead to vulnerability and cause the creation of these conditions. This is applied primarily to address social groups who have faced a disaster event. The PAR model emphasizes distinctions of vulnerability by different exposure units (e.g., class, ethnicity). However, there is also criticism that PAR does not sufficiently incorporate the vulnerability of biophysical subsystems and cannot fully address human and environmental systems due to their proximity to hazard zones (Cutter et al. 2008). It cannot identify adequately 'the structure of the hazard's causal sequence, including the nested scales of interactions' (Turner et al. 2003, p.8074).

This study on Cyclone Nargis incorporates some aspects of PAR, especially in identifying root causes. PAR's strength in organizing the hierarchical structure of causal factors (Blaikie et al. 2004) is also noted and informed this study.

The 'Access Model' also has influence in developing some analytical tools for examining the data coming from the qualitative method of this research. This model is designed to look at long-term social and environmental change in a disaster-affected community. While the PAR model facilitates studies to see how to trace the underlying

causes of vulnerability including economic and social pressures, the Access Model tries to examine how individuals or communities can access the resources that are necessary for them to secure a livelihood in pre-disaster time and their ability to adapt in a disaster (Blaikie et al. 2004).

The process of achieving access to required resources, such as the process of earning a living, is determined by social and economic relations, including the social relations of production, gender, ethnicity, status and age. Blaikie et al. (2004) stressed that, 'It is essential that assets and the patterns of access to them remain central to this project and do not become detached from the underlying political economy which shapes them' (Blaikie et al. 2004, p.94).

This model is also useful for looking at access to lifelines during an emergency period. Venture (2014) argues that lifelines are synonymous with civil infrastructure that is vital to the economy and quality of life. Lifelines can be grouped into six categories including (1) electric power, (2) gas and liquid fuels, (3) telecommunications, (4) transportation, (5) water, and (6) wastewater systems. In the case of poor countries, a lifeline is meant to include basic life sustaining systems and infrastructure.

In Cyclone Nargis-affected areas, access to lifelines is a key determinant of life sustaining during an emergency. It has also become an indicator of social vulnerability in the post-Nargis period. Platt (1991) defines lifelines as systems or networks that provide for the circulation of people, goods, services, and information upon which health, safety, comfort, and economic activity depend. Again, social relations involve decision making about how to obtain these lifelines.

In the case of Cyclone Nargis, the Delta's geographic position and climatic features are not the only factors that contribute to its vulnerabilities. Political, social and economic factors have been major drivers of unsustainability and vulnerability to disaster. Apart from the broad categories of biophysical and socio-economic attributes of vulnerability, features of resilience were also evident in the struggle and survival of people during the storm and after community-led mobilization in relief efforts. This research will attempt to look for specific attributions to vulnerability in the

Ayeyarwady Delta by bringing safety aspects of the community to the core of the study.

2.8 The state of community security: examining resilience

> Community resilience is a process linking a network of adaptive capacities (resources with dynamic attributes) to adaptation after a disturbance or adversity. (Norris et al. 2008, p. 130)

However, the resilience of a region is likely to be disturbed when its 'spatial pattern' is prone to frequent occurrence of hazards (Cutter and Finch 2008). Because of the potential for temporal and spatial changes in vulnerability and resilience levels, Cutter and Finch (2008) state that 'for future preparedness, response, recovery, and mitigation planning, a one-size-fits-all approach may be ineffective in reducing social vulnerability or improving local resilience to the impacts of hazards' (p.2305). Out of numerous ways of identifying means to enhance resilience for the future, 'a capital based approach' (Mayunga 2007) can also display how resilience may be built throughout emergency and recovery phases.

In measuring resilience for human security, which dimensions to be measured is a challenging question for this study. As human security threats emerge out of physical, living and social systems (Tanaka 2015), system approach can be one way to be considered. In 'a systems approach', Holling (1973, p. 14) describes resilience as 'a measure of the persistence of systems and of their ability to absorb change and disturbance and still maintain the same relationships between populations or state variables'. According to UNDP, a system-wide approach to resilience needs to capture 'a range of activities, actors, and processes that are part of a resilience-building system' (Winderl 2014, p.7). Cavallo and Ireland (2014) argue 'disasters involve different independent systems, which are all dependent on each other. Therefore, a disaster can be considered as a system of systems (SoS). Boardman and Sauser (2008) also claim that systems are an integrated network of independent systems which are heterogeneous.

Although the conceptual framework of SoS sounds challenging to the linear approaches to disaster risk management, system approach itself is not free from critics.

Cavallo and Ireland (2014) insist that a system of systems approach advocates to look closely to the function of a complex set interdependent risks which may interact in a cascading manner. Although conceptually clear and understandable, its applicability is much in question. Olsson et al. (2015) pointed out that a systems approach for measuring resilience in a social setting is not as appealing as it is used in the ecosystem. As Olsson et al. (2015) pointed, defining a system ontology and setting the boundary of a system is not easily workable in the real-world assessment:

> With regard to boundaries, there is no sharp line of demarcation in reality to explain perceived differences between natural or social systems. Neither in nature nor in society are boundaries fixed unless we first decide on the phenomenon to be described or explained. Pragmatic considerations imply some degree of construction—in both social and natural contexts. (Olsson et al. 2015).

As a contested model for measuring resilience, Gall (2013) pointed that a 'coherent system approach' has not yet materialized (p.22). Rather than viewing societal entities within the villages and their respective research zones as multiple systems, forms and process of resilience in the studied villages are examined with the capital approach in which several domains are somewhat similar to the sustainable livelihood framework. However, this study prioritizes to focus on the capacity of the village community to respond to an emergency disaster risk but not on domains of capitals that are usually analyzed in studies searching solution to development.

The notion of resilience which also carries the meaning of adaptive capacity and shock absorbent ability is discussed in this study by using a capital framework for human security. The Community Capitals Framework (Flora, Flora and Gasteyer 2015) is widely applied in rural and community development studies. Flora and Flora (2008) argued that the characteristics of successful entrepreneurial and sustainable communities involved seven types of capital: '(1)Natural (resource, amenities and natural beauty), (2) cultural (the way people 'know the world' and how to act within it), (3) human (the skills and abilities of people), (4) social (the connections among people and organizations or the social glue to make things happen), (5) political (The ability to influence standards, rules, regulations and their enforcement), (6) financial

(The financial resources available to invest in community capacity building) and (7) built (The infrastructure that supports the community)'(Flora and Flora 2008, p.4).

This categorization of community capitals is also reflected in the disaster resilience assessment used by the capital approach of Mayunga (2007). The capital approach covers a number of capitals including human capital, social capital, economic capital, natural capital and physical capital. With reference to both Flora, Flora and Fey (2004) and Mayunga (2007), this study tries to adapt the domain of capitals in a context of Myanmar village communities. In addition to the capitals Mayunga (2007) applied, political capital and cultural capital, which are inseparable from other forms of capital, are also considered as a foundation of social resilience in rural village society in Myanmar. It is assumed that these forms of capital can be accumulated in the village society as elements that can build up disaster-resilient assets and facilitate processes for disaster risk reduction.

Woolcock and Narayan (2000) believe that social capital is primarily important in social contexts in which formal insurance and financial instruments are lacking. One of the earliest pioneers in the study of social capital is Lyda Judson Hanifan who is credited with coining the term social capital as 'those tangible assets [that] count for most in the daily lives of people: namely goodwill, fellowship, sympathy, and social intercourse among the individuals and families who make up a social unit' (Hanifan 1916, p.130). The well-known concept of cultural capital was introduced by Bourdieu who highlighted ways people use cultural knowledge to locate their high status and authority in the ladder of social hierarchy (Bourdieu 2011). Coleman elaborated on the differences in function of the three types of capital namely human, physical and social capital (Coleman 1988, p.95). By citing Schultz (1961) and Becker (1964), he clarifies the core value of physical material as tools, machines and other productive equipment which are categorized as assets in this study. Again, referring to the definition of human capital in the field of the economics of education, he elaborates that 'human capital is created by changes in persons that bring about skills and capabilities that make them able to act in new ways' (p.100). Among all types of capital, social capital is the least tangible but its reproductivity function is very similar to what physical capital and human capital can perform (Coleman 1988).

Based on interpersonal relations, social capital can also be grounds for productive activity. In addition, political capital is also present in the process of emergency response although it might not have the same meaning as it usually functions in a fully grown democratic state. For a country under authoritarian regime, the meaning of 'political capital' can be understood as 'the capacity of the people to influence political decisions' (Schugurensky 2012, p.3). In situations like Cyclone Nargis, taking necessary precautionary measures for disaster risk reduction was considered a political act in many cases. Furthermore, the dynamics of response among community members to influence community disaster politics had enough reasons to be seen from the perspective of political capital. In the case of Cyclone Nargis-affected areas, the concept of resilience can be applied at many levels of analysis. In this study, qualitative assessments of resilience are implied in the safety aspects of physical features, ecological systems, social infrastructure, community capacity (including economic strength) and the support of the state DRR system.

2.9 Human security as a way forward in the Ayeyarwady Delta

Three basic conditions are required to have a community where everyone can live with human security (Brklacich et al. 2010). They are '(1) the options necessary to end, mitigate, or adapt to threats to their human, environmental, and social rights, (2) the capacity and freedom to exercise these options, and (3) the opportunity to actively participate in attaining these options' (Longergan 1999 cited Brklacich 2010, p.37).

As shown in Figure 3, there is a strong relationship between human security and vulnerability. When vulnerability cannot be overcome, human security cannot be present, as vulnerability and human security sit at opposite ends of a continuum (Brklacich 2010, p.37). A natural disaster affects all seven elements of human security in many ways. Cyclone Nargis is a classic example of the link between human security and people's vulnerability in the seven areas of human insecurity.

Figure 3 **Relationship between vulnerability and human security**

Source: Brklacich et al. (2010, p.37)

The seven dimensions of human security in the post-impact Delta are briefly considered below, before continuing discussion of the multidimensions of Cyclone Nargis in the coming chapters.

Economic security

In a comparative study of livelihood assets before and after Cyclone Nargis in the final recovery assessment report of the TCG (TCG 2010), Periodic Review 4 discovered that, the amount of fishing gear went down to 58 per cent, fish processing to 77 per cent and boat ownership to one-third in surveyed areas compared to the time before Cyclone Nargis. The post-Nargis Delta economy was still severely affected by cyclone-related destruction even after two years. TCG (2010) stated that livelihood opportunities in the Delta were not restored. As usual, impacts move down to the poorest segments of the population.

Food security

In the research zones that participated in this study, people in many villages passed the first three days without food and water. Coconuts and some rotten rice were the only survival food they could find in the environment. Some villages were left empty-handed and moved out to temporary camps in town for survival. In some remote areas, the government and NGO arrived only after 20 days or a month. In a massive disaster like Cyclone Nargis, the flood and surge caused drastic changes to crop and soil quality in the long run, which led to crop failure in many cases. TCG (2008a) stated that more than half of the households living in the most affected townships reported having lost all food stocks during the cyclone. Even after a month, 55 per cent of households did not have food for more than one day.

Health security

Cyclone Nargis had a serious negative impact on the healthcare system. Immediately, the health security of the affected region was largely destroyed because 130 health facilities were totally destroyed while another 500 were damaged (TCG 2008a). Moreover, in some remote villages, there were people who died only after landfall because of zero access to medical services for their pain and injuries.

Community security

Cyclone Nargis displaced 800,000 people and totally destroyed around half a million houses. It also destroyed food stocks and rice depots (TCG 2010). These indicators are the impact of a disaster that can be more severe than the consequence of an armed battle. When people are displaced, not all community members can gather again in their original places. Some of the villagers disappeared for good. With physical violence committed by armed personnel, community security was destroyed.

Bacon and Hobson (2014a) argue that some communities are socially more resilient than others. Bonding, linking and bridging social capital as denoted by Aldrich (2012) can support the community to be more disaster-resilient through successful mobilization of resources and social cohesion. According to Aldrich (2012), communities with a high level of social capital are more likely to recover from disasters for three main reasons:

- Deep levels of social capital serve as informal insurance and promote mutual assistance after a disaster
- Dense and numerous social ties help survivors solve collective action problems that stymie rehabilitation
- Strong social ties strengthen the voices of survivors and decrease the probability of their leaving (Aldrich 2012, pp. 149–150).

Environmental security

Population increase, poverty, agricultural land expansion and aquatic industries are the main sources of environmental decline in the Ayeyarwady Delta. Environmental

factors are also drivers of the marginalization of people in areas more are prone to disaster. The likelihood of exposure to natural hazards is higher in environmentally vulnerable land (UNDP 1994). A disaster can add more destruction to the environment. During Cyclone Nargis, natural resources for livelihoods were severely impacted and the whole Delta lost 38,000 hectares (ha) of natural and replanted mangroves, submerged over 63 per cent of paddy fields, and damaged 43 per cent of freshwater ponds (TCG 2008a).

Personal security

Life after Cyclone Nargis for many survivors was extremely insecure with little support for continued survival. Family and social networks were lost for many people until they reached temporary shelter, and many people struggled to find a place for refuge. In the government-run temporary camps, security was still a concern in crowded conditions (UNICEF 2008). People were also forced back to their ruined villages after some weeks (less than four weeks in many places). In this restless struggle after the cyclone, personal security of women, old people and children was at risk. According to TCG (2008a), in the middle of June 2008, only 14 per cent of the affected villages had temporary settlement. At that time, many of the government-run temporary camps and other temporary camps were already closed (TCG 2008a). Displacement usually occurred together with insecurity and more vulnerability for children, women and the elderly.

Political security

Long before Cyclone Nargis, political insecurity had been a dominant aspect of Myanmar under military rule. Political security in the form of people having a say in issues affecting their life was not much improved in the aftermath of disaster and even worse in some areas of the Delta. After Cyclone Nargis, government sources from state-owned newspapers were silent about the death toll for two days after the cyclone's landfall. It was privately-owned weekly newspapers whose reporters were first to reach the Delta and who discreetly recorded the ground situation. Censorship did not allow certain pictures and many stories were cut about the severity of the cyclone impact and the suffering of the victims. For several months, censorship

authorities toned down stories that highlighted the traumatic experiences of the victims (Downman 2013; Freedom House 2009).

2.10 Why human security approach

Human security approach is considered as a starting point to study a crisis like a meteorological hazard. When human security approach is viewed from policy perspective, it is considered not as a policy 'process for development' but as 'policy challenges that arise in times of crisis and threaten security in an immediate way' (Suhrke 1999, p.271). From individual level perspective, someone who is making adjustment for long term socio-economic change is also different from another being hit by a sudden life-threatening disaster, Suhrke (1999) argues. By quoting Scott (1977) who referred to situation in rural China in 1931 as 'there are districts in which the position of the rural population is that of a man standing permanently up to the neck in water, so that even a ripple is sufficient to drown him', Suhrke (1999) analyzes that human security approach has been a proper method for situation that resembles a person standing in the neck-deep water. Human security can save that man, 'either by taking immediate preventive measures to flatten the ripple before it reaches him, or by throwing out a life buoy' (p.271).

In this study, the safety aspects of in the villages from the margin of the Delta are examined in the light of human security. As the situation in the Delta is found resembled to a man standing in neck-deep water, attempts are made to enhance local understanding of how the ripples can be immediately flatten from an almost drowning person. While this study does not sway away from discussing potentials for long term policy process to get the man out of the river while making the structural adjustment to lower the water level, its emphasis is on overcoming human insecurity if any hazard happens to this disaster-prone region. Moreover, human security approach is also wide enough to cover several dimensions of security including environmental security which is fully linked to Eco-DRR and other dimensions of human security closely associated with life-safety of the villagers from vulnerable areas.

In response to disaster risk, Nature-based Solution (NbS) has been recommended by International Union for Conservation of Nature as a new trend for its presumably cost-

effectiveness and advantage of better livelihood and sustainability (Cohen-Shacham et al. 2016). IUCN defines Nature-based Solutions as 'actions to protect, sustainably manage, and restore natural or modified ecosystems, that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits' (Renaud et al. 2016). Ecosystem-based DRR is increasingly considered by low-income countries that cannot afford high-cost disaster risk reduction infrastructure. Applying the lens of Eco-DRR approach in disaster policy research have a lot of potential because of its applicability in addressing Myanmar's challenges against environmental degradation and urgent needs of disaster risk reduction plans. While the adverse impact of climate change is visibly signifying the need of effective disaster risk management and climate adaptation, some efforts are also underway to understand the linkages between the environment and disaster in Myanmar (JIAC 2015). In the context of the most rural villages of Ayeyarwaddy Delta, these linkages are strongly related to the other political, socioeconomic and cultural factors that make the poor people living in this area trapped in fragile and marginal spaces without much capacity to tackle disaster risk. Despite Eco-DRR concept will be able to explain the story of resilience and vulnerability to disaster in research areas as part of the whole story, some key aspects of rural life in the context of disaster will be left out of the community narratives (for instance, the role of agencies and structure during emergency and recovery phases and politics of disaster).

Again, sustainable livelihood approach (is also commonly used as a conceptual framework to study the long-term process of a disaster recovery and in some cases, to evaluate the effectiveness of aid in reconstruction (Cannon 2003; Carney 2003; Birkmann 2006). The sustainable livelihoods approach was first introduced by the Brundtland Commission on Environment and Development (Krantz 2001). Later many forms of livelihoods approaches were expanded with disaster risk reduction. One of the modified version is the sustainable livelihoods framework from the Department for International Development (DFID) of the United Kingdom (Good Practice Review 2017). Chambers and Conway (1991) defines livelihoods as:

> A livelihood comprises the capabilities, assets (stores, resources, claims and access) and activities required for a means of living: a livelihood is sustainable which can cope with and recover from stress and shocks, maintain or enhance its

> capabilities and assets, and provide sustainable livelihood opportunities for the next generation; and which contributes net benefits to other livelihoods at the local and global levels and in the short and long term. (p.6)

Overlapping with the Eco-DRR in some degree, Sustainable Livelihood Framework (SLF) helps identifying ways community members respond to shocks at household and community level. Possession of assets (or capital) offer a wider range of options for survival and speed up recovery if an event of hazard hits the community. With a focus on reducing vulnerability of the people in the long term, SLF offered choices for policy planning, prioritizing and impact monitoring. Livelihood options involve a vast arrays of coping strategies for recovery rather than safety risk at emergency. This study does apply the core value of capital embedded in the community as highlighted by the SLF but forms of capitals are viewed in the light of response strategy of the village communities in the context of a life-threatening hazard.

To sum up, this chapter has discussed human security issues in existing studies on Cyclone Nargis, and has highlighted many gaps yet to be filled regarding Cyclone Nargis. The discussion moved to vulnerability and discussed several frameworks in vulnerability studies emphasizing relevance to the Ayeyarwady Delta of Myanmar. The crucial area of the resilience concept was outlined in relation to human security and vulnerability. Finally, this research's implications for domains of human security were discussed with a brief profile on each domain for the post-Nargis period.

Long-term disaster recovery is assumed to be ongoing and the human security dimensions of recovery are explored in later parts of this study. If disaster recovery is not properly managed, future disaster prevention will be compromised (Hobson et al. 2014). Moreover, Soroos (2010) has confirmed that an anticipatory strategy is required toward reducing vulnerability in advance before threats come to fruition. Soroos (2010) argues that 'anticipatory efforts may be directed either toward preventing or limiting threats to human security or to reducing the vulnerabilities of societies to these threats' (p.179). Anticipatory responses for human security or reducing vulnerability include emergency preparedness planning, such as early warning systems, evacuation procedures, and assembling relief supplies that could minimize the number of casualties at the time of exposure to a disaster.

Chapter 3

Research methodology

3 The qualitative approach of the research

In disaster research, qualitative research design is not a stranger (Phillips 2014). This study utilizes a case study approach while the arguments in each chapter are backed up by facts and figures that indicate measurable dimensions of community vulnerability and resilience. The case study method usually involves data collection tools for a field study and analysis methods to extract textual data which is useful for in-depth analysis of the socio-economic and political dimensions of the field:

> Case study is an in-depth exploration from multiple perspectives of the complexity and uniqueness of a particular project, policy, institution or system in a 'real-life' context. It is research based, inclusive of different methods and is evidence-led. (Simons 2009, p.21)

This research is designed as a 'multiple-cases study'. By studying more than one case or one region, my purpose is to enable replication of a theoretical proposition about human security in linking it with disaster risk vulnerability and resilience in the Ayeyarwady Delta. Yin (2004) argues that:

> Focusing on a single case will force you to devote careful attention to that case. However, having multiple cases might help you to strengthen the findings from your entire study—because the multiple cases might have been chosen as: replications of each other, deliberate and contrasting comparisons, or hypothesized variations. (p.5)

To strengthen replicability, the study uses more than one technique of data collection and data analysis. This multi-case study required me to travel extensively to Nargis-affected sites stretching from the western end of the Ayeyarwady Delta to the eastern side and then to the upper Delta near Yangon. Stallings (2006) noted that field research is a critical component of disaster research as it strikes a balance between theoretical and practical significance. A positive side of the qualitative approach is that the researcher can still be reflexive in interactions with respondents. Most of the

respondents who participated in this research from the different zones of the Delta went through post-disaster stress to a high degree; the nature of reflexivity in the qualitative approach allowed interactive dialogue between researcher and respondents, enhancing deeper understanding of the issues without compromising the local 'voice'. Ungar (2003) said, 'Giving voice to those who are otherwise silenced in the production of knowledge contributes to a deeper understanding of the localized discourses of resistance that permeate disadvantaged communities' (p.94). Schubert (1995, cited in Payne 2000) pointed out that reflexivity 'helps us identify the socially and rhetorically constructed boundaries that delimit our view of the social field, to transgress those limits, and provide a basis for creative, ethical alternatives' (p.10).

Moreover, for an inquiry that also relates to vulnerability and resilience of a society, the qualitive method is helpful to identify 'the social and cultural factors that play a deciding role in determining what are good and bad outcomes, make the notion of contextually specific and culturally biased construct' (Ungar 2004, p.18). Ungar (2003) also explains why qualitative research is well suited for the following types of disaster-related situation:

> (1) It can lead to the discovery of the unnamed protective processes relevant to the lived experience of research participants
>
> (2) It provides thick description of phenomenon in very specific contexts
>
> (3) It elicits and adds power to minority 'voices' which account for unique localized definitions of positive outcomes
>
> (4) It promotes tolerance for these localized constructions by avoiding generalization but facilitating transferability of results
>
> (5) It requires researchers to account for their biased standpoints (Ungar 2003, p.85).

Phillips (2014), citing Goffman (1959), suggests that the qualitative approach is appropriate for cases of disasters that 'represent a location in which to observe the human condition at a most sincere level of performance' (p.5). Phillips argued that, 'social problems along with the resiliency found in social networks and social structures' can be studied with the help of the holistic value of the qualitative approach.

By saying ‘holistic’, the qualitative approach looks for ‘meanings produced by social actors through social interactions’ and helps the researcher understand ‘the broader context rather than specific acts’ (p.4) without him or her being necessarily pre-deterministic on the facts he or she will find.

In other aspects, there is heated debate among researchers and disaster-related agencies over what should be the best way to study disaster recovery: should it be based on ‘process’ or ‘an outcome’? (Constas et al. 2014; Nigg 1995; Winkworth 2007). The findings in this study suggest that the notions of ‘outcome’ and ‘process’ are not mutually exclusive in the cases of the disaster-prone and poverty stricken coastal areas of Myanmar. This study attempts to analyze the variables of the vulnerability and resilience that are embedded in the ‘process’ the community experiences and the assets they can apply in three temporal dimensions: the ‘pre-impact, impact and post-impact’ phases of Cyclone Nargis.

Given the context of a changing political climate in the decade after Cyclone Nargis and the multidimensional changes in the national disaster risk reduction framework, a ‘process-based approach’ is complementary to studying ‘the outcomes’ that are embodied in the long-term consequences of relief and reconstruction aid in the safety aspect of the community. Human security in each part of a disaster cycle is measured by using a ‘trace-back technique’, which Phillips (2014) referred as to ‘the long standing and deeply embedded political, economic and social problems that lead up to the event’ (p.127).

This study traces back to the points of disaster, to resilience structures in pre-existing vulnerability. Moreover, this study is also based on the two theoretical principles which Ferreira et al. (2015) suggests for disaster research dealing with vulnerable populations: ‘utilitarianism and social justice’ (p.32). Delivering policy-oriented recommendations to help vulnerable people as much as possible and to contribute to the greater good is the goal, by adhering to the lens of social justice when dealing with disaster-affected people.

3.1 Research design for studying disaster resilience in temporal and spatial scale

The design of this dissertation includes both temporal and spatial scales in studying exposure of Cyclone Nargis in the Delta in 2008 and the experience of recovery beyond 2008. A place-based approach that links the physical features of the three places of the Delta to the broader context of resilience is applied. Cutter (2006) argues, 'social and biophysical elements mutually relate and produce overall vulnerability of the place' (p.88). In revisiting Cyclone Nargis, place vulnerability in Myanmar in terms of biophysical features is a given fact. The geographical risk is largely shaped by its position in 'the most at risk' country category. The biophysical vulnerability of the Ayeyarwady Delta is compounded by weak governance, a poorly functioning disaster risk response system and people's lack of access to resilient infrastructure, including telecommunications, the media (as risk communication facilities), roads, bridges, boats and emergency shelters, etc.

Pre-disaster vulnerability and resilience in the three different research zones is evaluated through the lens of interaction of three domains including 'people', 'place' and 'governance'. The interactive dimensions of 'people', 'place' and 'governance' are also reflected in all discussions in the next chapters which cover the impact phase and post-impact phase. Through the lens of vulnerability and resilience, the human security perspective of the three selected zones is studied by noting that disaster exposure varies across geographical and temporal scales (Adger 2006; Cardona et al. 2012; Cutter et al. 2003).

People

'People' refers to the community members who live in the villages of the three selected zones. Individual voices will also be counted as community members representing community issues. Throughout a disaster cycle, sometimes, people may have only limited capacity to act independently from the administrative authorities' rule that is imposed on them. Nevertheless, it is far from taking community as a passive subject of the administrative structure. This study looks into the dynamics of communities in

all segments of the disaster cycle, namely disaster response, recovery, preparedness and mitigation.

Place

Here, both the biophysical features and man-made infrastructure are counted as part of 'places'. Any of the 'places' that enhance people's capacity to respond to disaster risk are also alternatively called 'assets' in discussion in this dissertation. But the notion of 'place' needs to consider not only the physical vulnerability of a geographic region but also the resilience function of the natural environment around the community.

Governance

Weak governance can result in an increase in the number of risk drivers that are connected to each other (Preventionweb 2015). Governance is defined by UNDP (2010):

> Governance is the exercise of political, economic and administrative authority in the management of a country's affairs at all levels. It comprises mechanisms, processes and institutions through which citizens and groups articulate their interests, exercise their legal rights, meet their obligations and mediate their differences. Governance encompasses, but also transcends, government. It encompasses all relevant groups, including the private sector and civil society organizations. (UNDP 2010, p.1)

In this research, the meaning of 'governance' encompasses the international level to the village level and transcends all aspects of community lives that link to community disaster risk reductions.

Vulnerability and resilience factors are embedded in the condition of the environment and the status of its resource as being crucial elements of a community's resilience system (Constas et al. 2014). In building a disaster-resilient community, the perspectives of micro-level community systems should be linked to those of the macro-system at the national level that deals with policy, social protection systems, infrastructure, laws and governance issues (IFRC 2014). The state of vertical integration between community and the national, regional and global disaster risk

governance regime will also be explored in order to identify enabling factors for communities in reducing vulnerability.

In terms of 'spatial' scales, this study primarily focuses only on village-level resilience while considering villages' linkages with the regional, national and global scales as part of the study. For instance, organizing an emergency evacuation drill in a village is a positive variable of the resilience capacity of the community. Although the village's participation in the drill is the focus of this study, the driving forces behind this participation will also be considered as the involvement of the other layers. Therefore, the guideline of the Relief and Resettlement Department to organize the emergency drills in the respective villages and the mandate of the Myanmar government to implement the designated Action Plan for Disaster Disk Reduction to fulfill its obligation as a member of the Sendei Framework for Disaster Risk Reduction will be taken into account. Although this precautionary exercise is a community-based action, the influence of a policy framework from the township and national political system on the community's decisions will also be included in the 'safety analysis'.

With respect to the 'temporal' scale, the current process of building a community's resilience is considered to have a threshold in pre-Nargis years. As the emergence of some of the villages from the Bogale area (Zone II) was a by-product of undocumented agricultural expansion in the last 40 years, the way their villages emerged has tremendous implications for their vulnerabilities and the resilience of the community nowadays.

3.2 Applying the C Model

Kreps (2001) argues 'disasters are non-routine events in societies that involve conjunctions of physical conditions with social definitions of human harm and social disruption' (p.3718). Not only the disaster, but also the post-disaster period featured a series of non-routine events in Myanmar in which efficient disaster risk management mechanism was lacking at the time of Cyclone Nargis. To see the events around Cyclone Nargis in 2008 as numerous, non-routine events, a qualitative research method called the 'C' model is useful as a guideline. The 'C' Model (Quarantelli 1987) was developed by E. L. Quarantelli, the co-founder of the Disaster Research Center

based at Ohio State University, which is one of the oldest schools in the disaster research field which has encouraged qualitative field study for disaster research. Table 1 shows how the four Cs are defined by the disaster research center (Phillips 2014, p.80):

Table 1 **Elements of the C Model**

Characteristics	What are the features of the individual, organization or community?
Conditions	What pre-existing contexts produced physical and social vulnerability? What kinds of social, economic, environment, or political factors influenced how the event unfolded? How did such factors impact the outcomes?
Consequences	What are the obvious and less obvious outcomes of the event, interactions, process, or decisions?
Chronology	How did the event or process unfold over time?

Source: Phillips (2014, p.80)

The letter 'C' represents the four stages of the data processing of the disaster research: Conditions (C1), Characteristics (C2), Consequences (C3) and Chronology/Career (C4). The C Model is useful for unpacking and reorganizing data coming from field research (Phillips 2014). Not only for the data analysis here but also for the writing-up of each chapter of the dissertation, the C Model is applied. As Quarantelli (1987) explains, the four Cs work in sequence: 'conditions or circumstances which lead to certain characteristics which will have consequences as a result of the career of the phenomenon' (p.7).

Preparing the discussion points or interview questions by applying C-Model

The C Model also gives a guideline for the questionnaire used in the semi-structured interviews with experts, in focus group discussions and in open-ended questions with village leaders. Inquiries to the village leaders started by asking the village historical background that intended to investigate the events in the lifetime of a village including: (1) the emergence of the village in the Delta historical context, (2) relationship between

the village environment and the people across the time, (3) disaster experiences before and after Nargis Cyclone, (4) socio-economic background of the village and (4) the present day progress and challenges against sustainable livelihood and disaster risk reduction. The following Table 2 is the backbone for both village leader interview and focus group discussion. It shows how the questions can be categorized into the different elements of 'C' to delve into information in every phase of the disaster cycle.

Table 2 **Issues explored with the 4C Model**

Conditions (C1)	Condition specific to a setting that may influence disaster-related matters
Questions based on the conditions of the pre-Nargis hours	• Situation of the disaster risk management systems at both community level and national level for Cyclone Nargis • The state of the risk communication system • Political dynamics of the country and their influence on disaster policy-making • Operation of national disaster management system linking with regional and global-level systems • Communication and transportation infrastructure in the community as part of the resilience system • Level of disaster knowledge among community members • Socio-economic conditions in pre-Nargis days
Characteristics (C2)	Characteristics that can clearly be 'informed by empirical observation'.
Questions about the emergency response and the state of survivors	• International humanitarian system and debates on humanitarian intervention • Search and rescue • Chances and methods of surviving among the affected communities • Efficiency of disaster response • The role of social capital in emergency • The effectiveness of relief aid • Who are the most vulnerable? • What are the localized assets to reduce vulnerability?
Consequences (C3)	Intended and unintended outcomes, positive and negative outcomes
Questions about the continuation of life	• Loss and damage • Outcome of humanitarian intervention • Recovery experiences and social capital • The state of the ecosystem • Restoration of sustainable livelihoods • The impact of humanitarian aid on the community disaster resilience system

Chronology (C4)	The process of recovery unfolding overtime
Questions about disaster preparedness	• Disaster preparedness in terms of knowledge and skill • The efficiency of community-based disaster management systems • Risk perceptions across time • Existing threats to the wellbeing of the community • Capacity to bounce back if hit by disaster

The relationships between different dimensions (people, place, and governance) in the pre-Nargis setting, the emergency, and the post-Nargis setting are examined as shown in different 'C' columns of Table 2. Details of questions that is used in focus group discussion is attached in Appendix 2 while the question to village leaders are as shown in the next section of this chapter. These questions were developed within the scope of preset themes organized based on 'the four Cs' (Phillips 2014, p.80). It is plausible to say that the C-Model has influenced every step of this research from the beginning to the end of writing the manuscript.

3.3 Major field visit and shorter observation trips

The field study began in the first week of January 2013. Before the official field trip, a preliminary study was conducted in Bogale township and Kungyangone township to test feasibility with pilot interviews with 10 people in July 2012.

A major field visit for the focus group discussion in each of 45 villages was organized in 2013. It was conducted over a period of nine months between January 2013 and October 2013. Although I myself was fully involved in humanitarian aid projects in Labutta, Bogale and Kungyangone areas throughout 2008-2009 as a senior program officer of the International HIV/AIDS Alliance, it was necessary to make several new contacts for liaison with the community before going to the research areas. Friends, former colleagues from the local areas and other contacts from local organizations operating projects in the Delta helped to identify possible contacts from host villages. Friends and former colleagues were from local NGOs such as Spirit in Education Movement, Eco-Dev, Paung Ku, Karuna (Pathein), Metta, Network Activities Group (Former Nargis Action Group), Saturday Group from Kungyangone, and Alin Dan (Rays of Light) from Bogale township. Former fieldworkers in some international

NGOs, including Care and ActionAid also helped by introducing me to hosts and potential respondents from local villages and by giving advice about possible approaches to conduct focus group discussions and expert interviews in local settings.

This post-Nargis field study period coincided with the start of the multidimensional reforms in Myanmar that began to have implications on the lives of ordinary citizens. For example, during the five years between 2011 and 2015, Myanmar promulgated or amended more than ten major laws for the first time in more than half a century. These new laws brought significant effects on the citizens and some impacts have been more visible in the rural areas. These are the Ward or Village Tract Administration Law (2012), the Telecommunications Law (2013), the National Education Law (2014), the Vacant, Fallow and Virgin Lands Management Law and the Farmland Law (2012), the Labour Organization Law (2011), the Anti-Corruption Law (2013), the Right to Peaceful Assembly and Peaceful Procession Act (2011), the Contempt of Courts Law (2013), the Environmental Conservation Law (2012), and the Associations Registration Law (2014). Moreover, a law that is most relevant to the topic under study was approved by the Parliament in 2013 and which started to be effective in the post-2013 period is the Natural Disaster Management Law (2013). Considering the significance of changes at both macro and micro levels, May and June of 2015 were dedicated to revisiting the areas and I conducted another round of interviews with not only the former members of focus group discussions but also with new ones. Some of the old members could not find the time to join the new round of inquiry.

3.3.1 Purposive sampling of the villages

Each of the cyclone affected village participated in this research was selected based on the following criteria: (1) it must be located near the coast where the tide daily touches the shore of the village (2) it must be near the mouth of the rivers of the Ayeyarwaddy Delta preferably closer to Kungyangone, Dedaye, Bogale and Labutta townships which lie on the cyclone track (3) it existed as a village community before Nargis Cyclone and its existence has remained the same status as ‘a village’ (without disintegrating or integrated into a bigger community such as a town) and (4) it must fall within a formal administration structure, at least being governed by sal eain gaung, the head of every ten households (smallest unit of official administration in the village

level). Some of these selected villages may differ from its original shape of the pre-Nargis days either in terms of population size or geographic location. It also must be holding an individual entity without being swallowed by a bigger village in terms of administrative structure or not living as a small collection of houses not having any status at all in the post-Nargis reconstruction period. Nevertheless, migrant communities which are found near the selected villages with no legal village status were also included as part of the study when the focus group discussion raised the topics related to them. By extending the scope in such case, it helps the understanding relationship between migrant communities along the coast and their nearby villages in the pre- and post-Nargis days. Migrant communities are found near Zee Thaung in Zone I and the villages along the Toe River of Zone III. All villages taken part are shown with their exact location in Appendix 1.

3.3.2 Maintaining research integrity

At the time of the field study, the researcher went into these villages as an individual scholar without being affiliated with any aid organization. The individuals and organizations helped the researcher during field visits to find the contacts in each village especially with the village leaders and the leaders of small community-based organizations. None of the organizations which help to find the local contacts were involving in disaster-related issues at the time of research. Although NGOs were playing a vital role in the recovery phase of these selected areas, this study is designed to be free from voicing any NGO's interest for sustaining their programs. Or the country's democratic transition has been drawing the attention of NGOs to other prioritized areas. The donor's influence in this research is zero except the fact that the researcher needed to use the community's links to the former aid network that was active in the research areas between 2008-2010. They used to get involved in many activities related to the Nargis reconstruction. However, in 2013, only Paung Ku alone was present in Bogale and Kungyangone townships for farmers' right awareness program.

3.4 Research method

3.4.1 Data collection

Semi-structured interviews for social economic background and community disaster resilience systems of the village

A set of semi-structured questions was prepared to get information about the causalities of vulnerability and about opportunities for promoting resilience in the community. Through these open-ended questions, the human capital, economic capital, social capital, physical and cultural capital of each village was identified. The background data retrieved from this questionnaire helped reveal tangible aspects that contributed to disaster resilience at the community level such as demographic figures, numbers of schools and students, clinics and health workers. These questions were asked only of authoritative figures or official leaders of each village. Sometimes they were a group of young leaders who were well informed about changes happening in the village or formal village administrators who are elected in the Ward or Village Administrator Elections newly introduced in 2012.

In short, the aggregated background data will display the strengths and weaknesses of the community's capacity to respond to disaster risk and the impacts of the recovery process on the lives of communities. All 45 villages were included in the areas that had an average housing damage between 88 per cent and 98 per cent as stated by the Post-Nargis Joint Assessment. Now, comparing the number of facilities or assets available to the community members in terms of disaster preparedness may raise some subsequent questions: 'Why do they not have an equal opportunity to revive?', 'Why are they not yet a resilient community?' or 'Why are some villages or aspects of people's lives are better than others?'. The attempts were made to verify the facts raised in the qualitative discussion of the focus group with all quantifiable data rasied from the interview. In the following set of background questions, some quantifiable inquiries were included and the answers to these questions were helpful to verify accuracy and validation of the information from focus group discussion by cross-checking.

Official name of the village and local name of the village

Demography

- Population
- Number of female/male
- Number of children attending schools
- Tell me about the races living in this village? What ethnic group the villagers belonged to?
- Which is a majority race in the village?
- Percentage of farmers out of the village population
- Percentage of Fishermen out of the village population
- Percentage of manual/landless laborer

Education

- How is education facility for the children from the village? Is there a school in the village? If not, where the children go to attend school?
- Do you have monastic school or religious school in the village? What kind of education service are these schools providing?
- Do you have a library? How is it operating?
- Do you have book rental shops? How is it popular or functional?

Health

- How do you manage to get medical service if someone from the village is sick? Is there a village clinic/dispensary? If not, where do you go for treatment?
- Is there any health worker posted by the government to the village?
- How far is your village from the hospital?
- Describe how you access to water in the village.
- Describe the number of drinkable water sources (eg. lake or tube well or well)
- Describe how you access to non-drinkable water that is useful for cleaning and washing in the households

The village and disaster risk

- How many died in Nargis Cyclone?

- Could you elaborate more on loss and damages caused to the village by Nargis Cyclone?
- Do you have designated cyclone shelter in/near the village? How far from the village center?
- What are the storm-resistant buildings in this village? Explain how you can access to these buildings?
- Name the natural hazards the village encountered in the last 10 years.
- How does the village get involved in any disaster risk reduction activities related to government institutions, NGOs, and CBOs you know?

Economy

- What are the common jobs for landless manual workers?
- What do the rest of the people do?
- What is the estimated average household income?

Communication and transportation

- Describe the number of TV in the village.
- How many TV channels the village can access?
- Describe the number of households with Radio.
- Describe the number of the telephone in the village.
- How do you access the newspapers?
- What is the means of transportation you can use to go to the nearest town? Are there any changes in transportation in the aftermath of Cyclone Nargis?

Religion, culture, and DRR

- Do you have the monastery in the village? How many? How will you describe the role the monastery playing at the time of Nargis Cyclone?
- Do you have non-Buddhist religious buildings and organizations in this community? How will you describe the role the non-Buddhist religious institution at the time of Nargis Cyclone?
- What are the main religious ceremony/ festivals in the village?

Energy and sustainability

- What are the energy sources for household use? How easy for the village to access the energy sources available?
- How dependent is the village on firewood for household energy?
- Do you have a commonly owned forest conservation area or official community forest?

Engagement with civil society network

- Please tell about the existing projects of NGOs or any other aid organizations in the village? How many of them are related to DRR?
- Do you have any form of community-based organization? What are their current roles in the village?

Expert interviews

A shorter set of semi-structured interviews was also prepared with some room for flexibility according to the C-Model. This set of questions was targeted at various experienced people from diverse backgrounds who were personally involved in the rehabilitation and recovery process of Nargis-affected areas. While some of them were involved in projects in the research areas, others played their role at macro-levels of management. The questions were intended to reveal the perspectives of different stakeholders from different layers of the Nargis recovery process with longitudinal changes in policy and their impacts on survivor communities. The open-ended questions facilitated exploring respondents' roles in relation to Nargis response initiatives and documenting their assessments of the setting of Cyclone Nargis's political ground and changes in its aftermath.

Twenty-five interviews were conducted with government officials, religious leaders (both male and female), representatives of both international and local development organizations (which had experience in the research areas), individual humanitarians, journalists and technical experts. Participant selection was made based on snowballing method. Some were identified through media networks and my previous contact with the government officials and members of the local and international civil society groups who spent years for the post-Nargis emergency and recovery.Their expertise

carried extensive knowledge from the following areas: (1) function of local government at time of emergency, relief and rehabilitation period (2) the role of media and people's awareness about disaster risk preparedness or reduction (3) education for disaster risk reduction (3) public policymaking and implementation at the village level (4) the role of civil society in disaster risk reduction (5) community-based disaster risk reduction and the role of religious institutions (6) emergency communication and (7) disaster recovery in the aftermath of Nargis Cyclone. These interviews are helpful in verifying information for the disaster risk management policy analysis. In the interviews, probing questions were raised from time to time to clarify facts or to ask for further details. Basically, the expert interviews took between 45 minutes to one hour.

Organizing focus group discussion

With the help of leaders from the village, both female and male focus group discussion members are recruited by avoiding power differentials among participants as much as possible. That is one reason why the official leaders were not included in the focus group discussion to remove constraints in terms of social and political hierarchy. Without a presence of the leaders, each focus group discussion was carried out in a comfortable atmosphere. In most of the cases, children aged above 10 to 17 also involved in discussion while they were together with their family members or friends in the discussion groups.

For setting the criteria of focus group discussion participants, all members must have had experience with Cyclone Nargis in the same village which meant that the participants had lived in the same village within the last five to seven years at the time of interview. In some cases, villagers who had experienced Cyclone Nargis in other villages while they were away from home and then returned to the community right after Nargis or at some point of the post-Nargis period, shared their experience in discussion. In such cases, I could not prevent them from taking part in group talks. With sensitivity to the trauma and psychological impact among survivors, I did not disturb the flow of conversation when they collectively recalled their own experiences. But the voices of the returnees must be cut from analysis as they are not relevant to the specific community under discussion.

Participants are recruited as much as possible with a rule of diversity in terms of age, gender, occupation, and ethnicity. The ethnically diverse group is essential to get a sense of community life where the village composed more than one major ethnic group which is Bamar (Burmese). The researcher also tried to have a diverse group of people with different occupations. Focus group discussion usually happened in a house of a villager that is strong enough to accommodate group discussion or in a monastery in the village. In Zone II, some villages do not have any house big enough for group discussion of five to ten people. In this case, the ground under a tree or a temporary tent of fishermen were used. During the trip, I was accompanied by one or two assistants who can make audio recording or video and photo documentation. While the cameras were equipped with the global positioning system, photos and video footage of the surrounding of the village and the exact place of focus group discussion at each village were recorded. Nevertheless, not every part of focus group discussion was videographed while every group had several photos. All the documentation process was made ethically with the permission of the leaders of the village and other stakeholders. These were very useful later during analysis process in understanding the village environment in the context of possible disaster risk. The researcher needed to go back and see the pictures during transcription and analysis whenever participants' discussion draws any information with a reference to the village's location.

As soon as the participants can gather comfortably in circle seating, I started to introduce myself and the purpose of my field research. Knowing me as a research student from a university made the participants comfortable enough as I could assure that I was not linked to any government agency, aid organization or the media. While moderating skill was an important factor for stimulating discussion by raising semi-structured questions, noting the number of attendants in focus group discussion according to their name, age, occupation, and ethnicity was helped by my field assistant. Although the questions were designed to generate the village level discussion, we also expected that some answers would represent both personal and communal experiences. To remember who said what, I also need to use a matrix of questions and participants as shown in the following table:

Table 3 **Format of documentation in focus group discussions**

Village Name	Member1	Member 2	Member 3	Member 4
Question 1				
Question 2				
Question 3				

While moderation was carefully conducted not to leave out any voices among the members, the village's experiences were step by step revealed based on four Cs framework. The village's preparedness for a hypothetical risk of similar hazard was assessed through the capital focus questions. Disaster vulnerability and resilience related questions revealed the state of human security at the village level. The past and present human security conditions were also compared.

Table 4 **Participants in focus group discussion**

Participation	**In focus group**	**Individual interviews**	**Total**
Female	102	58	160
Male	190	62	252
Total	292	120	412

Age of participants from focus group and individual interviews	
Years	Number
10-15	11
16-25	71
26-35	92
36-45	64
46-55	72
56-65	75
Above 65	27

Occupations of participants from Focus group discussion and individual interviews	Number of participants
Paddy grower	57
Fisherman	79
Other type of agriculture (Non-paddy)	28
Student	82
Government servants	15
Shopkeepers	25
Dependent	39
Manual laborers	87
Total	**412**

The village narrative in focus group discussions

The chronology of people's experience and the sequence of events are central elements in the narrative analysis; these were articulated in semi-structured questions asked by the researcher. This was intended to explore community resilience dynamics by looking at environmental and societal changes in temporal and spatial scales in linking with disaster preparedness in the three phases of pre-Nargis, the emergency and post-Nargis. The size of focus group discussions in each village varied from a minimum of five persons to a maximum of eight persons. Although the focus group discussions were primarily limited to eight persons, in some situations it was not possible to exclude additional community members from contributing in group discussions. In such cases, all voices were counted as community members.

The definitions of a 'community' may vary from one setting to another but for the purposes of this research, the concept of community is based on place (location) and people (social groups). As an operational definition, community can be understood as:

> A group of individuals and households living in the same location and having the same hazard exposure, who can share the same objectives and goals in disaster risk reduction. The community members may have varying perception of disaster risk depending on social class, education, age, gender, etc., and the community risk assessment and disaster risk reduction planning processes helps to unite the community in understanding of the risks and in preparedness, mitigation and prevention actions. (Victoria 2002, p.271)

In order to explore through villager's voice in the context of various physical, environmental and social changes, narrative inquiry is applied for 'discovering and preserving the experiences of ordinary people', and 'studying hidden histories and geographies, the place-based lives and memories of disadvantaged people, minority groups, and others whose views have been ignored or whose lives pass quickly, producing few, if any written records' (Kwan and Ding 2008, p.448).

As this research focuses on changes through the occurrence of hazards and the level of vulnerability and resilience of the community across time, as Kwan and Ding (2008) noted, this study also confirms that the purpose and analytical process of narrative inquiry from field areas offers accounts of events or series of events that are chronologically connected. The three-dimensional narrative inquiry 'over time, in a place or series of places, and in social interaction with milieus' (Clandinin and Connelly 2000, p.20) is also used as it offers a way of understanding that the experiences of different members of the community whose access to essential assets for resilience are not the same. Moreover, the chronology of narratives and the emphasis on sequence (Cortazzi 1993) signified by narrative inquiry was also complementary to the data collection process with the C-Model.

These narratives also delivered communicative action (Habermas 1984) among community members especially when people of all ages participated. The focus group discussions provided the forums that brought people together in order to 'share and evaluate knowledge, appreciate the interests, values and aspirations of different stakeholders, generate common understanding, highlight areas of uncertainty and ambiguity, and agree on actions' (Measham and Lockie 2012, p.7).

Secondary data

Collecting data by using not only the community narrative but also media and expert narratives is one of the key features of this research. The historical records of the geographical data and environmental change data have been collected as much as possible from all available sources including government departments, international institutions such as the UN, periodical reports and other scientific inquiries. The post-Nargis field-based interviews conducted by various organizations were especially

useful to verify facts for background checks. Location-specific data such as the history of the research area and what previous studies discussed as regards the region, both in Burmese and English, have been compiled. Although it is difficult to get material on the history of all three research zones, the lifting of censorship in 2012 made present-day investigation easier. Any media highlights on the 'local distinctiveness' of research villages and their respective zones (Clifford and King 1993) are helpful in understanding their 'place' better.

Media content analysis

Media content analysis is also part of the study and it helps in documenting and fact checking the data that described the changes in resource management, geography, and the ecosystem that are linked with community disaster risk management in the years before and after Cyclone Nargis. All these materials can also be referred to as part of the secondary data. Such kinds of secondary data are useful to explain the context of the comparison and foundation of the analysis (Friedman and Wenger 1986; Barnes et al. 2008). The coverage of the different newspapers of the emergency phase of Cyclone Nargis and its recovery period was especially important in interpreting the politics of disaster around Cyclone Nargis. Compared with the coverage of state-owned newspapers about Cyclone Nargis that toned down the intensity of the destruction and the challenges posed to disaster resilience, the private outlets were more open but did not have much independence from the censor's scissors and this reminds us of the value of freedom in disaster response.

3.4.2 Data analysis

In the next step, the data collected by the four 'C' model were prepared and put into data analysis and a writing up process for a comparison of multiple case studies. Yin (2004) argues case study methods are suitable when the research intends to address 'a descriptive question (what happened?) or an explanatory question (how or why did something happen?)' (p.2). The strength of the case study method is well-accepted as having the ability to examine a case in indepth within its 'real-life' context (Yin 2004, p.1). However, a single case study is often prone to criticism for its perceived failure to meet standards of methodological rigor, researcher objectivity and external validity

(Evers and Staa 2012). In this study, every village which participated in its respective research zone is observed within the four 'C' framework not only as a stand-alone case but also as a comparative study with other villages from the same zone. In the next layer of analysis, the key distinct features of the four 'Cs' in all three zones are observed with a 'cross-case comparison' analysis.

This study enhances the external validity or generalizability of its findings by using various research elements. From the selection process of the villages to cross-case analysis in multiple case comparisons, it attempts to prove generalizability. Here, generalizability is meant only for the theoretical application of 'human security in the context of disaster vulnerability and resilience' in replicated cases rather than generalizability as a case that represents situations in the whole cyclone-affected area. Although the picture of the whole affected region cannot be characterized here, the findings for the three areas provide strength for the entire study and indicate that they are a replication of each other.

Organizing the data

After transcription from hand notes, video and audio files, field data was collected village by village. All the information coming out from the individual interviews, and focus group discussion were organized in one master file for each village. It is a long process as it involved checking the consistency of written notes and audio-visual records. At the end, 45 master files resulted from three respective research zones. Before comparing one zone to another, the internal validation was made for each village by counter checking the rich discussion of the focus group with the data collected from individual participants. When a separate master file for each village was developed by gathering information as much as possible. Together with field notes which reflected the manner, tone and highlights of the participants, a full transcription of each village was combined in one master sheet. All quantifiable data coming out from the background interviews of each village were organized in excel files as one master sheet that visualized comparability of the village's vulnerability and resilience factors. All these data are not measured by the purely quantitative approach, they are complementary to the rich narratives coming out from the focus group discussion. It helped the researcher to verify and confirm the findings from focus group discussion.

Coding

Coding is part of a process that raises raw data to a conceptual level (Juliet and Anselm 1998). Miles and Huberman (1994) refer to the role of coding in data analysis as follows:

> To review a set of fieldnotes, transcribed or synthesized and to dissect them meaningfully while keeping the relations between the parts intact, is the stuff of analysis. This part of analysis involves how you differentiate and combine the data you have retrieved and the reflections you make about this information. (p. 56)

While transcribing the data from audio and hand-written formats to a computerized word sheet in the Burmese language, the thematic coding process started. Before jumping into the coding process, a set of pre-identified themes were developed within the frame of the four Cs models. In a thematic coding process, as explained by Ayres (2008), the researcher can begin with a list of anticipated themes that are already found in the raw material. This process helps to reduce the data from raw material that came out from semi-structured interviews. Thematic coding is useful for a study in which the conceptual frame is explicitly reflected in the data collection. In this stage, codes are now directly relevant to the conceptual model of the study, the literature the researcher studied and professional experience (Ayres 2008).

During the coding process, the researcher also added some more items to the existing list of themes when new topics appeared from reading and analyzing raw data. Additional list consists of short descriptions of issues that became apparent during the focus group discussions and village interviews. Once data from each village was categorized into different themes, and a tentative set of coding categories for each respective theme was developed, I need to lend a hand of an independent second rater. A code book that had phrases and words with their own definition and their own address (number) was also developed to makes the code fits the data rather than putting the data in the box of specific code. Based on the codebook, we parallelly tried to test the same three villages from each research zone. After reviewing our independent finding, we could construct an agreement for a final version of codebooks that would apply to the rest of the villages. In the final discussion, we still had to adjust the existing

codes and defined new ones. As the transcription work of all 45 villages was very rich, the process of data analysis one year from March 2014 to February 2015.

Differentiation and integration of data into only respective themes was challenging in a comparative study. For instance, when the 'Conditions' segment had a thematic code with a label 'medium to receive emergency warning', multiple answers could emerge to a simple open-ended question such as, 'how did the participants of a focus group discussion receive a cyclone warning?' Although the purpose of this question is to find out the pre-existing vulnerability of the community in the days before Cyclone Nargis, the respondents often brought their experiences not only from the pre-impact hours but also from the impact hours and associated events.

In a quantitative interview, this kind of question may go together with a tick box by which the respondent can choose one of the answers as an information source they could access to get warnings. The strength of a qualitative study is that it can provide more variables to one question than one can imagine. For example, if the respondent could only tick pre-identified types of answers in the questionnaire sheet, it was not possible for the researcher to know of cases such as Zee Thaung in Zone I and Ayeyar in Zone II as the warning came from the nearby army unit, which was an unusual factor in comparison with others. Here the challenge is how to handle these diverse materials although they fall under the same thematic code. As Ayres (2008) argues, in this stage, 'coding facilitates the development of themes, and the development of themes facilitates coding' (p.868).

Again, some of the paragraphs from transcribed materials cannot be decontextualized with labels as they are attached to more than one 'C'. When the respondents discussed the 'Conditions', the 'Characteristics' became inseparable in data analysis as well as in writing up. For example, the absence of primary school education was related to pre-Nargis vulnerability of showing a lack of shelter during Cyclone Nargis as well as to the weak potential of a human system to provide community resilience in the post-Nargis 'Chronology'. That is why a topic code is also needed for issues that overarch the concepts, ideas, categories and phenomena.

Data analysis with constant comparative method

Throughout the coding, the constant comparative method (Glaser and Strauss 1967) was applied to avoid missing some key points without coding.

Constant comparison among the three research zones was used to find out similarities and contrasts. Comparison matrices were also built to underline concrete similarities and differences. As hypothesis of the pattern had been developing based on initial findings since the researcher started the field interviews and group discussion, these patterns are clearer throughout the transcription process into a word document. They are also tested by building multiple matrices manually by applying to the following units of comparisons. The relationships between patterns are noted and discussed in respective chapters.

1. Comparison within a single interview or a single focus group discussion.

2. Comparison of one village to another within the same research zone (10 villages under Zone I and Zone III and 25 villages from Zone II)

3. Comparison of one village tract to another (comparison among Kone Gyi, Dee Du Kone and Oke Twin village tracts in Zone I; Aye Yar, Ka Don Ka Ni and Kyein Chaung Gyi village tracts in Zone II; Taw Kha Yan (East), Taw Kha Yan (West), Thone Gwa, Kanyin Gone and Toe in Zone III)

4. Comparison of one township to another within the same research zone (Labutta township and Ngapudaw township in Zone I; Bogale township and Dedaye township in Zone III,)

5. Comparison of several aspects of resilience and vulnerability among Zone I, II and III

6. Comparison of one administrative 'Region' to another (Ayeyarwaddy and Yangon Regions)

7. Comparison of one moment to another (Days before Cyclone Nargis, 24 hours before and after Cyclone Nargis, the first week after Cyclone Nargis, Current situation of 2013 and 2015)

8. Comparison of one disaster experience to another (comparison between 2004 Indian ocean tsunami and Cyclone Nargis)

In short, data analysis involved findings agreement or contrast between theoretical propositions and the empirical evidence from these three research zones are identified through pattern-matching. Expected patterns always specify the value of one or more dependent and independent variables. In the first round of data analysis, differences or similarities are retrieved from multiple cases in the same zone and later comparisons move outside of the same zone and cross-case analysis (Khan and VanWynsberghe 2008) is used to examine the commonalities and differences among the four 'Cs' of the three zones. Through cross-case analysis, it was possible to find explanatory factors that contributed to the outcome of Cyclone Nargis in the four 'Cs' for every region.

3.4.3 Triangulation

The use of triangulation as a concept in the social sciences can be traced back to Campbell and Fiske (1959) and was later elaborated by Denzin (1989). It is used as a 'strategy for validating results obtained with individual methods' (Flick 1998, p.230). Triangulation refers to the use of a 'combination of methodological practices, empirical materials, and perspectives' in a scientific inquiry to produce understanding (Flick 2002, p.229).

The triangulation method suggested by Denzin (1978) requires the assessment of the nature of the research problem and its relevance to a particular method. This involves checking the consistency of the results, which comes about by using different data collection or data analysis methods:

> The core strength of methods triangulation is its potential to expose unique differences or meaningful information that may have remained undiscovered with the use of only one approach or data collection technique in the study. (USAID, p. 22).

The extensive use of triangulation is embedded in the design of this research. First of all, investigation of events happening in the time line of Cyclone Nargis needs familiarity with the research areas and the progress of the recovery over a timespan of six to seven years among the local people. As the researcher was involved a self-organized relief aid program in the emergency phase and continued in the long-term recovery aid of cyclone-affected children in Zone I and Zone III, some of the events experienced were hard to forget. My personal experiences were useful in interpreting the field discussion and aggregated data but the personal reflections are always checked by using triangulation. As the standard of qualitative research is consolidated only when the data can be verified among the different options, this research is designed to form a hybrid type of inquiry to check the validity of one approach against the other.

By means of data verification, Denzin (1989) suggests that researchers must measure the same phenomena at different times, places and with different persons. Media analysis is also part of the research method; newspapers from the post-Nargis period were examined but the accuracy and truthfulness of one source (especially in the content of the state-owned media) always needed to be checked against other sources of information. Finally, this study also pays attention to what Flick (2009) suggests:

> Triangulation is less a strategy for validating results and procedures than an alternative to validation, which increases the scope, depth, and consistency in methodological proceedings. (Flick 2009, p.445)

Systematic triangulation is especially needed at the beginning of desk reviews. Myanmar was not strong in the tradition of encouraging scientific academic research; most of the publicly available and updated research had been conducted by independent researchers rather than government departments. Due to the lack of baseline data and lack of a proper documentation system for decades, it was common to have a set of diverse figures for the same item under investigation, for example, the population of the Ayeyarwady Region or the deforestation rate of the Delta. This situation required great care to check and evaluate by acquiring data from the most reliable sources possible.

3.5 Limitations and delimitations of the research methods

Even though the structured questions with open-ended questions are formulated in both focus group discussions and in in-depth interviews, the authority to control the flow of the discussion often fell to the most powerful respondents sitting in the groups. I had to remain alert to make the balance of power between the dominant speakers and those who shunned engaging in the dialogue. Gender equality was often an issue when all the villagers present at the meeting were males as men are more engaged in village affairs, and group meetings in the rural social setting of normal conditions are likely to be dominated by men. That is why, even in the preparation stage, the researcher asked the local facilitators who helped organize focus group discussion in the villages to bring the gender aspect into consideration as much as possible. Personal contacts were also sometimes used to identify the right local and international experts in the Nargis recovery process for the interviews. Keeping the question of 'Whose voice is heard and amplified because of the research?' (Dudwick et al. 2006, p.4) in mind, the structure of various groups and conflict of interests are also explored.

Another challenge is the limited availability of baseline data including scientific studies, experts' opinions, academic papers and news outlets that cover geographically marginalized areas of the Ayeyarwady Delta. Giarratano et al. (2014) say the field researcher should know that the services a community can access and deliver in a post-disaster period can be changed across time and life in the community may develop a 'new normal'. Seeking a set of baseline data for the areas concerned is very useful to understand how the community adapts or is forced to adapt quickly to a new situation. Unfortunately, Myanmar has very little baseline data for each province due to previous restrictions on the press and independent research. Especially in the marginalized communities that are located at the tip of the Delta as sample villages, little is known. In many cases, comparing the past and present was almost impossible as there was not enough data about the village in the existing literature. Also, the absence of or limited access to scientific data in the public domain did have impacts on the breadth and depth of conveying community narratives. For example, the community's experience on rising tidal water and salinity cannot be explained adequately by borrowing evidence from existing 'climate change' literature in Myanmar as context-specific studies do

not exist yet. In such cases, only global data from the international literature provides some resources to rely on.

3.6 Ethical considerations

All interviews and focus group discussions were conducted with the consent of the respondents to allow the researcher to use the data in the dissertation. The rule of anonymity for privacy and confidentiality was also clarified, so that people could stay anonymous. Some requested that I omit their names. As many villages are located in the forest areas of Kadon Kani Peninsula, the participants had a lot to discuss in relation to governance issues in the recovery process, and forestry and marine resources. In this area, grievances caused by corruption and chronic poverty were also strongly present and very often I witnessed the outcry of discontent. Report of conflicts and complaints about past conflict between the alleged beneficiary of the existing system and those who have problems with the system frequently appeared. In such cases, the security of structurally vulnerable people is a concern and very often some of the individual interviews also go without real names.

In terms of procedure, the respondents were also informed about the purpose of the interview before organizing focus group discussions or interviews. The emotional responses that might appear during the discussion were also considered risky for participation and were well explained to them as regards the nature and pattern of questions before starting the inquiry. Audiovisual recordings and taking photos of human subjects were always conducted by permission of the respective persons or groups.

3.7 Maintaining consistency with usages related to ‘disaster’

Based on a long tradition of qualitative research schools, this study also began with understanding, ‘What constitutes a disaster?’ Phillips (2014) observed that researchers should have a clear conceptualization of key terms such as hazards, risk and disasters as this is the core of the whole study. He also stressed that conceptual clarity will ‘help the researcher to move forward a scientific body of knowledge’ (p.6) and that a comparison of the events would be easier when the key definitions were consistent.

For conceptual clarification in this research, rather than reinventing a new wheel, I use existing definitions of terminology that are most relevant to the Myanmar context.

In Myanmar, it is traditional for the military authorities to refer to any case of mass destruction due to heavy natural hazard as a 'natural' disaster. On most occasions, under the military, the message was given to the public that disasters were inevitable as they are caused by nature (Government of Myanmar 2011, ABC 2015b). Nature as a cause is the oldest form of analysis in vulnerability study (Anderson,1995). In Myanmar language, it is common usage not to make any distinction between hazard and disaster. 'Kat Bay u yfab ;' has been used with reference to any exposure to the hazard and its consequences. Whether without taking internationally known distinction between 'hazard' and 'disaster', for successive Myanmar governments have been using 'natural' as an adjective to the word 'disaster'. One may find it in examples such as 'Natural Disaster Management Law' which was enacted on 31 July 2013 or the National Natural Disaster Management Committee (NNDMC). What the Myanmar government perceived the term 'natural disaster' is divergent from a widely known reference of the UN.

When the government formulated new disaster-related policies and legal frameworks in the post-Nargis period such as the Standing Order on Natural Disaster Management in Myanmar (2009). What the Myanmar government perceives by the term 'natural disaster' is divergent from the widely-known position of the UN on disaster issues in the contemporary world. Bankoff (2001) contends that seeing disaster as natural makes the government care less about the vulnerable when they think disasters are nobody's fault but due to nature. Vulnerable people are at risk not simply because they are 'exposed to hazards' but also because they have been made 'marginal' (Bankoff 2001, p.25). He argues:

> What makes a hazard into a disaster depends primarily on the way a society is ordered. Human systems place some people more at risk than others, creating relationships best understood in terms of an individual's, household's, community's or society's vulnerability. (Bankoff 2010, p.23)

Bankoff'a argument is also reflected in the UNDP's position that disaster counts on the role of society affected. A fundamental approach of this study considers that the

Myanmar people's vulnerability is derived not only from the present natural state of hazards but also from the construction of social, political and economic environments of the affected communities. From the UN point of view, disasters are often described as a result of the combination of exposure to a hazard, the conditions of vulnerability that are present, and insufficient capacity or measures to reduce or cope with the potential negative consequences (Scheuer 2012). For the sake of conceptual clarity, the UNISDR official definitions of key terms as shown in Table 5 will be used in the interpretation of the field results and in describing them throughout the discussion in this dissertation.

Table 5 **UN's definition of disaster-related terms**

Hazard	A dangerous phenomenon, substance, human activity or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage.
Natural hazard	Natural process or phenomenon that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage.
Disaster	A serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources.
Disaster risk	The potential disaster losses, in lives, health status, livelihoods, assets and services, which could occur to a particular community or a society over some specified future time period.
Disaster risk management	The systematic process of using administrative directives, organizations, and operational skills and capacities to implement strategies, policies and improved coping capacities in order to lessen the adverse impacts of hazards and the possibility of disaster.
Disaster risk reduction	The concept and practice of reducing disaster risks through systematic efforts to analyze and manage the causal factors of disasters, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events.

Emergency management	The organization and management of resources and responsibilities for addressing all aspects of emergencies, in particular preparedness, response and initial recovery steps.
Early warning system	The set of capacities needed to generate and disseminate timely and meaningful warning information to enable individuals, communities and organizations threatened by a hazard to prepare and to act appropriately and in sufficient time to reduce the possibility of harm or loss.
Mitigation	The lessening or limitation of the adverse impacts of hazards and related disasters.
Prevention	The outright avoidance of adverse impacts of hazards and related disasters.
Preparedness	The knowledge and capacities developed by governments, professional response and recovery organizations, communities and individuals to effectively anticipate, respond to, and recover from, the impacts of likely, imminent or current hazard events or conditions.
Recovery	The restoration, and improvement where appropriate, of facilities, livelihoods and living conditions of disaster-affected communities, including efforts to reduce disaster risk factors.
Resilience	The ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions.
Response	The provision of emergency services and public assistance during or immediately after a disaster in order to save lives, reduce health impacts, ensure public safety and meet the basic subsistence needs of the people affected.

Source: UNISDR (2009)

3.8 Selection of the research sites

This study covers 45 villages in three self-identified research zones of the Ayeyarwady Delta as shown in Figure 4. All are situated along the cyclone track. Depending on geographic position, they are situated along Cyclone Nargis's path and their existing level of resilience, and the impacts, vary in each research zone. A village's geographic position subject to direct exposure to the storm surge was a major determinant in selection of research sites. From the aerial view, the cyclone moved from the

southwestern end of the Delta to the northeast passing all three zones at a highly destructive speed.

The elements of the community resilience system are analyzed by comparing how similar or different they are among these three zones. Zone I as shown on the map can be divided into two places: the first half of ten sample villages is in Pyinsalu sub-township and the other half is in Pyinkhayine Island. Zone II covered 25 villages spread over a large part of Kadon Kani Peninsula, which is situated in a face to face position with Mainmahla Kyun Wildlife Sanctuary. Nearly the whole of Zone II used to be part of the forest reserved area, but by the end of 2015 it received the official status of residential area. Zone III which is located just beside the Toe River flowing into the Bay of Bengal also contained 10 villages. When they are categorized as administrative units, eight villages are part of Kungyangone townships while the other two, Toe village and Sar Gyin village, are governed under the township administration of Dedaye.

3.8.1 Background to Zone I

Pyinsalu sub-township

When the Asian Tsunami hit Myanmar's shores in December 2004, Pyinsalu was one of the worst damaged spots. Pyinsalu, which used to be a fishing village became a sub-township just before the tsunami. It was ranked as a sub-township under the Labutta district of the Ayeyarwady Division in 2006. In the 2004 Asian Tsunami, over two thousand people were affected in Pyinsalu alone and 25 persons died. According to the official statistics, nearly 300 houses were destroyed. Four villages under the Pyinsalu sub-township were directly exposed to the wave (WFP 2005). Three of them participated in this research.

In Cyclone Nargis, according to township official records, the death toll was over 50,000 (Phyu 2013) although local people believed the number could be higher. After Nargis, a mass influx of migration occurred as people from other areas reached Pyinsalu. The town and its neighboring villages also gained more attention from the military government because of the relatively high amount of loss and damage. The

residents said over 95 of the existing population were new, settling in the town only in 2008. According to the 2014 Myanmar census, the population in Pyinsalu is over 85,000 (Department of Population 2015, p.29).

During Nargis, only one house, one monastery and half of the hospital buildings remained without being ripped apart while the whole town was smashed by the wind and storm surge. There were only 10 telephones in the town at the time of Nargis. Newspapers and weekly periodicals could only reach the town when the boats arrived from Yangon. The two cyclone shelters were built with the support of two private companies, Max Myanmar and A-One under the supervision of the government. Before Cyclone Nargis, people from Pyinsalu could travel to the nearest district town Labutta only by boat. Since 2008, a new road linking Labutta, Thingangyi and Pyinsalu was constructed along with four road projects that were initiated as part of the rehabilitation in the cyclone-affected areas (NLM 2009; NLM 2014). The five selected villages, namely Kone Gyi, Lay Yin Kwin, Aung Hlaing, Kwin Yar and Nant Thar Kone, are governed by the township authorities of Pyinsalu sub-township.

Pyinkhayine Island

Pyinkhayine Island can be reached only by taking the boat from Pathein, the capital of the Province. It takes around 10 hours from Pyinkhayine to Pathein by boat. On the island, motor scooters are a popular means of transport to commute from one village to another. The research area, which covers five villages at the cape of Pyinkhayine, is located next to point 'Mawtin', formerly known as 'Cape Negrais', which is the westernmost landmark in the Ayeyarwady Region. Geographically, these villages lie just opposite Haing Gyi Island, which is another seaward extremity beside a spur of the Arakan Yoma range between the Pathein River and Thetkal Thaung River. When Cyclone Nargis hit Myanmar, the first point of landfall was the Thamee Hla Island which is next to Haing Gyi Island. Although the eye of the cyclone was very close to the selected villages, not all villages suffered from the surge to the same degree. Having topographically favorable positions, three villages, namely Dee Du Kone, Zee Thaung and Kyaukkalat, were less affected than the other two villages, which are geographically more vulnerable.

3.8.2 Background to Zone II

Bogale Township

Bogale is in Pyapon district, which covered 71 village tracts comprising 589 villages by March 2009 (MIMU 2009). As the most downstream delta town, it also serves as a trading center for all the village tracts from the surrounding areas. It is situated on the coastal bank that faces the confluence of Kyaikpi River and Gonenyindan River. These two rivers join together to become the Bogale River near the town which continues to flow to the South until it reaches to the Andaman Sea. Bogale is approximately 43 miles from the sea.

The villages under study are spread over the Kadon Kani Peninsula on the mouth of Bogale River. Before the Bogale-Kadon Kani road was opened in 2014 (Hlaing, 2014, p.1), local people from the whole peninsula commuted to Bogale and other upper towns only by boat. The inland road infrastructure around Bogale was constructed after 2008 and now it takes only four hours to reach to Bogale from Yangon. In the past, the morning and night boats between Yangon and Bogale were the only means of transport and took approximately eight hours.

The villages that participated in this research are part of the Kadon Kani, Kyein Chaung Gyi, Kyun Thar Yar and Ayeyar village tracts. All the village areas are located inside the Kadon Kani Reserved Forest Area or overlap the forest area. As very few existed outside the forest, most of the villages were not registered as official human settlements until late 2015. In Bogale township, it is estimated that 36,325 people died due to Cyclone Nargis (Aung 2013). Even in the official records, the death toll accounted for 12.5 per cent of the town's population at this time. As the effect of the storm was not the same everywhere, some villages were hit harder than others. Over 90 per cent of houses were destroyed and the tools for income-generating activities of the farmers and fishermen almost completely vanished (Aung 2013, p.7).

3.8.3 Background to Zone III

Kungyangone

Kungyangone, which was believed to be a village of Mon ethnic people in ancient times under the Burmese monarch, is just 48 miles away from Yangon (Maung 1978, p.215). When someone goes to Kungyangone via Dala Township, it is only a two-hour drive from Yangon. Eight of the selected villages under Kunchangone are in areas that are historically and geographically known as the Southern Kunchangone, and the other two that belonged to Dedaye are the closest to the sea, residing on a shore between Toe River and Yangon River.

Kunchangone was only a village of 200 houses in 1850 and was inhabited only by 100 people. Under the British, it was transformed to a small town by combining with another village called Taw Pa Lal. Since the early years of the twentieth century, Kungyangone was governed as a district under the Twente Division which contained nine other districts. The sparse population contains mostly Burman and other minorities including Karen and Indian migrants (Maung 1978, p.217).

The southern parts consist of coastal villages and islands exposed to sea water after the mangroves were rapidly cleared in the last half of last century. Traditionally, people from the northern part of Kunchangone made their living from plantations and the southern part is inhabited by paddy farmers and fishermen who made settlements along the coast line.

Dedaye

Two villages from Dedaye are located on the mouth of the Toe River facing the sea. Administratively, these villages are combined with the Dedaye township, although they are geographically closer to Kungyangone. These three villages are on the right side of Toe River, which was the borderline for the two townships of Kungyangone and Dedaye. These villages are close to a historic place called China Bakir Flat, where the British government installed a light-house between 1869 and 1920 (Maung 1978, p.327).

The name Dedaye was assumed to be a Mon name and the town's people believed that it was founded by ancient Mon. After Independence, Dedaye remained as a town in the Ayeyarwady Division, although Kungyangone became a part of Yangon Division. Dedaye used to be bigger than Kunchangon in size and population in the early 20th century. The peak of agricultural land expansion occurred during the colonial days, but more forest areas were cleared for agriculture under the military government that came into power in 1988 (Yan 2016). After nearly three decades of rapid deforestation, the local people have become increasingly aware of more frequent floods and strong weather. Nargis was a wake-up call for the people of Kunchangone and Dedaye, where mangroves were cut until they reached zero level. The case study villages under Dedaye lost part of their mangrove areas during the rule of SLORC and SPDC. It is an inconvenient truth for the local people who are now highly aware of the negative consequences of deforestation, but they did not have the collective bargaining power to challenge the local authorities (Yan 2016). Dedaye, which used to have 2,800 acres of mangrove forest in the past is now covered by 50 acres (Yan 2016). Selected villages in the Dedaye under study have a majority population of fishermen with a few paddy farmers.

Figure 4 **Map of research zones in the Ayeyarwady Delta**

Source: The United Nations Institute for Training and Research.

Chapter 4

Historical outline and vulnerability in the Ayeyarwady Delta before Cyclone Nargis

This chapter identifies vulnerability and resiliency in the Delta before Cyclone Nargis hit the region. It intends to locate disaster in historical context and learn the implications of recent history in enhancing human security in the delta. Bankoff (2004) points out that 'disasters are both historical processes and sequential events' (p.24). Anthony Oliver-Smith also makes a similar point, 'the life-history of a disaster begins prior to the appearance of a specific event-focused agent' (Oliver-Smith 1999, p.29-30). This chapter argues that much of the vulnerability around Cyclone Nargis is rooted in national history and its implications for conditions of the community's assets (physical, institutional) and processes (social capital, participation, trust) for resilience.

Much of the modern history of Myanmar has been described in terms of failure of development as evident in the state of the economy or failure in democratization as evident in the long domination of the military in politics. While several accounts on different features of Myanmar have been discussed in various thematic studies: general history and politics (Holliday 2012; Steinberg 2001; Hlaing et al. 2005), development and economic (ADB 2012; Cheesman et al. 2013; Furnivall 1947; Than 2007; Thein 2004), society and culture (Gyi 1983; Myint-U 2006), ethnic conflict and military (Gravers 2007; Lall 2009), civil society and human security (James 2005; Steinberg 1997), environment and resource extraction (James 2006; Skidmore and Wilson 2013), specific accounts of the Delta were limited. Adas (2011), Schendal (1991) and, Than (2000) provide accounts of the Delta with the main focus on an agricultural aspects of the Delta communities in the colonial and post-independence period.

In this chapter, issues related to the Delta are extrapolated from secondary data and reports on Myanmar. The first part of the chapter provides a background of Myanmar with issues affecting to the whole country including the Delta. In the second part, socio-economic and environmental vulnerability in the Delta before Cyclone Nargis is analyzed within a framework of three domains: 'people', 'place' and 'governance'.

4.1 Historical outline of land and living in the Delta

The history of Myanmar can be presented from different starting points. We can either start from ancient history, from colonial times under the rule of the British Empire, or from Independence. This study begins with a historical background of the Delta from the colonial period. Several historical writings on Myanmar/Burma agreed that the current political map of Myanmar was created by the British Empire (Lintner 1994; Taylor 1987). Taylor (2007) even specified that 'Though this flies in the face of official nationalist historiography of the country, it is no exaggeration to say that the British made modern Myanmar' (p.72).

In pre-colonial days, the center of power was concentrated in Central Myanmar cities such as Ava, Amarapura or Mandalay. Lower Burma, which includes the Ayeyarwady Delta, was quite far from these central authorities but they were loosely represented locally by district governors (myowun), who ruled over the headmen of the townships (myothugyi) and villages. In the Delta, the land was abundant and sparsely populated (Myint-U 2001). The British annexed Lower Burma in 1852 and started to 'develop' what they saw as 'neglected' resources. They introduced a plan for rice cultivation which focused on exports and improved rural infrastructure such as embankments, roads, and canals (Schendel 1991).

The whole of Burma fell under British control in the 1890s. In a study of the Burma Delta under the British rule, Adas (2011) stated that what the British brought in was a liberal economic framework and policy measures to stimulate capitalist expansion. After the opening of the Suez Canal in 1869, the fertile land of the Delta and lower Burma were eyed by British rice exporters as new areas to exploit for international trade. Within half a century (1855-1906), the cultivated area in lower Burma increased from over 700,000 acres to nearly six million acres (Adas 2011). In the early twentieth century, the Burma Delta became the rice basket of Asia. Demographic change was also apparent with a huge migration of Burmese from upper Burma as well as of Chinese and Indian migrants. Economic growth under the British in the last half of the 19th century was hailed as an impressive achievement (Adas 2011).

Then came the First World War and a downturn in the economy that loomed over the next two decades. Local farmers were hardest hit during the economic downturn. Many lost their farmland due to the debt crisis and their possessions were transferred to Indian moneylenders. It was recorded that more than half of all agricultural land in the principal rice-growing districts of lower Burma was owned by non-native absentee landlords by 1940 (Turnell and Vicary 2008). As Furnivall noted, a poor man in the poor country of the past under the Burmese king was now changed to 'a poor man in a comparatively rich country' (Furnivall 1947). Schendel (1991) observed that the dramatic change the British hegemony brought to rural Lower Burma was the destruction of the self-reliant peasantry.

The Second World War came to Burma in 1942 with the march of the Japanese army through Southern Burma. After three years, the Japanese retreated and the British re-entered. After the Second World War Burma was devastated by huge economic loss. The war, as quoted in Schedel's book, 'destroyed a larger share of the nation's physical wealth than was destroyed in any other country except Greece' (Hagen 1956 cited in Schedel 1991). Since Burma has been plagued by a series of armed conflicts after Independence, Schedel (1991) contended 'Post-war reconstruction was largely undone by the revolts that followed Burma's Independence in 1948' (Schedel 1991, p.211).

After gaining independence in 1948, fourteen years of 'democratic interlude' existed in Burma until the military coup of 1962. The significance of this short democratic rule was credited for the level of economic growth which reached back to pre-war levels and the expansion of education and social sectors (Thein 2004), and growing civil society and village life (Steinberg 1981). However, these years also marked widespread civil war, ethnic tensions, and political infighting. A major criticism of the Prime Minister U Nu was his failure to prioritize the bridging of the ethnic and religious divide of the country (Callahan 2004). In this context of civil war, the Delta witnessed fighting between the Burmese military and the Karen ethnic armed groups for several years after Myanmar's Independence.

In the meantime, Burma's military power gradually moved to a stronger position in the context of civil war and in battles against the invasion of Kuomintang Chinese armed forces who entered the Shan States in 1949-1950 (Callahan 2001; Seekins

2007). Finally, in 1962, the military staged a coup and decades of entrenched military rule in Burma started. Under the military government of General Ne Win, which rebranded itself later as the Burma Socialist Programme Party (BSPP), all rice trade was nationalized and rice prices were manipulated for state benefit, which affected the lives of farmers in the Delta and elsewhere. While rice procurement was undertaken by the State, growers were isolated from the world market. The State's procurement also served to subsidize urban consumers. Legislation in 1965 abolished all rents on farm lands, but tenancy in practice did not disappear. In 1969-70, 61 per cent of lower Burma's cultivators were reported as tenants (Schendel 1991). The State became the sole owner of the land and land tenure was used by the State to force adherence to the State's economic policies. Steinberg (1981) stated that the 'majority of the Burmese peasantry is once again at the mercy of its landlord, but today the landlord is the state' (p.128).

'The Burmese Way to Socialism' was the main state's narrative in General Ne Win's era of the Burma Socialist Programme Party (BSPP). In the BSPP era, the steady socio-economic decline of the country led to the UN's designation of Burma as a Least Developed Country in 1987 (Steinberg 2010). Under the socialist regime, there was little interaction with the global sphere and citizens were isolated from the world in various ways (Steinberg 1981). Public expenditure on agriculture declined from 11.3 per cent of capital expenditure in 1964-65 to 4.4 percent in 1970-71. Due to little budget for irrigation, only 13 per cent of agricultural areas could be used for multiple cropping in 1972 (Steinberg 1981).

The BSPP's rule ended in 1988 with a popular uprising against the government and subsequent military takeover on 18 September 1988. The military tried to convince the people that the takeover was to be understood as 'a coup by consent' (Steinberg, 2013). The stated reason of the military was to prevent what they considered chaos on the streets; they said they would be holding power temporarily and promised to go back to the barracks. They fulfilled their promise partially in 2010 after more than two decades in power. In all these years, much has been recorded and analyzed about the military regime's human rights abuses, forced labors, corruption, and ongoing civil wars in several ethnic regions (Graver and Flemming eds. 2014).

In more than two decades of military rule since 1988, the global media had to cover mostly bad news, be it the 2007 bloody crackdown on monk-led protests, or long prison sentences for rights activists, or the neglected victory of the opposition in the 1990 election, or the extension of house arrest of the main opposition leader Aung San Suu Kyi for several times, or the seemingly endless constitution-drafting process since 1993 which finally finished in 2008.

Holliday (2012) argued that 'social impacts of martial law have been mainly devastation' and Myanmar has pinned itself at the wrong end of various global indexes. Callahan (2013) concludes two major changes in the political and economic environment of Myanmar since 1988 to the years before Cyclone Nargis. These changes are described as follows:

> One is the explosion of rent-seeking opportunities that has emerged with the state rebuilding process from the late 1980s until today. The second was that changes in the world economy ushered in at the end of the Cold War—and particularly the expansion of neo-liberal institutions and policies—gave senior officers access to an unprecedented range of lucrative (and often informal) business partnerships. (Callahan 2007, p.42)

At a casual glance on the period before political transition in 2011, Myanmar was ranked 174th of 178 countries in the Press Freedom Index of 2010 (Reporters without Border 2010), 176th out of 178 countries in the Corruption Perceptions Index of 2010 (Transparency International 2010), 132nd out of 149 counties in the Global Peace Index 2010 and 16th most fragile state out of 177 countries in the Failed States Index 2010. The US and other western countries responded to Myanmar with economic sanctions as punishment, while most regional countries including ASEAN members and China maintained either engagement or business as usual with Myanmar. The military's dominance over most of public institutions and the economic sector became 'sources of political patronages' (Lambrecht 2010). In this context, the society grew weaker in what Duffield (2008) referred to as 'chronic emergency in Myanmar'.

4.2 Vulnerability of the Delta and Myanmar in the three domains

In order to locate historical aspects of vulnerability and resilience in the Delta, three aspects of village community are identified as shown in Figure 5. These aspects can be seen in 'people', 'place' and 'governance' domains. 'Governance' is a collective reference to local power structures under national political control and policy frameworks while 'place' refers to natural resources and environment around the village or in the region under study in which a village community is situated. 'People' refers to human capital aspects of health and education together with livelihood conditions. The strengths and weaknesses of each aspect contribute to the levels of vulnerability and resiliency while these three aspects interact and impact on each other. For example, mangrove degradation (the place domain) affects the livelihoods options of the people (the people domain) and corruption of the local authority in the forest conservation area (the governance domain) impacts upon both people and place.

As shown in Figure 5, communities situated within these three domains are nestled within the nation state which in turn is influenced by changes in regional and global contexts. Changes in national or regional contexts also have impacts on the stated domains (three aspects) of the community with dual stages of resiliency and vulnerability. General patterns of events and issues from a distance (national or international level), in which local people do not have any control but nonetheless receive impact on their wellbeing ruled by the authoritarian government, were also explored using this three domains framework.

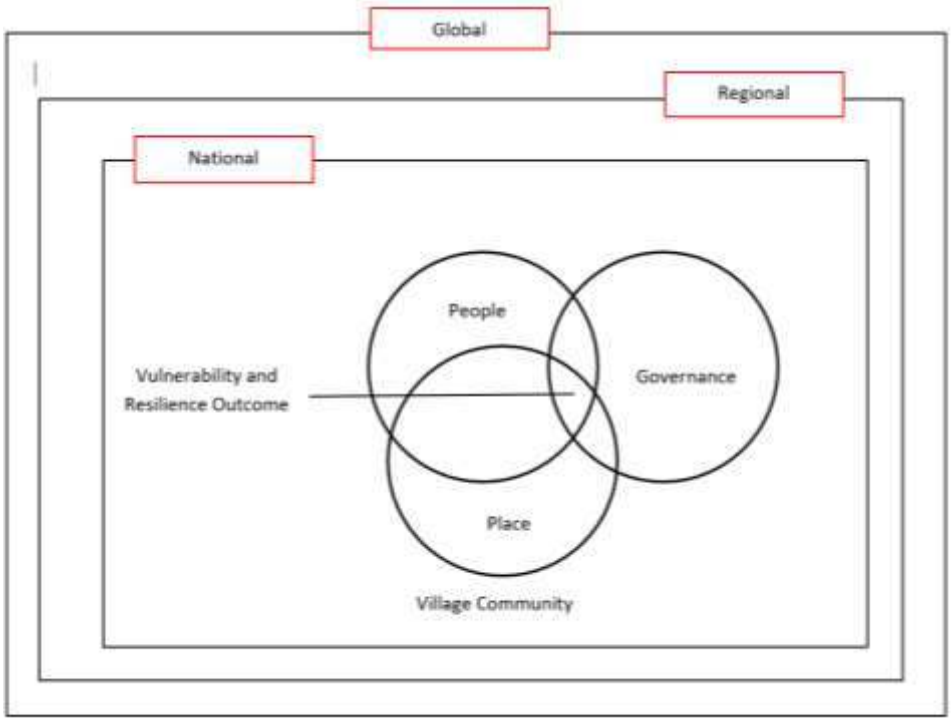

Figure 5 **Simplified representation of three domains in village community of the Delta**

Livelihoods in village communities of the Delta mainly revolved around farming, fishing, and related activities. While the farmers had been hard pressed by the government's socio-economic policies since the first military rule of 1962, fishing was also no longer a cheap option that could provide a safety net for local people after a new fishing policy was introduced to privatize common fishing ground after 1990. In the face of mounting livelihood insecurity, local people have relied more on natural resources around their communities while government policy and corruption shrank the resource domain in significant ways. All these situations led the Delta community to a vulnerable existence in terms of natural protection, weakening community asset-bases such as housing. In the meantime, local governance under direct control of the military did not always favor community processes of collective action which can accumulate resilience.

4.3 People

4.3.1 Land and livelihood of people

Furnivall (1957) in his reflection on pre-colonial Burma said that 'a man did not live in a village because he owned land there, but he owned land because he lived in the village' (p.85). From the time around Cyclone Nargis till the current situation in Myanmar, landlessness has been a major feature in the Delta as well as in broader parts of Myanmar. The only national household survey ever conducted under the military rule, called the Integrated Household Living Condition (IHLC II) survey (2009-10) showed that 24% of the population who earned income from agriculture were landless (UNDP 2011). Later, the World Bank revised the IHLC II survey, as it was based on the outdated population census of 1983. In the revised figure of the World Bank, rural landlessness is around 40% (two-fifths of the total population) (World Bank 2014, p.24). Save the Children (2009) also noted that the number of landless households in the Delta was estimated at 60 to 65% of the total population, which is significantly higher than the national landless ratio. A rapid rate of land loss around the time before Cyclone Nargis was recorded as follows:

> I was working for the Ministry of Forest for 35 years before I retired in 2006. At that time, we had about 500 landowners in Hlaingbongyi village tract listed in the ministry's statistic yearbook. When I looked at the same book published in 2008, there were only some 300 landowners left. Many of them had to sell the land because they were struggling to pay debts. (Interview with a resident of Halingbongyi Village Tract, Labutta Township)

Landlessness pushed the people to marginal places and to a higher level of vulnerability. In focus group discussions for this research, there were people who became landless in pre-Cyclone Nargis time. These participants stated that debt due to long-term decline in productivity and government procurements policy for years (which stopped in 2003) was a major reason. A generational dimension of debt incurred over time and gradual loss of land was a dominant pattern described in discussions when they referred to the time before Cyclone Nargis (Focus group discussion in Zone I and II).

Since the first military coup of 1962, the government's rice procurement policy put a heavy burden on the farmers of the Delta and all over Myanmar. Around 1987, the farmers were forced to sell around 10 to 12 tin of paddy (1 tin or basket is equal to 20.9 kg) per acre to the government at a fixed price. But in the 1990s, under the second military government, a new policy set the amount of rice procurement up to 30 to 40 tins per acre which was equivalent to the average amount of total rice production per acre. At that time, the government's fixed price was only 31% of the market price (Young et al. 1998). The procurement policy was stopped in 2003, but 70% of national poverty was already located in rural areas of the country (Steinberg 2001).

When farming was under pressure under the government procurement policy and a gradual decline in productivity, subsistence fishing was no longer a cheap option used to provide a safety net for local people because of a new scheme of privatization of many common fishing grounds in the Delta (GFDRR 2014). Extensive marketization and privatization started in the early 1990s under a scheme operated by the Department of Fisheries. At the township level, the Department of Fisheries controlled inland fishery resources and introduced finishing leases and licenses by allowing those who could offer a competitive price to own fishing grounds (Save the Children 2009). As most of the licenses were sub-leased by the primary bidder to smaller fishermen with a higher price, small-scale fishermen who had to rely on the income from daily fishing consequently suffered. Quite often, even fishing grounds in small creeks fell into the hands of bidders and livelihood options for the rest became fewer.

In a study of poverty and mangrove deforestation in the Delta, Htay (2016) stated that local people were often incapable of paying market price for fishing licenses even though the creeks and rivers are located beside them. Therefore, these villagers 'hide and catch marine animals in the small creeks at night' (p.82) but they do not usually get a good catch. Their income was shrinking while the supposed safety net rarely helped. Htay (2016) also describes a circle of deprivation among the Delta fishermen; the villagers at the margin need to borrow the money for food, then they go fishing at night. Due to a lower quality of fish catch, they cannot pay back the debt. Then they sometimes sneak into the mangrove forest to get something to make some money for debt repayment and daily food. Poverty forces them to make illegal extractions

although they know that depleted mangroves are part of the reason for declining fish stocks. When mangroves which serve as fish spawning grounds lose ecosystem services, they cannot find fish and poverty continues to grow.

In this context of government policy negatively impacting on local livelihoods, local communities in the Delta faced an increase in vulnerability. When the local participants in this research shared their life story under the military regime prior to Cyclone Nargis, they usually referred to two factors in the name of vulnerability: powerlessness and feeling neglected. 'Powerlessness' in the face of oppression, corruption and injustice and 'neglect' by the government policy and administrative structures to crucial issues which impact on society and community.

Powerlessness was profoundly expressed in Zone II of this research when participants recounted confrontational situations involving fishing license holders and ordinary fishermen in which local police or authorities usually protect the interest of licensees (discussions in Aye Yar village of Zone II). Lack of protection for local people and its impact on livelihoods at village level was observed not only in fishing rights and but also in the land rights issue stated in Chapter 7 which featured at the root of acute vulnerability before Cyclone Nargis and its continuation in the recovery phase. The following observation of Steinberg (2001) on the rule of law in Myanmar can also be applied at the small village level:

> Law is not the protection of rights but arbitrary set of regulations promulgated to support the state establishment and to prevent dissidence. Law is thus personal, not contractual, opening avenues for corruption…. In provincial areas, local military commanders have virtual dictatorial powers to enforce (or ignore) regulations that serve what they regard as state (or personal) interests. (p.41)

In the three research zones of the Delta, landlessness and limited livelihood options pushed more people to the lowest category of the wealth ranking. Doan (2008), described local households in four categories of wealth rankings, namely Very Poor, Poor, Better-Off and the Middle. In this study, which encompasses 45 villages of the Delta area, the conditions of landless farmers and manual laborers of fishing boats largely resembled the conditions of the very poor category of the Save the Children's

report description. The state of very poor villagers in Save the Children's livelihoods rapid needs assessment prepared by Doan (2008) is described as follows:

> The households in this wealth group are characterized by their lack of major productive assets, i.e., they do not have paddy land and cattle; a small number of them do not even have land to build their own houses and have to rent from others. Many of these households, typically about less than half of them do not even have boats; if they do, their boats are often of small size and low quality. Their fishing nets are small and for subsistence fishing of about US$10 or less; they may have crab traps that they can use without having to pay fishing license fee. Their crab traps are very simple and usually made by themselves with purchase of key materials such as small fishing nets and some bamboo sticks. Many of them cannot afford to have livestock, particularly pigs that can serve as meaningful buffer during hunger season. Thus, they must borrow in the form of 'advance' either in cash or in-kind from those households who provide access to casual labor opportunities; their loans are usually a few to ten dollars and to be repaid during the high labor season.
>
> If they are hired by landowners for both planting and harvesting season, they may typically get kyat 270,000 a year from this job. Without having land, all their income must go in to food, essentially rice and these households are extremely vulnerable to food price fluctuation. The income of these landless from working as casual labor in farm was sufficient to buy rice for their family consumption for 8-10 months only. They must seek additional income sources to cover their other expenses.
>
> Among poor households, there are extremely poor and vulnerable households that are often described by the locals in their own words as those in 'worst condition'. In addition to their lack of major productive assets, they are constrained by limited number of income earners in the family, having family member(s) chronically ill or disabled, etc. Some of them are elderly including widows who live alone and their capacity to work is very limited. They usually have modest income and have to rely on support from their neighbors and extended family members who live close by. They typically live far from the village center and drinking water pond. These households are extremely vulnerable to shocks and stress happening to them as well as their neighbors and family members. (Doan 2008, p.27)

In the post-Cyclone Nargis period of this research, it was discovered that 60 to 70 per cent of the households in all villages of Zone II are in a similar state to the above description. In contrast, Zone I and Zone III villages showed a mixture of all four categories of the stated survey. Yet, the proporation of landless and casual laborers there also ranged from 35 per cent to 45 per cent among the selected villages. These numbers indicate the continuing struggle of the people in the post-Cyclone Nargis period. Nevertheless, a new development in the pre-cyclone Nargis period is a space for local people to engage with issues that affect their life.

4.3.2 The health and education of the people

One year before Cyclone Nargis, the European Commission strategy paper on Myanmar concluded that, 'the country is severely off track to achieve any of the MDGs by 2015'. (European Commission 2007, p.9). At that time, the dismal figures of the Myanmar community's struggle were as follows:

- Average family spent 75% of income on food (Myint-U 2009). The CIA World Factbook estimated that the population living below the poverty line was 32.7 per cent by 2007 (CIA 2017)
- In 2008, Myanmar spending on education was at 0.7% of GDP and 3.5% of total government expenditures and many years before 2008 did not see expenditure higher than this (UNICEF 2013). That can be compared to the estimated military budget which consistently absorbed amount highers than total expenditure on health care and education for the period 2004–2009 (Turnell 2012). In the years prior to Nargis barely 60 per cent of children finished primary level education (Ministry of Education 2008)
- Total health expenditure in Myanmar is the lowest among Southeast Asia countries between 2003 and 2011. General government health expenditure (GGHE) as a percentage of general government expenditure (GGE) was only 1% in the same period (WHO 2014).
- Per capita income in 2008 was estimated to be about US$290 (Steinberg 2013).

As described in the above figures, a decline in the health and education standards of the people which linked to vulnerability was a distinct feature of people and

communities in different parts of Myanmar. The Delta was no exception and poverty in the region was 32 per cent (UNDP 2011).

Two prominent issues of social vulnerability in the Delta communities can be identified as health and education. Several discussions in Zone I and II described health situations in the villages before Cyclone Nargis as 'ill health is the fastest way to poverty'. In 2005, three years prior to Cyclone Nargis, the World Health Organization estimated that out of pocket payments for healthcare in Myanmar were 99 per cent and among the highest globally. In other words, people were on their own in terms of health care services (Saw et al. 2013).

Because of the poor healthcare services available in the country in the years prior to Cyclone Nargis, 41 per cent of children under five years of age were stunted and 30 per cent were underweight (World Bank 2010). The Myanmar Multiple Indicator Cluster Survey (UNICEF 2011) also showed similar indicators in a report published the year after Nargis. According to the MICS 2009-2010, Myanmar had the third highest malnutrition rate in South East Asia.

Malnutrition triggered a higher mortality rate among children. In addition to that it hampered children's ability to learn as well as having cognition skills. In the current context of a changing environment and of extreme climatic events, basic knowledge about geography and functional literacy will help the children and their families to survive. During the fieldwork for this research, people in several villages, teenagers and adults alike, expressed how they could not get a mental image of the cyclone's direction and geographical orientation even though they heard about it or listened to the storm news on the radio.

Changes in the education sector also need to be considered as underlying roots of vulnerability. In colonial and in early post-colonial days, Myanmar had a well-functioning education system and a high literacy rate (Matelski 2015). After the 1962 military takeover, the quality of education system started to decline (Ditlevsen 2014; Steinberg 2001). With little budget allocated for education, physical aspects such as school building quality, as well as the number of teachers and implementation of proper curriculum declined (Ditlevsen 2014).

Poverty, as noted by Phong and Tinh (2010), is 'not synonymous with vulnerability but one of its principal driving forces' (p.293). In the case of the Delta communities, a population in extreme poverty had fewer assets of strength that could withstand a hazard. An obvious manifestation is that there appeared many stories of strong buildings and houses that saved many lives in several villages, yet some suffered under the direct storm path due to having little barrier between the sea and their houses (for example, the villages in Zone I of this study). From the field visit and narratives from the villages, the linkage potential of better housing and public buildings such as schools in villages with improved livelihoods was very tangible. Unfortunately, in the poverty-dominated rural community of the Delta, the quantity of stronger houses that can provide better survival chances is limited. With respect to locating a safe place to take refuge, almost all of the villagers in this research echoed the following quote of a woman participant of research Zone III:

> Running was my only option. My house was too small. It could not be safe for my three-month-old daughter and me. I crossed the road and run into the opposite house which looked stronger. Oh, too many people there. (Ma Thida, 30 years old female farm worker from Eastern Tawkhayagyi, Zone III)

While it is less tangible to assess, the potential for improved education to save lives is also high. Having awareness of the incoming storm, a better comprehension of early warnings and a good understanding of the Delta's geography, could all contribute to a local process of disaster preparedness measures so that people could probably have a better chance of survival.

In addition to health impacts on both poverty and education, which factored in having tangible and intangible assets for disaster resilience as mentioned above, poor health and malnutrition showed another visible dimension in the storm emergency: a weaker position to survive in the storm. It is not hard to imagine how lopsided it was for old people, children, and people with weak physical strength struggling against the ferocious storm surge and storm wind of Cyclone Nargis.

4.4 Place

When George Orwell wrote an article about Myanmar in 1929, he referred to the country as an 'earthly paradise' (Blair 1929). He said, 'Its abundant natural resource offered the potential of a great source of wealth that world capitalists were attracted to'. Stating that Burma was as an immensely fertile land of Southeast Asia, George Orwell condemned that 'the British were robbing and pilfering Burma quite shamelessly'. In his observation, the Burmese could not notice that they were being exploited because hunger and unemployment were words with which they were familiar and there was adequate works and food for everyone. But George Orwell foretold that, 'the Burmese will begin to suffer when a large part of the richness of their country has declined'.

Capitalism or 'market economy', as it is referred to by the military government, started to shape Myanmar's economic policy after the beginning of the second military takeover in 1988. Skidmore (2005) noted the influence of the market on public life as 'the encompassing domain of the popular is infused with power and with commodification. The penetration of capitalism and dictatorship into even the most intimate provinces of personal relations is an increasing reality in daily life (of Burma)' (p.8).

With changes in economic policy, natural resource extraction accelerated. At the end of the first military/BSPP rule, many natural resources were left intact due to the prevailing disengagement with the outside world and restrictions on possessing private property whereas the country was in poverty nonetheless. Under the second military regime, natural resource exploitation was common amidst corruption, favoritism and self-enriching schemes under the name of the market economy. Fast forward to 2008 or 2015, a general description of Myanmar as a country with natural resources does not translate into prosperity or development. When describing Myanmar's renowned resources of teak, Bryant (2007) observed that 'little profit has 'trickled down' to Burmese residents in terms of improved social services or infrastructure. Instead, tighter political and military control over and interference in the lives of local people has been a norm' (p.144).

In the Delta, the dynamics of natural resource depletion, poverty, and vulnerabilities are complex. In the pre-colonial days, the colonial days and sometimes post-independence, informal land tenure was held by whoever cleared the land and cultivated it. If a family continued to possess a plot of land for three generations, the land would become 'ancestral property' (Schendel 1991). Population pressures, migration, and poverty pushed the extension of agricultural land into mangrove forest areas over the last several decades. While the Forest Department was the government unit responsible for managing and conserving forest resources, in theory, its aim in practice was to generate revenue. As Htay (2016) noted, the 'existing forest management system is based on the revenue target defined at a particular time, not on the carrying capacity of the forest itself' (p.75).

Energy poverty added another dimension on deforestation and vulnerability of place in the Delta. Until 2011, over 95 per cent of the people in Myanmar used solid fuel for household lighting, cooking and value-added income generation activities (Mercycorps 2011). According to Nam et al. (2015), Myanmar's average rate of electrification, calculated based on the number of electrified households connected to the grid over the total number of households, increased from about 16 per cent in 2006 to 31 per cent in December 2013 (Nam et al. 2015). However, the rural/urban divide and regional disparities still exist. For instance, while Yangon, the former capital, has the highest electrification ratio (78 per cent), the Ayeyarwady Region has only 11 per cent by the end of 2013. Ayeyarwady has the third lowest electrification among all provinces of Myanmar. In this study, only six villages from Zone III, which are also part of the rural area of Yangon Region, have access to electricity while the other 39 villages are living with zero electricity. Only in January 2013 did the government adopt the first ever energy policy in history with short-term and long-term energy development plans (Nam et al. 2015). Paradoxically Myanmar is among five major energy exporters in the region with 35 per cent of total foreign direct investment going to the energy sector in 2015. But Myanmar is referred to the World Energy Outlook of 2012 as a country in 'extreme energy poverty' (IEA 2012).

Previously in Zone II of this research, charcoal production was known as one of the major energy sources for the former capital city of Myanmar, Yangon. An official ban

on charcoal kiln construction and charcoal production was announced in 1994 (Mangrove Service Network 2006; Aung 2012). Nevertheless, charcoal making still exists as some kilns are exempt from the ban (Htay 2016). With population expansion and household consumption, corruption inside the regional government was reported as a causal factor in more rapid deforestation in the years following the charcoal making ban. When Cyclone Nargis hit the Ayeyarwady Delta in 2008, the charcoal price in Yangon suddenly went up, indicating that the Delta was still a key energy source for the urban area.

From the 1990s to the early 2000s, the military government's procurement policy also contributed to deforestation in the Delta. With ever-increasing pressure from the government to sell set amounts of paddy at a fixed price to the government, many farmers were pushed into the forest. A more problematic issue was lack of official recognition of their settlement. Farmland and villages location were not officially recognized as they were situated in reserved forest areas. As long as the farmers met the sales quotas of rice, they could keep farming in extended areas (Htay 2016). The focus of the rice procurement policy was not conservation or sustainable development but extraction from the local people.

In a context of rampant corruption with little regard to sustainability from vertical layers of authorities, commercial industries came into the area for profit. Their arrival resulted in environmentally highly degrading business ventures such as shrimp farming and land reclamation for industrial agriculture. On the edge of the Delta and the reserved forest area, it was shrimp farming that created most damage to the ecology of the local communities. Mangrove waterways and saline water are regarded as preferred conditions for shrimp farming. It was common for business companies in Myanmar to pay the bribes to local authorities to encroach on mangrove reserve forest areas. These activities were in full swing in the 1990s (Htay 2016; Aung 2012). In the short term, the villagers received some income by becoming manual laborers on shrimp farms, but later when the normal routine of shrimp farming resulted in the the polluted land being abandoned, the villagers' livelihoods were left in a worse situation.

Apart from shrimp farming, the military government launched an extensive land reclamation program after the 1990s. The land was then given on a thirty-year lease,

free of charge on the condition that it would be developed for industrial agriculture. The state provided subsidies in various ways such as advising local banks to provide loans, selling fuel at discount prices, and giving permission to import equipment (Steinberg 2001). In the World Bank report on Myanmar (1999), experts warned that the current land expansion policy was uneconomical because all the projects were heavily subsidized, and did not really reflect the market cost of the operations. The costs of the projects would be even higher if the effects of environmental damage and local community access to the wetlands were added (Thawnghmung 2004). Now the sustainable livelihoods of the Delta are largely challenged as the success of these agriculture industries did not last for long and the environmental impact is no longer negligible (Soe 2016).

The cumulative impacts were unmistakably destructive and reminded that forests are now at the margin of total disappearance in Delta (Webb et al. 2014; Phyu 2012) as shown in Figure 6. JICA (2005) also reported that the lost areas are amounted to 82 per cent of the whole coverage of the Ayeyarwady Delta. It is estimated that the area of the Ayeyarwady Delta covered by mangrove forests totaled some 2,623 square kilometers in 1978, but that figure had declined to just 938 square km by 2011 (Webb et al. 2014). In comparison with natural forest in other areas of Myanmar, mangroves depletion was three times higher in the statistics of the Forest Department (Htay 2016).

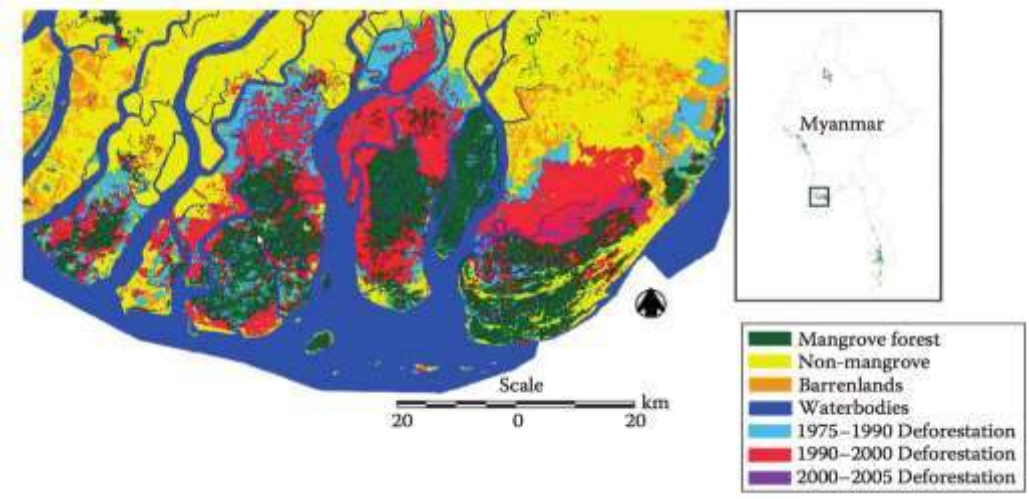

Figure 6 **Mangrove forest depletion rate in Myanmar since 1975**

Source: Webb et al. (2014)

If deforestation of the Delta is placed into the perspective of regional comparison with other cyclone hazard-prone countries, mangrove forests in India and Bangladesh remained unchanged or increased slightly between 1975 and 2015 (Giri et al. 2016). In the same period, the annual deforestation rate was higher in the mangrove forests of Myanmar than it was in Thailand, Indonesia, Malaysia and Sri Lanka (Webb et al. 2014). After Cyclone Nargis the verdict was in. In their study 'Mitigation effects of forests as a natural shelter in the cyclone Nargis in Myanmar', Thant et al. (2010) stated that,

> Human mortality decreased with distance from the cyclone track and was significantly reduced by the presence of forest stands near or around communities. The most remarkable result is that no mortality was recorded in communities located in forest reserves with dense forest cover, even in those located in the high-mortality zone. (p.1)

4.5 Governance

In a broader conception of 'power' in Myanmar in the context of military rule after 1962, Steinberg (2001) observed that factionalism has become common and patron-client relationships have been prevalent. He also stated that a meritocratic civil service that could act as a brake on personalized authoritarianism had not developed in Myanmar (Steinberg 2001, p.38-39). In this background of power setting, Steinberg explains how the traditional role of village leader has changed over time. The village headman, who traditionally was locally appointed and was often hereditary, was the top village official: it was his job to keep the central government (the king) away from the village. The British administration transformed the position into the lowest government appointee, whose function was to represent the state at the lowest level. This completely transformed local governance, no doubt making it more efficient even as it eliminated autonomy. The state thus reached to the village and could, and did, more easily intervene, as it still does today (p.39).

In bureaucracy under military rule, directives to the people from various layers of administration (central, regional, township) or from various line ministries based at the township level, stop at the village head to instruct people or to implement the instruction himself. Local headmen have relatively little autonomy and bargaining

power in relations with the State to protect the interests of their residents. Thawnghmung (2004) describes the problem of leadership at the village level of Myanmar as follows:

> Pressure from the central authorities who not only had access to the use of force but also had no scruple about using it, was immense enough to impair the village headmen's capacity to protect the interests of their communities. (p.81)

The implications of pressure from a central authority are especially visible once a community has a leader who in most cases is powerless to protect the community at best or corrupt at worst. In this context of local governance under authoritarian rule, two aspects of community resiliency to disaster can still be identified. The following section discusses these two factors in the frame of 'community process' and 'community assets'.

4.5.1 Community process: civil society and social capital

Adger (2006) stated that even poor people have capacities in the form of networks, knowledge, and skills. For the poor people at the bottom, social capital is one of the few remaining assets available (Fukuyama 1996; Dordick 1997; Woolcock 2001). In the Delta, social capital in the form of bonding exists and in many places, these bonds are being transformed into collective efforts in what one can refer to as civil society. Individual agency and different types of collective resilience are evident in Delta communities even under the difficult authoritarian context, as recognized in local-led relief efforts after Cyclone Nargis. But as Sen (1999) noted, individual agency is 'qualified and constrained by the social, political and economic opportunities'. Under military rule, the Delta communities were living with all these constraints to their individual and collective agency.

Steinberg (2001) asked the question in his book on the State of Myanmar, 'To what degree will the state allow citizens to band together to pursue common interests?' (p.40). In other words, will it allow civil society to be formed or to flourishing? After Cyclone Nargis with its much-lauded civil society effort, it is now safe to say that civil society did exist even under the difficult circumstances of authoritarian government in Myanmar. After observing the crucial role of civil society in relief efforts after Cyclone

Nargis, one observation on civil society was that 'a dynamic, varied, active, mobilized and intelligent civil society exists in Myanmar' (CCPS 2009, p.v).

But the different dynamics of civil society before and after Cyclone Nargis can be understood from local and national governance contexts. Most villages in all zones stated that they had informal groups functioning around religious activities before Cyclone Nargis. Larger and more well-to-do villages had social groups that could extend voluntary works in providing service to vulnerable populations such as old people. Whenever these groups raised their visibility, they were being watched by the local authorities. An example that illustrates such a working environment comes from research Zone III. The name of the informal organization is called 'Saturday Group' and it was formed by young men and women from the town of Kungyangone and satellite areas. The name 'Saturday Group' came from the day of the week they usually gathered at the temple for merit making. Later they were involved more in social work by mobilizing resources among themselves. This kind of activities is reflected in the observation of Doan (2008):

> Rural communities in Myanmar are relatively socially cohesive, providing a strong foundation for effective local safety net that is extremely important particularly in the absence of safety nets from the state and employers. (p.36)

But the Myanmar government, like many authoritarian governments, did not want to see these groups' services as they were assumed as proxy indicators of the government's capacity shortage. Local groups had to manoeuvre carefully in order not to appear to be undermining local authority in their initiatives. Still, once the actions became visible, the local authorities monitored them in many ways. As in the case of the 'Saturday Group', the local authorities closely watched group activities even after Cyclone Nargis, when interaction with civil society groups from the town increased. In fact, the 'power over' mood of the military government is at odds with the 'power with' mood of civil society which is based on social capital among the local people. The civil society operated in various forms under the military regime and social capital aspects demonstrate changes in civil society before and after Cyclone Nargis.

Aldrich (2012) used the commonly used concepts of social capital namely bonding, bridging and linking capital, as shown in Figure 7.

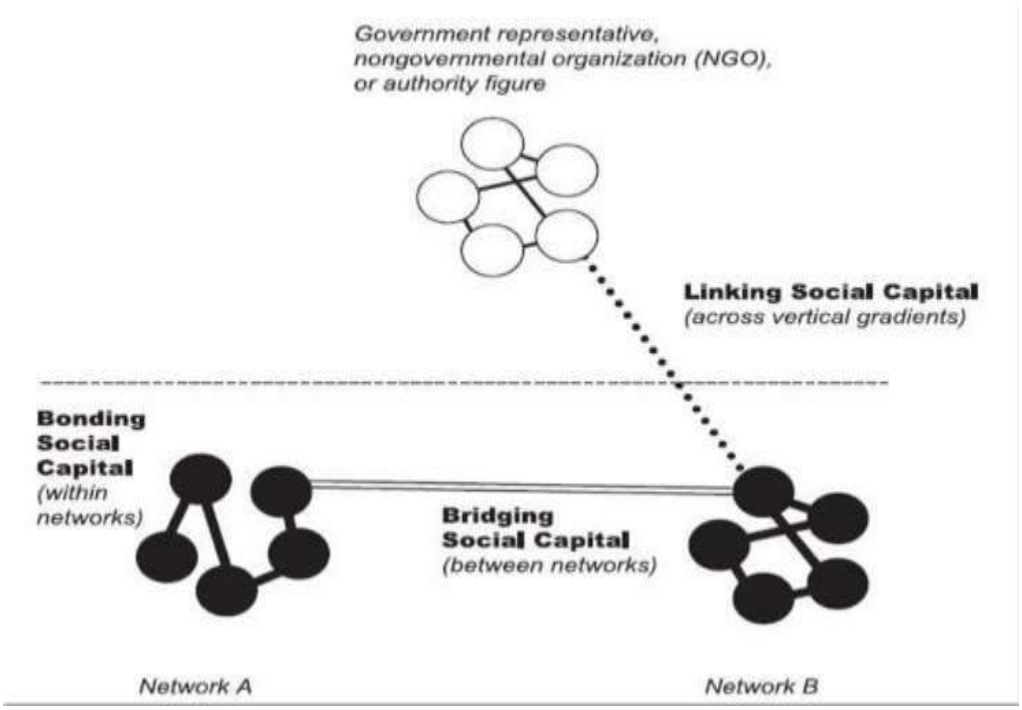

Figure 7 **Social capital formation (Aldrich 2012, p.33)**

The first type of social capital called 'Bonding social capital' represents strong ties within a community connecting individuals in the form of a horizontal network (Szreter and Woolcock 2004; Putnam 2000; Aldrich 2012). Bonding is usually strong in communities sharing similar demographic characteristics (Nakagawa and Shaw 2004). It is common to see such strong bonding social capital in the Delta society as the religious leaders, friends, family members, and neighbors form a network in varying degrees in village communal settings.

'Bridging social capital' is formed by the social ties between people who share similar social and cultural traits such as economic status, interests and political stance (Aldrich 2012). The third type, 'linking social capital' is the least personal form of social capital. It represents a vertical connection by which individuals can build mutual interaction with institutions and individuals who have relative power over them (Szreter and Woolcock, 2004). Australian Red Cross (2012) echoed that the positive contribution of these three networks was 'vital to sustaining community vibrancy and

prosperity and form part of an interrelated system of group and individual relationships' (p.14). Aldrich (2012) claims that the bonds are important for reducing vulnerability of communities and promoting their resilience. He argues,

> Recovery from natural and other disasters does not depend on the overall amount of aid received nor on the amount of damage done by the disaster; instead, social capital – the bonds which tie citizens together – functions as the main engine of long term recovery. (p.1)

Conceptually, it can be argued that what was strongly present in the Delta before Cyclone Nargis was 'bonding' social capital. When the poor people in the Delta tried to 'get by' with the vulnerable emergency, they needed to leverage bonding social capital. But resources available in the rural area via bonding social networks were rarely adequate to move up to greater resiliency. The dominating features of poverty provided merely small opportunity and options to bridge and access resources, knowledge, and information to strengthen themselves. Barr noted that bridging can help people to move up from a stage of 'getting by' to 'getting ahead' (Barr 1998).

In the restricted environment of the military rule, civil society in Myanmar lacked venues to link to the institutions that could bring ideas and resources. Therefore, without bridging and linking social capital which could empower and enhance their resilience, rural communities happened to be struggling with all available bonding social capital which provided relative resiliency with little social safety net supported by the military government. While local leaders could play a role in enhancing social capital by focusing more on collective actions, the national political framework did not give much space for networking among civil society groups. Participants at discussions in research Zone III stated that the local leaders sometimes assumed the role of civil society leaders as competitors to their authority and influence.

From a social capital point of view, leadership in the community must have a 'shared sense of fairness, including mutual respect between all concerned' for a collective action (Szreter and Woolcock 2004, p.656). The success of disaster risk reduction and emergency preparedness largely rely on collective efforts. Many limitations were put on civil society by the governing structure before Cyclone Nargis. When the local governance did not always accommodate local initiatives, community resilience could

not be present in significant ways. Limits on bridging and linking activities among the communities and outside institutions also hampered cross-fertilization of ideas regarding environmental change and risk knowledge. Restriction of movements turned out to be one of the limiting factors as revealed in the three research zones of this study. Later, larger villages in all three zones could organize DRR education activities such as public talks and smaller villages also obtained chances to participate in such occasions in nearby areas, especially after 2010. Due to the government's restrictions, such activities were even limited before Cyclone Nargis. (Interview with local organizers in research zones and educators in Yangon.)

Restrictions by the authoritarian government on outside organizations also prevented them from reaching the local community. This impaired linking social capitals. In October 2007, 13 international non-governmental organizations based in Yangon sent an open letter to the government appealing for more space for humanitarian actions needed inside Myanmar (Reliefweb 2007). The letter stated that,

> Current social and economic policies have led to conditions which have pushed many below subsistence levels, continuously weakening existing coping mechanisms of local communities.
>
> This is compounded by the lack of investment at the scale needed to meet the needs of the people. Low public expenditure in the health and education sectors leave people with little to no access to basic affordable services in many parts of the country. In the absence of adequate public services, civil society groups have attempted to respond to local needs but are constrained in their ability to operate formally.
>
> Despite efforts by the humanitarian community to provide international humanitarian assistance, the level of support is highly insufficient, programs are too narrowly defined and the humanitarian space for organizations to operate is frequently at risk. Although international humanitarian organizations have been able to develop and expand their actions, there are restrictions placed on the geographical and sectoral coverage of their operations.
>
> We believe that the above factors have contributed to the existing humanitarian crisis. It is essential to consolidate and sustain existing programs as well as to reassess and seek new ways to expand and work together to better serve the people of Myanmar.

This letter got a harsh response from the government in return and spaces for humanitarian work with NGOs and local groups were more scrutinized. Nevertheless, this letter validated the need for intervention in promoting human security in the communities. The vulnerable reality was also witnessed in the Cyclone Nargis tragedy few months after the above-mentioned letter.

After Cyclone Nargis, waves and waves of civil society from different areas of Myanmar came down to the Delta and helped their fellow countrymen. What they did was bridging and linking up with the local community for rebuilding their lives. In the process, the communities also benefited from bridging and linking social capital after the bonding capital had raised them from the devastation in the immediate days after Cyclone Nargis. As James (2012) stated,

> The conjunction of domestic and international civil society and the resources and networks in their bridging level social capital has been critical in facilitating both relief and recovery phases in Myanmar. (p.20)

The changes in spaces of civil society before and after Cyclone Nargis were noticeable. Interactions and networking in humanitarian spaces and increased functioning of different social capitals were obvious to many observers (Kramer 2011; CPCS 2009). Before Cyclone Nargis, the old authoritarian structure did not give much space to a civic forum and civil society as their movement could be a 'social obstacle' challenging the legitimacy of the powers that be by revealing their shortcomings and the prevailing injustices. When the military came to power in 1988, one of their initial decrees was to prohibit assemblies of more than five people (Lall 2016). Although this limitation was not enforced strongly, later, many other formal and informal restrictions were put in place to control the community. Such a mood of inhibition hurt the local community and their resilience to disaster.

Discussion with former village leaders demonstrates that the authorities abandoned most of these restrictions after Cyclone Nargis, in varying degrees, accepting the urgent need for communities' survival and tried to accommodate domestic and international assistance. Focus group discussions also revealed that if formal village leaders are not prioritizing villages' welfare, informal leadership tends to step up in

the form of civil society and mobilize resources to rebuild the community. Still, as was shown in the blockage of aid in the immediate days after Cyclone Nargis which prompted the international outcry, human security was not much of a focus for the military government. As Steinberg (2013) noted, Myanmar's military regime was ruled by its rigid hierarchy characterized by disdain and distrust towards civilians (Steinberg 2013). This rigidity was on display against civic initiatives before Cyclone Nargis.

4.6 Discussion

A formidable social feature of the Delta before Cyclone Nargis was poverty, as in many other places of Myanmar. While impoverished people in all parts of Myanmar suffered in different ways, the Delta had one additional dimension of human insecurity: extreme vulnerability in the face of natural hazards which cost lost lives and vanished property. While the nature side of the disaster is less debatable, the human side of the disaster was obvious in the discussion as the factor that pushed people to vulnerablility. As outlined in the previous three sections of this chapter, several conditions had apparently weakened families and communities. High poverty, lack of proper education, and poor health care reduced disaster-resilient assets and resilience capacities such as housing, awareness and physical strength. The 'place' in the rural communities has been increasingly exposed to declining natural resources such as depletion of mangrove forests, which could provide barriers against storm surge and wind. Local governance is supposed to build resilient communities but it did not function well to protect the 'people' and the 'place'.

This chapter makes a case for the military regime's failure to take responsibility in reducing community vulnerability and promoting human security before Cyclone Nargis, with an emphasis on selective policy implications over the issues of poverty and social and environmental decline. The 'politics of disempowerment' in the context of authoritarian rule had a negative impact on social capital and resilience of the community. As Bass et al. (2005) stated,

> If poverty and environmental problems persist, it is in large part because poor people and environmental concerns remain marginalized by –and from – sources of power. (p.1)

In the Ayeyarwady Delta, a combination of poverty, environmental degradation and powerlessness was translated to vulnerability and collectively turned into a disaster when natural hazard in the form of the storm swept through the land.

4.7 Conclusion

This chapter tries to outline changes in the Delta along the national history. It also tries to analyze the pre-existing vulnerability of the village communities there before Cyclone Nargis. The people, place, and governance formed three domains of a local community. This intends partly to dispel the notion of 'natural' once a hazard turned to a disaster.

Several aspects of the Ayeyarwady Delta were similar to the overall situation of Myanmar under military rule. However, human insecurity and vulnerability in the Delta were revealed in a staggering loss of lives at one stroke of the storm. In this context of human tragedy, pre-existing conditions were revisited and regional experience was extracted in analyzing the national history and community narratives.

In a better scenario for the Ayeyarwady Delta, the current political transition and improved space for civil society means more possibility for better 'assets' in terms of physical and environmental together with an enhanced 'process' of community in collective efforts for safety and wellbeing. These two aspects were in a much weaker condition before Cyclone Nargis as discussed in this chapter. The following chapters on the early warning process and emergency response will also highlight the state of the community's vulnerability and resilience in an 'assets and process' frame. Discussions there will also reach back to the pre-impact conditions in both implicit and explicit manners.

Chapter 5

Revisiting the early warning system

5 Introduction

This chapter will discuss the role of the Early Warning System (EWS) at the time of Cyclone Nargis and its structural vulnerability, which has been embedded in the political setting of a military dictatorship. In a way, this chapter tries to analyze the conditions and characteristics of the early warning system. The consequences of its shortcomings at the time of Cyclone Nargis were discovered during my field studies and the community narratives are used to portray the whole EWS process in the emergency phase and its impact on the response capacity of society.

Before the institutions for early warning systems (EWS) were well developed, storm surge was the main cause of mass mortality in many cases of major storms. Before early warning systems as well as technology for risk evaluation came to exist, drowning accounted for 90 per cent of deaths related to cyclones (Chowdhury et al. 1992; Keim 2008; Shultz et al. 2005). In the past few decades, technology has been a great help in developing a highly advanced early warning system although it is not perfect yet (Kelman and Glantz 2014). The technical aspect of Myanmar's early warning system in 2008 was relatively weaker than that of any neighboring countries and even the basic function of forecasting was not properly equipped (Lwin 2015). Even in countries in which EWS is technically advanced, it is still likely to be ineffective as it is not able to be successfully incorporated in the social context (Paton 2003). Kelman and Glantz (2014) suggest that the technical components of any EWS be embedded in the social context of all levels from the frontier to the national level.

The notion of people-centered early warning (Anderson 1969) emphasizes raising awareness of the people about the degree of risk they are likely to face, to engage with disaster agencies for an efficient disaster risk communication and respond to the message with action in a timely manner. A good design of a people-centered early warning system involves a nice combination of a bottom to top and top to bottom approaches. The essential elements of a people-centered EWS are good governance,

strong institutional and social arrangements, technical resources and reliable communication mechanism (Villagran de Leon 2012).

An EWS should not merely have a technical focus that is largely occupied with observing hazards and acting as an expert body with a top-down operating system that has no or little contact with end-users who are likely to be affected by the very action of an EWS (Basher 2006; Kelman and Glantz 2014). EWS must be socially engaged to keep up a continual relationship with communities to enhance awareness for disaster risk reduction as much as possible. Technically, it also requires the government agencies to extend actions beyond the monitoring of hazards and the dissemination of warnings. It functions well only if 'those who can benefit from the information provided by the system are empowered to participate in 'all stages of development of the system (design, testing, routine operation and evaluation)' (p.491). Only if the early warning system can function in a proactive manner rather than reactive one, action for the evacuation process can proceed safely.

Paton (2003) describes how early warning system functions technically and socially:

> Thus, during periods of hazard quiescence, when most readiness work must take place, natural hazards will compete with their social counterparts for attention, with the salience, or otherwise, of a hazard (natural or otherwise) evident in how much people think and talk about it. This contention is based on discursive arguments to the effect that people use language both to construct and to express their judgements. (p.211)

No matter how good is the system, temporal factor still can make evacuation process more complex. (Buckle, Philip, 2012, p. 496). He suggests that any warning process this temporal factor (day or night, rainy season or hot summer) into account, so that risk can be responded effectively with enough flexibility and adaptation.

5.1 Was Cyclone Nargis predicted?

The BBC (Jackson 2008) posed the question in its story about the early warning system of Myanmar: 'was Cyclone Nargis predicted?' It was four days after Cylone Nargis had hit Myanmar. Questions over the accountability and efficiency of the national early warning system sprang up in other media outlets too. Even one year after Cyclone

Nargis, the Voice of America (2009) revisited the debate over early warning and reported on 27 October 2009 with the title 'Indian forecasters gave Burma advanced warning of Cyclone Nargis'.

The following paragraph provides an excerpt from an MSNBC interview by science writer Chris Mooney (Mooney 2008), who authored *'Storm World: Hurricanes, Politics, and the Battle over Global Warming'* (Mooney 2007) on 7 May 2008:

> MSNBC: But you had written about Nargis, gosh, more than a week in advance and indicated that this would be a pretty bad storm.
>
> Mooney: Yeah, I wrote about it over at the *Daily Green*. I track cyclones, so whenever I see something developing in the Bay of Bengal, and I see the ocean temperatures are really warm… you just know that it can't be good. I didn't know how strong the storm was going to get, but I knew that the ocean temperatures were warm and I knew that it was already completely formed – and it had this ocean ready to pounce and ready to draw energy from. If you look at the Bay of Bengal, it sucked a couple of degrees Celsius out of the ocean and flung that at the coastline. (Mooney 2008)

The article that the host of MSNBC referred to was published on 28 April 2008 with the title, 'Tropical Cyclone Nargis: Get Ready for the Worst: A Very Warm Bay of Bengal Means Cyclone Nargis Will Hit Hard – Somewhere' (Mooney 2008). In this article, Mooney (2008) stated,

> This storm, which formed over the weekend, is now a Category 1, and the official forecast right now is for steady intensification up to Category 4 at least. No one is sure where the storm will make landfall, but India, Bangladesh, and Burma/Myanmar all have worrying to do.

Similarly, Dan Shapley, the *Daily Green* editor wrote on April 29 a short post titled 'Tropical Cyclone Nargis will Strike Myanmar; Downgraded, Storm Will Still Reach Category 2 Strength' (Shapley 2008). When the World Meteorological Organization completed its fact-finding mission to Myanmar in the aftermath of Cyclone Nargis, its report stated that,

> The first tropical cyclone advisory indicating landfall over Myanmar coast was issued at 0600 UTC on 1 May based on observations at 0300 UTC (about 36 hours in advance). It was indicated in the bulletin that the system would cross

> Myanmar coast between Lat. 16.0 and 18.0 degrees N around night of 2nd May 2008. On the morning of 2nd May, it was indicated that the system would cross Myanmar coast near 16.0 degrees N around evening of the same day. (WMO 2009, p.24)

All these statements from experts and professional organizations provide significant evidence that there is not much room for debate and make excuses that Cyclone Nargis was not expected to hit land in Myanmar. The specific location of the cyclone landfall was given in an alert by the Regional Specialized Meteorological Centre in New Delhi 36 hours in advance (WMO 2009). In this context of early warning, process, outcome and issue from three sides as shown in Figure 8 will be explored according to four functions of the early warning system.

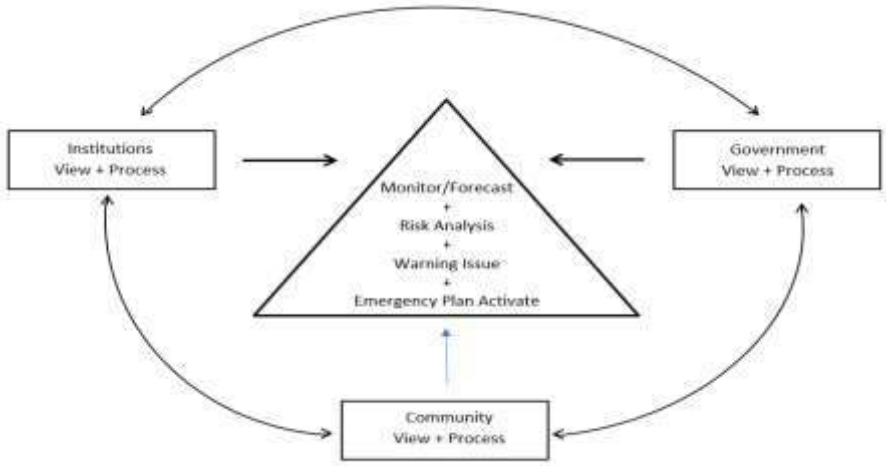

Figure 8 Four founctions of an early warning from three domains of government, institutions and community

5.2 Four key functions of an early warning system

Although the ruling military regime of Myanmar had to shoulder a large portion of the responsibilities for various shortcomings during the cyclone, it is important to look to several linkages of failure that explained the root causes of mass mortality in Cyclone Nargis. What factors that influenced people's risk perception even if they received cyclone warnings? Why did the warning not prompt a systemic response earlier? Did the international community, which opposed the regime, fail to find a way to improve

the infrastructure of the Myanmar disaster risk reduction system? Consequently, had the transboundary nature of climate risk been forgotten in a politically charged environment by donors? The World Meteorological Organization said all disasters are not totally unavoidable, although some are inevitable (WMO 2005). Disaster risk can be mitigated by the EWS's function of providing weather forecasts and early warnings in an efficient manner. In recent decades, science and technology have helped improve early warning systems in many parts of the world (WMO 2005). The United Nations International Strategy for Disaster Reduction defines an early warning system as:

> The set of capacities needed to generate and disseminate timely and meaningful warning information to enable individuals, communities and organizations threatened by a hazard to prepare and to act appropriately and in sufficient time to reduce the possibility of harm or loss'. (UNISDR 2009)

A well-known myth of EWSs is that they are activated only when a hazard is looming (Kelman and Glantz 2014). ESWs should be in operation at all times even without signs of a forthcoming hazard. Theoretically, an EWS is expected to be functioning to educate people about disaster preparedness, to raise disaster awareness of the community by exercising drills and demonstrations, collecting baseline data and enhancing vulnerability maps and updating community's hazard risks (Kelman and Glantz 2014, p.93). The UNISDR Platform for the Promotion of Early Warning specifies the role of an EWS as having four key functions as follows:

(1) Monitoring and warning service: To develop hazard monitoring and early warning services

- Are the right parameters being monitored?
- Is there a sound scientific basis for making forecasts?
- Can accurate and timely warnings be generated?

(2) Risk knowledge**:** To systematically collect data and undertake risk assessments

- Are the hazards and vulnerabilities well known?
- What are the patterns and trends in these factors?
- Are risk maps and data widely available?

(3) Dissemination and communication: Communicate risk information and early warnings

- Do warnings reach all those at risk?
- Are the risks and warnings understood?
- Is the warning information clear and useable?

(4) Response capability: Build national and community response capabilities

- Are response plans up-to-date and tested?
- Are local capabilities and knowledge made use of?
- Are people prepared and ready to react to warnings?

Despite the world experiencing a 50 times increase in extreme hydro-meteorological events over the past five decades, the life-saving capacity of the new technology has significantly reduced the death tolls from various hazards such as floods, droughts, and storms (Golnaraghi and Douris 2009). Nevertheless, experiences in the past decades showed that top-down early warning system is hard to 'induce the desired actions' in emergency response among the people (Kelman, 2012, p.483). In the case of Cyclone Nargis, the 'last mile' that Kelman (2012) referred to as a gap between 'where the knowledge comes from and where the knowledge is needed and used' (p.483) was big and wide. It was revealed that the EWS was carrying heavy constraints in all four key functions specified by the UN.

5.2.1 Monitoring and warning

Institutional capacity of weather forecasting and storm warning

The scientific and technical dimensions of a robust early warning system or process are centered in monitoring, forecasting and 'nowcasting' (WMO 2011). The British Meteorological Office define nowcasting as 'a technique for very short-range forecasting that maps the current weather, then uses an estimate of its speed and direction of movement to forecast the weather a short period ahead'. The WMO distinguishes nowcasting as a current weather alert which extrapolates a future weather pattern for a maximum of six hours from now. Up-to-date radar, satellite and observational data are a prerequisite for getting current details of a small area with

accurate focus. Alerts for high impact weather patterns such as a moving storm needs nowcasting as it can effectively contribute to saving lives and property (Anderson-Berry 2006). However, many of the developing and least developed counties do not have operational systems or are struggling for maintenance and sustainability of this apparatus which requires rich data sources (Coning and Roberts 2012). Myanmar was one of the countries lacking a nowcasting system 2008 because there was no adequate radar for forecasting function.

Myanmar has been on the list of 189 member countries and territories to which the WMO provides data exchange for hazard observation, monitoring, forecasting and warning capabilities (IFRC 2012). Under the supervision of the WMO, the Regional Specialized Meteorological Centre (RSMC) New Delhi was the responsible agency for issuing tropical weather outlooks and tropical cyclone advisories to the regional countries bordering the Bay of Bengal and the Arabian Sea including Myanmar (WMO 2008). At the time of Cyclone Nargis, the information coming from the RSMC was used by Myanmar's national meteorological agency, the Department of Meteorology and Hydrology (DMH), which operates under the Ministry of Transport. However, the India Meteorology Department mandate does not include warning for storm surges. Sadly, 80 per cent of mortality in Cyclone Nargis was related to storm surge (Webster 2008).

Dr Tun Lwin, the head of DMH at the time of Cyclone Nargis wrote in his memoir that the only radar (WSR 74, Weather Surveillance Radar) that Myanmar relied on for weather forecasting was an old 1974 model (Lwin 2015) and it had not been operational since 1997 (IRIN 2014). Lwin tried to improve the situation in his capacity as Director General and he ordered spare parts from the original production company, GE, in the United States. He got a reply stating that the company had already stopped manufacturing this model, and the stock was no longer available as it was too outdated. He compared this inadequacy of equipment with better situations of neighboring countries by showing numbers of radars as an indicator of preparedness; five radars in Laos, nine in Bangladesh and 26 in Thailand, by 2008 (Lwin 2015).

In his article on 'Why the cyclone (Nargis) in Myanmar was so deadly', Casey (2008) quoted the WMO and commented that Myanmar, unlike Bangladesh and India, did not

have a radar network to help predict the time, location and height of the storm surge. While not complaining about not having an advanced system in Myanmar in 2008 given the socio-economic and political situation, it is an even more tragic state of affairs for not having basic meteorological and hydrological infrastructure. In fact, the Director General and his team at DMH made attempts to update the weather forecast by utilizing very outdated tools and relied on their mathematical skills to track the storm and issued a warning for the approaching Cyclone Nargis (Lwin 2015). The WMO in their inquiry into the efficiency of DMH's Cyclone Nargis warning states,

> The position of the cyclone center was also manually determined by Dr Tun Lwin at NMC Yangon by using a magnifying glass and the satellite meteorology knowledge and experience. Then the x-y coordinates of the cyclone center measured by using a pencil and a ruler were calculated into the latitudes and longitudes by using Excel program on a small laptop PC. The same procedures were applied to the measurements of radius of storm, movement, speed of propagation, distance from the coast, radius of maximum winds and storm coverage. (WMO 2009, p.8)

After the 2004 Indian Ocean tsunami, Myanmar's weather forecasting and monitoring system was upgraded with data exchanged with India and Thailand via the global telecommunication system (GTS). The Department of Meteorology and Hydrology (Xinhua 2006) called it the biggest change in 20 years as the data exchange rate would be 600 times faster than before. But the system was internet-based and access to the internet in DMH is limited. The WMO also reported the record of system breakdown during Cyclone Nargis as follows:

> The frequent power shortage disrupted the operational services of DMH and the blackout after the landfall of Nargis significantly affected its services. All communications were broken down in Yangon from 20:00 MST on 2 May to 17:00 MST on 3 May 2008. (WMO 2009, p.9)

Functioning of DMH was almost impossible while the office of DMH was without electricity and interagency communication began to halt soon after the storm started hitting Yangon around 9 o'clock at night (Lwin 2015).

Locating political will in early warning

Myanmar became a signatory to the Hyogo Framework for Action (HFA) in 2005 and as a member state it is expected to implement the following five priority actions (UNISDR 2005): '(1) Ensuring that DRR is a national and local priority, with a strong institutional basis (2) Identifying, assessing and monitoring disaster risks and enhancing early warning systems (3) Using knowledge and education to build a culture of safety and resilience at all levels (4) Reducing underlying disaster risk factors, whether social, economic, environmental or land use, and (5) Strengthening disaster preparedness to promote effective response at all levels' (pp.6-12).

As a member of the HFA, the military government set up the Central Committee on National Disaster Prevention with notification No. 14/2005 dated 25 January 2005 (ADPC 2009). Despite the initial institution set up after signing the HFA, the roles and functions of central and regional governments at all levels, including village councils, were not clearly defined until 2009 (Ministry of Social Welfare, Relief and Resettlement 2010). Since 2005, progress for implementation had been slow and the national standing order on disaster management was issued only one year after Cyclone Nargis. Only after the standing order, was the problem of lacking clarity of roles and responsibilities between ministries and departments improved and institutionalized responsibility was assigned formally (Relief and Resettlement Department 2009). Nevertheless, incorporation of disaster risk reduction elements into national policy was very much constrained by a lack of budget. The state of financial challenges imposed on the DRR system was described by the national interim report to HFA (MSWRR 2010) in the following way:

> There is an absence of a policy directive for allocation of funds for specifically for DRR. Financial resources are not adequate and not available yet…To ensure the DRR budget allocation, State budget should have separately allocate/mention DRR component) and the consolidation efforts among ministries and capacity development/ institutional strengthening should be reinforced. (p.6)

Under all these constraints, it is not surprising that the EWS was weak in all dimensions at the time of Cyclone Nargis. The DMH, which was the focal agency for dissemination of the cyclone warning, tried to inform the township general administration offices about incoming cyclone and even advised local administration

bodies to coordinate with local NGOs and the Red Cross if they were present in their area (Lwin 2015). A leaked US embassy cable dated 2 May 2008 (WikiLeaks 2008b) also showed that the US embassy's knowledge of the cyclone had already been distributed to some townships where American tourists were likely to be visiting. Moreover, the military attaché tried to directly contact his Myanmar counterpart to give the warning. During the fieldwork for this research local respondents confirmed that the Township Peace and Development Council in Bogale township relayed the news to the village tract leaders, this was not the case for other townships. But the cyclone warning at that time did not include action plans that specified the next steps to be taken for safety. In fact, the DMH's mandate did not include specifying what to do next for evacuation or preparation (Lwin 2015).

What becomes clearer is that disaster preparedness plans and contingency plans were not in place at all administrative levels (Relief and Resettlement Department 2010). The fact that no contingency plans or procedures existed or were tested shows that political will was essential for a functioning EWS; upgrading the technological aspects of hazard monitoring was insufficient.

5.2.2 Risk knowledge

On 6 May 2008, four days after Cyclone Nargis, the head of the Ministry of Social Welfare, Relief and Resettlement, General Maung Maung Swe, told a press briefing that the government took preemptive action for disaster risk reduction to a certain extent but the high death toll was caused by the storm surge (The Voice 2008). After Cyclone Nargis's landfall, storm surge become an easy target to transfer responsibility (WMO 2009, The Voice 2008). While it must be acknowledged that surging water killed most people, it still begs the question of why these risk factors were not elevated.

In retrospect, the existing risk factors in the Delta needed to be incorporated into the risk analysis of the approaching Cyclone Nargis. The prime risk factor was the tidal pattern. As Cyclone Nargis hit the shore at high tide, it greatly increased the impact of the storm surge. The tidal range in the Delta under normal conditions was around five feet between low tide and high tide (Masters 2009). Another known risk factor was a shallow continental shelf. The immediate water area to the south of the Delta is the

Andaman Sea, which has an extensive shallow continental shelf, which built a bigger storm surge compared to the western costal area of Myanmar (Webster 2008).

Additional aspects that need to be taken into account as risk factors are low-lying geographical features, and high population of the Delta. These risk factors should have alarmed everyone by the time a powerful cyclone was approaching the densely-populated areas. 'On 30April 2008, the detailed route, speed and locations of landfall were known' (p.38) said Pattie (2009) and in this context what we can analyze is that the warning was there but the risk factors were not well incorporated into the EWS. As Golnaraghi (2012) reminds us, saving lives with effective warnings needs careful analysis of risks and incorporation of risk information in emergency planning and warning dissemination.

On the local people's side, many did not take serious action based on their own risk perceptions and evaluations, even if they received proper warnings. One example of this response pattern comes from Zone I:

> People were saying that the flood and strong wind were coming. I thought I did not need to care because I have seen flood in my life many times. I was happy to see seasonal flood. We had nice memories of flood indeed. In the past, we were joyful when the wind and rain shook the mango and coconut trees. We collected fruits together with friends. We were carefree. (Aye Aye Mon, Aung Hlaing, Zone I)

In the context of Cyclone Nargis, it might be not fair to leave people of the Delta with their own risk analysis and let them face the consequences. Even if individual or community risk perception can vary depending on many attributing factors, the risk information provided in the early warning likely weighed in on their own risk evaluation. When the message did not convey the level of risk involved, generally the people were left to evaluate based on their experience or were neglected outright.

5.2.3 Disseminating and communication

In the study of EWS, it has long been acknowledged that 'excellent meteorological forecast will not necessarily result in minimal damage' (Elsberry 2003, p.169).

Dissemination of warnings was crucial to follow up with other assigned tasks. As Pattie (2009) noted,

> The greatest challenge in fact, is determining how to disseminate warnings effectively in the shortest time possible to large numbers of people who possess considerably diverse communication resources and are spread across vast areas. (p.42)

Regarding the shortcomings of the EWS in Cyclone Nargis, the controversy about who issued what kind of warning at what exact time finally had to be settled by the fact-finding mission report of the World Meteorological Organization published in 2009. In this report, the WMO absolved the two governmental departments. One was the DMH and the other was the Regional Specialized Meteorological Center (RSMC) for Tropical Cyclones based in New Delhi. The main responsibility for the technical side of storm monitoring and tracking and providing advisories and warnings falls on to these two departments. RSMC provided data to DMH via GTS. The mission report stated the communication between RSMC and DMH in detail. For instance, RSMC New Delhi issued 'tropical weather outlook (3 times); tropical cyclone advisories (41 times every three hours); and tropical cyclone advisories for aviation use (19 times every six hours)' for Cyclone Nargis (WMO 2009, p.7).

Nevertheless, a statement by the WMO that said that, 'the early warnings and relevant information were duly delivered to villages' (WMO 2009, p.9) was not corroborated by the findings of this research in three different zones of the Delta. It was not clear which level of the village-level administration that the WMO referred to. 'Is it village tract (a group of villages) or individual village?' Verifying based on the records of the former director of the DMH, reaching to the village tract level was more realistic while it was almost impossible to deliver the warning to each individual village due to the geographical distance and communication barriers. Villages that received a storm warning directly from the administrative structure were very few and were outlier cases rather than part of a general pattern. For their part, the DMH tried to reach various levels of government, hoping that the top officials concerned would do something in their power (Lwin 2015, p.17).

Ronan and Johnston (2005) highlight a number of factors that impact disaster preparedness: These factors related not only to the institutional shortcomings but also have to do with the people's motivation to response.

- 'Preparedness or warning messages that do not provide specific guidance, are not consistent and repeated over time, do not emphasize controllable and preventable aspects of the hazard, and do not emanate from multiple sources that can be trusted;
- Personal factors including low levels of personal responsibility, concern, self-efficacy and personal control, low levels of belief in adjustment efficacy, low levels of community bondedness'. (p. 30)

General guidelines for effective warnings have been formulated in international EWS systems and used in various public communication structures across the world. Some examples of these guidelines include 'the warning must have a heading that should stand alone and stand out, the components of the message must be clearly defined, the location references must be related to well-known places, plain language must be used and recommended action must be included' (Zillman 2003, p.150). A national EWS usually must deal with issues of (1) whether the warning reaches its target audiences, (2) whether a warning is understood correctly, (3) whether appropriate actions are taken upon receiving a warning (Kelman and Glantz 2014). Referring to these factors and guidelines, the operation of the EWS regarding dissemination of warnings at the time of Cyclone Nargis will be evaluated in the following sections. Analysis will be based on the voices of local people from focus group discussions and individual interviews with some stakeholders in the media and communications sector of Myanmar.

5.3 Did the medium give the message?

At the time of Cyclone Nargis, the most common medium was radio, the second most widely used medium was television and the third was daily newspapers in the three regions this study covers. Television-programs ran only two times a day. They started the morning broadcast at 7 am and ended at 9 am. For the evening program, it lasted from approximately 4 pm to 10 pm. At that time, under the restrictive censoring

regime, both television and daily newspapers were state owned. The government runs two Burmese-language papers and one English-language paper. Only the English-language newspaper featured a weather forecasts section while the Burmese-language paper carried them from time to time in various formats.

All these mass media arms of the military regime were heavy in propaganda and did not feature much public service information (IMS 2012; Moe 2014). Generally, the content of these daily newspapers in this period serves as a guide to policy direction and the government's priorities. Agenda-setting of the military regime for public policies in those days was clearly stated. By analyzing the content, the readers, including junior level bureaucrats or township-level administrators and the general public, could get clues about the seriousness of the issues of the day.

Figure 9 **The weather alert on 1 May 2008 in the State-owned Newspapers**

Source: Myanma Alin newspaper dated 1 May 2008, p.13

When the tropical depression system formed and made its way through the Bay of Bengal in the last week of April in 2008, the military regime in Myanmar was gearing up for the coming referendum. The priority of the day was the upcoming referendum for the new constitution. All the government-owned mass media gave a lot of space for content of propaganda items the public to support the new constitution. The storm warnings in the newspapers were low profile at best and minimal at worst in allocating place, space and wording of the storm news in the run up to Cyclone Nargis's landfall. Figure 9 is taken from a newspaper of 1 May 2008, one day before storm landfall. In this paper, of a total 20 pages, Cyclone Nargis news appeared on page number 13 in the bottom left corner, 2 x 2 inches in size (Myanmar Alin 2008a).

Regardless of overall credibility of the mass media under the military government's control, these were the main outlets to disseminate the storm alert and the public had to rely on limited options for information access. All the small alerts and low profile warnings about the incoming storm from 28 April 2008 to 3 May 2008 reflected a low priority towards the approaching hazard. The presentation and packaging of the storm news did not covey the seriousness of the approaching storm and exhibited little regard to public safety and human security. Although there was little chance to break through this rigid structure of governmental control on information, efforts of individual agency were also recorded in alerting the public to the seriousness of the approaching storm. One initiative from the DMH was recorded for this matter.

Figure 10 shows the printed version of an interview that appeared in a newspaper on 2 May 2008 (Myanmar Alin 2008b) which was given by the Director General of the DMH. In this interview, he tried to raise concern about the approaching storm. In his personal reflections, he revealed how the unusual circumstances happened:

> My deep concern over the situation drove me to contact directly to a reporter from the State-owned paper, Myanma Alin. I decided to give him an interview which highlighted the preparation measures we should have taken in coming hours. This is the first time in my life to call a reporter to request writing an interview column stating my views. When I was interviewed by the reporter, it was 11 am of 1st of May 2008. It was 36 hours away from the landfall and the eye of cyclone was still 450 miles away from Myanmar coast. (Personal communication with the researcher in 2013)

Even in this serious effort of conveying the message in interview form, the newspaper formatting was problematic with three different strengths of storm stated on a single page as shown in Figure 10. Lwin mentioned in his interview with Myanma Alin newspapers that 100 miles per hour would be the wind speed, the top right of the box said 130 miles per hour and the bottom right box said 50 miles per hour. Even with the contradictions, this newspaper, which contained the most serious alerts on the intervening days of Cyclone Nargis, was delivered to homes in central areas of big cities on the morning of 2 May. But one or more days of delivery time to reach beyond urban centers meant this newspaper had little chance of reaching the public on time as the storm was about to cross the Delta that afternoon.

The storm will pass the western Delta and the speed will be as high as 100 mph.

'The movement of the storm in the Bay of Bangel still slow. Yet, at the center, the wind speed is estimated as 130 miles per hour. It is transforming into a stronger cyclone', Joint Typhoon Warning Center (JTWC) said. The direction has shifted from the Northwest to the East. The areas which are likely to be affected by the storm are Western Thailand, Southeast Bangladesh, India. Myanmar will also be affected said JTWC. JTWC said the height of the wave in the sea was as high as 20 feet.

Heavy rain and shower are expected in coastal areas. The wind speed will be 50 mph.

Figure 10 **The storm warning in 2 May newspaper (note different forecasts of the storm strength on a single page**

Source: Myanma Alin newspaper dated 2 May 2008, p.13

5.4 Did the people have means to communicate?

Information and communication technology (ICT) plays a critical role in disaster risk reduction (UNESCAP 2010). Fearn-Banks (2002) noted the phrase 'Crisis communication' which comes in various forms of 'verbal, visual, and/or written interaction between the organization and its stakeholders (often through the media) prior to, during and after the negative occurrence' (p.480). Innovative use of ICT has been more accelerated after the Indian Ocean Tsunami of December 2004. During the

Tsunami, procedures to deliver warnings to the governments concerned and infrastructure were not adequate in the region, meaning the transmission of the tsunami warning was delayed unnecessarily (UNESCAP 2010). UNESCAP observed that 'The lack of access to ICT and connectivity is a critical bottleneck in establishing end-to-end EWS'.

Cyclone Nargis was another example of poor telecommunications capabilities that hamper early warning efforts to reach people in various locations (Zillman 2003). At the time of Cyclone Nargis, development of the telecommunications sector in Myanmar lagged far behind many of Myanmar's Southeast Asian counterparts. The following Table 6 compares Myanmar and Thailand in terms of mobile, fixed line and internet penetration in 2007.

Table 6 **Comparison of telephone penetration between Myanmar and Thailand**

Country	Mobile penetration	Fixed-line penetration	Internet penetration
Myanmar	0.7%	1%	0.01%
Thailand	81%	11%	11%

Source: Evans (2008)

In the research areas, telephone availability in Zone I and Zone II was very limited. Zone III, which is closer to Yangon, has more telephone lines and there were cases of families that received the cyclone warning via telephone:

> The cyclone news was given to me by my friends from the other side of the village who kept regular communication with Yangon. They got news from the telephone conversation with Yangon people. (Ma Aye Khine, 39 years old, a housewife, Kyun Chaung village, Zone III)

ICT development was hampered in Myanmar in the years leading to Cyclone Nargis mainly due to restrictions of the military government. Government' policy was known to be designed to be overpriced control the information flow and make communication

options beyond the reach of ordinary people (Freedom House 2011). While limited access to mobile phones was allowed, the cost was astronomical. In 2008, a mobile phone SIM card cost more than 2400 USD[2] and one-off installation for a broadband internet line was charged at approximately 1500 US dollars with monthly service charges ranging from 45 USD to 130 USD (Freedom House 2011). Land lines were available in most townships (mostly for government offices and local businesses) but were more difficult to obtain in the Delta area due to geographical barriers. These prices were prohibitively high for the majority of the citizens, whose annual per capita income, according to the International Monetary Fund in 2007, was only 250 USD.

What the coastal areas across the Delta could access was a particular mobile telecommunication service, locally known as 'coastal phone' or 'CDMA' (Mizzima 2008). Just before Cyclone Nargis, coastal phone became popular among local businessmen and officials who could afford the price tag of 1500 USD per SIM card. Of the 45 villages in this research, four villages were found to having access to CDMA phones before Cyclone Nargis. In these four villages, it was referred to as very useful to convey the cyclone warning to some areas. More than that, after the storm these phones became valuable tools to reach out for external help.

Looking back to the Cyclone Nargis experience, the use of mobile phones could have helped in two areas. Firstly, they gave a chance for people to communicate among each other to alert others to the risk posed by the cyclone. Such 'communicative action' could help for preparation or evacuation. Secondly, mobile technology was a chance to overcome the geographical barriers of the intricate waterways in the Delta regarding to early warning and emergency responses.

One of the most vulnerable places in the Delta was farm houses or huts (normally made of bamboo and nipa with various sizes and strengths) which were scattered across a wide paddy field. These shelters are built for temporary use in each cultivating or harvesting season to facilitate easier access to daily farm work. Normally when farmers and farm workers are away from the village community, they do not have

[2] This was the price of a mobile SIM card I bought in May 2008 right after Cyclone Nargis for communication purposes in the disaster relief operation in Labutta and Kungyangone areas.

much access to the outside world unless they are using radios. At the time of a cyclone emergency, person-to-person contacts are the only way to access information at the farm houses. In Zone III of the research sites, several orphans reported that their parents had died while in the farm house. An eldest child of a farmer's family from Seik Kyi village (Zone III) who is now taking care of her two younger siblings recounted her story:

> When the storm hit at 9 pm, we, three children were at home while our parents were staying in the farm house of faraway paddy field. Here, our house was built on a bit higher ground. But it also collapsed around 10 pm and we had to rush for our uncle's house. His house was also damaged and only the kitchen was remaining stable place for all of us. Both of my parents were seen by their friends drifted away by the surging water. A friend of my father who survived and was swimming together with them in this very minute said my parents were deeply worrying about us and talking about our safety before they separated from each other. (Moh Moh Thu, 23 years old dress maker, Zone III)

5.4.1 The role of radio and television

The Asia-Pacific Broadcasting Union stated that 95 per cent of Myanmar's people listened to the radio in 2012. Again in 2012, a Gallup poll showed that 67.3 per cent of respondents from both urban and rural areas said they got news from the radio at least once a week (Gallup 2012). The same poll noted that 86.7 per cent of listeners to the radio said their primary interest was the weather report.

During fieldwork, when the respondents were asked how they received the news about Cyclone Nargis, the two answers most commonly found were from the radio and from their neighbors. For DMH, state radio is most accessible medium for disseminating weather news to the public as it is flexible to request to announce breaking news if needed (Lwin 2015). At the time of Cyclone Nargis there was a limitation in this favorite media, too. Back then, the state-owned radio programs started from 7 am and ended at 10 pm with one or two intervals in between. There were several foreign-based Burmese-language radio programs such as those from the British Broadcasting Corporation, Voice of America and Radio Free. In short, when Cyclone Nargis came

to the shore of the Delta, there were no 24hour broadcasting services to keep track of and provide updates about the cyclone's progress to the public.

Regarding television, in many villages in Zone I and Zone II covered by this research, TV signals were weak and received transmissions intermittently. Some families possessed TV only for entertainment purposes as they were used for watching movies with DVD players as the TV channels were difficult to access. Regardless of the socio-economic conditions of the community, villages in all three research zones stated that most of them got news about Cyclone Nargis via the radio:

> We got the storm news from radio around 1 pm on that day (referring to 2nd May). I was not serious that much. We thought we, people from the Delta were resistant to storm wind and rain. TV is useless for news here as we could not access to the channels. (Focus group discussion, Ywar Tharyar village, Zone II)

Even if transmission smoothed out and rural people had electricity to turn it on, TV programming was not the best stage for disseminating weather news back in 2008. Back then news programs on TV started at 8 pm The prime-time news was mostly extensive coverage of the daily activities and travels of senior military officials, largely for propaganda purposes of military legitimacy in taking care of national and religious affairs. Only after these lengthy news stories about individual or group visits by high ranking officials, came the weather news. By then it was almost 9.30 or 10 pm or occasionally 11 pm. The former Director General of the DMH recalled how the DMH worked with the state broadcasting station for weather news as follows:

> My department was responsible to deliver the weather news every day at 2 pm as the latest to TV station. Even if it happened that a storm would make a landfall at 6 pm, the people might already be dead when this weather news was broadcasted late at night after all this long news program dedicated to the official and ministerial daily digest. (Lwin 2015).

In the view of the Cyclone Nargis survivors who lived in areas stretching from the Southwest to the Northeast (Zone I to Zone II and Zone III), even the same news which was announced at the same time had different implications. Villages in Zone I had the earliest exposure to the storm and the local people did not have much time to prepare

when the initial cyclone landfall started affecting their area around noon. For some, the time they received the warnings from the radio and the time they started running got little interval as in the following quote from Zone I:

> I heard the warning from the radio. I was in my house listening while many others did not have direct access to radio. It said, the intensity would be 120 miles per hour. It was 12 o'clock news and in this hour, the sky was dark and the wind became violent (Focus group discussion, Kong Gyi village, Zone I).

For the people from Zone III in Kungyangone and Dedaye, the landfall was at least 3 to 6 hours away when they received the storm warning. In spite of having a few more hours for preparation compared to Zones I and II, the warning mostly failed to prompt actions. Hypothetically, real time coverage such as 'nowcasting' with a forecast for the next few hours could have informed people from the other side of the Delta about what had been going on at the other corner. A more specific warning could have saved more lives.

Another problematic feature of TV programming was the lack of roll-on or pop-up captions on TV screens which have already been widely used in the world. This feature was introduced few days after Cyclone Nargis after the apparent request of a senior military official for such a feature (Lwin 2015). Based on DMH's own reflection, the following were bottlenecks in the dissemination of the storm warning via radio and TV in the context of Cyclone Nargis:

- It was not an end-to-end warning system. DMH could not reach the audience directly. Due to poor communication infrastructure, there was no micro-messaging opportunity.
- The end receivers (users of the media) could not have the latest news because no broadcasting media provided 24-hour services in 2008. In the absence of up-to-date channels, a fixed broadcasting time for weather news could have offered an exact time slot to tune in for updates. Yet, this option also was not working before the cyclone's landfall.
- There were media-blind areas in the Delta (and several places in Myanmar) where either transmission did not reach people or there was no facility at all to receive news; one such example is fishing groups residing for days in boats.

5.5 Response capacity and activation of an emergency plan

In WMO's fact-finding mission report, it was noted that,

> DMH had also tried to communicate with the respective authorities and state/division Peace and Development Councils in a repeated manner. A good lead time was there as well for making evacuations (WMO 2009, p.9).

Interestingly, WMO did not state whether such evacuations happened and neither did it investigate what the reasons were for this not happening. In the WMO guidelines for early warning, it was clear that an early warning needed to be (1) clearly understood by the people, (2) easily and readily accessible to people, (3) timely, and (4) tied to response actions to be taken by the people in advance of, during, and after the event (WMO 2010).

In the process of the EWS at the time of Cyclone Nargis, there was no such thing as activation of an emergency plan, as there was only a structure on paper for emergency management for a natural hazard in Myanmar before Cyclone Nargis. Regarding the response of the government, Tun Lwin, former Director General of DMH pointed out that,

> There are some government departments which should have acknowledged the level of vulnerability in the Delta and could have initiated some precautionary activities. The problem is they did not realize it was their responsibility. After Asian Tsunami of 2004, Myanmar government form 'National Disaster Preparedness Central Committee' in which Prime Minister was the chairman leading 17 ministers, all chiefs of the State and Divisional General Administration Departments and two mayors who were members. Officially it consisted of 8 sub-committees. What did they do during Nargis, before Nargis? (Lwin 2015, p.67).

His narrative clearly conveyed the facts yet in the sensitive context of the political situation in Myanmar, even under a more open transitional phase, he did not say anything upfront against the military government.

The Myanmar Government's national progress report in regard to Hyogo Framework for Action (HFA) (MSWRR 2010), which was dated November 2010, carried

indicators that demonstrate a lack of efficiency in disaster management. Although it was more than two years after Cyclone Nargis and some initial progress had been made, it acknowledged that resources and capacities had fallen short. A summary of HFA's core indicators and Myanmar's performance ratings are presented in Box 1.

Box 1 **HFA's core indicators and Myanmar's performance**

Core Indicator 1: National policy and legal framework for disaster risk reduction exists with decentralized responsibilities and capacities at all levels

Level of Progress Achieved: 3

Institutional commitment attained, but achievements are neither comprehensive nor substantial

Core Indicator 2: Dedicated and adequate resources are available to implement disaster risk reduction plans and activities at all administrative levels

Level of Progress Achieved: 2

Some progress, but without systematic policy and/or institutional commitment

Core Indicator 3: Community participation and decentralization is ensured through the delegation of authority and resources to local levels

Level of Progress Achieved: 2

Some progress, but without systematic policy and/or institutional commitment

Core Indicator 4: A national multi-sector platform for disaster risk reduction is functioning

Level of Progress Achieved: 3 Institutional commitment attained, but achievements are neither comprehensive nor substantial.

In a close-up assessment of the four components in the Early Warning (System) of Cyclone Nargis, the following observations came out: (1) monitoring and forecasting of the storm turned out to be accurate although the risk analysis was inadequate especially in identifying vulnerability, (2) dissemination of the warning was problematic although it could have been worse, (3) an emergency plan did not exist to activate per the warning. Under the heavy constraints of the prevailing social and

political systems, initiatives of human and institutional agency were still visible. Sadly, even if one component of the EWS worked, mass fatalities still occurred. Being effective in one component does not mean preventing failure in others. The overall results are still negative; in this case thousands of people perished.

5.6 Why did the warning fail to warn?

Unless the most vulnerable people can receive information in a timely manner in understadable language, there will be limitations to acting on the warning message (Basher 2006; Collins 2009; Kelman and Glantz 2014). UNESCAP (2015) referred to the challenges in the form of gaps for 'extension of the warning chain down to the local level' as the last mile. More often, reference of the 'last mile' is used as synonymous to the 'first mile' giving importance to the most vulnerable people at the frontline of disaster. In recent decades, proposals have been raised to disaster management policy makers to replace the 'last mile' approach with a 'first mile' approach that means putting the involvement of vulnerable people in the first place of the warning system (Richardson and Paisley 1998; Lassa 2008; Kelman 2009). Beyond improving the disaster risk reduction system, keeping people and communities at the center of the EWS from the beginning can contribute to sustainable development and more livelihood safety for the people.

The experience of Bangladesh in Bhola cyclone in 1970 is a case comparable to Cyclone Nargis in the aspect of slow response from the government. The political leadership of Bangladesh (East Pakistan) at that time was heavily criticized by their political opponents as 'gross neglect, callous indifference and utter indifference' for their failure to take serious action at the initial information release and evacuation. Estimated some 500,000 people were killed when the storm surged intruded to the low-lying the Ganges Delta. Inefficient rescue and relief operation triggered mass grievance that eventually led to the downfall of the government in the cyclone affected region. The Awami League led by political opponents of the main Pakistani government gained a landslide victory in the next general elections of December in the province. Similar to Cyclone Nargis experience, the President of the whole Pakistan was condemned by its own people for playing down the news coverage and let the

people died where they were sleeping in their own houses (Mathur 2014). In East Pakistan, the failure in rescue and relief led to the protests that demanded to make a new liberated Bangladesh. A political consequence was different in Myanmar from that of Bangladesh. In the authoritarian context, the Burmese people could not directly punish the government by means of the election. Instead, the constiutional referendum which favored the supremacy of the army in politics was approved. Since the 1970s, Bangladesh has taken the necessary steps to improve early warning systems. With the development in the mid-1990s, cyclone prediction became exact and the country avoids extreme casualties. Although a cyclone on 19 May 1997 had the same intensity as that of 25 May 1985, it caused only 127 death which is much lower than the death toll caused by the latter that resulted 11069 deaths. In addition to the improved early warning system and pro-active disaster risk preparedness measures, 1350 cyclone shelters were built by 201and 26.6 per cent of the population is covered by cyclone shelter (Akhand 2013, p.50). In addition to significant progress in early warning system, in 2007 the people-centered cyclone preparedness programs mobilized 43,000 volunteers successfully. They have been stationed in the coastal districts and hold the responsibility of disseminating cyclone warnings among villagers via megaphones and by house-to-house contact (Paul 2009, p.292). Regardless of type of political system, what Myanmar need to do is to learn from Bangladesh for DRR experience.

The national EWS does not necessarily need to be a separate system that comes into use only when the community is exposed to a hazard (Kelman and Glantz 2014). To move people and communities from the add-on position of the ‘last mile’ to the ‘first mile’, and help them benefit from an effective warning system, strong political commitment and durable institutional capacities are crucial (Basher 2006; Jacob 2008).

Tapscott (1997) also stated that early warnings must ‘warn’ and be ‘early’. There are persistent questions about why people in the Delta were not warned by the warning when many of them at least knew the cyclone was approaching. Even though the warning did not come that early and it is still difficult to count as an effective warning, some of them heard directly from the DMH. Here, the risk perception is embedded in the socio-economic situation of communities, government policies and cultural

factors, is another determinant of success in saving lives. As in many other disasters, the EWS turned out to be a social process that equally weighed the importance of technical aspects. Hence, non-technological aspects also need to be considered to check whether predictions of an extreme weather event really prompted the communities' responses (Alusa 2003; Sorensen and Sorensen 2007).

5.7 Education could save lives

There is some research that highlights the role of education in early warning and disaster management (Tong et al. 2012; Muttarak and Pothisiri 2013; Gaillard and Mercer 2013). Landis (2003) argued that it must be 'a knowledgeable public' that understands and is aware of natural disaster risks. Muttarak and Pothisiri (2013) concluded that the education level of household members is positively related to disaster preparedness.

Education plays a critical role in building understanding of natural phenomena (Smawfield 2013). In the context of the overall decline in the education system, schools and curriculum in Myanmar did not provide knowledge for comprehensive understanding in recent decades. While local weather forecast knowledge such as movements of animals and tidal patterns has been passed from generation to generation in some communities of the Delta, in general the majority rely on formal education for living. In fact, local knowledge of disaster risk reduction is in decline as it is in many other places in the flux of modern ways of life. The gap between young people and traditional knowledge is widening and comprehension nature by means of local wisdom is fading gradually.

Smawfield (2013) also noted that the education of children could be a means of passing relevant messages and practices to homes and communities; initiatives of that kind were referred to as 'let our children teach us' (Wisner 2006). Ronan et al. (2001) argue, if a child is more educated and more knowledgeable, the caregiver is more likely to be better informed if the child is encouraged to share information. In Cyclone Nargis, stories of children and how they contributed to the safety of the family were recorded in community narrative. A story is shared in a focus group discussion in Zone III in the lower Kungyangone area:

> Initially I didn't know about storm but later I heard the announcement from the TV and Radio, but I did not have much concern. My daughter stressed that she learned storm news in newspaper and asked her father not to go fishing. I wanted my husband to go for fishing but he listened to our daughter and fortunately his life was saved (Daw Khin, a street vendor, Auk Seik village, Zone III)

In the experience of Cyclone Nargis, the narrative of residents revealed that comprehension of the Delta map and coastal geography had an influence on the level of seriousness among individual families and persons over hearing the storm warning. Lack of understanding may possibly have been rooted in a low-level of formal and informal education. Geographical awareness-raising could have been possible in informal ways as part of the public service media. The respondents tried to link low education and limited understanding of the warning message with the negative consequences they saw in the evacuation process. A brief classification of the most common responses to the cyclone warning is shown in Box 2. Some of these perceptions have roots in limited knowledge and lack of experience while some are linked to low levels of trust in the early warning and the government. Some are related to poor communication infrastructure and lost opportunity to interact regarding emergencies.

Box 2 **The community's response to cyclone warning**

I heard the news and acted

- 'There was only one radio in the village. But the owner of the radio made his earnest effort to share the news by mouth to mouth to the whole village.' (Thaung Thar)
- 'When the villagers received the warning, they also gave alert to an army unit stationed near the village.' (Auk Seik)
- 'As soon as I know my surrounding area Haing Gyi island was included in the news I went to my aunty's house which is two-storey building and big enough for us.' (Mar Dar Aai)

I heard the news but I was very indecisive

'We listened to the radio and got the warning. But we were very indecisive what to do next. I was still guessing the direction of the cyclone. I was lost in my thoughts without doing any preparation.' (Toe)

I did not receive the news

- 'Here we lost nine out of every ten people in the village because we did not hear about the storm.' (focus group discussion, Chaung Byal Gyi)
- 'I locked my radio in the cupboard. When I noticed the rising tide, it was already too late.' (Hnar Gyi)
- Radio transmission was so poor and no radio was working around us. (Shwe Sar Yan)
- 'I was living in the far end of the river and did not know anything about the storm.' (Chit Thaw Maung, 35) (Say Yoe Kwin)
- 'Here, the houses were sparse and very far for a message to go from one household to another. A more established and collective community had better chance to get information.' (Western Yay Kyaw Gyi)
- 'TV has not been useful in seaside village like us because there is no signal to any broadcast channel.' (Ywar Thar Yar)
- 'The village council received the news from the central administration of the village tract, but the council did not share to the community members.' (Kyein Chaung Phyar)

I heard the news but did not trust it

- 'I do not remember where I got the news. It reached me two days before the actual landfall. But I did not trust the news.' (Pauk Sein Kya)
- 'The storm news came like a rumor. The message could not be verified whether it was true or not. Weather news style back then was not serious. Not many people know the truth. I did not have access to any TV channel. I got TV but my family did not watch the news. We used TV only for watching movie with DVD players. People back then were not interested in State TV.' (Kyun Chaung)
- 'People used to listen to the radio. But we listened only to the music and turned off the radio when the news and weather report came.' (Sar Kyin)
- 'We were poor and we did not own TV.' (Bhone Daw Pyae)

I heard the news but there was no safe place

- 'We received the news, but we did not have any place to go except going to the trees nearby.' (Seik Kyi village)

I heard the news but I did not care

- 'Many working in the paddy field neglected the warning and did not want to leave their work.'(Kyunchaung)
- 'I heard the news from radio. But I was not so worried about that because even my grandparents who lived till 70 and 80 never heard of such a violent storm.' (Kwin Yar)
- 'A boy from my neighboring village came to me with a bicycle and he said, 'Big brother, a storm called Nargis is coming.' I replied 'Whatever name it is, I do not care'. I left to Bogale on that day. When I arrived to the town, I listened to the radio and heard the warning. I keep listening and listening but at some point, I did not hear the news any more. Because my radio was already flying off from my hand. The storm was that violent.' (Ko Aung Zaw Latt, Say Yoe Kwin)
- 'As people never heard of such a strong cyclone in one hundred years, no matter how many times we heard the warning from radio, we did not care.' (Aung Hlaing)

I heard the news but I was confused about the name of the place the media was referring to

- 'The radio was announcing the storm news again and again in hours before the landfall. I thought the storm would strike other places rather than my home.' (Pyi Daw Thar)
- 'We were confused. Most of us here did not know the place the radio was referring was just beside our village.' (Bhone Daw Pyae)

I heard the news but I could not inform others

- 'I heard the news from radio but I cannot go to the paddy field where my children were working. It was too far for me to reach them.' (Thone Gwa)
- 'I told the people that I heard the storm news from the radio. But people from the village thought I usually behaved strange and not worth listening.' (Pay Gone)
- 'We watched TV with the battery and heard the warning after the prime-time news around 9 pm After the battery, had gone, we were in the dark and could not go out to inform friends.' (Thayet Thone Bin)

I heard the news but did not understand the technical terms

- 'I did hear the cyclone warning in every hour but I did not know what they mean by mile per hour of the storm clearly. I also did not know which areas will be affected.' (Pyi Daw Thar)
- 'We did not understand the usages the radio use. The information was not clear to me.' (Taw Ku)

5.7.1 Lack of comprehension: Where is that island you keep referring to?

When the storm warning was issued, the announcement stated that 'Hlaing Gyi Island' would be the first and foremost landfall point in the Delta. This name, as used in official announcements was geographically accurate and clear as there is no other name to describe it. However, a clear name which referred to one of the significant landmarks in Myanmar still created misunderstanding and confusion, according to the focus group discussion in nearby villages. The people who lived in Zone I knew Hlaing Gyi island (the initial landfall point) well as they are close to the island. But that was not the case for many people in Zone II and Zone III. In many focus group discussions, the villagers mentioned that they were having a hard time getting a mental image of that location. As most of the schools in these areas were extremely poor, access to physical images of Delta maps was difficult. This problem is somehow linked to the poverty of Zone II in which schools often lacked support from the government because they were not yet formally recognized or teaching aids such as maps were scarce. Confusion over locations was stated in Zone II:

> My aunt and I got the news from the radio while we were eating lunch and but the problem was we did not understand what was meant by 'Haing Gyi island was at the centre of the storm.' Where is Haing Gyi? We wondered. We thought it was very far away place from us.' (Focus group discussion, Ywar Tharyar village, Zone II)

Similar narratives were recorded in different discussions at research Zone II and III. Also, there are some positive stories highlighting the benefits of knowledge and comprehension over the movement of the cyclone's path:

When I heard the announcement for the first time in the morning of cyclone day, the radio did not include our area, the Southern part of Yangon region in the cyclone path. So, I did not think it was serious news for us. Later we found out that our region was included in the warning list, I called one of my workers and assigned him to shout loud the warning across the whole village. Around 8 o'clock we prepared to be ready. No sooner than the clock had struck 10 pm, houses in the other side of the village started to collapse. So, people moved to this side of the village where the ground is a bit higher than their low lying plain. Even the army unit residing in our village was moving to my house. We did not have cases that led to death here because of the warning. Many people from the other side of the villages died because they did not have information. (U Sein Win, 56, Toe, Zone III)

Figure 11 **Map showing the location of Turtle Island or Thamee Hla Island**

Source: Colin Limpus, IOSEA Advisory Committee and Douglas Hykle, IOSEA Coordinator

Another issue of confusion with names in radio announcements relates to local knowledge in stating geographic entities in the weather announcements. When the warning was heard by the people from Zone I, which is close to initial landfall point of Haing Gyi, they tried to interpret a specific reference that they heard from the

announcement. It said, ‘the storm would pass the areas between ‘Haing Gyi Island’ and ‘Thamee Hla Island’ which is shown in Figure 11. Most of the people were not clear about the name, ‘Thame Hla Island’. In the local understanding, the people referred this island as ‘Lake Kyun’. A colonial name ‘Diamond island’ (at 15° 51' N 94° 17' E) was changed to ‘Thame Hla Island’ in the government registry but local people just know it by the name of ‘Turtle Island’ (Lake Kyun in Burmese). Local names and local understanding in early warnings were critical for effectiveness. Kelman (2012, p.483) recommends applying ‘locally contextual warnings’ considering the nature of risk and effectiveness of the language. A female participant from focus group discussion in Kone Gyi recalled her experience with the message that she was not able to comprehend because of unfamiliar name,

> While we are preparing for a wedding reception of the next day (day of landfall), I did receive the news about cyclone. They said it would come from somewhere near the Thamee Hla Kyun. I did not notice that it was our Lake Kyun. (Htay Htay Hlaing, a housewife of 34, Kone Gyi village Zone I)

5.8 Failure to provide awareness and indirect experience

In the evaluation of the EWS in Cyclone Nargis, the WMO noted that,

> Both local authorities and people faced difficulties due to lack of knowledge and low public awareness to the warning. (WMO 2009. p.10)

This statement brought another layer of questions: Why did public perception evaluate the risk as low? Most respondents in this research attributed a lack of experience to the failure to prepare. This also brought another ‘why’ question over their knowledge domain: why did they lack indirect experience by means of education or exposure to media content?

5.8.1 Where did the weather map go?

The older generations in Myanmar who had grown up after Independence were more familiar with weather maps in day-to-day experience (Lwin 2015). Whenever they picked up the newspapers, the weather map was part of daily content in the past. But this content lost space on the pages of state-owned newspapers in the mid-1990s. This

long-existing tradition of providing public knowledge space disappeared from newspapers when newspaper contents were driven by a heavy dose of propaganda and revenue generation by inserting more commercial advertisements. Only the English version of the newspaper put in the map as the intended audience was a limited number of diplomats and expatriates. As shown in the following Figure 12, the weather map in the *New Light of Myanmar* newspaper for 2 May 2008 provided an example of the description of the cyclone path.

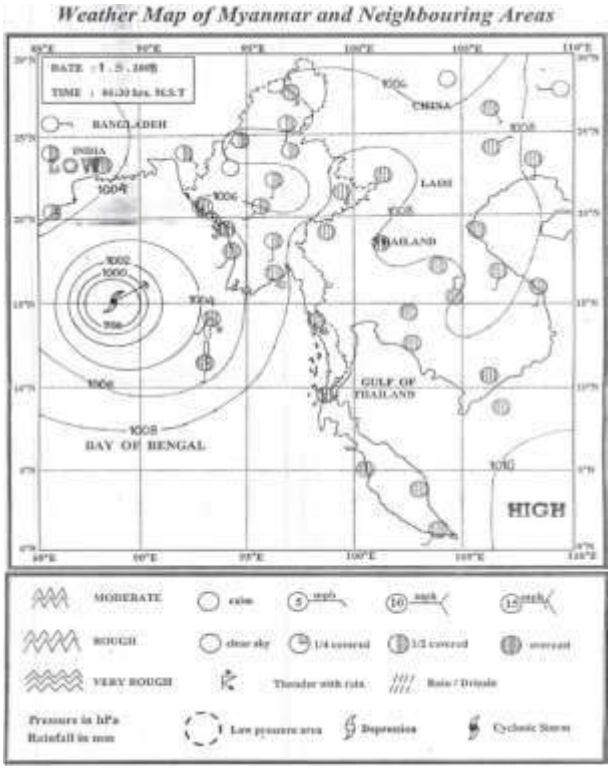

Figure 12 **Weather map for an English-language newspaper audience**

Source: *The New Light of Myanmar*, 2 May 2008, p.15

Such a visual description was not available for Burmese-language newspaper audiences. For the local audience in Myanmar, they had not seen this designated space for the weather map and related information for a long time as it no longer existed in the public sphere. The former Director General of DMH lamented that,

> Weather map and news, which existed in newspapers since the DMH started Myanmar Daily Weather Report since 1 June 1947, just disappear from public domain like that. People nowadays are less familiar with weather map and the

> rural area might not know how weather map look like. (Lwin 2015; personal communication with Lwin in 2013)

Zillman (2003) attributed the effectiveness of satellite images to public awareness in some areas. Although some privately-owned media outlets occasionally used for satellite images relevant to their contents, the state-owned media rarely utilized such images for public awareness. This knowledge gap is significant in the context of little internet penetration and mobile phone availability in the years leading up to Cyclone Nargis.

5.9 Questions of experience and frequency of disaster

Although it is more and more difficult to believe that large-scale natural disasters are likely to be events of low-probability in the current climate change context, it is certain that they are consequential irrespective of frequency. Hence, an EWS must be a part of community consciousness, irrespective of hazard frequency (Kelman and Glantz 2014).

Webster (2008) noted that four major cyclones have occured since 2006 in the North Indian Ocean, compared to eight major cyclones in the previous 25 years. Lwin (2015) also noted that cyclone tracks in the Andaman Sea similar to Cyclone Nargis (although not the same path of landfall) had happened in 1982. Landfall in cyclone Nargis was 16'N compared to the 1982 landfall of 18'N. In the 1982 cyclone (locally known as the 'Gwa Storm' named after the nearest, small town of landfall), wind speed was 120-140 mph (in Cyclone Nargis it was 140 mph) and similarly devastating in terms of property but not as much in the loss of lives. Another devastating storm was recorded in 1975, locally known as 'Pathein Storm' in which the western part of the Delta was affected by 381 deaths and more than 10,000 cattle were lost in the storm. These two big storms happened in one generation (Lwin 2014).

In 134 years of records (from 1877 to 2010), a total of 84 storms crossed Myanmar and 43 storms (51 per cent) happened in the early onset of monsoons in April and May. On average, one in two storms in the Bay of Bengal during this season usually crossed Myanmar's western coast. Lwin (2015) cited the respected meteorologists in Myanmar who compiled a data set of 100 years and published their research. The highlighted

remark of their book was, ‘if a storm is originated near Preparis Island which lies between the Andaman Sea and the Bay of Bengal, 82 miles from the coast of Myanmar, they are likely to cross Burma’ (Lwin 2015, p.48). Remarkably Cyclone Nargis’s origin was near Preparis Island (Lwin 2015). Also in the Asian Tsunami of 2004, several villages of the Delta suffered an estimated death toll of 71 people (Satake et al. 2006). In 2006, Cyclone Mala hit both Rakhine and the Delta, and in 2007, Cyclone Akash had moderate impact along the coast of Myanmar near the Delta.

Frequency and experience of tropical storms is high in the Bay of Bengal and Myanmar is never free from the negative impacts of storms in this region. Why was Myanmar not ready to disseminate disaster preparedness education in the public domain and why did it not create a knowledge base from secondary experience to build a ‘knowledgeable public’? General attribution will go to overall declines in the socio-economic situation under the military regime, while poverty shrank the space knowledge and a cultural depository. For most people, day-to-day subsistence has been an utmost priority. Specific attribution will go to the decline in formal, informal and non-formal education. Especially in non-formal education, government propaganda crowded out space for public awareness.

One underlying factor for the poor state of public awareness is strict censorship. As Emma Larkin chronicled in her book *No Bad News for the King*, the prevailing conduct of the military government was attempting to control bad news from reaching the ears of higher levels of power and the wider public. At the time of Cyclone Nargis, there were privately-owned media outlets in Myanmar that worked under heavy censorship. News about internal natural disasters was mostly prohibited or drastically toned down to look like small, insignificant events, no matter what it was, even an earthquake or flood with high destructive power (interview with former press scrutiny board member). The reason behind the censorship was that press scrutiny officials were instructed to think of disaster news or stories as undermining the government’s credibility (personal communication with a former censor official). This was the default mood of information control under Myanmar’s military rule, in which the rulers focused on regime security and in the process, they trumped public security by limiting public awareness of disaster risks.

As Friedman (2008) says, censorship restricts the people's imagination. In the case of Myanmar, public awareness and the knowledge depository was undermined under information control. As we have seen in Cyclone Nargis, much of this links to human security.

5.10 Did the cultural narrative create a false sense of security?

In the focus group discussions in all three research zones, I tried to get the views of villagers on cultural aspects related to the disaster. It was assumed that some elements of culture enhanced community resilience. On the other hand, there are some cultural aspects that are arguably not helpful. On example is that many Burmese abstain from talking about negative scenarios such as ill health or disasters. Such cultural traditions constrain people from talking about possible negative impacts that need adjustment and could contribute to the community's resilience.

There are two arguments on culture and the Burmese community: 'it is the culture that blinds us' argument and 'it is the culture that bind us' argument. During the summer, almost every Buddhist village has what is locally known as 'continuous recital of *Pa Htan*' (a ceremonial reading of a part of Buddhist holy scripture) performed collectively over a few days to a week. Such a recital of Buddhist text is believed to protect the community from possible danger. One of the famous poems in Burmese that was blacklisted by the censorship board for several years underscored how life in Myanmar was vulnerable to disasters even with this recital. A few verses are translated to reflect the cultural dimension of the people's risk perception: '.....it is good to have *Pa Htan* recital for freedom from harm, but what is not good is we are not free from harm' (Pwint 2015, p.5).

People who challenged the prevailing culture argue that the 'practice of asking protection from higher-up power does make us weaker. It takes our attention away from working on real things for protection'. (discussion in Bogale of Zone II during preliminary field trip)

On the other hand, the 'it is the culture that binds us' group believed these traditional religious activities carried deeper meaning than asking help from the people who hold power:

> We did this because we are aware of risks and uncertainty. Contrary to assumption that it is a blind faith, this is an idea of caution in practice. Without these activities, where these poor, helpless (little support from their own government) will gain strength. These cultural activities give them strength. When you walk in paved road you do not need much to care as traffic police even will work for you. But when you are going inside the forest there are a lot of unseen and unpredictable. So, homage to the forest guardian or religious text recital before going inside the forest gave you some sort of strength. You may think yourself wise for not adhering these practices if you have protective gear and equipment enough and when you can really feel safe to go inside the forest. But for most of us, these cultural activities give us chance to come together as a group and help building social cohesion that leads to a sort of resilience. (Discussion in Pathein with local community based organizations during preliminary trip)

Harris (2012) argues that behavioral changes for disaster preparedness may link to existing cultural and religious practices. In the case of the Delta community, cultural attribution of risk perception is visible but it is hard to delineate how it extends to the boundaries of vulnerability or resiliency.

Regardless of disapproval between these two perspectives, both cultural arguments somehow have common ground in understanding that the military government's incorporation of cultural practice to enhance its legitimacy did not help disaster resilience. The military government attempted to portray themselves as providers of safety and security. They set up 'organized religious activities' aiming to show the Buddhist majority people that they were the true patron of religion and defenders of the faith and the country (Ganesan 2007). For many years under the military regime, the State-owned television frequently broadcast the early morning sermons of popular monks, one of which carried the remark, 'this monk protects the country in palm of his hand'. It is plausible to say that the military government was buffering themselves from poverty and the struggles of the people, and even enhancing their credibility with such a plain security narrative. On the other hand, the regime failed to provide practical measures of human security for the people.

However, community-based cultural practices with multiple connections to the lives of local people are very different from state-led rituals. Still the administrative authorities usually occupy cultural and religious spaces and propagate grand narratives of security that have impacts on village communities. When the power, propaganda and false security narrative in the form of cultural and religious images replaced real action based in real life, it was the local community that had to deal with distorted belief systems and live with weakened resiliency:

> When some people in our village said 'nothing bad is going to happen such as disaster, because we are devoted Buddhist and honorable monks are here to protect us too', I was responding to them in my thought. No. No. This is not mentioned in Buddhist teaching and this is not correct thinking. But you see, where do the people get this kind of narrative? The answer is the State television. (A founder of a local NGO)

5.11 Complex relations between censorship, rumor and trust

When information is tightly controlled and a strict censorship rule defines the norm of a society, rumor is abundant as a way of discreet communication (Kapferer 1990). When people receive word-of-mouth information, it is their responsibility to evaluate whether it is rumor or the valid truth. Under a given situation, the news can be either undervalued or overvalued (Kapferer 1990) based on many other factors such as who said what by citing which sources. Some respondents from the research areas said they had initial confusion over the storm news in this manner. The following quotes from Zones I and II relate to this:

> I do not remember where I got the news. But it reached to me two days earlier before the cyclone. Like many people in the community, I did not trust and thought it might be rumor. On the day of landfall, I heard the 12 pm news from the radio with my own ear. Then I did not have much time left to prepare for evacuation. (U Aung Myo Thet from Pauk Sein Kya village, Zone II)

> We did not hear directly from radio. It was spreading like mouth to mouth rumor. People were saying that flood and strong wind were coming. (Aye Aye Mon, 49, Aung Hlaing Zone I)

As described above, the military in the Delta got direct alerts from the DMH. But trust between the military and ordinary people had deteriorated under the long military rule and a country in decline. Their warnings in some areas did not prompt actions. The following story came from Zee Thaung village of Zone I which is close to the initial cyclone landfall area. The soldiers from the navy and army unit near the area were obviously on high alert. The following story came from group discussions in that area:

> On that day, the patrolling soldiers came and told us about the approaching storm. We did not pay attention to the soldiers because the storm was not new to us and we were confident seafarers. Around 12, the soldiers came back again, they were already impatient and shouted at us, 'You all must leave here'. 'Now'. Then people were already moving to the hill as more and more intense wind came. (U Kyaw Thin, 60 years old fisherman, Zee Thaung, Zone I)

Issues around rumors and trust were involved in these stories of early warning. Trust could help people to verify the news quickly and act. The role of trust in early warnings again highlights the need for community processes to be prioritized in DRR.

5.12 The current state of EWS

After Cyclone Nargis, the Japanese government helped DMH to establish three radar stations in Yangon, Mandalay and Kyaukphyu and 30 automatic weather observation stations which would be ready by 2017. DMH established a new section for Remote Sensing and Geographic Information System (GIS) on September 2012. Multifunctional Satellite Images (MTSAT) are provided by the Japan International Cooperation Program for accuracy of storm forecasts. Skills and data management for daily weather forecasts and detecting extreme weather condition were also built up by training given by the Asian Disaster Preparedness Center with the financial support of the government of Norway. In addition, training for effective disaster communication linked with early warnings was also supported by UNESCAP and RIMES. Assistance from bilateral donors including Japan has contributed to the improvement of the equipment and capacity of DMH (Tun 2016).

The example of Bangladesh can also inform the DRR process in the current political transition in Myanmar. In a cost benefit analysis of the EWS based on Cyclone Sidr,

it was calculated that 'for every $1 invested, a return of $40 in benefit over a ten-year period may be realized' (Hunreuther and Michel-Kerjan 2013, p.465). In addition to these improvements in assets for detecting and forecasting, community process initiatives were taken in some area. As this chapter shows, institutional and community assets, together with processes centered on people and communities are critical to the success of EWS in Myanmar.

5.13 Conclusion

This chapter explored and analyzed issues of early warning in Cyclone Nargis. In the first part, the role of government and responsibility in the failure of the early warning were outlined. Lessons are drawn from the past experiences rather than blaming the responsible actors and institutions. Based on the four phases of early warning, weak linkages among all three domains of 'government', 'institutions' and 'community' were observed. Areas of governance and institutions are studied from secondary sources and expert interviews while the community side was explored from the community narratives. It concludes that during Cyclone Nargis, assets for effective early warning such as communication technology were limited. Community processes in getting messages, verifying risks and taking actions were also problematic due to various factors that linked to decades of national political regime which did not put much effort for human security. In the context of authoritarian rule in Myanmar, the role of governance weakened physical assets and local processes. For future implications for resilience, communities' active involvement is needed to improve both tangible assets (ICT/risk map), and intangible assets (human capital/education). Both tangible and intangible assets should be enhanced in parallel.

With regard to Early Warning System (EWS), a good example of EWS for Myanmar is Cuba. In Cuba, the year 1995 brought a major turn in the country's early warning system. This year was registered as the second most active hurricane season of the 20th century in Atlantic, Gulf of Mexico and Caribbean Basin and many of its neighbors suffered from disaster. Without being affected by major hazards, Cuba revitalized the early alert system befor the tropical cyclone in 1996. Immediate benefit from a newly installed EWS came to Chua during Hurricane Lili which crossed central

Cuba in the same year. Since then EWS of Cuba has been more strengthened and institutionalized (Torres & Puig 2012).

Another example which carries a lot of lesson to Myanmar is Bangladesh. A cost-benefit analysis of EWS based on the Cyclone Sidr showed that 'for every one US dollar invested, a return of 40 US Dollar in benefit over a ten-year period may be realized' (Kunreuther and Michel-Kerjan 2013, p. 465). After extensive calculation, Kunreuther and Michel-Kerjan (2013) made the following recommendations for developing countries: 'to start investing more systematically in DRR rather than focusing almost exclusively on post-disaster assistance', 'to put more time and energy into reflecting ways to reduce future losses rather than focusing solely on emergency relief'. For developed countries, it is suggested to provide resources to low-income countries for the above-mentioned measures (p. 472).

In the context of political transition in Myanmar, some of these recommendations are taking shape even though some bureaucratic bottlenecks still exist. An as an example is a recent planning to set up tidal gauge for Tsunami warning near the Diamond Island with the support of UNESCO and International Tsunami Information Center (Swe 2011). This installation plan was delayed due to red tape in the administrative system of Myanmar and finally, it chose the Philippines instead of Myanmar as the project end date became closer at the end of 2010 (Lwin 2015). Yet, Myanmar has seen some institutional setup. Japan is a major donor for disaster risk reduction plan of Myanmar and it provided US$ 40 million to set up three weather stations in three major points of Myanmar and 30 automatic weather observation stations across the country by 2016 (ABCID 2015). Referring to these improvements, one of the leaders of a local community-based organization said, 'it's not going to bring back my fellow villagers from death, but that is good news if our children in the village become safer'.

Chapter 6

Resilience and vulnerability in the cyclone emergency

6 Introduction

This chapter analyzes the characteristics of disaster vulnerability as well as the 'assets' and 'processes' that constituted resilience for community security in the emergency phase of Cyclone Nargis. When a life-threatening danger was imminent, the village communities in the three research zones needed to locate disaster-resilient assets through self-organized evacuation processes.

Studies on the behavior of people in emergencies (Quarantelli 1954; Dynes et al. 1972; Wenger et al. 1975; Barton 1969) have stated that communities' actions are usually far from irrational. Knowledge of the community members may be limited to analyzing the whole complexity of risk. They may not be able to choose the safest option under the given time and resource constraints. Yet, in an emergency they have many reasons to protect themselves and their loved ones as best possible (Fritz and Williams 1957). Regardless of priority for self-survival, Ronan and Johnston (2005) argue that the pattern of response among affected communities tends to be pro-social rather than anti-social. It is observed that positive human nature had influence over choices for life safety in Cyclone Nargis's impact phase despite people's actions being constrained by many factors rooted in the structural vulnerability of the society.

The first part of this chapter will explore sources of resilience for the people by exploring the 'physical assets' available for safety, and dynamics in evacuation as 'processes' for survival. The second part will analyze the underlying causes of social vulnerability in this unique context of political complexity, and impoverished yet close-knit community.

6.1 Human security in the 'impact' phase: determinants of survival

One of the guiding principles of the Sendai Framework for Disaster Risk Reduction denotes that 'the state has primary responsibility' for disaster reduction measures and

for taking immediate action in an emergency. This responsibility must be shared by 'relevant national authorities, sectors and stakeholders' for protecting a community and its 'property, health, livelihoods and productive assets, as well as cultural and environmental assets, while promoting and protecting all human rights, including the right to development' (UNISDR 2015, p.13).

Observations on disaster emergency were noted in studies by Quarantelli (1980), Fritz and Williams (1957), Kiel (1995) and Pursiainen (2007). Quarantelli (1980) observed that mass movement was characterized by behavioral complexity in which the process is full of interactions that develop along multiple lines rather than a single path. Kiel (1995) and Pursiainen (2007) stated that disaster emergency of any kind is a nonlinear event in which constantly changing variables are likely to confuse decision making. Fritz and Williams (1957) point out that lack of communication heightens vulnerability during the impact hours. Panic is most likely to occur when there are limited choices for action and finding escape routes is not easy or they do not exist (Fritz and Williams 1957, p.44).

During Cyclone Nargis's emergency phase, the state's involvement in disaster evacuation was minimal to none. People did not have ambiguity about the role of the authorities and realized that they were on they own. Generally, it came down to individuals or households, in most cases, to decide what actions to take. Flight from an unsafe place became a solution for most people when they started to feel the strength of the storm wind and storm surge. Even in normal conditions of the Delta, person-to-person communication was the main method of sharing information, and in the increasing intensity of the storm and the accompanying storm surge, villagers were in an emergency situation with many unknowns. Especially for Zone III of this research, where the storm surge came in the dark of night, survival was most difficult in the drifting water.

Human security in the emergency phase of Cyclone Nargis was determined by the availability of assets (shelter, stronger buildings) for safety, processes that could facilitate actions needed to reach assets (for example, the evacuation process), and withstanding the emergency. Group activities with collective actions were the norm in the village cultures of the three research zones. Many altruistic stories were recorded

in the emergency phase of the disaster in Cyclone Nargis. But the intensity was unexpected for many of villagers and preparedness for the storm surge was almost nil.

Based on the interviews and focus group discussions in the village communities, survival in the cyclone emergency was attributed to a community's capacity or capital that provided 'assets for safety' and 'processes for safety' as shown in Figure 13. Generally, emergency mechanisms and survival strategies of the community were derived from the existing capital of the community, such as physical, cultural, human social and political capital. The conditions of these capitals are not independent of national policy and governance and, in many cases, they are hampered by government policy that increases vulnerability when human security is not the focus. Apart from the government, communities in their own 'social interaction' possess varying degrees of social and other capital. How assets and processes were critical to human security of the Delta in the storm hazard context is explored in this chapter by looking at the critical hours of the emergency struggle. Assets, process and capital linkages to national governance are also examined in this chapter.

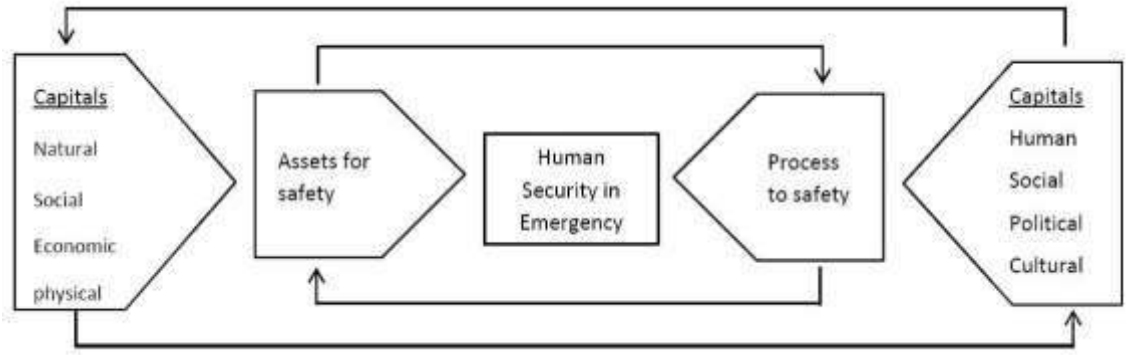

Figure 13 **The assets and processes frame of community security in the emergency phase**

6.2 Assets for safety in the cyclone emergency

The cyclone passed to the western side of the villages in Zone I between 12 and 1 pm. With the help of daylight, the communities at the edge of the Southwestern Delta could make sense of routes and their surroundings more clearly than the other regions. In contrast, the villages from Zone II and III, which started to experience the storm later

around 3:30 pm and 8:30 pm respectively, had difficulties finding the way to a safe place.

When their own houses started to collapse, immediate action was needed to locate any accessible building or shelter for refuge, i.e. 'assets' for safety. Local assets for refuge were the stronger houses of neighbors, rice depots nearby, a church or a monastery, or higher ground. In a desperate situation, when no man-made shelter could be found as the water level rose, it could be a big tree. In most cases, people needed to move from one asset to another until the storm stopped. When the strength of the refuge became questionable under intensifying wind and surging water, quick thinking was a must to locate another shelter amidst narrowing options. In most of the villages, village leaders or leading figures in the neighborhood facilitated the evacuation process until they were separated by the storm surge or they could settle in a safe place until dawn.

6.2.1 Private property as emergency assets

In all 45 villages of the three research sites, most people lived in bamboo and woven nipa houses, some people had wooden houses and few lived in brick houses. This general pattern was the same in all 45 villages while although half of the villages did not have brick houses at all. In general, most bamboo houses collapsed in strong winds at the initial stage of the storm. Most wooden houses endured the strong winds but not the storm surge. Normally the brick buildings were stronger at withstanding both wind and storm surge. Cases of mass survival in the big houses were found in all three zones but Zone III had the highest number of cases as the local economy was stronger in Zone III. In comparison with the other two zones, the average house damage in ten villages of Zone III was 86 per cent and the lowest in comparison with Zone I (average 97 per cent) and Zone II (average 98 per cent). Relatively, Zone II hosted the poorest of the poor among the three research areas. Except for Gway Chaung Gyi, Ayeyar, Shwe Sar Yan, Thabyay Yoe, Dani Chaung, Thama Seikta and Ywar Thar Yar villages (in which less than 100 per cent of houses were damaged or collapsed), the other villages from Zone II lost 99 per cent to 100 per cent of houses. Even under this circumstance, a few standing houses became refuges for most community members in many villages. Although Zone I did not have many good houses, Aung Hlaing village was one of the examples that showed mass survival was possible in a single house:

> We run to my father's house and it hosted more than 100 people when we arrived, we all survived. Before Nargis, Aung Hlaing village has 548 people. Nargis killed more than 300. The total population now (2015) is less than 250. (Focus group discussion, Aung Hlaing village, Zone I).

Apart from the houses, rice depots were another type of private shelter used for refuge. Land owning farmers usually keep paddy in rice depots in the backyard for long term rice storage after the harvest. As they are designed to support the heavy weight of rice, they are usually strong, although they existed in limited number in most villages. There were cases of survivals in rice depots in all three areas but not all depots were able to resist the storm surge. Some people saw tragic endings of family members in the rice depots:

> All my family members, our workers and I went to the rice house when the storm hit the village. We were altogether over 100 people. The rice house had over 3000 baskets (one basket of paddy is equivalent to 20.9 kilogram) inside. The rice pile was as high as 20 feet. I thought we would be safe there even if the flood was as high as ten feet. At midnight, after all the houses in the whole villages were shattered by the wind, it was the only remaining structure. When the water level was getting higher and higher it was finally uprooted and moved along with the drift. Out of over 100 people, only six survived. The night was too dark and I was the only one still breathing among the dead. (Kone Gyi village, Zone I)

The important role of private houses in life-saving is clear in the case of Wah Taw Kone village in Zone II. At the tip of Kadon Kani Peninsula, this village saw only two surviving houses when the cyclone passed while the rest of the 75 houses disappeared with the storm surge. These two houses sheltered half of the total population of around 300. This village had minimal death toll compared to its neighbors. The high survival rate of the village was also attributed to other factors such as storm surge levels but the role of the two surviving houses in sheltering half of village was also significant.

However, future implications of the use of private facilities as temporary refuges must count upon the integration of risk factors such as storm intensity and possible storm surge levels in the larger context of risk and vulnerability assessment. At the same

time, capacity assessment must be done within a community to identify possible ways to enhance safety with socially embedded physical structures in the village context.

6.2.2 Community and religious spaces as emergency assets

Beyond the private houses, there are public places including religious buildings such as temples, monasteries or churches. Villages with populations of more than 1000 people tend to have bigger religious buildings or other public spaces such as primary schools. In Zone III, eight villages out of ten have populations above 1000 people and their monasteries were strong enough to host most community members in the emergency. These monasteries also functioned as rescue centers in the early days of shock after Cyclone Nargis and continued to be involved in the rehabilitation process as centers for aid distribution or meeting points for people. For example, two monasteries in Taw Khayan village helped displaced people who arrived in the hours after the cyclone. Sadly, this hardly happened in smaller villages. The field study observed that the smaller the population of the community, the weaker the public spaces. For example, small villages such as Eastern Yay Kyaw Gyi, Thaung Thar, Dani Chaung, and Mone Tine Lay of Zone II did not have monasteries.

The role of religious buildings as emergency shelter was recognized in the report of the Shelters Cluster of the TCG after Cyclone Nargis (Alexander 2009). Right after the cyclone, an estimated 239 temporary formal and informal settlements emerged. Out of them, 70 per cent were monasteries and 28 per cent were public buildings such as schools and hospitals. Only 2 per cent were tented camps (OCHA 2008, p.1).

Out of 25 villages in Zone II, 19 villages had a monastery and among them only ten villages could use their monastery as an emergency refuge while as other monasteries were damaged or destroyed by the storm. Out of these ten, only six from Say Yoe Kwin, Thama Seikta, Thabyay Yoe, Aye Yar, Kywal Phyu, Ma Pway Tan villages had enough strength and space to continue to function as relief center or temporary camps for displaced people.

In Zone I, the monastery in Dee Du Kone village is a good example of leadership in the disaster cycle. The monastery gave refuge to more than 200 people from

neighboring villages. The monastery-turned-relief center attracted national-level civil society networks and formal NGOs through its existing contacts with the city and towns in non-affected areas. Relief efforts from the monastery with multiple connections made a substantial impact on the whole area. Similar cases happened in Christian villages in Zone I. A Roman Catholic church in Nant Thar Kone village saved the whole village and helped neighboring communities with relief support:

> My family arrived to the door of the Church just in time. The church was one and half story brick building. We carried elderly people to the upstairs. We spent the whole night there. Around 130 children who took refuge there, only one child died of injuries. It was my son. He was badly injured when a beam fell over him. People outside the church were unfortunately more helpless than us. When the wind finally stopped, we found out that we had lost over 200 people. Only three persons survived among those who left outside of the Church. (Nant Thar Kone village, Zone I)

Being common infrastructure in the community, monasteries and churches are a proxy indicator of the status of wellbeing in the community as the main contributions to these religious institutions come from the community. Collective efforts and bonding social capital help to organize religious and cultural activities around the monastery. It is also a public sphere where bridging and linking social capital happened when monks became facilitators in communication between local people and visitors. These religious spaces usually support community cohesion when the monk or leader of the church are highly respected and socially engaged.

As Burmese day-to-day life is bounded by religious rituals, it is hard for a community without a monastery. Having no monastery in the village means this is a place with less pride and more dependence on other villages for religious activities and other cultural rituals embedded in village social life. That is why community members usually try to have one even if they can only afford a weaker physical structure. Before Cyclone Nargis, Aung Hlaing village was very enthusiastic about building its own monastery, hoping that they would no longer be dependent on nearby Kong Gyi village for religious functions. This story explains social capital and cultural aspects in having the common asset of a monastery. Unfortunately, the monastery in this story did not

survive but the community function of the past and current aim can be seen from this story:

> A few years before Cyclone Nargis, we organized community's common pool of labor contributed by young people from all households. For paddy harvest, each farmer hired the laborers from this collective pool. The labor charges cost 10 baskets of rice for one week duration. When the whole season was finished, we could collect 200 baskets in each year. We all agreed to sell this rice and save money for building monastery. After five years, we came to afford a wooden monastery. But storm surge of around 14 feet swallowed this brand-new building. Now we are poorer than the past. But we still want to build another one. (Focus group discussion, Aung Hlaing village, Zone I)

Linkages between social capital accumulated around religious infrastructure, and communities' resiliency was apparent in most areas but physical and economic capital also played a crucial role in sustaining the strength and capacity of structures to save lives. An important distinction here is that in an area with high storm surge and direct exposure to a waterbody, any type of structure (whether house or monastery or church) regardless of strength, could not withstand the storm and provide safety. Two villages of Zone I (Aung Hlaing village and Phonedawpyae village) showed that mass refuge in such shelters tragically turned to mass fatalities in the case of a powerful storm surge. But in many other villages, stronger shelters saved many lives and proved to be valuable assets for the community.

Human agency and evacuation processes to 'assets' also set an example in Thama Seikta village of Zone II. U Hla Tin, a man of 44 at the time of Cyclone Nargis, quickly teamed up with his teenage son and friends to mobilize the relocation of over 30 households from the whole village to the monastery in the first two hours of the initial strong winds. In this village, only two persons died although only three houses were left the next morning. People felt relieved at the minimal death toll compared to others. Here, the leading figure of this rescue effort was the informal leader. His higher wealth ranking in the village and his family's status of influential wellwishers in the community and donors to the monastery contributed to building social capital around him. This convinced people to move to safer places even in the early hours of the storm.

6.2.3 Natural environment as an emergency asset

The natural environment, in the form of mangrove forests, barrier islands or geographical features of relative higher ground, provided protection to some areas, in general the flat land of Delta. The integrity of these structures changed according to the socio-economic structures of villages in the context of the national regime.

In villages located around the hilly ranges of Zone I (May Dar Ai, Zee Thaung, Dee Du Kone, and Kyauk Kalat villages) the death tolls were much lower. The people in these villages could run up the hill in the surging water and wind. This area was on the perimeters of the initial Cyclone landfall with the highest intensity. The conservation history of this hilly range is an important part of this story. Before Cyclone Nargis, some parts of the hill had lost their strength because of the stone extraction business from the hilly range over many years. For poorer local people, commercial quarrying of stone became one of the extra income generation activities. Later the respected abbot of Dee Du Kone village from the monastery next to the hill conveyed a message of sustainability and showed concern for community safety. Due to the abbot's advocacy and the cooperation of the village, the extraction rate was dramatically reduced. After Cyclone Nargis such extraction was stopped and the protective value of the hill was mentioned in focus group discussions in this area.

The opposite storyline of the hill is located not very far from Dee Du Kone village tract. The experience of Bhone Daw Pyae village is an example of how a degraded environment weakens community resilience. This village used to have a natural barrier between the sea and the village in the form of a barrier island for many years. When the market economy opened after the military coup of 1988, some traders from the city came to Bhone Daw Pyae village to buy the calcium-rich sand which was found on the surface of the barrier island to the village. In the context of poverty and limited income options, local people enjoyed the short-term economic benefit of extracting the sand from the barrier island. Since no regulation was there to monitor the extraction, rapid depletion followed and later half of the barrier island was eroded. When the Asian Tsunami hit the area in 2004, the big wave removed the remaining half. After losing the whole island, the village was totally exposed to the sea. When the storm surge in Cyclone Nargis reached the area, there was nothing between Bhone Daw Pyae village

and the open sea. The storm caused 100 per cent damage to houses and half of the village population, approximately one thousand, was recorded as dead. The question raised here is not 'How many lives might have been saved if the barrier island still existed?' Given the intensity of the storm and storm surge, not many people could have been saved by the island alone. But the question could be asked, 'In what ways did the stronger natural protection increase the village's resilience?' The local people projected that a little more protection could have saved many more lives even if it could no longer be proven in the chaotic struggle in rough winds and waves.

Moreover, in all three zones of the research, trees and mangrove forests were rarely described in a negative light even though some people were killed by falling trees. A clear reason for this sentiment towards the trees as guardians of the community was explained in the group discussions. When people drifted along the path of the storm surge, there were very few options to survive. Hugging the closest tree was one of the few choices.

When coastal communities have mangrove forests around the village, these forests can manage to slow down the surge and reduce the speed of surface waves (McIvor et al. 2012). Storm surge reduction research by McIvor et al. (2012) indicated that a kilometer-width of mangrove trees can reduce '5 to 50 centimeters of storm surge water level'. In addition, surface wind waves can be reduced 'by more than 75%' (p.3). Global experts and scientists also agree on the protection value of well-designed and managed coastal forest belts (Blankespoor et al. 2016).

Several stories of gaining benefits from having mangroves around villages were stated in Zones I and II. In Kone Gyi village of Zone I, focus group discussion identified that the survival of people until the end of the storm was mainly contributed by the trees:

> In my village, six houses which could survive until the end of the storm were those which were protected by surrounding trees. The others even if they were newer ones, collapsed because they were situated in plain area without trees. It seems that the intensity of wind is reduced by the trees. (Daw Phwar Myint, a female farmer of 50, *Kone Gyi* village, Zone I)

In general, the experience shared in all group discussions, strongly confirmed that forests and trees are assets for safety.

These illustrative cases show that the environment as an asset for safety highlighted the importance of the ecosystem-based disaster risk reduction (Eco-DRR) approach at the village level. According to Estrella and Saalismaa (2013), Eco-DRR refers to,

> Decision-making activities that take into consideration current and future human livelihood needs and bio-physical requirements of ecosystems, and recognize the role of ecosystems in supporting communities to prepare for and cope with disaster situations (Estrella and Saalismaa 2013, p.26).

The core elements of Eco-DRR as denoted by PEDRR (2010) recognize the multiple functions and services provided by ecosystems, including natural hazard protection or mitigation. Investment in ecosystems is worthwhile as they are readily available and effective solutions to reduce underlying risk factors. However, the contribution of hard engineering for disaster risk reduction cannot be neglected either (Uy et al. 2016). 'A hybrid approach combining both natural and 'hard' defenses' is also possible to increase disaster resilience (Gupta and Nair 2012 p.13).

The coastal embankments in Zone I and Zone III were built by the government in the 1970s and they have not been well maintained since then. Cyclone Nargis only added more damage to these embankments. Experts argue that dykes can be constructed to protect the Delta's low-lying land from flooding. But the function of embankments cannot be effective for disaster risk mitigation if they are not properly maintained and designed (Driel et al. 2015). In Zone III some villages such as Seik Kyi, Kyun Chaung and East Tawkhayan Gyi, shared about the hybrid system of protection they tried to maintain. Mangroves are essential in backing up the strength of embankments around farms:

> If we do not have mangroves along the dyke, the dyke can easily be broken and the flood would come. (Daw Tin Hlaing, a female farm worker of 59 years from Seik Kyi village, Zone III)

Even when strong natural assets exist to provide refuges, processes for safety still need to be mentioned as in the example of May Dar Ai village in Zone I. Focus group

discussion there shared the experience of a local woman who tried to help her neighbours who were not taking serious action in the early hours of storm or were losing orientation in the increasing storm intensity:

> When I was shouting 'we should go uphill direction', some people did not appreciate my warning. They responded to me like I was overreacting. Under the speedy wind and higher water level, some were foolish to run around the village instead of running up to the hill. (Zar Zar Khine, a housewife of 33, May Dar Ai village, Zone I)

In such cases, it also highlighted that knowledge of how to use Eco-DRR should be more integrated into the daily lives of people.

6.2.4 Lesser known assets for safety

While running in the dark without any guidance and preparation, some readily available assets were a great help for safety. These items ranged from floating balls that were attached to fishing nets, to torches. In fishing communities, the floating balls cut from fishing nets helped children and women to stay afloat on the surface of the water and the torches showed the way to those who were running along unpredictable escape routes. When people huddled in houses or monasteries or churches, they were anxious to know what was happening and what could happen next; in that regard radio was also an important tool to get the news. Discussion in a few villages said that sometimes the worry prompted circulation of rumors, even in a small group that survived in a confined space. The rumors of coming big waves or no survival outside their place were expressed in focus group discussions as a common thing that demoralized survivors until daylight came. Current day availability of mobile phones might be helpful for such a situation in the future but even in my fieldwork days in 2013, five years after Cyclone Nargis, there were still families who did not possess gadgets such as radios or proper torches.

In Zone III of the Upper Delta, in which the lead time for evacuation was a few hours longer than the other two zones, many respondents wondered if they might have had better options to evacuate quickly if they had owned boats with more powerful engine. Most of the boats in the Delta during Cyclone Nargis were hand-row boats without

engines. Evacuation with fishing boats was the only option for some of the Delta residents who used the boats for daily livelihood activities such as fishing, commuting to farmhouses, and ferrying people in various waterways. The boats, regardless of the power of the engine, found it difficult to survive the high intensity of the storm. Yet they proved to be very useful in the early evacuation of families in all three zones of the research.

6.3 Processes for safety in the cyclone emergency

'Disaster response' is a more complex function than disaster mitigation, preparedness and recovery because 'it is conducted during periods of very high stress, in a highly time-constrained environment, and with limited information' (Coppola and Maloney 2009, p.55). As Blaikie et al. (2014) noted, in many cases of disaster, the community themselves are the leaders of the response. But 'coping' mechanisms are defined by limited 'resources' and 'methods of handling stress' (p.113).

The process of disaster response, especially in Cyclone Nargis, was characterized by a highly-constrained environment without institutional support from the government, adequate communication or organized evacuation plans. Especially in the emergency hours of Cyclone Nargis, it was distinctly local-owned initiatives from which resilience mainly came from the community's social capital.

In the experience of the Cyclone Nargis emergency, physical assets such as shelters were vital but the existence of these structures alone did not guarantee safety. Mobilization and evacuation to safety was revealed as a part of a social process that involved political capital, social capital, human capital and cultural capital. In the Cyclone Nargis situation, taking necessary precautionary measures by local or regional leaders (administrative structure) and working together with people to benefit the local community were considered forms of political capital.

Exploring family or individual processes for safety in Cyclone Nargis, the roles of bonding and bridging capitals were easy to identify. Especially in the emergency (impact phase) of the cyclone's landfall, it was the bonding social capital of inter- and intra-group social ties that counted the most. After losing a home, making an initial

decision of 'where should we go' was influenced by social ties with relatives and neighbors. In several cases, village leaders guided their community members in group evacuations and showed the direction to places that appeared safe. However, the effectiveness of such emergency response processes depended on the amount of lead time to communicate and coordinate effectively. Based on the contents of focus group discussions in the three research zones, the community processes for safety were defined by interactions among different kinds of capital: political, human, cultural, and social.

6.3.1 Political capital for safety processes for safety

In this category, a formal village leader is supposed to have influence in over collective efforts. The leaders who could give alerts and coordinate on ground processes were using political capital that could help the community. Discussion with current and former leaders from the village council of Kyein Chaung Gyi village in Zone II showed the role of political capital in the emergency; unfortunately, the outcome of such leadership had more impact in the rehabilitation phase than in the emergency hours as revealed in story below. Kyein Chaung Gyi village used to have 3260 people before Cyclone Nargis. After Cyclone Nargis, the village leader could gather only 308 people as most perished in the storm. At the time of the interview (January 2013), the population had increased to 1392:

> On 1 May 2008, we were gathering in town for a meeting and the participants were from all the village tract level leaders. We were informed that the cyclone was coming. On return to the village next morning, we decided to use loud speakers from three places including a monastery and two from the privately-owned video hall where community gathered for watching TV with pay. We also went around the village to make sure the alarm reached all members. We told all to stay together with their own family members and repair the houses immediately within hours to ensure the storm resistance. We also instructed to build a shelf close to the roof top for storing our property to avoid the flood. We warned all the boats at the village harbor not to leave the shore within 24 hours. We also instructed the boats sitting near the exit water way to carry families and friends in case the level of water was rising. As we got the news 20 hours earlier than the landfall, we could make some preparation. However, the intensity of the destruction was huge and I was the only one who survived

> from my family of seven. At 5 pm, the storm hit our village and around 7pm, we could barely move from one place to another. At 8 pm, our village was vanished. (U Thaung Shwe, former village council member, Kyein Chaung Gyi village Zone II).

Although political leadership was visible in Kyein Chaung Gyi village, negative outcomes might be attributed to the lack of physical assets such as cyclone shelters. In a village with higher land and stronger physical assets, such active political leadership could achieve more positive outcomes. Another example is seen in Bhone Daw Pyae village in Zone I. For its people, safety assets of higher hills could be found just across the river, but the political leadership failed to give an effective warning and evacuations were not registered there.

6.3.2 Human capital and cultural capital for processes for safety

Jonjoubsong and Thammabunwarit (2016) argue that human capital can be knowledge, skills and the experience of humans. When formal education and media literacy enriches the knowledge of the people, community also becomes more informed and equipped to take proper action. Discussion in this section focuses on understanding and acting on early warnings that bordered with the impending emergency as a process for safety with human capital and cultural capital as some of the contributing factors. A story of human capital exhibits that the value of formal education and promoting human security in saving the life of family had in one study village. This story, stated below, was from the much-damaged Bhone Daw Pyae village: the name of village can literally be translated as a 'place of miracle':

> My neighbor, U Maung Maung, sent his children to the high school and college. They read books and they are more educated than us. They listened to the radio and looked at the map when the news came. So, they realized that the storm was coming toward us. When they were looking at the map and had a group consultation with family members and neighbors, we were mocking at them. We thought they were insane. They were the only family around the village who realized Thamee Hla Island announced by the radio was an island near to us called Lake Kyun. They could analyze coming risk and packed their stuff as quickly as possible. They moved to the other side of the river since the morning of that day. All four family members of them survived. When they moved out

> of the village, we were still busy with our own routine jobs. If we could interpret the early warning as correctly as they did, we could also run. (U Khin Shwe, a farmer of 49, Bhone Daw Pyae village, Zone I)

In disaster risk reduction, local knowledge that is embodied in cultural and human capital is grossly underutilized, although there have been proposals for hybrid management of risk in the last decade (Wisner 2003). The villages in the Delta have their own cultural construction of risk perception, which is based on knowledge gained from coexistence with nature. Elders in the villages of Zone I generally describe the learning process as the warnings are being carried to humans by other living creatures.

People from Thaung Thar village in Zone II stated their awareness of the potential bad weather situation came from groups of seagulls flocking inland, passing over their village on the day of the storm. Seagulls flying inland were assumed to indicate impending bad weather. Unusual flocks of seagulls confirmed the storm news they got from other sources. In this case, direct observation of natural phenomena, embedded in the community as cultural capital, helped to confirm the news from outside in assisting processes for safety. Manuel-Navarrete et al. (2007) argue that a failure to communicate scientific knowledge effectively to a community can increase disaster vulnerability. Even if scientific knowledge is readily available, traditional knowledge can be a complement to understanding risk. In the rural society of the Ayeyarwady Delta, traditional knowledge has the potential to promote awareness and alert levels in community processes of disaster preparation. Unfortunately, inter-generational transfer of knowledge has been weakening due to changing values of local knowledge in the context of modernization. In addition to the depletion of the traditional knowledge body, a tragic aspect of Cyclone Nargis was the death of old people who were more knowledgeable about weather signs. Only in two villages of Toe and Thaung Thar was indigenous knowledge relating to weather and nature actively transferred from the elders to the new generation in a community social setting. The following Box 3 displays commonly found weather forecasting methods in the local knowledge of the three research zones. Some of these traditional ways of knowing signs are said to prompt alerts at the individual and family level.

Box 3 **Common local weather reading methods in the research areas**

- Homecoming Seagull is another indicator of storm weather. If seagulls choose to stay near the shore, the storm could not be so serious. But if they came straight to the inland human residents' areas, we can guess the weather be strong. If people cannot shoo them away and they are trying to stick to the house roofing, it means they are giving you an alarming storm warning. If jelly fishes are coming to the shore and staying in the small creeks instead of wide streams and rivers, this mean strong storm is approaching. (Focus group discussion, Kone Gyi village, Zone I)
- In normal condition, birds, crabs and snails are weather forecasters for us. If snails are trying to climb to a higher ground and pole, this mean the flood is likely to come. They never remain stable in hours before the flood. We have to keep watching their movements from time to time. (Daw Khin Aye Kyiang, a farm worker of 55, Auk Seik village, Zone I)
- I can read weather condition in childhood by looking at the sky. In deep sea, we have to read the wind direction by looking at the winking stars. (Tun Tun Win, a seafarer of 37 from Kyun Chaung village from Zone I)
- I went to my radio and tuned it on when I heard a roar from the sea or little bee-eater (*Merops orientalis*) and Seagull are flying rushing to the land. They are telling us to stay alert. (U Sein Win, A farmer of 56, Toe village, Zone I)

6.3.3 Social capital for processes for safety

In the social capital literature, it is argued that social capital such as trust among people, social norms and networks can be observed and measured (Nakagawa and Shaw 2004). Several studies on the role of social capital in disaster preparedness and disaster recovery process also use collective actions as an indicator (Aldrich 2012; Nakagawa and Shaw 2004; Cox and Perry 2011; Hawkins and Maurer 2009). Most stories in the three research zones reflected the positive nature of people helping in times of need and distress. Even without using social capital attributes, the distinctive feature of each

village in the storm emergency was people helping each other to reach a safer place. Some link to the social capital aspects of community as shown in following story:

> On that dark night of storm, I knew that my house was not strong enough to stay longer. I listened to my neighbors who forcefully encourage me to join with him to go to another house which was two stories wooden building. When storm intensify, we decided to break the walls and windows of house so that the wind could pass through. That house withstands the storm with hundreds of people there. In total ten big houses, which stood stall until the cyclone had passed. (Focus group discussion, Lay Yin Kwin village, Zone I)

Two aspects of social capital can be seen in the above story, one in the social network influencing people to move to a safer place and another in collective action (to break the walls and windows of the house in high wind) at the place of refuge.

Other social capital aspects such as reciprocity are reflected in the case of the Dee Du Kone village tract where a self-helping disabled group was founded after finding difficulties during emergency and relief. In an interview with founding members of this group, it was discovered that even in the emergency hours of Cyclone Nargis, some of them were able to extend assistance to other community members as well as their fellow disabled people.

When the storm passed, the first thing people attempted was self-organized search and rescue for missing people. In this moment, most people went out in search of missing relatives or community members. Social processes and social capital continued to function as local people tried to seek outside help. Group activities were mobilized in the village for cleaning and the construction of temporary shelters. They also helped in finding food for collective kitchens or food provision was managed in temporary shelters such as monasteries or churches. The survivors also managed the burial of dead bodies. This turned out to be the most difficult work for the community with few survivors and many fatalities.

The role of bridging and linking social capital turned out to be more important in cases in which the whole village disappeared (Western Yay Kyaw Gyi, Aung Hlaing, Bhone Daw Pyae, Nant Thar Kone, Lay Yin Kwin, Khar Gyin Kyun, Thanyet Thone Bin). A

case like this stands out in Khar Gyin Kyun village as its reconstruction was primarily contributed to by bridging social capital.

> During the storm, we were all displaced. In our village of around 150 people, 70 per cent of the people died on that night. While the rest were having shortage of food in the following days, my big brother who lived in the upstream village came to pick up over fifty people with two motor boats. He accommodated all of us in his compound and provided food for twenty days as he still had rice in private storage. Then he motivated us to rebuild the village back with all remaining energy. He contributed a lot for reconstruction too. (U Tun Shwe, a village leader of 52 from focus group discussion of Khar Gyin Kyun village, Zone II)

6.4 Discussion on assets and processes during the cyclone emergency

At Cyclone Nargis's landfall, the Delta communities found themselves in a struggle in the absence of proper communication channels, evacuation assistance from the State, and limited assets for safety. At this moment, a process of evacuation to presumably safer assets was facilitated by the available physical, social, political, cultural and human capital. There are several previous studies on disaster with a focus on factors of vulnerabilities rooted in geographic location, dwelling and socio-economic characteristics of the community (Bates and Peacock 1987; Hewitt 1998; Quarantelli 1987; Quarantelli 1995). Anderson (1995) also classified causes of vulnerability into three categories: (1) nature as a cause of vulnerability, (2) cost as a cause of vulnerability, and (3) humans as a cause of vulnerability. In this part of study, causes of vulnerability are discussed from a 'limiting factor' perspective and the five limiting factors of 'assets and processes' in the cyclone emergency are identified. These limiting factors significantly and repeatedly appear as the most common findings in all villages but mostly in different degree from one research zone to another. Village level resilience is largely undermined when these following factors are present and mutually reinforcing: (1) economic wellbeing of the community, (2) lack of strong political leadership, (3) exclusion of gender and marginal groups, (4) top-down approach to disaster risk management, and (5) lack of social learning from the past and the present.

6.4.1 Poverty as a limiting factor

In the experience of all three research zones, having disaster-resilient buildings was strongly linked to chances of survival except in the cases of the highest intensity of the storm surge with direct exposure to a water body without any natural or vegetation buffers. Nevertheless, the presence of strong houses was the exception rather than a general pattern in most places, especially in Zone II and Zone I. Reflecting the prevalence of poverty in the region, the Post-Nargis Joint Assessment (PONJA) reported that 50 per cent of housing in the affected area was built of a wood and bamboo mixture. Only 35 per cent were all-wooden and 15 per cent were brick or concrete (TCG 2008a, p.13). Figure 14 shows the scale of house destruction in eight affected townships. The respective destruction levels of all three research areas have already been stated at the beginning of this chapter. Nearly all bamboo structures were blown away by the wind and water when the storm crossed their area or near their area. In community narratives, self-evacuation and displacement were the dominant theme.

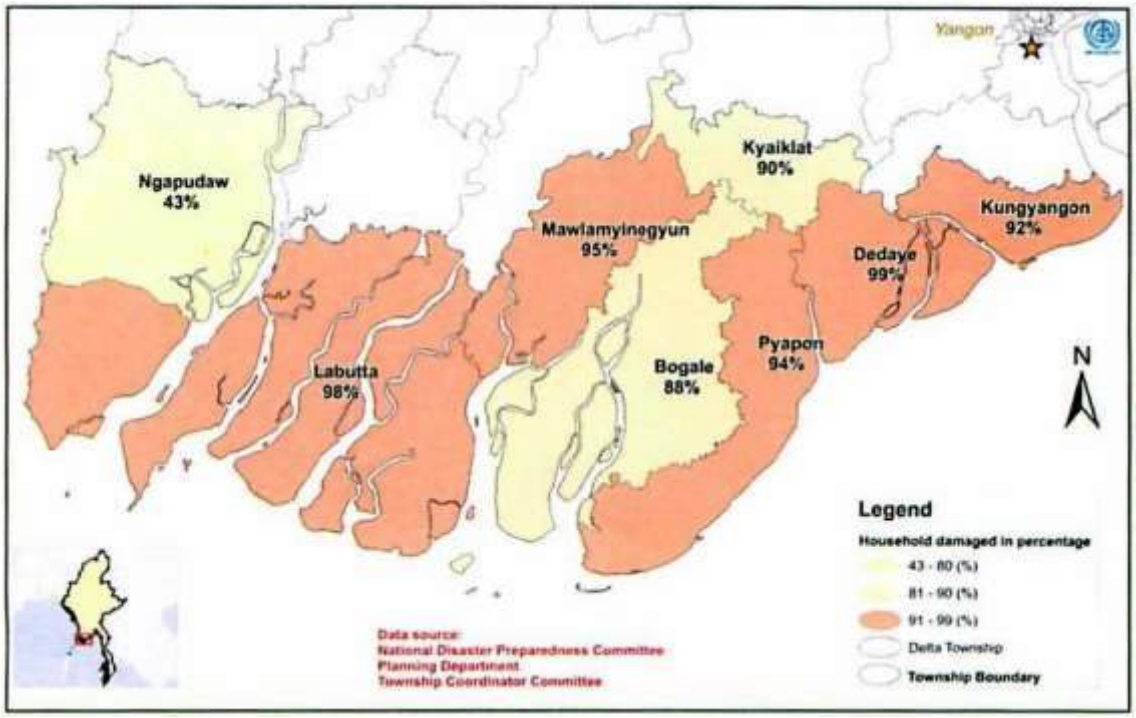

Figure 14 **Number of houses collapsed or damaged in eight affected townships**

Source: TCG (2008a)

Anderson (1995) argues that vulnerability can be reduced with the help of technology, but affordability dictates community security. Technical options are available to build resilient housing in the Delta but the high cost does matter to impoverished communities with day-to-day struggles for basic needs. In all three research zones, landless casual workers compose more than 60 per cent of the population. Their daily income ranges from 1000 to 3000 Kyat (approximately 0.8-2.5 USD) per day but food consumption on average absorbs more than 90 per cent of earnings. In these circumstances (let alone a strong house) having small gadgets such as torches is not even an option although people know that they are useful in the dark night of emergencies. Cyclone shelters are an essential part of disaster preparedness in the research areas but are still very limited in terms of number and size. Furthermore, almost a decade later, the cyclone shelters that were built after 2008 are standing there with communities that rarely can afford proper maintenance. Also, with the current cyclone shelter coverage, convenient access by a scattered population of big, medium and small villages located in intricate water-ways is not easy in storm emergencies. In this context, poverty reduction or rural development can help to enhance villages' disaster resilience. Potentially, when the economy is improved, overall wellbeing might lead to more resilient community processes which could include establishing locally appropriate assets such as stronger buildings in community settings or proper maintenance and access to existing cyclone shelters if they are nearby.

6.4.2 Lack of political leadership as a limiting factor

Alam and Collins (2010) use the phrase 'localized vulnerability' as a reference to underlying causes of vulnerability that weaken the capacity of local people to negotiate hazards and rights and freedoms in response to disasters. One main feature of vulnerability in the specific context of Myanmar or the Ayeyarwady Delta in Cyclone Nargis was a missing link between the community and political leadership in the pre-impact, impact and post-impact phases of the cyclone. There were some initiatives from local administrative structures to help communities in a few places, but that was more ad hoc action than a coordinated effort with pre-planning and clear procedures. It was difficult to see effective evacuation without pre-planning with guiding principles on where to move and how to decide collectively for safety, let alone

consideration to protect public assets and the environment for the safety of the community.

In all villages that took part in this study, there were no guided rescue or search activities at the time of the storm. The Ministry of Social Welfare, Relief and Resettlement is a key DRR policy-implementing body (Mizzima 2015a) but unfortunately was not authorized to conduct rescue and search during the emergency phase. The Relief and Resettlement Department at that time could not do much for disaster management; later it was involved in relief efforts though. In terms of institutional strength, it also did not have township-level departments. The size and strength was also relatively smaller than other departments under the same ministry (Mizzima 2015b). Only the Ministry of Home Affairs (MHA) is authorized to conduct search and rescue functions if the country is hit by a disaster. The Fire Brigade and Police Force, under the MHA, are responsible for going to communities to give help. In the best scenario, the MHA must cooperate and coordinate with other government bodies, including the Army and General Administration Department (GA). For the Relief and Resettlement Department, its role was to request assistance from the GA and the Ministry of Home Affairs as a liaison on behalf of affected communities (Mizzima 2015a). In a devastating situation, such as Cyclone Nargis, when the Ministry of Home Affairs and township-level GAs or their affiliated bodies were not known or there was no preparation for conducting any rescue and search activities, the villagers were left to struggle themselves to search for missing relatives.

In terms of resource allocation under the military rule of 1988-2010, the Delta was among the regions underserved by development policies (Driel et al. 2015). As case studies in this chapter have exemplified, multiple dimensions of vulnerability were manifested in the villages. The communities were left to cope with the risks with whatever means available.

Nevertheless, local initiatives and community processes exist even under difficult circumstances. An example is a local initiative by Dee Du Kone village of Zone I, which led the relief efforts for the surrounding area after Cyclone Nargis. The abbot of the village monastery tried to get permission from the administration to run an evacuation drill as a practice for disaster preparedness. It was 2009, one year after

Cyclone Nargis and politically still restricted in Myanmar. It was a community exercise involving a few villages around the monastery but it was not easy to get permission to carry it out in the context of military rulers suspicious of mass mobilization. Yet, the authority granted a permit and it turned out to be a success story. Given the current context of political transition and greater engagement with the global community, if this could happen then, it also can happen now in a more effective way with multi-level participation of the people, the state and other disaster risk reduction institutions.

6.4.3 The missing link to gender in DRR and marginality as a limiting factor

In PONJA, it was reported that the storm left a disproportionately high female death toll. The majority of those dead, 61 per cent, were female (TCG 2008a, p.155). During fieldwork interviews for this research, discussions often highlighted the role of women as primary caregivers to children and elderly family members. Traditional gender roles appeared strong even in the emergency setting as men were expected to go out and engage while women were supposed to take care of children and the elderly. For women who were not physically as strong as men or as skillful in surging water, swimming was difficult even if they knew how to swim. People who died in water were those who could not swim or who did not find something to hold on to stay afloat above water. Women with children were vulnerable especially when they were carrying infants. A Karen woman from Nant Thar Kone village of Zone I shared her views on the struggle of mothers:

> I was not a mother of any child. So, I survived. If I had children, I might not be here now speaking to you. Those who died in this village were mothers with young children. (Nant Thar Kone village, Zone I)

Ochola et al. (2010) claim that 'gender determines what is expected, allowed and valued in a woman or a man in a given context. It determines opportunities, responsibilities and resources, as well as powers associated with being male and female' (p.215). From a gender perspective and from a traditional way of life in a rural society, it was the women who needed to take a bigger role in taking care of children

than men. In normal circumstances, it could be a less debatable aspect of division of labor between men and women, but in a time of emergency this situation clearly dragged down many women to a more vulnerable position. The following case is a story of a 37 years old housewife from Bhone Daw Pyae village of Zone I. When Cyclone Nargis struck, she was looking after her elderly mother and two young children in her house, which was merely a bamboo hut beside the river. Out of the whole family, only she and her husband survived. Seemingly a story of equal struggle for both men and women, it still reveals the gender pattern of assigned roles in the emergency and the emotional burden faced by the woman in this story:

> My husband is a seafarer. He is skillful at sea. When the tide got higher, we decided to evacuate quickly from our place. I was shocked and did not know how to take care of my two young children and my old mother at the same time in the boat. What I could rely was only the floating balls cut from our fishing net. We women and children tied the balls to our bodies. When we crossed the water, the balls were not strong enough to protect us. All family members were scattered all over the place by a strong blow of water. When I spot my mother in last minute was when the water dragged her away with a high speed. I lost my consciousness not knowing how long. Later I found myself clinging on a wooden altar floating over water without children. (Ma Yin Yin Htwe, a house-wife of 37, Bhone Daw Pyae village Zone I)

Stories of women from the focus group discussions indicated several issues relating to women's vulnerability. It was stated that women's mobility was also hampered to some degree by the traditional costume and long hair. In many parts of rural society, women with long hair are regarded as traditionally more decent although it is an individual choice to maintain a preferred length. For some women, traditional dress hampered their mobility. Like Bangladeshi women's experience with saree in the storm (Alam and Collins 2010), Myanmar traditional dress Htamein or Longyi were believed by some to restrict body movement in the water while others stated that they were easy to remove. The gender aspect of good lead time in evacuation needs to be stressed here as movement with children and the elderly's needs should be taken into consideration in advance.

Issues relating to marginality were also found in focus group discussions as the villages selected for this research were mostly at the edge of the Delta and marginal in terms of infrastructure development and resource allocation from the state. The consequences of marginality weakened community resilience and their ability to survive and thrive. An example was the inadequate allocation of schools for several villages in Zone II. As the villages inside the Kadon Kani Reserved Forest were not recognized as legal settlements in government records, the children from these villages did not have access to formal school and health care service allocation. Marginality within marginality was identified in villages of Zone III. One fishing community, located along the river near Toe village tract lost homes for 19 households. As they were not part of any village around and were assumed to be migrating people, this community had difficulty in staying safe. Even without active discrimination, social facilitation to help these people was hard to materialize in the wider network of villages in which they tried to seek refuge.

6.4.4 Top-down approach as a limiting factor

Two focus group discussions in Zone I and II showed that there were cases of confusion in the evacuation due to military orders coming from the security forces. In the context of military rule, orders coming from the power hierarchy were often associated with pressures on the community. Usually, the command structure imposed rules over the people rather than engaging with them. Cases from villages in Zone I and Zone II stated that using military units in a disaster emergency without proper training and understanding in community processes was hardly helpful for the community. Military-style orders given to civilians to leave home and undertake quick evacuation were perceived as a usual pattern of domination and did not prompt a desirable action in a village from Zone I and another in Zone II, while the Zone I case even led to a conflict between the army unit and the villagers. While local people frequently complained about lack of leadership from authorities in the early warning and evacuation, most community narratives in this research showed that what they expected was inputs and coordination to enhance their capacity rather than commands from a higher-up authority.

6.4.5 Lack of social learning as limiting factor

The following Figure 15 shows a roadside memorial for the loss and damage of Western Yay Kyaw Gyi village from research Zone II. A UNDP project supported the stone monument which inscribed with the following data:

> Damage from Cyclone Nargis in Yay Kyaw Gyi village, death 85 per cent, house damage 100 per cent, public building damage, 100 per cent, household livestock damage 100 per cent, livelihood tools loss 90 per cent, loss of livelihood activities 90 per cent. The loss of the past carried the lessons to learn and to prepare for our future and sustainability.

Social learning here refers to 'a process of collective and communicative learning, which may lead to a number of social outcomes' (Muro and Jeffrey 2008, p. 330). UNDP-sponsored memorials in these villages are intended to facilitate learning in the community for disaster preparedness. This kind of memorial exists in some villages of Zone II but is not present in the other two zones. These memorials provide inputs for collective memory and social learning with the object being community preparedness.

Figure 15 **Cyclone Nargis memorial at Yay Kyaw Gyi village of Zone II**

The world was reminded of the Bangladesh cyclone of 1971 to make a large improvement in the early warning system in the 1970s onwards. Then serious attention was given to community disaster preparedness by the international community after the Kobe earthquake of 1995. And a rethinking of land use planning became a necessity after the Asian Tsunami of 2004. O'Brien et al. (2010, p.499) generated the following question, 'Does it have to be a big event to learn better disaster planning?'

A similar question is needed in the context of Cyclone Nargis. All three zones had the experience of small and medium scale disasters in the years before Cyclone Nargis. Especially, Zone I had been prone to storms and tsunami wave more than the other two areas. It is true that the intensity of Cyclone Nargis in terms of the storm surge was incomparable to any other disaster experience. But that the lack of experience led to a lack of awareness of the risk is not a totally valid point. It is saying that past experience did not lead to learning and preparation. In the case of Bhone Daw Pyae and Aung Hlaing villages of Zone I, both suffered from the Tsunami of 2004, the Mala cyclone of 2006 and a huge loss of life again in Cyclone Nargis. There are records that these two villages received international assistance after the Tsunami in 2004, which was known to be an exceptional case of outside organizational involvement in reconstruction under the strict rule of the military regime. International organizations including UNICEF (UNICEF 2009), FAO (FAO 2006), Oxfam and their partners including the local NGO Metta, were there for relief and rehabilitation in coordination with the Myanmar government (WFP 2005; OXFAM 2006). Despite reconstruction aid, risk reduction and preparedness was not effectively constituted after previous experience of hazards.

In the years leading to Cyclone Nargis, adaptation and disaster risk reduction were high in the national agenda of many countries in the region, in the context of global climate change. Myanmar should have learned either from inside the country or international experience such as from the next-door neighbor Bangladesh. But failure of learning was echoed and in all three zones of research there was frequent utterance of 'never heard of storm surge before', 'never experienced before'.

After Cyclone Nargis, the Department of Meteorology identified reasons for the high death toll as: (1) very low-lying nature of the Delta (2) population density of the Delta

(3) complex tributaries of the river system with seven major river mouths (4) no storm shelters and little higher ground (5) no hazard maps and risk assessment for the region (6) poor mobility, mostly people using small boats to move along in water ways (7) powerful wind-induced waves, plus the natural cycle of high tide and shallow continental shelf off the coast to create a high storm surge (8) depletion of mangrove trees and vegetation buffer (DFID 2009).

The above arguments concerning the vulnerability of the Delta, mostly drawn from fixed geographical aspects, could be incorporated into the learning process of the Delta society. Even before Cyclone Nargis, the Delta experienced smaller levels of devastation from previous cyclones. The storm surge of Cyclone Mala in 2006 reached 4.57 meters at the highest level, while Cyclone Nargis's storm surge reached a maximum of 7.02 meters (WMO 2009; Lwin 2015).

Awareness and preparedness issues will be crucial for building resilience to future hazards in the Ayeyarwady Delta. The nexus between social learning, development and resilience is discussed by O'Brien et al. (2010) as follows:

> Resilience building is needed in pre-disaster planning within a context of sustainable development to develop the social and institutional capacity to respond to produced unknowns. Resilience is argued as process that aims to reduce harm, both now and in the future. The focus of resilience is on wellbeing. Resilience building is a learning process at all levels. (O'Brien et al. 2010, p.506)

So far in all three zones, social learning initiatives are limited especially for the children who were born after Cyclone Nargis. In a preliminary trip for research in Zone II, the research observed that social learning issues could be a dilemma for the community. On the one hand, the adults wanted to forget painful memories of the cyclone. On the other hand, they still recognized that they needed to transmit their knowledge and experience the younger generation with the aim of better preparedness. Collective efforts at the community level to overcome such a dilemma were also observed in a few villages of Zone I, during the field visit.

6.5 Conclusion

This chapter has analyzed the characteristics of the emergency response of communities in the 'impact' phase of Cyclone Nargis. Survival chances of the community were defined by the assets that could provide safety and the processes that could facilitate a community to reach a safe place and survive in it. Stronger private homes, higher ground or robust public building such as schools, monasteries or churches were assets perceived to be safe places. These processes were often mixed with spontaneous struggles to locate shelter while moving with uncertainty and coming together with a group under the storm and alone after losing sight of family and friends.

Levels of structural vulnerability were exhibited in the form of poor or inadequate structural assets and natural protection. Chaotic processes of evacuation in the absence of preparedness often took lives. Community security would have been possible only if, multidimensional capital and strong structural assets such as cyclone shelters, schools, churches or monasteries existed. In the context of learning from Cyclone Nargis, the importance of community-based disaster risk reduction activities was highlighted. Human capital and economic capital need to be strengthened with community-centered development, which potentially could provide more viable physical structures and well-informed communities. The social learning of experience during Cyclone Nargis was also crucial to enhancing resilience and should be considered for long-term safety.

In summary, Cyclone Nargis provided two frames of reference from the storm emergency: 'Did the village communities have assets for safety?' And 'Were the local community ready to proceed to safety with a form of evacuation and collective preparation to survive in the storm emergency?'

Chapter 7

The dynamics of recovery

7 Introduction

Recovery is a multistage process through which people and organizations move at varying rates (Phillips 2016, p.25). It is a common approach to divide recovery in to 'short term' and 'long term' phases. Short-term recovery is defined as efforts to return 'vital life support systems to minimum operating standards' (NGA 1979, p. 13). Although short-term and long-term overlap to some degree, long-term recovery refers to activities with the purpose of 'returning life to normal or improved levels' (NGA 1979, p.13). Recovery can also be looked at in terms of physical and social dimensions (FEMA 2011).

The first part of this chapter tries to situate the Cyclone Nargis recovery process in the political context of Myanmar since the recovery process coincided with a time of political transition which started around the 2008 constitutional referendum. The second part of the chapter analyzes recovery outcomes by using profiles of each research region and a small village sample selected from each research zone. In the third part, recovery is discussed from the 'process' aspects within and beyond the affected communities with a follow-up section on recovery outcomes. Similar to the emergency phase, recovery outcomes are also illustrated with overall concern for the communities regarding safety, sustainability and capabilities aspects in having resilient community processes and locally relevant physical assets. Although my research scope does not cover measuring households' level of recovery, the overall analysis of human security of the village in the recovery context is explained representing views from the individual people and households who participated in focus group discussions.

7.1 Situating disaster recovery in the political transition of Myanmar

After Cyclone Nargis, several high-profile visits, including the UN Secretary General's trip, were made to persuade the military government to accommodate the international aid efforts. The Tripartite Core Group, was comprised of ASEAN, the Myanmar government and the UN with humanitarian and development communities, was also formed as a diplomatic breakthrough (Amador 2009). The TCG led the relief, rehabilitation and recovery works for two years until 2010. The TCG and ASEAN-led mechanism ended in July 2010, and media reports at that time alleged that the Myanmar government was cutting cooperation with the international community before the planned election in 2010 (Jagan 2010). For whatever reason, it is true that the Myanmar government decided not to extend the mandate of the TCG beyond July 2010 (IRIN 2010). In terminating the TCG, the Special Envoy of the Secretary-General of ASEAN for Post-Nargis Recovery in Myanmar referred back to the Myanmar government for recovery: 'As we move into a longer-term recovery process, it is time for the Myanmar Government to take full charge over the process' (Marr 2010, p.83).

The Social Impact Monitoring Report III observed that, 'The steady decline in aid provision since the cyclone has been accompanied by a significant change in the priorities of aid providers' (TCG 2010, p.7). A report called 'Another Nargis strikes every day: Post-Nargis social impacts monitoring five years on' was published during the final round of assessment for the Nargis-affected area in 2014. In this report, co-sponsored by GFDRR and World Bank (GFDRR 2014), the recovery is assessed as follows:

> In most post-disaster situations, the aid provided is insufficient to meet everyone's needs, and Myanmar proved to be no exception. The largest portion of post-Nargis aid was provided within the first year of the cyclone, even though the Tripartite Core Group remained in place for another year. Four years would pass after Nargis before political developments allowed for a deeper engagement of the international community. The Ayeyarwady Region and the Delta area have never been among the poorest areas of Myanmar, and development assistance after the political opening in 2012 focused on other

> parts of the country. Aid to the Delta was no longer seen in a post-disaster context, even though the socioeconomic situation in highly affected areas in the Delta would still justify targeted recovery assistance. (p. 68)

Cyclone Nargis caused destruction of wealth even for those who could generate wealth before Cyclone Nargis. In the very first trip to Myanmar in 2009, Nobel Prize winner in Economic Sciences, Joseph Stiglitz reminded that, disaster impact can be even more cruel to those owning no wealth. To examine the long-term impact of Cyclone Nargis and the evolving changes of socioeconomic life across the time, a master plan was laid down by TCG to conduct a regular monitoring since 2008. The four rounds of periodic reviews and social impact monitoring reports illustrated how aid response can be best help to the Delta population (GFDRR 2014). All these reports discussed not only how the villages regain their capacity to resist the subsequent shocks but also the attributing factors that slow down the process of recovery. Especially the latest Social Impact Monitoring Report (SIM4) reflects on their experiences over the five years that marked a rapidly changing political environment. As agriculture is the mainstay of the Delta's economy, the post Nargis periodic review I summarized experience of agricultural sector in the first year of the post-Nargis recovery in December 2008 as,

> The sheer number of people killed has dramatically reduced the labor force. The storm surge salinated, washed away or flooded large tracts of land. Animals, crops, trees and the equipment needed for fishing and farming were lost. Without the capacity to produce their own food or income, communities will remain aid-dependent. (TCG 2008c, p. 46)

Loss and damages also led to the rising number of casual landless workers in the subsequent years. It was not easy for the Delta people to see sooner recovery as most of the livelihoods pattern are closely connected to nature. For a period of five years between, 2008-2013, production in both farming and fishing did not meet the pre-Nargis level (TCG 2008d, TCG 2008c, GFDRR 2014). In 2008, SIM 1 (TCG 2008d) reported:

> Reductions in harvests have increased the debt burden of farmers, who have been unable to repay old loans and have had to borrow to meet their consumption needs. Fishing has also been severely affected. Fishermen are struggling to recover. This

> has affected those at every point in the value chain. Reduced catches and a lack of fishing boats and nets mean fishermen have been unable to repay their debts. (p.ix)

Productivity loss also contributed large a scale to joblessness, job instability and outgoing migration. It has not changed much until the SIM 4 was completed after five years of Cyclone Nargis. In SIM III which was conducted in March and April of 2010 summarized the state of the Delta as,

> There were signs of a recovery in the farming sector though output in the majority of villages was still over 30 per cent below pre-Cyclone Nargis levels. The situation of fishermen deteriorated significantly over the year preceding the study due to a decline in fish stock and a lack of credit and livelihood support. Debt continued to undermine the prospects for recovery, with the poorer groups (small farmers, fishermen, and labourers) carrying the greatest debt burden. (TCG 2010, p.6)

SIM IV which revisited the cyclone affected areas in April and March of 2013 states that,

> Five years after Nargis Delta, villages still found themselves in a dire economic situation. This situation cannot be attributed to the cyclone alone, as multiple other factors influenced the path to recovery, such as climatic variability, crab and rat infestations, and flooding. Highly affected villages were significantly more exposed to these events because of Nargis's follow-on effects (p.8).

In this situation, threats to human security persists in many forms. Stiglitz (2014) argues that 'human Society that cannot install good shock absorbers are likely to live with downward spirals'. In these downward spirals, it is not implied that every village or every township are living in the same speed of recovery. As SIM IV notes that aid delivery that was made with participation of formal leadership enhance aid effectiveness and it 'shaped a village's path to the long-term recovery.

After the TCG's termination and the 2010 election, a semi-civilian government came into power. The new government was led by former Prime Minister U Thein Sein. Relating to Nargis, U Thein Sein was given credit for opening the door for foreign aid during the tense stand-off between the military government and the international community after Cyclone Nargis (Fuller 2012). Under the new government, several

measures of disaster risk reduction were introduced. The draft of the Natural Disaster Management Law was approved by the Parliament in 2013. In the drafting process, the Disaster Risk Reduction Working Group (DRRWG) was composed of various local and international humanitarian actors that were engaged in the recovery phase of Cyclone Nargis and they played a vital role. The Law was later followed by the disaster management rules endorsed by the government in 2015. The Law recognized that DRR elements should be integrated into national development programs and DRR should include both 'short and long-term measures to mitigate the effects of natural disasters' (MCCR 2013, p.41).

Regardless of these DRR measures and activities in general, the priorities of the national government and humanitarian and development community were shifted to other areas in the context of more freedom and space to engage. Alesch (2005) describes recovery as a process in which people 'struggle to achieve viability in the newly-emerging environment within which they exist' (p.3). In the recovery process after Cyclone Nargis, the Delta communities faced multiple layers of changes happening within their own community, their region and also in the national polity.

After Cyclone Nargis, changes in their community had occurred, starting with clearing dead bodies and cleaning debris piled in the villages, and they later moved to self-mobilization for relief and recovery. With the arrival of relief and reconstruction resources and political, humanitarian, developmental and civil society actors from outside, the community witnessed changes in terms of networking and outreach. The national political regime gradually moved in the direction of expanding engagement with the international community in the context of disaster risk reduction. Changes in the political regime also impacted the community, this time in a positive way with some space for the community to be able to engage in decision making that had impact on their own affairs. Even though it has not been happening uniformly in the context of the selected communities of the Cyclone Nargis-affected areas, the benefits from changes depend much on local leadership and outside actors who have sensitivity regarding local participation.

The political context before Cyclone Nargis had negative impacts to the delta community's resilience and human security as shown in Chapter 4 of this thesis. If disaster recovery is narrowly defined as 'bouncing back' to its pre-disaster level of conditions in society (Wildavsky 1991), this was not desirable for most of the affected communities in the Delta. In this regard, the current political change with enhanced local rights and freedom was welcome as a contribution to the recovery process in the Delta. The new administrative structure was designed to accommodate more local participation in governance. Humanitarian space was gradually expanded after Cyclone Nargis and the new environment in national politics with accompanying structural changes at the local level contributed to the long-term benefit of Myanmar, including in the Delta community.

The political change had shown low priority for disaster recovery in the affected region but national development is assumed to have a trickle-down effect on regions. In this regard, a question can be raised, 'Were the short term or medium term needs of the Delta fulfilled in the recovery process, so that it could sustain resilience and reduce vulnerability?' If this is not the case, if natural hazard devastates the region again, the expected developmental benefit of the political transition could result in loss for village communities. As shown in an earlier chapter of this research, much of the responsibility for pre-existing vulnerability, early warning and emergency response to the disaster of Cyclone Nargis falls onto the military regime. At present and in the future, the political implications of resiliency and vulnerability to a community should be verified in advance so that it will be possible to avert the worst-case scenario.

Analysis in this chapter about the recovery phase focuses on the political transition context. The community 'assets' and 'process' are accounted for in both short-term and long-term recovery processes and how they are influenced by the factors of political change.

7.2 Process and outcomes framework for the recovery

Dacy and Kunreuther (1969) claim, 'it just seems reasonable to assume that the speed of recovery following a disaster will be determined primarily by the magnitude of the

physical damage' (p.72). Disaster management is generally described as a cycle that includes preparedness, response, relief and recovery but the focus is normally on response although it is usually described in equal parts for all four phases (O'Brien et al. 2010). The situation in the Cyclone Nargis recovery reflects these two statements as while the scale of devastation was huge, most attention was on the initial phase of the disaster response. Also, poverty in the Delta needs to be highlighted as 32 per cent of the whole population from the Ayeyarwady Region has been living under poverty line while the national average ratio has only been 26 per cent (UNDP 2015). In this regard disaster recovery can be analyzed by looking at the 'assets' for capabilities in a community as these assets contribute the recovery outcome. The recovery 'process' also needs verification for its attribution of resiliency of community in the form of social cohesion, positive interaction and empowerment via participation.

In this context, disaster recovery after Cyclone Nargis is explored from the recovery 'process' and 'outcome' framework as shown in Figure 16. This framework is informed by physical and social dimensions.

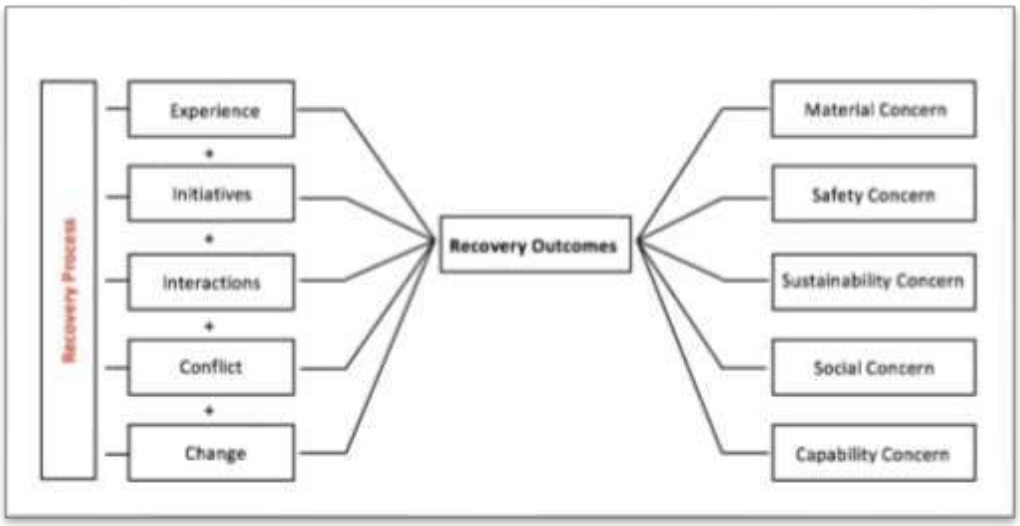

Figure 16 **Dynamics of recovery: Outcomes of recovery corresponding to the community's concern**

The physical dimension is referred to as community assets such as shelter and infrastructure while the social dimension is attributed to community processes such as participation and interaction. This study does not measure disaster recovery as a

success or failure; rather it looks for dynamics in processes with positive or negative outcomes.

7.3 Descriptive account of recovery outcomes in Zones I, II and III

In this part of the chapter, the recovery dynamics of the three research areas are presented with an emphasis on the profile of the smallest village in each research zone. These villages are purposefully selected to explore observable interactions, initiatives and conflicts of the recovery process. In each of the three villages, Cyclone Nargis destroyed all physical assets and there was a huge loss of life in terms of village scale. Basically, these villages were empty-handed in the aftermath of the Cyclone's landfall. The first village, Aung Hlaing from Zone I, and the second, Western Yay Kyaw Gyi village from Zone II, are on the edge of the Delta in its southern part. The third village is in Zone III and is Thayet Thone Bin, which is in the Yangon Region and closer to the city. The contextual analysis of the three zones and a zoom-in picture of the three villages will highlight how pre-Nargis socio-economic factors contributed to the different dynamics and outcomes of recovery in line with the prevailing geographical marginality status of each region. The research areas and village cases are presented starting from Zone III, over which the cyclone path crossed last only after the other two zones had experienced it. Nevertheless, it was the place where the international and national aid agencies could reach the easiest as it is the closest place to Yangon where most of the relief and rehabilitation functions started. Taking the geographical advantage of Zone III in consideration, comparison for recovery phase started from Zone III.

7.3.1 Research Zone III

Among the three research zones, the villages from Zone III are economically stronger in general. Due to their proximity to towns and urban areas with easier transport to markets, relatively more livelihood opportunities were observed. Six of the selected villages from Zone III had access to the main grid of electricity right after Cyclone Nargis. In the other villages, household-scale solar power in the villages has been a recent development that indicates energy access has improved in the post-Nargis years.

The relative aid sufficiency in the post-Nargis period has helped many households rebuild and maintain good houses. Better transportation means frequent visits from top government officials and the ongoing presence of aid organizations in this area. Moreover, human resources are also more concentrated here than in the other two zones. Interviews and discussions conducted in this region reflected the impact of aid and the recovery process generally in positive terms.

> The village is much upgraded now. Even people who used to live in the hut got bigger houses. The aid from the organizations were helpful in this village. (Le' Le' Hlaing, 19 years old female student, Thayet Thone Bin village)

Even so, inequality still exists within individual villages and among villages as this area has quite a high number of orphans and old people who survived while their working-aged children and parents died on farms during Cyclone Nargis. They are still struggling in the recovery phase. Many farmers are still debt ridden and fit in to the difficult situation of agricultural sector across the country (Cho et al. 2013). The embankment dykes in this area were constructed during the short-term recovery phase in several villages of Zone III but there are still reports of widespread sea water intrusion that causes low yields on rice farms. These complaints were more serious in Tawkhayan Gyi, Kyun Chaung, Taw Ku, Thayet Thone Bin, Pay Kone, Thone Gwa and Sar Gyin villages. Farming women in Seik Kyi village of this zone said the decline in yield in the post-Nargis year due to the high intrusion of salt water had compounded the debt burden to make their lives difficult in spite of the recovery aid that has improved their houses.

The community resilience aspect of recovery is reflected in the improved structure of religious spaces such as monasteries and public buildings such as schools and clinics. This happens due to a large flow of resources from aid agencies and collective efforts made by local households with higher level of economic wellbeing. As a religious and cultural space, the monastery was extended to offer space for civil society and to development activities of the community as well. In the years after Cyclone Nargis, the monasteries in this area usually provided space for local civil society organizations (CSOs) to safely distribute aid and later encouraged their expansion to implement other

development activities. In general, space in the monastery could be utilized not only as an emergency refuge in Cyclone Nargis but also for assistance in the further development of CSOs.

In general, better housing with improved strength met the safety concerns of the community and even less well-off families stated in interviews that they had confidence in the improvement of monasteries as shelter in future scenarios involving storms. Residents of any villages in this research zone can reach a stronger shelter such as monastery or school within 15 to 30 minutes. But safety is not fully guaranteed in communities, since many people work in the rice fields and stay at farm houses that are usually far from villages. Effective early warning was essential even in Zone III, which represents the most positively evaluated recovery out of all three areas. The recovery experience and outcomes in this zone highlight the fact that while material recovery can strengthen the community, a DRR system such as early warning and action for preparedness must be integrated into the daily lives of the villagers to build resiliency in the community.

During the recovery process, what might be referred to as 'linking social capital' has certainly helped the villages in Zone III, with official connections and easier access from private donors. Many of the Yangon-based NGOs quickly tried to channel resources to this zone for a quick recovery. As a consequence, some villages like Seik Kyi and Thayet Thone Bin from this region even became showcases of recovery in the military regime's television programs. Dynamics of recovery in Thayet Thone Bin village are shown in Box 4. This research zone is quite a contrast to the villages in Zone I and Zone II in terms of getting attention from the national authorities. The geographical configuration of aid inequality was evident when it was compared to the general wellbeing of other research zones in terms of basic infrastructure improvement.

Box 4 **Case study from Zone III**

Thayet Thone Bin village of Zone III

Village fact	**Quantity/Type**
Current population	120
Death toll in Cyclone Nargis	80
Total houses/structures vanished in Cyclone Nargis	100 per cent
Community organizations	1
Library	1
Emergency refuge	Cyclone shelter

This village was newly reconstructed after Cyclone Nargis to accommodate the remaining survivors scattered across the rice fields and from other areas. As a showcase for reconstruction, this village was frequently visited by government officials. The respondents said they had received attention from foreign and local donors, business companies, and the diplomatic community because one of the Ministers at that time was known to be a native of the Thayet Thone Bin area. As he was serving as the Minister for Energy, the main donors who contributed aid to the village were companies from the energy sector. The government newspaper recorded a visit of the Prime Minister to the reconstructed village (Myanma Alin 2008c). Heavy machines from military units helped build a 3350 feet long access road between the new village and the Kungyangone-Dedaye highway road. The government newspaper also recorded the donation of books to the village library from the Ministry of Information (Myanma Alin 2008c).

New houses donated to the village were better than those of other villages in surrounding areas. A school, a cyclone shelter and a library were also built under the supervision of the Minister. Other livelihood support such as fishing boats, fishing gear and tractors was given to farmers and fishermen. This village is composed of mainly three types of jobs: farmers, fisher men and manual workers. Most of the villagers are landless manual workers and they frequently become seasonal migrants in the nearest city, Yangon, when demand is low in farming and fishing jobs. The

community members stated that outside assistance reached the village three days after landfall and at one point of the discussion it was recalled that 'Donors came from dawn till dusk later' (U Hla Kyi, a farmer of 46, Thayet Thone Bin, Zone III).

Because of high-profile interaction with military officials and the donors, the infrastructure of the village was improved to a status that the community had never experienced. The houses were built in a row with wood, corrugated roofs and a school-cum-shelter that is big enough for 300 people (Figure 17). Recalling the initial phase of relief and recovery, most memories were focused on receiving aid and visits of dignitaries. After housing, the most significant change was easier access to towns and cities thanks to the new road. Regardless of such physical improvements, livelihood options were identified as shrinking due to the decline in the crop yield of the area and lower productivity in fishing. A participant in discussion said 'People in our village are poorer because most of the people here do not have regular income and regular job. We have fewer owners fishing boats which can employ local workers. After Nargis, some people quit fishing business' (U Mya Aye, a fisherman of 65, a member of trustee board, Thayet Thone Bin, Zone III).

In term of initiatives, community members registered their participation in DRR training and in organizing village preparedness committees. These activities were once initiated by NGOs. By the time of the field research in 2013 the disaster preparedness kits donated to the village were still well-maintained and ready for urgent utilization in case of disaster. They also attributed more awareness to hazards due to media accessibility to TV, radios and phones. The village library as mentioned in the interview, was not active.

Figure 17 **School-cum-shelter in Thayet Thone Bin village**

7.3.2 Research Zone II

An important feature of the recovery process of Zone II has been the completion of a new road in 2015 that is directly linked from Yangon to the biggest village of the whole peninsula, Kadon Kani village. All villages across the peninsula can now come to the terminus of the road by boat and can go to Yangon by car. Before the road's construction, this was one of the least accessible areas in the whole Delta. After Cyclone Nargis, aid delivery to this area was hampered due to the lack of a main road and a long commute by boat. Pre-existing geographical isolation was one of the factors that contributed to the recovery process, which has been characterized by the degraded state of housing and other reconstruction needs.

This section makes a comparison between research Zone I and Zone II in terms of vulnerability. Although both exist at the edge of the Delta, and they are equally far from urban areas with long waterway transportation, Zone II has been more impoverished in general in terms of infrastructure, housing and livelihood options. One

of the main causes of deeper vulnerability in this area is the 'lack of land entitlement'. Among 25 selected villages, except Aye Yar village and Eastern Yay Kyaw Gyi village, the rest of the list are living inside the reserved forest area or overlapping with reserved forest, according to a map which has not been updated for a long time. While equally marginal areas of Zone I enjoyed formal recognition and limited flows of resources from government and other organizations even before Cyclone Nargis, Zone II was more marginalized for both geographical and administrative reasons.

Although agricultural expansion and other factors have contributed to the emergence of new villages in Zone II in reserved forest areas over the last 30 years, no policy initiatives were formulated under the military regime and many villages retained the status of informal entity. Regardless of their legality, administrative structures were put in place and the state extracted taxes and resources as in other places. Nevertheless, little public funding reached this area for services such as provision of schools and teachers. Construction of a school in Pauk Sein Kya village after Cyclone Nargis is an example. Although the school's construction was completed with funding from UNDP, there were no teachers assigned to the school as the school lacked official status. While community members tried to reach the township administration to get permission for the school, they had not heard any answer at the time of the field visit in 2013.

During the recovery process, land issues were raised by local communities through various channels to government officials. By the time of writing in 2016, official demarcation is ongoing and the land registration process has started granting the legal status of farmland to villages on Kadon Kani Peninsula. Most of the villages of this research have already had applied for land title for their farmland at the end of 2015(Myawaddy 2016). The farmers may also benefit from new farm law promulgated in 2012 that allows farmers to use their land for mortgage collateral.

While improvement in land titles will contribute to the livelihood of communities, mangrove conservation in remaining forest patches has weakened, as experienced in Zone III. Paradoxically, most of the villages showed high awareness of the value of mangroves due to their experience of Cyclone Nargis. The forests are vital for the

resilience of communities and excluding these villages from formal recognition does not help to improve the community's participation in conservation efforts either. In this context, soil erosion and sea water intrusion have become a common pattern in Zone II and farmers have observed a dramatic decline in crop yield. Community narratives in this area indicate that recovery does not have impact in balancing conservation needs and livelihood needs of this area.

Amid these changes, safety concerns remain high in Zone II as physical assets including homes and public buildings are not adequate. The most common answer in this area to the scenario of a future storm was, 'No. We do not have a safe place to go.' A similar opinion was expressed in the assessment of UN-Habitat for the whole Delta as follows:

> The geo-physical location of the delta, poor communication and evacuation protocols further worsen the risks for the Delta people and shelters without disaster resilient features may further increase these risks. (UN-Habitat 2011a, p.44).

In this research zone, there are two designated cyclone shelters: one is in Kadon Kani village and the other is on the other side of Aye Yar village. Although each one can accommodate 500 people, the neighbouring villages cannot not reach them easily as they need to cross water ways. As shown in Figure 18, there is a small river between Aye Yar village and the cyclone shelter with no bridge so far. Other villages around this cyclone shelter will take at least 30 minutes to reach the shelter. A cyclone shelter was much anticipated by villagers during the recovery processes of all three zones of the Delta. In addition to the number of cyclone shelters, which is so far very limited, accessibility was also problematic, as all large and small villages are scattered across the whole peninsula and have different geographical vulnerabilities.

Figure 18 **Shelter in Tauk Tar Kone village designated for people from the whole Aye Yar village track**

Another negative outcome from the recovery process in this research zone has to do with social cohesion. Of all villages of this research in the area, Kyein Chaung Gyi is the only village where a private company constructed more than 237 houses as well as a pagoda, a monastery, a school, a clinic and a sports ground. However, its smaller neighbouring villages were also severely impacted as Kyein Chaung Gyi village received relatively lower amounts of assistance. In this case, small villages such as Lay Gwa village, which does not have a school and has a deteriorating monastery, missed out. Based on perceived injustices in aid and recovery, negative attributes were mentioned frequently in discussions in this area.

During the reconstruction process, a few large villages such as Kadon Kani and Aye Yar became logistical bases for aid distribution groups and other relief organizations. When the aid distribution was operated from these larger villages and did not frequently reach communities beyond the primary base, the organization needed to bring participation from smaller villages in surrounding areas to the base. But discussion in small villages such as Kywal Phyu, Zee Phyu, Pauk Sein Kya, Say Yoe Kwin, Lake Thaung Yay Kyaw, and Thaung Thar indicated that their chances to participate were limited and they assessed that resource distribution was unequal

between the base villages that accommodated aid organizations and their satellite smaller villages. Such negative opinions still existed in the communities although five years had already passed during the field visit of this research, and they highlight long-term impacts of aid and recovery on local social cohesion.

After the aid organizations or the donors left the aid beneficiary areas, local communities were left with positive and negative social outcomes. Participatory processes were the foundation of positive social outcomes. However, implementing a participatory approach might be challenging in the context of a difficult geographical location. In comparison, the above-mentioned issues ranging from aid disparity to impacts on social cohesion were not strongly present in Zone I, which is also located at the edge of the Delta at different end. The difference between the two zones is the geographical locations of the villages. In Zone I, as the villages are closer to one another and land routes support more connections, greater interaction already existed among the villages.

In this research area, marginal existence has been caused by both geography and administrative exclusion for several decades. Formal recognition was regarded as the ability to improve several aspects of the community such as in health and education services. It can also enhance village identity and in many ways that leads to enhancing the village's capabilities. A profile of recovery in Western Yay Kyaw Gyi village of Zone II is provided in Box 5.

Box 5 **Case study from Zone II**

Western Yay Kyaw Gyi village of Zone II

Village fact	**Quantity**
Current population	165
Death toll in Cyclone Nargis	119
Total houses/structures vanished in Cyclone Nargis	100 per cent
Community organizations	2
Library	0
Emergency refuge	Primary school structure at ground level

The original Western Yay Kyaw Gyi village, which was called Latter Chaung, never formally registered as a village in government records. It is the oldest community, having settled in the forest area some 80 years ago. It was relocated to its current position after Cyclone Nargis destroyed the old village. It is located inside the Reserved Forest Area in the map of the Forest Department. Nowadays, local people cannot even find enough firewood in their nearby forest which used to be a dense area of mangroves. After the cyclone, the old community members scattered to several places. Some of them never came back to the old community. In contrast to the experience of the villages from Zone III, no outside help rushed in to help these people. The very first organization that arrived in the village was the Myanmar Red Cross Society. The Red Cross arrived here one month after the cyclone's landfall. A few other organizations and private donors also came with help after nearly two months.

When its neighbor, Aye Yar village (a larger and more economically strong village) was coordinating with outside organizations to manage relief and recovery, Western Yay Kyaw Gyi people felt that they were neglected. Although they blamed their own leaders for inefficiency in acquiring resources, they also felt that other bigger villages in the same area such as Aye Yar village and Ywar Thar Yar village gained access to a higher quality and quantity of aid. Although it might have been a failure of outside

organizations to reach this marginal area, the blame in the eyes of the villagers goes to both their own leaders and higher-level management at the village tract level. In an interview the villagers also identified their communication skills as a short-coming in recovery interactions: ‘Here we cannot afford to drill a water well which will solve our water scarcity problem in every dry season. We lacked contacts with the donor who focused on water issue. The other villages around here were smarter than us and they knew how to approach to aid groups. While the village beside us got two drilled wells, we got nothing.’ (Western Yay Kyaw Gyi, Zone II)

Ywar Thar Yar village school/shelter (elevated)

Yaw Gyaw Gyi village School/Shelter (not elevated)

Figure 19 **The difference in primary school structures between Western Yay Kyaw Gyi village and Ywar Thar Yar village**

A school-cum-shelter for emergency was built by a private company for this village as shown in Figure 19. Obviously fewer resources were utilized here, as indicated by the ground level floor of the school. At a school in its neighboring village, Yaw Thar Yar, which shares the same topography, the floor of the school was elevated from the ground. The villagers again expressed their dissatisfaction with low quality physical asset: ‘The construction company was sent by the government. The whole building is

gradually sinking into the sand. As the school is constructed on the same level with the ground, even in normal year the school area is flooded.' (Focus group discussion, Western Yay Kyaw Gyi, Zone II)

In their efforts in the reconstruction of the village, the villagers struggled to channel resources, but organizations that reached Western Yay Kyaw Gyi with a set agenda also did not offer much help to village as stated by the village leader: 'When they approached us, we could not read the message and the kind of help they could offer. This was our weakness. Sometimes, we explained what we need in community but our needs did not match with what they could do. Then we did not get anything.' (Focus group discussion, Western Yay Kyaw Gyi, Zone II)

A negative impact of Cyclone Nargis was a deeper poverty that caused more mangrove depletion in remaining areas beyond the village. More trees were cut down for firewood after Cyclone Nargis to sell them to shrimp-drying businesses that need a lot of firewood for processing. While acknowledging the value of mangroves for safety and livelihood security, the village seems to be living in the trap of a vicious cycle of resource depletion and poverty. While livelihood conditions were quite weak in this village, people did not say much about help with livelihoods, either from organizations or government. While most of the survivors were involved in day-to-day initiatives for family and communal recovery, a few left the villages to migrate to other places. For some people who have more financial capacity, when they fear stormy weather in rainy seasons of years following Cyclone Nargis, they ususally send women and children from households to Ywar Thar Yar village which has stronger houses of relatives.

7.3.3 Research Zone I

In contrary to the experience with Zone II and Zone III, a special characteristic of Zone I is that it already had connections with a humanitarian NGO even before Cyclone Nargis due to their experience in 2004 Tsunami. A few villages in this area were affected by the Tsunami and received aid from organizations. This is not the case for Zone II and Zone III villages although a few villages in Zone II were also survivors of

tsunami. Although the two lower areas (Zone I and Zone II) had experienced 2004 Indian tsunami, experience of Zone I differed from Zone II which most of the local people have had little contact with outside organizations apart from encountering only occasional visits made by mangrove conservation organizations.

In most villages in Zone I, the reconstruction and recovery experience was dynamic and interactive to some extent. In group discussions in Dee Du Kone, the local people's facilitation in the recovery process was stated clearly. There, the role of Dee Du Kone monastery and its abbot in integrating local capacity and bringing outside assistance were recounted as follows:

> City-based organizations, Metta and Karuna (Pathein) which I get to know arrived here soon after the storm stopped. These early organizations wanted to start with the reconstruction of housing and our people assisted them to build efficiently. Here under Dee Du Kone village tract, my monastery host displaced people from four affected villages. So, in the first round, they thought it would be enough to give 50 houses for each village. Later they increased funding and expanded the humanitarian activities. They stayed here for 3 years. (Focus group discussion, Dee Du Kone village, Zone I)

Similar stories were also stated by the church leadership of Kwin Yar and Nant Thar Kone villages in Zone I. In a vertical link to the higher level of the Christian church in urban areas and other places, resources were quickly mobilized and local communities were empowered to coordinate and facilitate this process.

Sustainability in terms of local engagement to promote long term community wellbeing was noted in Zone I. In Dee Du Kone village tract, local civil society groups were actively involved in tree replantation projects for a coastal buffer. Here, outside resources were integrated into local involvement in most places. While reforestation efforts were initiated in several villages of all three zones, large scale efforts were observed in this area. Contrasting to other research areas, Zone III had more local initiatives in small numbers of villages, and Zone II struggled to maintain remaining mangroves and conservation or replanting efforts and faced difficulty due to poverty and limited livelihood opportunities.

However, the villages in Zone I have a track record of a more frequent hazard even before Cyclone Nargis. In addition to Tsunami 2004 which was noted as unusual event, these villages saw a more frequent type of hydrometerological hazards along the coastline such as storms and landslides. Seawater intrusion has been a yearly pattern since Cyclone Nargis. Its repeated occurrence in recent years has a direct impact on agriculture of the villages along the coastline. In comparison with Zone II and Zone III, this area reported a more serious level of seawater intrusion that contributes to the larger scale of landslide and water resource scarcity. Within five years from Nargis, Lay Yin Kwin village lost 20% of its soil because of bank erosion. Kone Gyi village which has existed in the same place for nearly a hundred years faced a serious problem of land erosion only in the last ten years. A Karen woman from Kone Gyi said, 'In the past, the walking distance between the village and the sea took more than one hour. Now it took only half an hour as the bank has been approaching to the village.' In comparison with Zone I and Zone II, Zone I suffered more than others.

Besides a higher degree of seawater penetration, arsenic contamination in the water has been another public health issue in this area for a long time. In every Summer, these villages have to struggle for clean water because of a quick dry-up of fresh water sources and highest degree of salinization around the year. Salinization not only spoils drinking water sources but also undermine the revival of agricultural works in the villages of Zone I. Even though seawater intrusion made the long-term economic problems, water scarcity affects day to day survival of the local people.

Being the very first area of the cyclone's landfall throughout the whole Delta and experiencing repeated loss and damage due to floods and salination, safety was more seriously prioritized than other topics in the discussions. In focus group discussions safety outcomes were evaluated as weighing on the negative side. Even though house rebuilding was more systematic than in Zone II in incorporating resiliency and public buildings in relative strength, it seems to a villager from Aung Hlaing that repeated hazard experience does not provide complete faith in it. He said,

> We can only be secured only if we have strong building which was carefully constructed. We also should be informed early enough about the coming

> storm. In our experience in Nargis, buildings which we thought strong were not strong enough. (U Kyaw Soe, a farmer of 44, Aung Hlaing village, Zone I)

An example of the heightened concern for safety was shown when participants of a focus group discussion calculated the capacity of cyclone shelters, and they added extra people to their consideration. In their experience, calculating based on village populations might not always work as in an emergency, people from outside of the village needed help too. Kone Gyi village (with a population of 1030) with a cyclone shelter was taken as an example. This building can accommodate around 200 to 300 and Kone Gyi also has a school with a capacity of 500 to 700 people. While the village itself might find enough protection in these buildings in the case of a storm emergency, nearby poorer villages such as Aung Hlaing, Na That Kone (Nant Thar Kone) and Kwin Yar villages and others do not have any strong shelters within a radius of 45 minutes of travel. So, they must also come to Kone Gyi for refuge. This discussion also revealed another aspect of recovery; while the completion of rebuilding and recovery accomplishments are usually displayed in 'numbers', the dynamics of recovery on the ground can be more complex than the numbers show. Village communities' assessments and considerations could be different from those of outside organizations as shown in Box 6.

Box 6 **Case study from Zone I**

Aung Hlaing village of Zone I	
Background	**Number**
Current population	230
Death toll in Cyclone Nargis	320
Total houses/structures that vanished in Cyclone Nargis	100 per cent
Community organizations	2
Library	1
Emergency refuge	Primary school

This village was affected by the Asian Tsunami of 2004 with damage to 55 houses. After Cyclone Nargis, the village population halved from 523 to 210. After the Tsunami, a local NGO called Metta came to assist. After Cyclone Nargis, they came back again to provide relief and recovery support while other organizations also reached out to this area.

Primary school construction in the village was supported by a local NGO, Metta while school running costs such as hiring teachers were covered by the community as formal government assistance was not enough. Compared to the case study from Zone II (Western Yay Kyaw Gyi*)*, cyclone damage was at a similar level to all properties and vanished houses. Similarly, immediately after Cyclone Nargis most survivors of both of the villages had to leave for temporary camps in other places, returning after a few weeks.

Being involved in the village's capacity building, Metta was credited for its use of participation and genuine engagement with the local people. Moreover, community initiatives and interactions within and outside were frequently referred to in the focus group discussion. Community initiatives were reflected in the collective management of the forest near the village for fuel and the collective decision to protect barrier sand banks. When the villagers mentioned physical improvements, they were mentioned quite often in association with capabilities outcomes of material progress. One example referred to increased telephone availability in the village: 'We now can call directly to meteorological department and ask about weather updates whenever storm news comes'. (Daw Aye Aye Mon, a female housewife of 49, Aung Hlaing, Zone I)

DRR activities were also organized in the village. Villagers expressed their confidence in the school as a cyclone shelter. The building process and the location of the school were reportedly organized in participatory consultation with community members: 'Our houses are not strong enough to resist even for strong wind; let alone the storm like Nargis. But we got school. The school is located at the center of the village and it can be reached from both ends of the village within 10 to

15 minutes. There is no bridge or creek on the way to the school shelter.' (Focus group discussion, Aung Hlaing, Zone I)

As in the villages of Zone II and III mentioned above, livelihood activities have been under pressure because of environmental change. Mangrove forests that served the community for protection against disaster and as breeding grounds for fishing had been depleted fast. In addition to that, water scarcity is a big issue in the whole region. Fresh water access was a big challenge for the village and rainwater harvesting was the main approach for household and community use. Economically viable households can maintain better storage such as bigger clay pots as shown in Figure 20, but for poor households, such options are unaffordable. The recovery process does not change existing patterns of water storage. In summer, they normally run out of water at higher temperatures. Then the community has to rely on outside water donations which involve newly-emerging civil society groups and religious organizations.

Figure 20 **Clay pots to store rain water**

In the profiles of the regions and the villages above, a general pattern of recovery in all three zones is discussed with an emphasis on the process of interaction between the community and the outside world, and the recovery outcome of community safety and

wellbeing concerns were presented. Recovery processes and outcomes were uneven within and among all three zones. Especially in the profile of all three small villages in the above section, the starting point of the recovery process was from total devastation. These three villages were empty-handed in the aftermath of the Cyclone's landfall. But the recovery process was mostly influenced by pre-existing access to outside resources, both physical and social. Zone III was easiest for channeling resources as there was pre-existing road access and proximity to the city. Zone I was somewhat better due to pre-existing channels to outside NGOs/CBOs and in some places as to church hierarchy. In Zone II, limited physical and social networks prevented resource access.

7.4 The process of recovery

Berke et al. (1993) argued that the recovery period can bring opportunity for the long-term development of an affected region via multi-layered interactions. Vertical integration involves the level of relations between social units and organizations of the community to outside social, economic and political institutions. Horizontal relationships occur among community members and between community members and organizations, not in egalitarian manner. External aid also helps the organizational capacity of the affected areas to usher in economic, physical and social development (Berke et al.1993).

With the active participation of survivors, the goal of building a more disaster resilient community can be achieved (Berke et al.1993; Rubin et al. 1985). Holistic recovery (PERI 2001) can only be achieved when community members can participate inclusively and the decisions coming out of consensus must be compatible with long-term community goals and take into account all the principles of sustainability (PERI 2001, p.2). Community participation is crucial because recovery is not merely a technical process, such as building and renovating and building roads, but it is a social process that involves decision making for the future of a society (Nigg 1995). Nigg (1995) also states,

> In order for successful post-disaster decisions to be made, however, there must be an awareness of the pre-disaster conditions that create situations of social

> and structural vulnerability, putting some segments of the society at greater risk …than others. From this perspective, what becomes important is how those decisions are made, who is involved in the decision making, what consequences those decisions have on the social groups within the disaster-stricken communities, and who benefits from these decisions and who does not. (Nigg 1995, p. 1)

With reference to the dynamics of networking and participation, recovery was analyzed here in each important category of process. The findings suggest that processes are a crucial dimension of recovery as the communities were left with a self-organizing process that tended to have forward momentum for community resiliency.

7.4.1 Initiatives in the process

Resource availability was crucial to recovery but resource acquistion alone does not guarantee positive outcomes. The community's commitment to take initiatives is the foundation for holistic recovery. FEMA (2005) defines holistic community recovery as follows:

> An attempt to incorporate all elements of the community as part of the recovery process, encourages consideration of the interrelationships of various sectors, such as commercial, environmental, etc., and forces community, federal and state partners to look at long-term implications of decisions. (p.6)

From mangrove reforestation to the forming of a village disaster risk management committee, to maintaining a community clinic or a library in the long run, the community must take a central role in implementing activities that lead to holistic recovery. In case study villages, it is shown that when community members themselves were not strongly involved, the benefit to the community was likely to decline after donors left.

An important example of a community's initiative is in disaster risk reduction. Many organizations have been involved in the reconstruction of Cyclone Nargis-affected areas and have formulated approaches to integrate disaster risk reduction initiatives into the recovery process (UNICEF 2015). Most villages from all three zones in this research were involved in one kind of disaster risk preparedness activity or another.

Different organizations that engaged with the villagers used different formats of training in line with their priorities and allowable budgets, and the impact on each community was largely determined by the quality, content and design of educational programs (DRRWG 2013). For example, the village that was supported by Save the Children had a primary focus on the DRR skills of children while a local organization such as Metta was interested in integrating DRR into sustainable livelihoods in the sample villages. Zone I villages are beneficiaries of DRR training provided by an NGOs, and the communities identified the local resources, geographical features of the community and organization networks of the community as explained in the example of May Dar Ai village from Zone I. An example of this mapping exercise is shown in Figure 21.

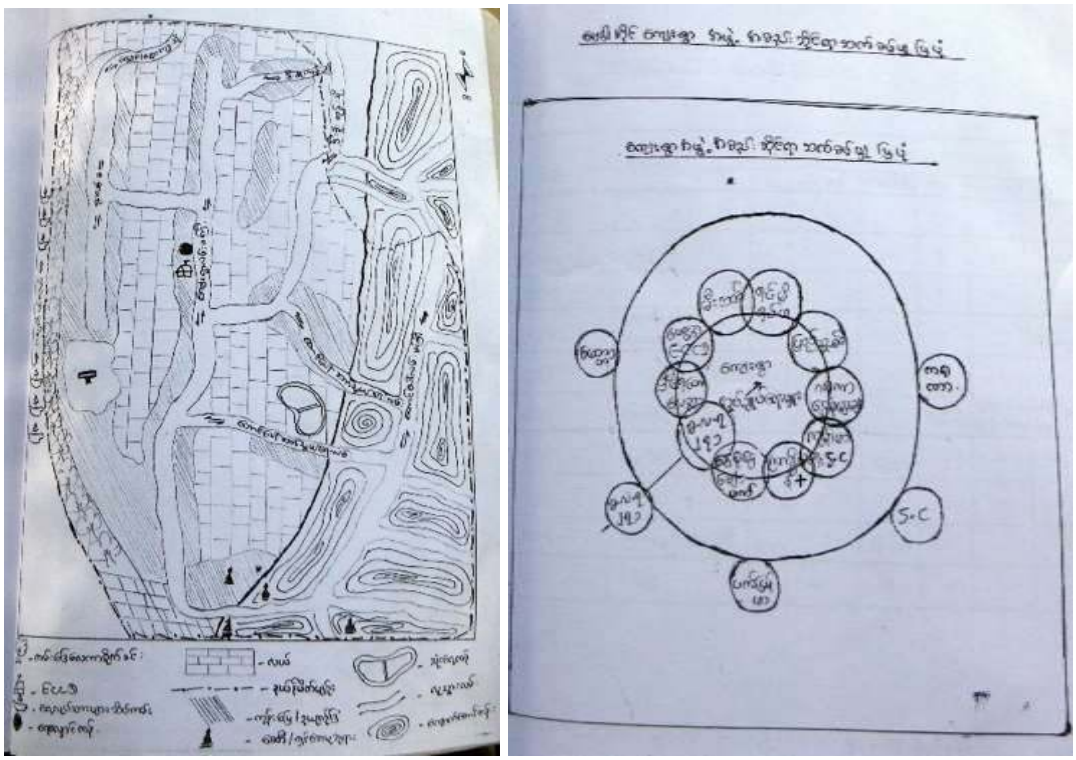

Figure 21 **DRR training tools: Resource map and organization dynamics of May Dar Ai village, Zone I**

In all villages, the DRR education programs encouraged the villagers to set up a village disaster risk management committee (VDRMC). Most villages from all zones participated in this initiative of VDRMC, which were formed in the early recovery

phase of the post-Nargis period (2008-2009). This involved a central body consisting of between 10 and 15 members selected by the community members, both male and female. The committee is composed of three to five task forces or sub-committees with specific assignments including early warning, first aid and sanitation, evacuation, search and rescue, temporary shelter and common food management, protection for vulnerable groups including children and elderly, and coordination, etc. When the field studies were conducted between 2013 and 2015, the action committees were sustainable only when the leaders were active in some villages, while most of them struggle to activate in the early monsoon. The poorer the village, the harder it is to prioritize DRR activities more regularly. In the poorer area of Zone II, most are not functional after five years while only bigger villages in Zone I and Zone III still have active committees.

While the functioning of a village's DRR committee and infrequent activation makes it harder to count as a positive outcome of the recovery, it gives space for interaction within villages, raises awareness and seeds ideas in many places. While Zone II still has transportation difficulties, larger villages in Zone I and III are active in inviting experts to talk on weather, climate and DRR. Marginality in terms of transportation infrastructure and in terms of resources seem to hamper initiatives with outside resources to enhance DRR and resiliency. While assets such as transportation help to foster initiatives as mentioned above, internal processes also need attention. Even in village-level DRR training, the illiterate found they were automatically left out by the selection process for training participants and often outside organizations failed to recognize this situation. In this way, the socially vulnerable are moving further from resilience initiatives.

7.4.2 Interaction in process

According to Comfort et al. (2000), the nonlinear process of recovery is largely influenced by interaction among public agencies, jurisdictions, private and non-profit organizations, and households for a collaborative effort to rebuild an affected community. Although the recovery phase brought development opportunities to the

post-Nargis Delta, process and space for interactions can define positive and negative outcomes.

Interaction with organizations

Although the main responsibility for emergency response rests with state agencies, the unique capacities of NGOs are also strategically important in the relief and reconstruction period (Osa 2013).

> Positive impact of NGO's service in disaster response may include: (1) As service providers that deliver food, non-food items, and water, and that provide medical and psycho-social services, shelter, and protection, NGOs can save lives and livelihoods, limit the physical and psychological damage of catastrophic events, and make a sustainable recovery more likely. (2) NGOs can bring transparency and can propose constructive, alternative policies to the government. (3) NGOs can channel information from disaster zones to the rest of the world when governments are not doing this sufficiently. (4) In many cases, NGOs are the first to arrive in the affected communities, filling crucial gaps until the assistance from UN agencies and government arrives (Osa 2013, p.71).

Local organizations are also identified as potential first responders in disaster response as they can take prompt action for search and rescue, provision of treatment to the injured and helping the homeless (Walker 2002; Benson et al. 2001). Interaction with NGOs including local civil social organizations and local people was significant in the post-impact phase of Cyclone Nargis as mentioned in several reports (CPCS 2011). It is also concluded that bridging and linking social capital in the context of local and external interactions after Cyclone Nargis had potential value for social community resiliency (Holliday 2012). Increased interaction with local and international organizations and village communities mean changes in power dynamics within a region. Villages in all three research zones indicate that information is no longer contained at the local level and local authorities are no longer immune from scrutiny both from outside actors and local people.

During the recovery process, local capacity to accommodate people was also crucial in bringing much-needed resources and networking with the outside, as shown in the example of Dee Du Kone village of Zone I, where the chief abbot provided space for

aid organizations at a monastery and channels to local human resources. Poorer areas in Zone II had limited capacity for such accommodation. Currently, activities of development-oriented organizations have still been operating in all three zones together with local civil society organizations. But the number of NGOs that focused on service delivery, such as microfinance and healthcare services, to the case study villages in all three zones has shrunk dramatically since 2010. Regardless of NGOs changing priority, interactions during the recovery process were observed as one of the main factors in widening the local agenda with civil society organizations and local unions. Their focus now includes labour rights, land rights, farmers' association rights and natural resource governance.

Interaction, marginality and conflict

The 'Equality in Aid – Addressing Caste Discrimination in Humanitarian Response' report by the International Dalit Solidarity Network (IDSN) discussed the India experience of inequality in aid, saying 'the so-called 'untouchables' at the bottom of the caste system – are frequently the worst affected. Nevertheless, they are often systematically excluded from relief and recovery efforts due to their inherent socio-economic vulnerability' (p.3). In the Ayeyarwady Delta, aid inequality mainly comes from geographical marginality and limited efforts by aid organizations to identify and reach these areas.

Another vulnerability that was revealed in the context of interaction was in totally collapsed villages. These villages took some time to re-populate and few or no physical structures had been left to accommodate outside organizations in the early days of resource flows to areas. Normally for villages in need of total reconstruction, assistance and interaction should come in substantial ways, but this was not the case for several villages of Zone II. Although some organizations or government provided resources for re-establishing villages from scratch, mostly in Zone I and III, totally collapsed villages in Zone II struggled to assert their existence as village communities on the map. Thaung Thar, Lake Thaung Yay Kyaw, Western Yay Kyaw Gyi, Say Yoe Kwin, Gway Chaung Gyi, Dani Chaung, Khar Chin Kyun villages from Zone II and May Dar Ai, Kwin Yar, Lay Yin Kwin and Nant Thar Kone villages from Zone I could

not restore their existence within 20 days to one month. In this context, a lot of interaction happened in bigger villages with the relative infrastructure intact.

From the organizations' side, this disparity in interaction may be traced back to a lack of resources to reach further. Another reason was outside organizations' tendency to stick to existing structures and not initiate structural change despite the reconstruction and recovery process offering this opportunity. Group discussion from Aung Hlaing village in Zone I, made a similar case of disparity in the government's initiatives as well:

> Small village like us did not attract the attention of the authorities. The government people usually went to Kone Gyi because it offered more safety and convenience in term of infrastructure. (Aung Hlaing, Focus group discussion)

In general, interaction as part of the recovery process after Cyclone Nargis provided the opportunity for empowerment, but interactions mostly followed existing physical and social structures and quite often failed to look to disadvantaged situations to engage and increase resilience.

7.4.3 Conflict in process

The overall recovery plan for the Ayeyarwady Delta after Cyclone Nargis was formulated in the PONREPP (Post-Nargis Recovery and Preparedness Plan) by the TCG. Different organizations also had their own plans according to their interest and resources. When these plans were implemented locally, instructions on what to do often came with a top-down structure. In this regard, initiatives were sometimes perceived as being inflexible. An example is Zee Thaung village of Zone I, which was relocated from a water-front area to higher ground for long-term safety. But the needs of fisherman to have fishing boats in the vicinity to adjust to changing tidal situations make it almost impossible to live on high ground. The forced relocation was initiated by the local authority and the military unit without much consideration for livelihood aspects. Flexible strategy with collective problem-solving was not accounted for in this case.

Similar to the above-mentioned case of conflict between safety needs (higher ground) and livelihood needs (water-front), short-term livelihood needs and long-term safety and sustainablity needs of the environment are also in conflict. Moreover, fixed guidelines in aid organizations also seem to stifle possible creative problem-solving approaches suggested by the community. An experience in Zone I showed the result of such an approach. An aid organization came to Zone I with limited resources for housing. When the available resources did not match the whole village's needs, villagers suggested drawing lots after allocating housing to essential beneficiaries such as old people and widows. For the local people, everyone who suffered from the storm should have an equal chance of getting a house. That is why drawing lots for a new house was a fair procedure. But the organization's procedure was to select beneficiaries using criteria such as wealth ranking, which is an almost impossible task in the aftermath of a cyclone when all people have been affected. Also, the local people argued that the supposedly well-to-do family should not be left out from the beneficiary list because they also shared their remaining resources to others as soon as the storm stopped. The set criteria for aid distribution in the context of pre-impact wealth ranking could hamper solidarity of the village community. In this illustrative example, the outside contribution to local social dynamics is apparent and the outside actors needed to be mindful of potential conflicts.

7.5 Changes in participation

In most research areas, there was an obvious change regarding the space for engagement from local people and conditions to bring out assertive leaders from the community. In all focus group discussions, participants recounted varying degrees of engagement for community welfare within a community and to outside people even if the formal village leaders were not very supportive of interaction. This change in the recovery process was not common in the context of the authoritarian rule in Myanmar of that time, and citizens' engagement was not encouraged over decades of military rule. This administrative mood of forced passivity changed in the context of Cyclone Nargis's relief, rehabilitation and recovery process:

> We afraid to stand out in the crowd in the past, but when outside people come and invite to talk our opinion after Nargis, we stand up for the sake of village and many other people do. Later sharing opinions change to debate and we all become active and somehow happy. (Naing Oo, Male fisherman of 31, Aye Yar village of Zone II)

Big changes in political participation for local people came in 2012 with the new the Ward and Village-Tract Administration Law that allowed local people to elect their administrative leaders. This law was an extension of national political change and had an impact on the ongoing process of the community's rights since Cyclone Nargis. Prior to the law, such local representation was not possible as the General Administration Department held the authority to appoint ward and village-tract administrators (Kyed et al. 2016; Kempel and Tun 2016). During the relief and disaster recovery phase, local people learned that leadership is very important in shaping a village's wellbeing and engagement with the outside world. The following quote is from Pauk Sein Kya village with an emphasis on leadership:

> We need strong leadership. The leader must not abuse the power and must not focus on his own interest at the stake of community. The leader must be a respected person. People also need to know what we should do in selection of such leaders. (Focus group discussion, Pauk Sein Kya village, Zone II)

Under the expanded space came both changes in civil society and national politics, local people changed to take more and more collective action. For example, the villagers from Pauk Sein Kya from Zone II formed a farmers and fishermen union by connecting township-level networks. Pauk Sein Kya had young people who were very politically active and their sensitivity to national political change was relatively high:

> After 2010, we have seen more space for local groups like us here. In the past, the authorities governed us by breeding fears inside us. Now we know how to connect with other civil society groups from town and it is time for us to remove the threat and fear imposed on us for a long time by the bad governance. The authorities appointed in the local levels are corruptive. They may do it better. If they are still being corruptive, we, as civic organizations must take action for check and balance. We cannot be quiet. (Pauk Sein Kya, Zone II)

7.5.1 Changes in communication

During the early phase of emergency relief after Cyclone Nargis, communication infrastructure and capacity became critical issues for UN and non-governmental agencies. Hattotuwa (2008, p.3) reported that after Cyclone Nargis on 2 May, bringing telecommunication equipment to disaster areas was delayed until the beginning of June, as imported equipment was held in customs and effort was required to negotiate for its release with the line ministry. Moreover, visas were not issued for foreign IT experts for nearly a month and a half after the cyclone. On the community side, mobile phone availability was near zero in most villages of the three research zones as explained in Chapter 4 of this research.

During the reconstruction and recovery process, the UN, NGOs and other organizations brought their urban based mobiles and what locals call 'coastal phones' to villages. In many areas organizations allowed the locals to use their mobile equipment and gradually in some larger populated villages, locals also started their own paid mobile services to villages. Then the government gradually relaxed its control on telecommunications and in 2016, it is estimated that nearly 90 per cent of the population are using telephones (Matsui 2016). In a follow-up fieldtrip to research areas in 2015, it was observed that mobile phones had become crucial for weather news, etc.

During the major flood of the rainy season in 2015, relief activities gained more efficiency with the help of mobile phones. Awareness-raising and education activities have become more accessible via Facebook and mobile phones. The educational Facebook page of former Director General the Department of Meteorology and Hydrology has 500,000 followers. One aspect of mobile phone accessibility was its application in the process of getting more information and taking appropriate action in advance in regard to disaster risk reduction.

7.6 Outcomes of the recovery

Compared to the time before Cyclone Nargis, the capabilities aspect of the community is mostly positive due to increased interaction and engagement with outside actors to

channel resources or to have more options to enhance community capacity. FEMA (2011) emphasizes that, 'each community defines successful recovery outcomes differently based on its circumstances, challenges, recovery vision and priorities' (p.13).

As exhibited in the outline of the recovery process in this chapter, the recovery process after Cyclone Nargis was mixed with changes in national politics. In this context, sources of recovery outcomes were hard to distinguish between political change and recovery process itself. Generally, the functional needs of every village to be disaster-resilient communities were not adequately fulfilled because of resource availability. In this context recovery outcomes will be assessed from a perspective of community safety and human security to natural hazards.

7.6.1 Physical and material outcome

Housing and other types of shelter were the most visible physical and material outcomes of recovery or relief efforts after Cyclone Nargis. It is difficult to count how many of the houses or shelters are 'safe dwellings'. Generally, Zones I and III owned safer shelters or houses in relative numbers but in Zone II most houses in the small villages could not be categorized as safe dwellings. Based on their experience of Cyclone Nargis, most houses in all three-research areas are evaluated by participants of the focus group discussions as having no way to withstand storm surge.

Davis and Alexander (2016) explain the pattern of housing recovery in a two or three-stage model as shown in Figure 22. In this model, two scenarios are stated. In scenario 1, the condition of a living space after the disaster was only a temporary tent or living temporarily in other households. From there, the survivors could move to Stage 2, which is a better place than a tent and they no longer need to share the other's space. After a certain period, the house condition improves or moves to Stage 3, which is a permanent house. In scenario 2, direct transition between Stage 1 (temporary tent) and Stage 3 (permanent house) occurs.

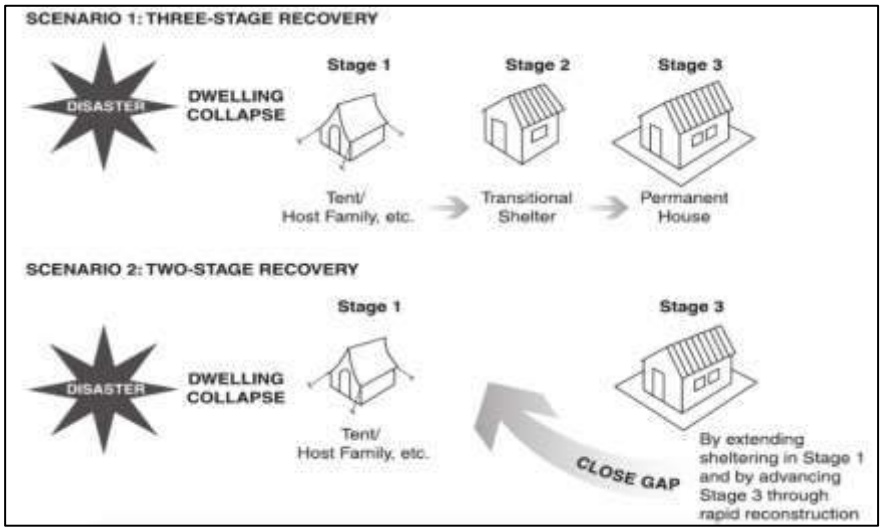

Figure 22 **Two- or three-stage shelter and housing recovery (David and Alexander 2016)**

In my study, most villages in Zone I and III had families who moved in three stages from a temporary shelter to a transitional shelter and then to a permanent house. However, most residents in the villages of Zone III still cannot afford to move from temporary shelter to permanent shelter due to a shortage of assistance in this area.

According to UN-Habitat, a total of 752,299 affected families lost houses in the whole Delta. Among them, only 152,322 houses were supported with cash and in-kind assistance by the combined effort of shelter agencies. It was estimated that 421,525 households were self-recovered, while it is estimated that the housing need of 178,452 households was never met. For poorer residents of all research zones, who do not have any economic foundation for revival, it is not easy to build the houses in decent way. After 2010, some donors tried to solve the housing problem by approaching it from the livelihoods angle, believing funding for sustainable livelihoods will empower families and regular income generation will give them a chance to rebuild better houses. But it was observed as not feasible. According to the Chair of the Shelter Working Group, 'it is a great mistake as families who earn perhaps US$1 or US$2 per day will never have sufficient funds to save hundreds of dollars for a new shelter'. (UN-Habitat 2011a, p.44).

In the context of limited resources for resilience-housing in Cyclone Nargis recovery, it was up to families to build stronger houses. Given the limited livelihood options in all three research areas, most families cannot afford to improve their houses. In a 2011 report of 'Lessons learned and way forward for resilience shelter interventions in rural Myanmar', UN-Habitat and UNISDR found that 62 percent or more of surveyed households in the Delta are not disaster resilient. Resilient structures were assessed according to six features: anchor, bracing, fixed purlin/rafter, fixed roof cover, roof projection and roof pitch (UN-Habitat 2011a, p.44).

This research looks at the physical and material outcomes of the recovery based on shelter or housing in two dimensions: short term and long term. In the short-term view, the outcome can be evaluated in a positive light as most families are in their own house regardless of the strength of the building, whether due to outside help or individual family initiatives. In terms of the long-term view and based on an evaluation of shelter based on resilience to future hazards, it can be evaluated as negative. It is observed that the majority in Zone II, many in Zone I, and several villages in Zone III are not disaster resilient.

7.6.2 Safety outcome

As stated in the previous section, individual housing is mostly not addressing safety concerns. Community members assessed their shelter as not safe for future hazards. Even designated disaster-resilient structures such as cyclone shelters do not guarantee safety without systematic aspects of early warning and disaster preparedness plans being initiated. Risk mapping, which includes the available assets for safety in an emergency, needs to be initiated urgently at the village level in the Delta.

Since the inception of reconstruction in 2008, Myanmar has built a total of 358 cyclone-resistant community buildings in the whole affected area of the Delta, which were listed as completed, under construction or planned by UN-Habitat by February 2010 (UN-Habitat 2011b). Out of them only 54 were stand-alone shelters and the rest are supposed to be schools, hospitals and monasteries. Only half of the 54 shelters can accommodate 500 people while the rest can house around 200 to 300 people. Recently,

thirty-five stand-alone shelters were allowed to be transformed into primary schools and dispensaries (MOI 2015).

Within the three research zones there are only three stand-alone shelters. Out of the three, two are located in Kone Gyi village and Lay Yin Kwin village of Zone I, which can accommodate 100 and 500 people respectively. Another one is in Toe village of Zone I, which is big enough for 200 people. Unfortunately, 25 villages of Zone II which had the biggest need for housing were not close to any stand-alone shelter, and the whole island on which these villages are located has only two cyclone shelters. Moreover, not all school buildings that can be used as emergency shelter are strong enough to be cyclone resilient, especially the wooden buildings that were constructed in 2008. The newer six villages that were established less than 35 years ago had no school until by the end of 2015. As they are still inside the reserved forest area, they do not have permission to build official schools.

As the school is most likely to be the biggest building in the village when the monasteries are smaller and weaker, the following small villages are identified as the most vulnerable: Lay Gwa, Htan Bin Kwin, Dani Chaung, Lake Thaung Yay Kyaw, Thaung Thar and Pauk Sein Kya villages. These villages do not have primary schools that can serve as emergency shelters. Meanwhile other villages have renovated schools that can accommodate villagers. But not all of them are elevated from the ground to protect from flood and surge. In group discussions in the three research areas, a new push for safety was expected in national and international engagement of current political context in terms of risk reduction. ‘The disaster can happen again’ was the prevalent opinion in the research areas as the existing buildings are not well maintained and the area continues to face hazards in the post-Nargis period.

7.6.3 Sustainability outcome

Considering the role of the environment in livelihoods, safety and place identity in the Delta community, conservation and reforestation was stated as one of the major aims of communities in the group discussions. Nevertheless, the actual implementation differs depending on economic conditions, leadership of the village and outside

assistance in the form of recovery or disaster risk reduction programs. The ecosystem provides a natural means to enhance protection against natural hazards and reduce socio-economic vulnerability that can limit response capacity to disaster risk (Andrade et al. 2011). Local knowledge on the value of mangroves reflected what scientists had said about the value of mangroves as rich in biodiversity, providing different ecological and ecosystem services and enhancing community welfare.

A small-scale replantation of mangroves in six villages (Kwin Yar, Kong Gyi, Lay Yin Kwin, Nant Tha Gone and Zee Thaung and May Dar Ai) of Zone I has been a great success. Kwin Yar's community forest is referred to as a success story, which was initiated in the framework of disaster risk reduction, and involved village-led efforts with some resources provided from outside. Moreover, individual farmers are also maintaining mangroves on the frontiers of their own farms. Participants in the discussion from this village credited the mangroves for a decline in erosion of the bank and also as a wind shield:

> In the past, we were eager to cut trees to expand the farm land. Now we have deep concern in cutting trees recklessly. Restoration of mangrove contributed to a recent increase of the number of crabs. Due to the revived forest, we have easier access to firewood and protection against the strong wind. (Naw Say Lwal, a female vegetable grower of 51, Kwin Yar village, Zone I)

In Zone II, 10 villages out of the total 25 had mangrove restoration projects in 2013. Some of them were supported by the forest department and some were initiated by NGOs. All of them are indicated as not expanding because of limited participation due to local people's day-to-day struggle for living. Zone III does not have much space for community-led mangrove restoration activities as few vacant areas are left around the villages. Tawkhayan Gyi, Seik Kyi and Thayet Thone Bin have collective initiatives for mangrove restoration. In these villages, villagers built a consensus to use a parcel of the village land for mangroves. Overall, mangrove reforestation as a recovery outcome for sustainability shows limited success in Zones II and III, while Zone I is relatively better. In general, the environmental degradation in all three research zones precisely reflected what was stated in UNEP's report on the Delta in the post-Nargis period:

> Poverty is the root cause of environmental degradation in Nargis-affected areas. The limited ability of local people to appropriately manage their natural resources is motivated by their struggle for survival in what has become an increasingly over-exploited environment. This is a classic example of the poverty–environment nexus. The vicious circle of unsustainable natural resource management results in environmental degradation, forcing households to over-extract resources just to meet daily subsistence needs. This leads to a downward spiral of dwindling resources, jeopardising food security and livelihoods. This phenomenon reflects the current state of the environment in the Ayeyarwady Delta as well as in parts of Yangon Division. (UNEP 2009, p.10)

7.7 Conclusion

After nearly 10 years, Delta recovery can still be assumed to be an ongoing process for local communities. The dynamics of recovery challenge clear demarcation due to processes and outcomes spread over years. The complex interactions of local communities, local authorities, the national government, local and international organizations also make it difficult to outline a simple narrative. This chapter has attempted to explore much complexity in an expanded narrative to locate community security in the present time. Moving to various narratives and the identification of the recovery process and outcome in the three research areas, this research concludes that both positive and negative aspects of recovery were present in all communities. Assets for safety are yet to cover marginal communities while community processes are advancing in varying degrees.

Community processes of participation and leadership gained momentum in the long-term recovery phase while the national political transition is contributing further. Sustainability and expansion of the environment and physical assets (in the place domain) seem to be recovering slowly in most places with a high intensity of poverty while the areas with more active community processes and better economic situations increase and enhance the assets to some degree. Human capital and other social aspects of the community such as health and education (in the people domain) have also improved to some degree under the national framework. But localized deprivation, such as fresh water shortages and limited livelihood opportunities, inhibit most of a

marginal community's ability to enhance its wellbeing. In a comparison of the three research zones, pre-existing inequality before Cyclone Nargis still has impacts in the reconstruction and recovery phases.

Chapter 8

Conclusion

This research has studied the disaster resilience and vulnerability aspects of village communities from a human security perspective in the context of a focusing event, Cyclone Nargis. Evidences show that the early warning system at the time of Cyclone Nargis was in operation but the effectiveness is in question. Evacuation planning was almost non-existent although the cyclone this time was forecasted to have a more severe devastation than Mala cyclone of 2006. In the global level, early warning systems (EWS) have been advancing with the help of technology in recent decades. Still, this phenomenal progress was not applied to the case of Cyclone Nargis.

Observation in this study of Cyclone Nargis with the lens of human security framework is expected to be useful in the context of developing countries that share similar characteristics with the Ayeyarwaddy Delta. In the light of human security with early prevention approach, findings in this study highlight a crucial role of assets to provide and receive storm warnings (national weather service, community radio, radio at household) as well as a process to act on warning (community DRR, local warning volunteers) in pre-impact phase. In a vulnerable geographic area where poverty deeply prevails, assets to take refuge (cyclone shelter, school) and process to reach a refuge (safe evacuation, taking care of vulnerable population) in impact phase; assets to relief and recover (livelihoods supports, housing etc.) and process to enhance resilience (more participation, community ownership, bridging and linking communication) in post-impact phase are identified as crucial elements for enhancing human security.

The chapters four, five and six present key findings regarding underlying conditions that hampered the disaster resilience of the community. Tracing back to the state of the Delta in the historical context of Myanmar, a profile of pre-impact vulnerability was explored in relation to direct and indirect legacies from different policy regimes. Moving from the pre-impact to the impact phase, problems with the early warning system were analyzed according to vertical linkages between national-level institutions and village-level communities. Then, in the storm emergency (impact

phase) of Cyclone Nargis, this study located the causes of vulnerability and resilience in the process of struggle and survival of the local communities. Long-existing structural and physical vulnerability at the time of Cyclone Nargis now can provide some explanatory answer to the basic question of 'Why did so many people die?'

The lessons learned from the community perspective as well as the national context illustrate what needs to be done to prevent another tragedy. Extending from the pre-impact and impact phase discussion, the post-impact recovery process was explored in Chapter 7. Recovery outcomes in relation to safety aspects of the community were discussed as a process that builds varying degrees of resilience and capabilities. This chapter assumed recovery in the Delta to be ongoing. As a process of being conditioned to the scale of devastation and marginality in the three research areas, the recovery outcomes clarify the current state of the community in the Delta regarding human security.

Overall, this study has argued that promoting human security in the disaster scenario in Myanmar's Delta needs to link the community's resilience capacity with the long-term commitment to the national disaster management policy framework. While this is a geographically focused study with specific cases from Cyclone Nargis-affected areas, an assessment tool to measure the safety aspect of community in the forms of 'assets' and 'processes' is expected to be useful in the context of rural communities in other areas, especially in coastal regions. Examples from several cases of the Ayeyarwady Delta show that access to basic life safety assets is often beyond local communities. As analyzed in the chapters concerned, the 'assets' can provide and receive hazard warnings in pre-impact phases. These assets include facilities that support functions of early warning systems and the effectiveness of warnings among the people such as the national weather service, media channels, community radio and TV, and disaster preparedness kits containing torches and so on.

The 'process' of acting on a hazard warning can be related to the community DRR mechanism including the functions of volunteers to spread the warning systematically in the pre-impact phase and support of NGOs and community-based organizations in disaster preparedness. In areas where people cannot afford to own disaster-resilient

houses, physical ‘life safety assets’ such as cyclone shelters, monasteries, churches and schools, and natural assets from the environment can be a place to take refuge. In a process for safety, many actions and actors are involved. To move along with the community or individually to the refuge, the process here includes safe evacuation, taking care of vulnerable people, and carrying out search and rescue by community volunteer groups. Both in the impact phase and post-impact phase, assets for relief and recovery may take the form of livelihoods support, building reliable infrastructure for communication and transportation, providing basic public services such as health care and education and access to disaster-resilient housing.

A process of enhancing resilience in the recovery phase needs more participation from the community, ownership by the community in taking initiatives, and bridging and linking social capital that sustains resource acquisition and knowledge transfer through social networks. A top-down recovery process with little involvement from the community was found to be ineffective, and sometimes even harmful to the social fabric. Also, weak and vulnerable communities alone cannot revive without linking to external support for sustainable development while their own deprivation is very deep. In communities where geophysical vulnerability is high and resilience is low due to the long presence of deprivation in a declining environment, the right configuration of assets and processes for human security can only be formed with resource and technological transfer from outside, which must be complemented by participatory initiatives.

With regard to pre-impact vulnerability, Chapter 4 of this research traced back to the agricultural expansion policy and transformation of the Ayeyarwady Delta in colonial times. After Independence in 1948, many areas of the Delta were embroiled in civil war. When the civil war was scaled down and most of the fighting moved from the central area of the country to ethnic areas along the border, the Delta together with Myanmar entered a long period of military rule. The first military rule from 1962 to 1988 was characterized by socio-economic decline of the whole country. In that period, the government’s rice procurement policy, which was designed to extract rice at fixed prices from farmers, weakened the Delta community as agriculture is the main source of livelihoods in the area. The extraction of resources from the rural population

continued under the second military rule of 1988 to 2010 and much of the Delta environment was devastated as revealed by Cyclone Nargis in 2008. It was argued in Chapter 4 that the socio-economic decline that made the whole country suffer was manifested in a brutal way in the Delta.

If the Delta had been assumed to have situations such as better health, this might have improved personal strength to survive, better education might have empowered the people to be able to understand the risks and better nourishment might have helped the children's development, better housing might have provided refuge in the storm, and it could have saved many more lives. In response to the question of why it is essential to state the obvious facts of socio-economic factors in disaster vulnerability and why I needed to devote one chapter to situate the vulnerability of the Delta in an historical context, the argument here is that the community's insecurity and vulnerability cannot be separated from the political regime if we are going to build resiliency. These causal links need to be stressed in the understanding of the nexus of disaster and human security so that we can use a particular disaster (in this case, Cyclone Nargis) as a 'focusing event' in reaching the overall goal of strengthening resiliency and promoting sustainable development.

In the current political transition of Myanmar, the opportunity exists to move the country to a sustainable and resilient pathway. Varying degrees of vulnerability in different places should receive attention before these aspects of vulnerability transition to a disaster when hazards strike. Natural hazards unfortunately are not that rare in the current context of climate change especially in the coastal region of Myanmar in the Bay of Bengal. Myanmar has been consistently ranked as one of the world's most vulnerable countries (Kreft et al. 2015).

Another aspect of vulnerability shown in Chapter 4 was when an authoritarian state tried to control or dominate the space of the local community: social capital of the community was hard to expand to reach bridging and linking levels, which otherwise could have helped them to channel resources for reducing vulnerability. It took the whole experience of Cyclone Nargis to bridge and link with outside actors such as civil society, to channel the resources in desperation. Even in much-lauded initiatives of

Myanmar civil society in relief efforts after Cyclone Nargis, we should not forget that such interactions were restricted for years under military rule of Myanmar. As shown in the earlier efforts of the intervention of the authorities to prevent aid from reaching the affected area right after Cyclone Nargis, the space of civil society had been fluctuating under an authoritarian mood of ruling.

What is revealed in the study of Cyclone Nargis is the importance of local leadership and social capital of the community that facilitates links with the outside. Without putting the community at the center of decisions in disaster recovery, resources transferred from the outside also might not effectively contribute to human security of the community. But without outside linkages to tangible and intangible resources, community capabilities were limited. The authoritarian nature of the ruling state resulted in shrinking civic spaces that led to community vulnerability and, in addition, many negative impacts on governance. After the political transition, the people can enjoy more freedom than they did before Cyclone Nargis. Still, the current government which has to manage a number of competing priorities from different regions and sectors within the country, is still struggling to channel resources for rural communities in the Delta. But expanded space for civic actions in a 'freer atmosphere' provides options to local communities to bridge and link up with resources and ideas to advance resilience-enhancing initiatives.

Recognizing the crucial role of an early warning system in saving life, Chapter 5 of this research looked into the lack of sufficient warning to the Delta population at the time that Cyclone Nargis was approaching. While monitoring part of the early warning system fulfilled its role in providing an accurate forecast, proper risk analysis was weak, effective dissemination was limited at best and no plan existed on the ground to activate evacuation. The warning process was intended to provide safety for the public, but it did not happen in the end result.

In the four phases of an effective early warning process, which include risk knowledge accumulation, monitoring and warning service, dissemination and communication warnings and response capability, much effort is needed to correct the system to gain positive results as shown in the discussion of Chapter 5. Details such as adapting the

warning system to meet local needs by using locally understandable names for issuing weather warnings, having policies that promote assets such as radios and mobile phones to receive the warning, providing formal or informal education, risk knowledge of storm surge and building public trust in the early warning system.

Beyond this local process, the national policy regime needed to be examined in the context of early warning in Cyclone Nargis. 'Did the government prioritize human security by using available resources to inform and alert the public?' The answer is negative. 'Did the government give attention to human resource development that can contribute capabilities such as understanding risk and acting on it?' The answer is that little effort was put in place. 'Did the government strengthen monitoring and warning capacity of state institutions such as the Department of Meteorology and Hydrology?' The answer is no. 'Did the government promote a false sense of security in the context of religion and culture to enhance their legitimacy?' The answer is that regular features of the government media machine drove a false sense of security. It was obvious from the Cyclone Nargis experience and is still relevant today that more effort is needed to bridge a local disaster risk reduction process and there needs to be a national commitment to effective early warning systems that save lives.

The horizontal move from the early warning to the harsh reality of struggle and survival at the cyclone landfall (the storm emergency/impact phase) was described in Chapter 6. So far, not many studies exist on this aspect of disaster in disaster research. Narratives of the community are shown in two strands of survival: Having refuge assets which could withstand storm and storm surge, such as strong houses, higher ground or protective trees; and individual or collective evacuation processes to safety. The process often involves looking for alternative assets when existing ones have collapsed and damage to seemingly safe refuges prompted people to move to another refuge. Again, it is revealed that strong structures (physical assets) could save many lives but management of these assets, a good lead time to start evacuation, and leadership in evacuation are all based in the community process.

Hence, the national political regime implicates a weak link in supporting both physical assets and community process in context of Cyclone Nargis. The reasons why houses

were not storm-resilient to some degree are rooted in the failure of economic policy and reduction of poverty. Environmental assets were degraded due to the mismanagement of resource extraction, prevailing corruption and lack of sustainable development policy. A lack of a functioning DRR policy also linked to failure to encourage disaster preparedness among the people.

At this point, a major issue in the context of human security is that of divergent views for helping the people of Myanmar. As explained in the initial part of this research, the state security (arguable regime security) was a focus of the military regime in Myanmar at the time of Cyclone Nargis. Human security in the aspect of safety in the community was not high on the national regime agenda. In this context, there are two opposing views to be noticed in the domestic arena. The first is to blame the military regime for everything that happened as much of the misery and the roots of poverty were caused by them. This view can be referred to as a political solution to vulnerability. The second view perceived that the military regime was responsible for many things but Cyclone Nargis was a natural disaster. That is why politicizing acts should not be involved here. This approach may be called a humanitarian solution to vulnerability. In the case of Cyclone Nargis, the coordination of the Myanmar government was its own adjustment in the political arena that allowed wider humanitarian space while some credit should go to the constructive engagement of ASEAN and UN. But a situation of intense pressure from humanitarian needs and from citizen mobilization to fulfill them with whatever was available, had pushed and expanded political boundaries.

In terms of engagement with the outside world, this research has highlighted the vital roles of both approaches, 'political and humanitarian', with the centrality of community and outcomes of capability in any formulation of strategy. Some critical points were raised concerning the sweeping disengagement of the international and humanitarian community from Myanmar in the context of sanctions against the military regime. While this approach was intended to weaken the military regime (the effectiveness is widely debated), the outcome of sanctions for the rural community meant fewer resources to reduce vulnerability. While resilience and vulnerability of community are directly related to the national political regime, the state has primary

responsibility for the disaster risk management. However, the lesson learned here is that there were missed opportunities for the humanitarian and development community to find ways to engage with the community to ease vulnerability and to promote risk sensitivity. The community's coping and resiliency can be better approached by the participation of all stakeholders who can contribute to effective DRR with development and capabilities of communities.

The dynamics of interactions among community members, authorities and the aid community was outlined in the recovery aspect of Chapter 7. Again, the centrality of community was highlighted in this chapter as the findings suggest that many initiatives that overrode community's participation and community's ownership ended up in overall negative outcomes in the recovery. While many resources are still needed to build safety structures such as cyclone shelters and better housing, it was community leadership that aid organizations should have put first.

This research finds that one of the best ways aid organizations can contribute is by empowering community and facilitating positive social capital in bridging and bonding to larger structures of institutions, organization and governance. This linking and bridging should not only target channeling resources and ideas to the community but also learning from the community and changing accordingly to meet local needs within the flexibility of a larger disaster risk reduction framework. Learning and understanding from the recovery phase insist that a vertical link of engagement among stakeholders including community, institutions, organizations and national governance should extend from short-term initiatives to long-term commitments.

Before Cyclone Nargis, the state of underdevelopment in Myanmar's disaster management system was little known. Cyclone Nargis called much attention from the policymakers to put necessary effort for preventing future risk. Institutions for long-term disaster risk reduction have been strengthened significantly in the aftermath of Cyclone Nargis. The Government of Myanmar modified the government structure and established new institutions and plans to improve the effectiveness of disaster management at all levels. However, (CFE-DM 2017) expressed 'the resources to implement the policy changes have been slower to develop' despite the enthusiasm of

Myanmar government to make new adjustments for progress. Regardless of level of capacity, integrating disaster risk reduction in the country's development agenda is increasingly in demand due to the following factors: (1) political transition in the country paved the way for a growing momentum of civic advocacy for mainstreaming disaster risk reduction and more citizens' participation in disaster relief effort, (2) the need for stronger disaster management and response institutions are highlighted by subsequent disasters in the Post-Nargis years including a major flood of 2015 and 2016 respectively, (3) needs to comply international DRR mechanisms such as the Sendai Framework for Disaster Risk Reduction 2015-2030 and the ASEAN Agreement on Disaster Management and Emergency Response.

Myanmar have taken steps to update Myanmar Action Plan for Disaster Risk Reduction (MAPDRR) 2009-2015 and the Standing Order on Natural Disaster Management which was adopted in January 2009 based on the experience in years after Cyclone Nargis. In the previous MAPDRR, national-level monitoring and evaluation of the DRR activities were not included and the new one must have institution and arrangement for monitoring and evaluation for future efficiency. Among the institutional improvement, the government also established a disaster Management fund at the national level (Mizzima 2015). Myanmar also planned to build a new roadmap for disaster risk reduction in 2016 in a collaboration with the UN and the existing Disaster Risk Reduction Working Group which is composed of a diverse network of 49 organizations (UNDP 2016). As there were critics from civil society against 2013 Disaster Management Law for not filling the gap of inclusiveness for the most vulnerable groups and leaving the aspect of mitigation out of the law, new strategy making under NLD government is expected to adjust the Disaster management rules and regulation to minimize disaster risk and improve resiliency in a better way. In eight years after Cyclone Nargis, time for the sheer advocacy disaster risk reduction has passed. Now the adovates says, it is time to shift from planning for ensuring human security in the context of disaster to effective implementation (UNDP 2016).

This legacy of institutional and financial weakness must be carried away by the incumbent government of 2016 led by NLD. As natural and man-made hazards are

demanding a huge cost in nearly every year, NLD government winning the election in 2015 with landslide victory also need to give attention to the disaster risk reduction within existing weak structure. The previous government's vision to go 'a people-centered resilient growth by building back better' is now transferred to the shoulders of NLD government. This study conveys narratives of different communities from three separate areas in the Ayeyarwaddy Delta. The findings in previous chapters give a vivid illustration of the gap between the state policies and existing needs of human security on the ground. Setting up national institutions from the above is not automatically translated as uplifting the lives of most vulnerable people especially those from the margin. The changes in national policy have had influence in improving the overall situation of people from the Delta. But the long-term recovery process has had mixed results so far as storm recovery assistance has dramatically declined since 2011 while expected sustainable economic development and better infrastructure have yet to reach the Delta in the current state of political change.

Disaster preparedness is more effective when it is locally relevant preparation and adaptation that can provide safety for communities, especially for marginal area of the Delta. As the safety aspect in the recovery in Chapter 7 shows, sparsely populated but scattered small villages areas need to be strategic in selecing the location of cyclone shelters as they need to consider the complexity of evacuation processes in cases where people have to travel from distant locations with difficult mobility through several waterways. Another lesson from Cyclone Nargis for that aspect is that the community needs good lead time and a community-based disaster preparedness plan to evacuate in difficult terrain especially if a stronger shelter is not located nearby.

To fight against the government's complacency was another expectation of this research. Since the 2011 political transition of Myanmar, more optimism has been spread nationally and internationally by semi-civilian governments. The military still has control of a good part of the government but the recent changes pivot on human security at least in the national policy discourse. The vulnerability of the Delta was still evident as stated in the number of cyclone shelters, rates of poverty, rising sea levels, and continuing degradation of the coastal environment. On the other hand, the resiliency aspect of community is also noted in the expanded space for local people to

engage in policy making. A growing civil society makes villages better connected with organizations and ideas from outside. Still there is a lot to be done for the community's safety and for the human security of the Delta by the government, by village communities themselves and by internal and external organizations. The most alarming questions are, 'Is the Ayeyarwady Delta ready for another Cyclone? Is the community better prepared for it? Is human security acceptably enhanced in the marginal area of the Delta so it could resist such a storm?'

Cyclone Nargis was the biggest disaster in Myanmar's history. More than 150,000 people died and there was huge loss and damage to the Ayeyarwady Delta. The lessons from Cyclone Nargis have been extracted from two aspects of this research: One, in an exploration of the temporal phases of Cyclone Nargis in looking at a community's resiliency and vulnerability, and second, in an analysis of the causes of vulnerability and resiliency within a village community and beyond. The lessons are applicable to many marginal areas with human security concerns. Roots of vulnerability and resilience can be located not only in the present but also in the implications of past policies. Holistic views linking the past and the present have revealed ways in which a society can be healed and built as a safer community. As stated in the introduction, it is believed that the lessons need to be spread. This research is an endeavor to drive the lessons from the village to the leaders of society and the policy community. In this way, there is hope that the tragedy of Cyclone Nargis conveys the message of how to avert future tragedy in the Delta and many other places.

8.1 Recommendations

The following recommendations are based on the findings of this research concerning the safety of the Delta community as regards exposure to cyclone hazards.

8.1.1 Early warning system

1. The early warning system process in Myanmar needs to review overall efficiency in communication with the masses and should be strengthened with an emphasis on each part of monitoring and forecasting, risk analysis, issuing warnings, and activating evacuation processes.

2. The institutional capacity of the Department of Meteorology and Hydrology needs to be strengthened with more technical capacity for monitoring and forecasting.
3. Systematic structures and standard procedures in dissemination of hazard warnings should be developed in coordination with government agencies, media, local authorities and community members.
4. Local geographical names and language that is understandable to all citizens of the country regardless of their literacy levels, should be adopted. News and warnings for areas that are likely to be affected and that need prompt action must be sensitive to local names to enhance community comprehension.
5. Public places such as schools, village clinics or communal spaces such as monasteries or churches should install a user-friendly risk map of the surrounding region. In the case of the Cyclone Nargis-affected areas, a map of the whole Delta could be helpful to avoid the direct impact of storm surge or Tsunami.
6. Village communities should have designated volunteers or community-based disaster committee members to be alert to updates of cyclone situations and to distribute timely emergency warnings to make sure they reach every household.
7. Schools in the Delta and in the coastal parts of Myanmar should include disaster preparedness education especially informing students about cyclone risk, and schools should maintain school-based disaster preparedness plans which are already tested.
8. Cyclone, storm surge and tsunami awareness should be raised in the Delta and coastal communities of Myanmar with different media outreach efforts.
9. Along with rising mobile phone penetration into rural society, a system should be installed for dissemination of alerts through telephone applications.

8.1.2 Emergency management

1. Disaster risk reduction activities need to be initiated at the community level and active disaster preparedness committees should be established in each

village or incorporated into the function of existing, strong organizations of a village.

2. Disaster preparedness activities or evacuation drills should be initiated in village communities at the onset of the monsoon, with emphasis on vulnerable groups in each community.
3. The need for and availability of cyclone shelters or other potential refuges should be assessed every year by the local authorities. These disaster-resilient buildings should be accessible to everyone in the community without discriminating against any marginal groups. These facilities should have enough strength and maintenance to accommodate a changing population.
4. Access roads to cyclone shelters or refuges should be assessed every year and adjusted according to the changing human settlement patterns of the community.
5. In villages without cyclone shelters or concrete schools or public structures, religious spaces such as monasteries or churches should be strengthened for storm emergency needs.

8.1.3 Community assets and processes

1. Communities should maintain and expand their natural barriers to prevent harm from hazards such as vegetation cover, barrier islands or mangrove forests.
2. Communities should constantly check and maintain emergency assets such as stronger public buildings, and natural or man-made surroundings such as high ground or embankments.
3. In the case of access to cyclone shelters or safer places, communities should plan for means of transportation in advance.
4. Senior people from the village should have the chance to facilitate and share experience about storms from the past, including Cyclone Nargis.
5. Villages that suffered in Cyclone Nargis should have memorials to remind the community about the storm experience and provide the lessons with the purpose of social learning.

6. In villages with sizable death tolls during Cyclone Nargis, an annual religious memorial for the deceased on the second or third of May could facilitate a social learning process.

8.1.4 Governmental process

1. The date of the second of May each year should be designated as a storm awareness day with educational and awareness-raising activities.
2. A risk map of the Delta and coastal region should be produced, widely disseminated and communicated in various formats to communities.
3. Local learning processes should be facilitated and supported by the State in various venues such as schools, cultural activities.
4. The government should provide improved infrastructure for safety such as shelter, roads and embankments.
5. Infrastructure development such as telecommunications should incorporate DRR services for communities.
6. Local development initiatives should be approached from the perspectives of human security and the capabilities of local people.
7. Environmental conservation should be integrated into the formulation and implementation of risk reduction and livelihood strategies.
8. Environmental changes and other climate change-related risk for the country should be constantly assessed with a human security and community wellbeing focus.
9. Local rights, local ownership and empowerment should be a focus in any development plans and disaster risk reduction activities.

8.1.5 International humanitarian and development communities

1. The recovery process and the current vulnerability of the Delta should be assessed in the year of the tenth anniversary of Cyclone Nargis (i.e. 2018).

2. Developmental and safety needs of the Delta should be highlighted and resource mobilization should continue occasionally.
3. Potential impacts of sea-level rise and climate on the human security of the Delta population should assess and provide help to the national government and local communities for adaptation.
4. Eco-DRR and other resilience-enhancing activities should be promoted and feasible assistance should be mobilized.
5. In the changing political landscape and expanding humanitarian and developmental space, the international community should seize the opportunity to support long-term sustainability of the community.

Appendix 1

List of the villages that participated in this research

No	Village name	Village code	ရွာအမည်	Village tract	Town-ship	Longi-tude	Latitude	Death toll	Popula-tion in 2013
Zone I									
1	Kone Gyi	154488	ကုန်းကြီး	Kone Gyi (Pyinsalu Sub-township)	Labutta	94.76142	15.8215	167	1030
2	Aung Hlaing	154491	အောင်လှိုင်	Kone Gyi (Pyinsalu Sub-township)	Labutta	94.77185	15.7987	320	230
3	Na That	154493	နသတ်	Kone Gyi (Pyinsalu Sub-township)	Labutta	94.77645	15.81801	211	311
4	Lay Yin Kwin	154494	လေယာဉ်ကွင်း	Kone Gyi (Pyinsalu Sub-township)	Labutta	94.81249	15.79643	500	1884
5	Kwin Yar	154495	ကွင်းယား	Kone Gyi (Pyinsalu Sub-township)	Labutta	94.74446	15.8301	30	714
6	Dee Du Kone	151513	ဒီးဒူးကုန်း	Dee Du Kone (Hainggyikyun Sub-township)	Labutta	94.41754	15.87928	0	1050
7	Kyauk Ka Lat	151514	ကျောက်ကလပ်	Dee Du Kone (Hainggyikyun Sub-township)	Labutta	94.43308	15.8841	0	3600
8	May Dar Ai	151517	မေဒါအိုင်	Dee Du Kone (Hainggyikyun Sub-township)	Labutta	94.41314	15.86831	7	680
9	Zee Thaung	151518	ဇီးသောင်	Dee Du Kone (Hainggyikyun Sub-township)	Labutta	94.41109	15.87558	6	400
10	Bone Taw Pyayt	158889	ဘုန်းတော်ပြည့်	Oke Twin (Hainggyikyun Sub-township)	Labutta	94.45863	15.92806	Over 1000	1050
Zone II									
1	Aye Yar Ward II	150602	အေရာအပိုင်း (၂)	Aye Yar	Bogale	95.1127	15.80894	5	3695
2	Western Yay Kyaw Gyi	150608	ဧည့်ကျော်ကြီး	Aye Yar	Bogale	95.10934	15.84594	37	428

3	Ywar Tha Yar	150609	ရွာသာယာ	Aye Yar	Bogale	95.11791	15.83643	41	433
4	Tha Ma Seik Ta	150610	သမစိတ္တ	Aye Yar	Bogale	95.14837	15.79868	2	335
5	War Taw Kone	150611	ဝါးတောကုန်း	Aye Yar	Bogale	95.13971	15.78869	5	300
6	Tha Pyay Yoe	150604	သပြေရိုး	Aye Yar	Bogale	95.16472	15.79585	2	595
7	Thaung Thar	No code	သောင်သာ	Aye Yar	Bogale	95.16485	15.77838	0	210
8	Say Yoe Kwin	150612	ဆေးရိုးကွင်း	Aye Yar	Bogale	95.14829	15.78481	0	597
9	Gway Chaung	153196	ငွေးချောင်း	Ka Don Ka Ni	Bogale	95.21425	15.82808	550	860
10	Shwe Sar Yan	153198	ရွှေစာရံ	Ka Don Ka Ni	Bogale	95.21934	15.80542	14	630
11	Leik Thaung Yay Kyaw	153205	လိပ်သောင်ရေကျော်	Ka Don Ka Ni	Bogale	95.19923	15.81042	15	567
12	Kyein Chaung Hpyar	153206	ကြိမ်ချောင်းဖျား	Ka Don Ka Ni	Bogale	95.20087	15.82568	25	675
13	Eastern Yay Kyaw Gyi	153207	ညောကျော်ကြီး(အရှေ့)	Ka Don Ka Ni	Bogale	95.19806	15.86102	119	214
14	Da Ni Chaung	153208	"နီချောင်း	Ka Don Ka Ni	Bogale	95.20907	15.84864	1	370
15	Kywe Hpyu	153209	ကွဲဖြူ	Ka Don Ka Ni	Bogale	95.15476	15.78105	0	398
16	Htan Pin Kwin	No code	ထန်းပင်ကွင်း	Ka Don Ka Ni	Bogale	95.1795297	15.798961	2	680
17	Zee Hpyu Ywar Ma	155504	ဇီးဖြူရွာမ	Kyein Chaung Gyi	Bogale	95.18591	15.87479	51	565
18	Pauk Sein Kya	155507	ပေါက်ဆိန်ကျ	Kyein Chaung Gyi	Bogale	95.1991	15.87241	58	951
19	Chaung Byea Gyi	155508	ချောင်းဗြကြီး	Kyein Chaung Gyi	Bogale	95.20987	15.89043	300	1511
20	Kyein Chaung Gyi	155493	ကြိမ်ချောင်းကြီး	Kyein Chaung Gyi	Bogae	95.19040	16.04791	1342	1392
21	Hnar Gyi	155538	နှာကြီး	Kyein Chaung Gyi	Bogale	95.17653	15.85083	14	350
22	Lay Gwa	No code	လေးဂွ	Kyein Chaung Gyi	Bogale	95.20959	15.89194	200	719

23	Khar Chin Kyun	156298	ခါချဉ်ကျွန်း	Kyun Thar Yar	Bogale	95.12110	16.01189	70	170
24	Mon Taing Lay	156301	မုန်တိုင်းလေး	Kyun Thar Yar	Bogale	95.12334	15.90548	335	190
25	Ma Pway Tan	164121	မပွေးတန်း	Kyein Chaung Gyi	Bogale	95.23816	15.94307	141	172
Zone III									
1	Taw Kha Yan (East)	161343	တော်ခရမ်း (အရှေ့)	Taw Kha Yan (East)	Kungy angone	96.05215	16.41045	309	2800
2	Seik Gyi	161345	ဆိပ်ကြီး	Taw Kha Yan (West)	Kungy angone	96.01879	16.40425	67	1318
3	Kyun Chaung	161346	ကျွန်းချောင်း	Taw Kha Yan (West)	Kungy angone	96.02817	16.39523	40	1900
4	Taw Ku (West)	161353	တော်ကူး (အနောက်)	Taw Ku (West)	Kungy angone	96.10759	16.43159	16	1453
5	Thone Gwa	162705	သုံးခွ	Thone Gwa	Kungy angone	95.99424	16.4196	210	2000
6	Pay Kone	159233	ပေကုန်း	Pay Kone	Kungy angone	95.99936	16.4215	9	1100
7	Auk Seik	153411	အောက်ဆိပ်	Ka Nyin Kone	Kungy angone	96.09692	16.34238	0	805
8	Thayet Thonebin	219290	သရက်သုံးပင်	Thone Gwa	Kungy angone	96.10192	16.42737	50	1200
9	Sar Kyin	215383	ဆားကျင်း	Toe	Deday e	96.07627	16.32858	20	1290
10	Toe	162818	တိုး	Toe	Deday e	96.06742	16.30759	17	4000

Appendix 2

Semi-Structured questions for Focus Group Discussions

(A) 24 Hours before Nargis

1. How did you receive information about the storm?

2.What was your immediate decision in the next hours?

3. What did you do for preparation?

(B) Would you mind sharing me about your experience during the cyclone?

(C) Please specify about your experience within 24 hours right after the cyclone

1. What made you survive?

2. What was your first action?

3. What you needed most by that time?

4. What was dominating in your thought and action?

(D) Recalling after the storm

1. Did people die here? If yes, what were the causes?

2. How can you relate the environmental changes (such as losing of mangrove) and high death toll?

3. Did you think the warning you receive made a difference to your experience?

4. What else could you have done to evacuate yourself and loved ones? What could you not do?

(E) Disaster response of different stakeholders

1. How do you think about the response of authorities to post-Nargis period?

2. After the storm, how long did it take for community members to start helping each other?

3. How long did it take to receive the first relief aid of civilian?

4. How long did it take to receive the first relief aid of NGOs?

How long did it take to receive the first relief aid from government institutions?

In emergency phase, how did the community leaders (formal, informal and religious leaders) reacts to the situation?

Who were the most vulnerable to disaster during the storm and after the storm?

What enhanced the resiliency of the survivors in post-disaster period?

What were the priorities for the community in immediate days after Cyclone Nargis?

What were the challenges in resettlement and rehabilitation phases?

(F) Assessment for change after five Years

In five years after the storm hit the community, what are the changes you have seen in your society?

What are the impacts of relief and reconstruction aid to the community?

What are the changes in your family?

What are the changes in your surrounding natural environment within these five years?

What is irreplaceable loss for the community?

(H) Disaster preparedness

What are the most essential elements for safety in case you happen to face a storm again?

Are there uses of traditional knowledge for understanding the weather? Could you elaborate more on traditional knowledge applied in the community?

What would you need to prepare to reduce disaster risk if something bad like Cyclone Nargis is likely to happen?

What would be a refuge for you to evacuate at the time of disaster? If you have any, please explain how you can access and the current condition of these assets?

How would you assess the vulnerability of the community if a strong cyclone like Nargis occurs?

How do you evaluate the capacity and adequacy of disaster preparedness mechanism currently established in the community and their function linking to the institutions above?

What are the progress and the biggest shortcomings in community-based disaster risk reduction institutions?

How do the community members get weather news now?

J. Question to understand the viability of eco-DRR

What are the biggest threats to the environment and sustainable livelihoods in your community?

How does livelihoods condition link to disaster risk reduction?

What are the changes you notice in weather/climate around you and at sea around your community?

In which situation, the community can apply best eco-system based disaster risk reduction?

References

ABC 2015, 'Myanmar president Thein Sein urges residents to evacuate low-lying delta region as floods rise', *ABC* (online edition), 7 August, viewed 7 August 2015, http://www.abc.net.au/news/2015-08-07/myanmar-president-urges-people-to-evacuate-delta-as-floods-rise/6679304.

Acharya, A 2001, 'Human security: East versus west', *International Journal*, vol.56, no.3, pp.442-460.

Acharya, A 2007, *Promoting human security: ethical, normative and educational frameworks in South-East Asia*, United Nations Educational, Scientific and Cultural Organization.

ActionAid International 2016, *Through a different Lens: ActionAid's resilience framework version 1.0*, viewed 31 December 2016, http://www.actionaid.org/sites/files/actionaid/2016_through_a_different_lens_-_actionaid_resilience_framework.pdf.

Adas, M 2011, *The Burma Delta: economic development and social change on an Asian rice frontier, 1852–1941*, University of Wisconsin Press.

Adger, WN 2006, 'Vulnerability'. *Global environmental change*, vol.16, no.3, pp.268-281.

Akhand, MH 2013, 'Disaster Management and Cyclone Warning System', in *Early Warning Systems for Natural Disaster Reduction*, p.49.

Alam, E and Collins, AE 2010, 'Cyclone disaster vulnerability and response experiences in coastal Bangladesh', *Disasters*, vol.34, no.4, pp.931-954.

Aldrich, DP 2010, 'Fixing recovery: social capital in post-crisis resilience', *Department of Political Science Faculty Publications, Paper 3*, viewed 17 December 2013, http://www.redcross.org.au/files/12-011_RED_Roundtable_Report_v3-F-web.pdf.

Aldrich, DP 2012, *Building resilience: Social capital in post-disaster recovery*, University of Chicago Press.

Alesch, DJ 2005, 'Complex urban systems and extreme events: Toward a theory of disaster recovery', in *Proceedings of the 1st International Conference on Urban Disaster Reduction*, Kobe, pp.18-20.

Alexander, J 2009, *Emergency shelter cluster review: Cyclone Nargis, Myanmar, International* Federation of Red Cross and Red Crescent Societies, viewed 1 January 2013, https://www.humanitarianresponse.info/system/files/documents/files/Shelter_Cluster_Review_Myanmar08.pdf.

Alliance for Affordable Internet 2015, *Case study: Delivering affordable internet in Myanmar*, Alliance for Affordable Internet, viewed 3 September 2016, http://a4ai.org/wp-content/uploads/2015/03/Myanmar-Case-Study.pdf.

Alusa, A 2003, 'Early warning, prevention-preparedness and response continuum in the management of hydro-meteorological disasters', in *Proceedings of the Sixth Kenya Meteorological Society workshop on meteorological research, applications and services, Mombasa, Kenya*, pp. 23-26.

Amador III, JS 2009, 'Community building at the Time of Nargis: The ASEAN response', *Journal of Current Southeast Asian Affairs*, vol. 28, no.4, pp.3-22.

Anderson, MB 1995, 'Vulnerability to disaster and sustainable development: A general framework for assessing vulnerability', in *Disaster Prevention for Sustainable Development: Economic and Policy Issues,* World Bank, Washington, DC, pp.41-59.

Anderson, WA 1969, 'Disaster warning and communication processes in two communities', *Journal of Communication,* no.19, pp.92-104.

Anderson-Berry, LJ 2006, *Nowcasting systems overview – forecast demonstration projects (FDPs): sub-theme - applying the Social Science*, Bureau of Meteorology Australia, viewed 2 February 2014, http://www.wmo.int/pages/prog/amp/pwsp/documents/Nowcasting_Systems_Overview.pdf.

Andrade, A, Córdoba, R, Dave, R, Girot, P, Herrera-F, B, Munroe, R, Oglethorpe, J, Paaby, P, Pramova, E, Watson, E and Vergar, W 2011, *Draft principles and guidelines for integrating ecosystem-based approaches to adaptation in project and policy design: a discussion document*, IUCN- CEM, CATIE, Turrialba.

Asian Disaster Preparedness Center 2009, *Institutional arrangement for disaster management/risk reduction in the Union of Myanmar: a compendium institutional arrangements for disaster management in Myanmar*, Asian Disaster Preparedness Center, viewed 8 August 2012, http://www.preventionweb.net/files/14637_14637Binding1.pdf.

Asia-Pacific Center for the Responsibility to Protect 2008, 'Cyclone Nargis and the Responsibility to Protect Myanmar/Burma Briefing No.', Asia-Pacific Center for the Responsibility to Protect, viewed 2 July 2014, https://r2pasiapacific.org/filething/get/1293/Cyclone%20Nargis%20and%20R2P%20Myanmar_Burma_Brief2%202008.pdf.

Aung, SL 2013, *Vital Signs: Prospects for recovery, barriers to progress- four years later in a delta township,* Lawkaalin, Yangon.

Aung, SMT 2014, 'The man to watch: Is Burma's top general maneuvering for a run at the presidency?, *Foreign Affairs*, 11 November 2015, http://foreignpolicy.com/2014/01/15/the-man-to-watch/.

Aung, TT 2003, Myanmar: the study of processes and patterns National Centre for Human Resources Publishing S/R No. 21, Yangon.

Aung, TT 2012, *Resilience of the mangrove ecosystem and its restoration perspectives in the mega delta of Myanmar,* Graduate School of Environment and Information Sciences, Yokohama National University.

Aung, TT, Mochida, Y and Than, MM 2013, 'Prediction of recovery pathways of cyclone-disturbed mangroves in the mega delta of Myanmar', *Forest ecology and management*, *293*, pp.103-113.

Australian Broadcasting Corporation International Development 2015, *Disaster information provider in Burma*, Australian Broadcasting Corporation, viewed 25 March, 2016, http://www.abcinternationaldevelopment.net.au/sites/default/files/country_reports/PSLP%20COUNTRY%20REPORT%2001%20BURMA%20r02%20FINAL.pdf.

Australian Red Cross 2012, *Relationships matter: the application of social capital to disaster resilience*, National Disaster Resilience Roundtable Report, Melbourne.

Ayres, L 2008, 'Thematic coding and analysis', *The Sage encyclopedia of qualitative research methods*, no.1, pp.867-868.

Ayers, J 2014, Social capital, resilience and the local church: Ayeyarwady Delta, Myanmar, Master thesis, Oxford Brook University, viewed 1 March 2015, http://architecture.brookes.ac.uk/research/cendep/dissertations/JoshAyers.pdf.

Bacon, P 2014, 'The politics of human security in Japan', in P Bacon, P and Hobson, C (eds), *Human security and Japan's triple disaster: responding to the 2011 earthquake, tsunami and Fukushima nuclear crisis*, Routledge, pp. 22-38

Bacon, P and Hobson, C 2014a, 'Human security comes home: Responding to Japan's triple disaster', *Human security and japan's triple disaster: responding to the 2011 earthquake, tsunami and fukushima nuclear crisis*, Routledge, pp.1-21.

Bacon, P and Hobson, C 2014b, Incorporating natural disasters into the human security agenda, in Hobson et al., *Human security and natural disasters,* Routledge, pp.1-21

Bankoff, G 2001. 'Rendering the world unsafe: 'vulnerability' as western discourse', *Disasters*, vol. 25, no.1, pp.19-35.

Bankoff, G 2003, *Cultures of disaster: society and natural hazards in the Philippines*. Psychology Press.

Bankoff, G 2004, 'Time is of the essence: disasters, vulnerability and history', *International Journal of Mass Emergencies and Disasters*, vol.22, no.3, pp.23-42.

Bankoff, G 2010, 'No such thing as natural disasters', *Harvard International Review*, *23*.

Bankoff, G 2012, 'Historical concepts of disaster and risk', in Wisner, B, Gaillard, JC and Kelman, I, *The Routledge Handbook of Hazards and Disaster Risk Reduction,* London: Routledge, pp.37-47.

Barber, R 2009, 'The responsibility to protect the survivors of natural disaster: Cyclone Nargis, a case study', *Journal of conflict and security law*, vol.14, no.1, pp.3-34.

Barnes, MD, Hanson, CL, Novilla, LM, Meacham, AT, McIntyre, E and Erickson, BC, 2008, 'Analysis of media agenda setting during and after Hurricane Katrina: Implications for emergency preparedness, disaster response, and disaster policy', *American Journal of Public Health*, vol.98, no.4, pp.604-610.

Barr, A 1998, 'Enterprise performance and the functional diversity of social capital', Working Paper Series 98-1, Institute of Economics and Statistics, University of Oxford.

Barton, AH 1969, *Communities in disaster: A sociological analysis of collective stress situations*, vol. 721, Doubleday, Garden City.

Basher, R 2006, 'Global early warning systems for natural hazards: systematic and people-centred', *Philosophical transactions of the royal society of london a: mathematical, physical and engineering sciences*, vol.364, no.1845, pp.2167-2182.

Bass, S, Satterthwaite, D and Reid, H 2005, *Reducing poverty and sustaining the environment: the politics of local engagement*, Routledge.

Bates, FL and Peacock, WG 1987, 'Disasters and social change', in *The Sociology of Disasters*, edited by Dynes, RR, De Marchi, B and Pelanda, C, Franco Angeli Press, Milan. pp. 291–330.

Becker, G 1964, *Human capital,* Columbia University Press, New York.

Belanger and Horsey 2008, 'Negotiating humanitarian access to cyclone-affected areas of Myanmar: a review'*, Humanitarian Exchange*, no.41, pp.2-5, viewed 1 January 2013, http://odihpn.org/magazine/negotiating-humanitarian-access-to-cyclone-affected-areas-of-myanmar-a-review/.

Bellamy, AJ and Beeson, M 2010, 'The responsibility to protect in Southeast Asia: can ASEAN reconcile humanitarianism and sovereignty?', *Asian Security*, vol.6, no.3, pp.262-279.

Béné, C, Wood, RG, Newsham, A and Davies, M 2012, 'Resilience: new utopia or new tyranny? Reflection about the potentials and limits of the concept of resilience in relation to vulnerability reduction programmes', IDS Working Papers no. 405, pp.1-

61, viewed 1 October 2013, http://www.ids.ac.uk/publication/resilience-new-utopia-or-new-tyranny.

Benson, C, Twigg, J and Myers, M 2001, 'NGO initiatives in risk reduction: an overview', *Disasters*, vol.25, no.3, pp.199-215.

Berke, PR, Kartez, J and Wenger, D 1993, 'Recovery after disaster: achieving sustainable development, mitigation and equity', *Disasters*, vol.17, no.2, pp.93-109.

Birkland, TA 2006, *Lessons of disaster: policy change after catastrophic events*, Georgetown University Press, Washington, D.C.

Birkmann, J 2006, 'Measuring vulnerability to promote disaster-resilient societies: Conceptual frameworks and definitions' in Birkmann (ed.) *Measuring vulnerability to natural hazards: Towards disaster resilient societies*, United Nations University Press, Tokyo, pp.7-54.

Birkmann, J, Buckle, P, Jaeger, J, Pelling, M, Setiadi, N, Garschagen, M, Fernando, N and Kropp, J 2010, 'Extreme events and disasters: a window of opportunity for change? Analysis of organizational, institutional and political changes, formal and informal responses after mega-disasters', *Natural Hazards*, vol.55, no.3, pp.637-655.

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

Blair, EA 1929, 'How a nation is exploited – the British empire in Burma'. *The Orwell Prize.* Viewed 12 March 2013, http://www.theorwellprize.co.uk/the-orwell-prize/orwell/essays-and-other-works/how-a-nation-is-exploited-the-british-empire-in-burma/.

Blankespoor, B, Dasgupta, S and Lange, GM 2016, Mangroves as a protection from storm surges in a changing climate, *Ambio*, pp.1-14.

Bourdieu, P 2011, 'The forms of capital (1986)', in Szeman, I and Kaposy, T (eds), *Cultural theory: an anthology*, John Wiley & Sons, pp.81-93.

Brichieri-Colombi, JSA 1983, Hydrological studies of the Irrawaddy Delta, hydrology of humid tropical regions with particular reference to the hydrological effects of agriculture and forestry practice (Proceedings of the Hamburg Symposium, August 1983), *IAHS Publ*. no. 140.

Brklacich, M, Chazan, M and Bohle, HG 2010, 'Human security, vulnerability, and global environmental change', in Matthew, RA, Barnett, J and McDonald, B (et al.), *Global environmental change and human security*, MIT press, Cambridge, pp.35-51.

Brown, K 2016, *Resilience, development and global change*, Routledge, New York and London.

Bryant, R 2007, 'Burma and the politics of teak dissecting a resource curse', in Bankoff, G and Boomgaard, P, *A history of natural resources in Asia: the wealth of nature*, Palgrave, New York, pp.143-162.

Buckle, P 2012,'Preparedness, warning and evacuation' in Wisner, B, Gaillard, JC and Kelman, I, *The Routledge Handbook of Hazards and Disaster Risk Reduction,* London: Routledge, pp.493-504.

Buzan, B 2004, 'A reductionist, idealistic notion that adds little analytical value', *Security Dialogue*, vol.35, no.3, pp.369-370.

Caballero-Anthony, M and Chng, B 2009, 'Cyclones and humanitarian crises: Pushing the limits of R2P in Southeast Asia', *Global Responsibility to Protect*, vol.1, no.2, pp.135-155.

Calkins, PH and Win, NW 2013, 'Impacts of Cyclone Nargis on social capital and happiness in slightly and heavily affected areas of Myanmar, N*atural disasters-multifaceted aspects in management and impact assessment*, pp.71-94.

Callahan, M 2001, 'Burma: soldiers as state builders', in Alagappa, M (ed.), *Coercion and governance: the declining political role of the military in Asia*, Stanford University Press, pp.413-429.

Callahan, MP 2004, *Making enemies: war and state building in Burma*, NUS Press.

Callahan, M 2013, 'Of kyay-zu and kyet-su: the military in 2006' in Skidmore, M. and Wilson, T., 2013. *Myanmar: State, Community and the Environment*, ANU Press, pp.36-53.

Campbell, DT and Fiske, DW 1959, 'Convergent and discriminate validation by the multitrait-multimethod matrix', *Psychological Bulletin*, vol.56, no.2, pp.81-105.

Cannon, T 1994, 'Vulnerability analysis and the explanation of "natural" disasters', *Disasters, development and environment*, pp.13-30.

Cannon, T, Twigg, J and Rowell, J 2003, Social vulnerability, sustainable livelihoods and disasters, *Report to DFID Conflict and Humanitarian Assistance Department (CHAD) and Sustainable Livelihoods Support Office*, viewed 13 October 2016, https://www.researchgate.net/profile/J_Twigg/publication/254398816_Social_Vulnerability_Sustainable_Livelihoods_and_Disasters/links/56656a1308ae4931cd621574.pdf.

Cardona, OD, van Aalst MK, Birkmann J, Fordham, M, McGregor, G & Mechler, R 2012, Determinants of risk: Exposure and vulnerability, in Field, C.B. et al., *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, Cambridge.

Carney, D 2003, *Sustainable livelihoods approaches: progress and possibilities for change*, London: Department for International Development.

Casey, M 2007, 'Environmental problems loom in Myanmar', *Washington Post*,14 October, viewed 16 March 2012, http://www.washingtonpost.com/wp-dyn/content/article/2007/10/14/AR2007101400600_pf.html.

Casey, M 2008, 'Why the cyclone in Myanmar was so deadly', *National Geographic* (Online Edition 8 May, viewed 10 May 2008, http://news.nationalgeographic.com/news/2008/05/080508-AP-the-perfect.html.

Cavallo, A and Ireland, V 2014, 'Preparing for complex interdependent risks: a system of systems approach to building disaster resilience', *International journal of disaster risk reduction*, *9*, pp.181-193.

Center for Conflict and Peace Studies 2009, *Listening to voices from inside: Myanmar civil society response to Cyclone Nargis*, Center for Conflict and Peace Studies, viewed 1 May 2015, http://www.centrepeaceconflictstudies.org/publications/browse/.

Center for Excellence in Disaster Management 2017, *Myanmar (Burma): Disaster management reference handbook*, Center for Excellence in Disaster Management viewed 2 July 2017, https://www.cfe-dmha.org/LinkClick.aspx?fileticket=zf5i3c7xwDA%3D&portalid=0

Central Intelligence Agency Fact Book 2017, 'Population below poverty line', the World Fact Book, viewed 9 February 2017 https://www.cia.gov/library/publications/the-world-factbook/fields/2046.html.

Chambers, R and Conway, G 1992, *Sustainable rural livelihoods: practical concepts for the 21st century*. Institute of Development Studies (UK). https://opendocs.ids.ac.uk/opendocs/bitstream/handle/123456789/775/Dp296.pdf?sequence=1&isAllowed=y

Cheesman, N, Farrelly, N and Wilson, T (eds) 2014, *Debating democratization in Myanmar*, Institute of Southeast Asian Studies, Singapore.

Cheesman, N, Skidmore, M and Wilson, T 2010, *Ruling Myanmar: from Cyclone Nargis to national elections*, Institute of Southeast Asian Studies.

Cho, KM, Wilson, S, Wong, LC, Win, NW and Sandar, TM 2013, *A strategic agricultural sector and food security diagnostic for Myanmar*, United States Agency for International Development, viewed 3 March 2015, http://fsg.afre.msu.edu/Myanmar/myanmar_agricultural_sector_diagnostic_july_2013.pdf.

Chongkittavorn, K 2017, 'Thein Sein recalls Myanmar's reform process', *Nikkei Asian Review* (online edition), 17 January, viewed 17 January 2017,

http://asia.nikkei.com/Politics-Economy/Policy-Politics/Thein-Sein-recalls-Myanmar-s-reform-process.

Chowdhury, AMR, Bhuyia, AU, Choudhury, AY and Sen, R1993, 'The Bangladesh cyclone of 1991: why so many people died', *Disasters*, vol.17, no.4, pp.291-304.

Chowdhury, M, Choudhury, Y, Bhuiya, A, Islam, K, Hussain, Z, Rahman, O, Glass, R and Bennish, M 1992, 'Cyclone aftermath: research and directions for the future', in Hossain, H, Dodge, CP and Abed, FH (eds), *From crisis to development: coping with disasters in Bangladesh*. University Press, pp.101-33.

Clandinin, DJ and Connelly, FM 2000, *Narrative inquiry: Experience and story in qualitative research*, Jossey-Bass, San Francisco.

Clifford, S and King, A 1993, *Losing your place, Local distinctiveness: place, particularity and identity,* Common Ground, London.

Clifford, S and King, A 1996, *From place to PLACE: maps and parish maps,* Common Ground, London.

Cohen-Shacham, E, Walters, G, Janzen, C and Maginnis, S (eds.) 2016, Nature-based Solutions to address global societal challenges, IUCN, Gland, Switzerland.

Coleman, JS 1988, 'Social capital in the creation of human capital', *American journal of sociology*, no.94, pp. S95-S120.

Collins, Andrew 2009, 'Early warning: a people-centred approach to early warning systems and the "last mile"', in International Federation of Red Cross and Red Crescent Societies, *World Disasters Report 2009*, IFRC, pp. 39-67.

Comfort, LK 2000, Disaster: agent of diplomacy or change in international affairs?, *Cambridge Review of International Affairs*, vol.14, no.1, pp.277-294.

Coning, ED and Roberts, R 2012, 'Nowcasting systems for Developing countries', World Meteorological Organization, viewed 4 May 2016, https://www.wmo.int/pages/prog/arep/wwrp/new/documents/Nowcasting_Developing_countries.pdf.

Constas, M, Frankenberger, T and Hoddinott, J 2014, 'Resilience measurement principles: toward an agenda for measurement design', *Food Security Information Network, Resilience Measurement Technical Working Group, Technical Series*, no.1, viewed 1 March 2015, http://fic.tufts.edu/assets/Resilience-and-Livelihoods-Change-in-Tigray-FINAL-30-10-12.pdf.

Coppola, DP and Maloney, EK 2009, *Communicating emergency preparedness: Strategies for creating a disaster resilient public,* CRC Press, Boca Raton.

Cortazzi, M 1993, *Narrative analysis,* Falmer Press, London.

Cox, RS and Perry, KME 2011, 'Like a fish out of water: Reconsidering disaster recovery and the role of place and social capital in community disaster resilience', *American Journal of Community Psychology*, vol.48, no.3-4, pp.395-411.
Cutter, SL 2006, *Hazards vulnerability and environmental justice*, Routledge.

Cutter, SL, Boruff, BJ and Shirley, WL 2003, Social vulnerability to environmental hazards, *Social science quarterly*, vol.84, no.2, pp.242-261.

Cutter, SL, Barnes, L, Berry, M, Burton, C, Evans, E, Tate, E and Webb, J, 2008, 'A place-based model for understanding community resilience to natural disasters', *Global environmental change*, vol.18, no. 4, pp.598-606.

Cutter, SL and Finch, C 2008, 'Temporal and spatial changes in social vulnerability to natural hazards', *Proceedings of the National Academy of Sciences*, vol.105, no.7, pp.2301-2306.

Dacy, D and Kunreuther, H 1969, *The economics of natural disasters: implications for federal policy*, The Free Press, New York.

Davis, I and Alexander, D 2016, *Recovery from disaster*, Routledge, London and New York.

de Weijer, F and McCandless, E 2015, 'Capacity development and resilience', in Greijn, EBH, Hauck, V, Land, A and Ubels, J, *Capacity development beyond aid*, SNV Netherlands development organisation; European Centre for development Policy Management (ECDPM), The Hague.

Denzin, NK 1978, 'Triangulation: A case for methodological evaluation and combination', *Sociological methods*, pp.339-357.

Denzin, NK 1989, *The research act: a theoretical introduction to sociological methods*, Prentice Hall, Englewood Cliffs.

Department for International Development 1999, *Sustainable livelihoods guidance sheets*, Department for International Development, viewed 11 June 2013, http://www.eldis.org/vfile/upload/1/document/0901/section2.pdf.

Department for International Development 2009, *Hazard profile of myanmar*, Department for International Development, viewed 1 September 2011, http://www.preventionweb.net/files/14567_14567HazardReport25.8.091.pdf.

Department of Population 2015, *The 2014 Myanmar population and housing census*, Ministry of Immigration and Population, viewed 11 November 2015, https://www.google.com.au/webhp?sourceid=chrome-instant&ion=1&espv=2&ie=UTF-8# .

Disaster Risk Reduction Working Group 2013, *A situational analysis of disaster risk reduction in Myanmar*, Disaster Risk Reduction Working Group, viewed 1 April 2014,http://www.preventionweb.net/files/workspace/37131_candidatepublicationasituationalana.pdf.

Ditlevsen, M 2014, 'Social issues', in Gravers, M and Ytzen, F(eds), *Burma/Myanmar: Where now?*, Nordic Institute of Asian Studies, Copenhagen, pp.34-368.

Doan, T 2008, *Livelihoods rapid needs assessment in Post-Nargis Myanmar*, Save the Children, Yangon.

Doocy, S, Daniels, A, Dooling, S and Gorokhovich, Y 2013, 'The human impact of volcanoes: a historical review of events 1900-2009 and systematic literature review', *PLoS currents*, *5*.

Dordick, G 1997, *Something left to lose: personal relations and survival among New York's homeless*, Temple University Press, Philadelphia.

Downman, S 2013, 'Reporting disasters from inside a repressive regime: A citizen journalism case study of the 2008 Cyclone Nargis disaster', *Australian Journal of Communication*, vol.40, no.1, pp.153-172.

Driel, WFV and Nauta, TA 2015, *Vulnerability and resilience assessment of the Ayeyarwady Delta in Myanmar: Full Assessment phase*, GWP and Delta Alliance.

DRR Working Group Myanmar 2013, *Working group strategic framework 2013-2018*, DRR Working Group Myanmar, viewed 1 November 2013, http://www.lse.ac.uk/GranthamInstitute/legislation/countries/myanmar/.

Dudwick, N, Kuehnast, K, Jones, VN and Woolcock, M 2006, *Analyzing social capital in context, A guide to using qualitative methods and data*, World Bank Institute, Washington, D.C.

Duffield, M 2008, On the edge of ''no man's land'': chronic emergency in Myanmar', independent report commissioned by the Office of the UN RC. *HC, Yangon and UNOCHA, New York*.

Dynes, RR, Quarantelli, EL and Kreps, GA 1972, *a perspective on disaster planning*, Disaster Research Center, Ohio State University.

Ellis, F 2000, *Rural livelihoods and diversity in developing countries*, Oxford university press.

Elsberry, R 2002, 'Track forecast guidance improvements for early warnings of tropical cyclones', in Zschau, J and Küppers, AN (eds), *Early warning systems for natural disaster reduction*', Springer Science and Business Media, pp.167-183.

Estrella and Saalismaa 2013, 'Ecosystem-based disaster risk reduction (Eco-DRR): An overview', in Estrella, M (eds), *The role of ecosystems in disaster risk reduction*, United Nations University Press.

European Commission 2007, *Country strategy paper Burma/Myanmar 2007-2013,* European Commission, viewed 22 August 2012, http://ec.europa.eu/europeaid/country-strategy-paper-burmamyanmar-2007-2013_en.

Evans, P 2008, 'Asia-Telecoms, Mobile and Broadband in Myanmar and Thailand', viewed 1 January, 2015, http://www.budde.com.au/Research/2008-Asia-Telecoms-Mobile-and-Broadband-in-Myanmar-and-Thailand.html#overview.

Evers, JC and Staa, VA 2010, 'Qualitative analysis in case study', *Encyclopedia of case study research*, pp.749-757.

Ewan, P 2007, 'Deepening the human security debate: beyond the politics of conceptual clarification', *Politics*, vol.27, no.3, pp.182-189.

Faber, MJ and Dekker, M 2014, 'Violent conflict and the individual security dilemma', *Routledge handbook of human security*, Routledge, London and New York, pp.125-138.

Fearn-Banks, K 2002, *Crisis communications: A casebook approach*, Erlbaum, Mahwah.

Federal Emergency Management Agency 2005, *Long-term community recovery planning process a self-help guide,* Federal Emergency Management Agency, viewed 5 December 2014, https://training.fema.gov/programs/emischool/el361toolkit/assets/long-termcommunityrecoveryplanningprocess.pdf.

Federal Emergency Management Agency 2011, *National disaster recovery framework strengthening disaster recovery for the nation,* Federal Emergency Management Agency, viewed 5 December 2014, https://www.fema.gov/pdf/recoveryframework/ndrf.pdf.

Fenton, M, Kelly, G, Vella, K and Innes, J 2007, 'Climate change and the Great Barrier Reef: industries and communities', in Johnson, JE and PA Marshall (eds), Climate Change and the Great Barrier Reef: a vulnerability assessment, Australia Great Barrier Reef Marine Park Authority and Australian Greenhouse Office.

Ferreria, R, Buttell, F and Ferreria, S 2015, Ethical considerations for conducting disaster research with vulnerable populations, *Journal of Social Work Values and Ethics*, no.3, pp.379-384.

Flick, U 1992, Triangulation revisited: strategy of validation or alternative?, *Journal for the theory of social behaviour*, vol.22, no.2, pp.175-197.

Flick, U 1998, *An introduction to qualitative research*, Sage, London.

Flick, U 2002, *An introduction to qualitative research* (2 nd Ed). Sage, London.

Flick, U 2009, *An introduction to qualitative research* (3rd Ed). Sage, London.

Flora, CB, Flora, JL and Gasteyer, S 2015, *Rural communities: legacy and change*, Westview Press.

Flora, CB and Flora, JL 2008, *Rural communities: legacy and change* (3rd Edition), Westview Press, Boulder.

Food and Agriculture Organization 2006, *Tsunami reconstruction: Myanmar status report*, Food and Agriculture Organization, viewed 13 January 2015, ftp://ftp.fao.org/Fi/DOCUMENT/tsunamis_05/myanmar/FAOAgencyReport-Myanmar_31-03-06.pdf.

Freedom House 2011, *Freedom on the net*, Freedom House, viewed 23 August 2012, https://freedomhouse.org/sites/default/files/FOTN2011.pdf.

Friedman, B and Wenger, D 1986, 'Local and national media coverage of disaster: A content analysis of the print media's treatment of disaster myths', *Journal of Mass Emergencies and Disasters*, vol. 4, no. 3, pp.27-50.

Friedman, T 2008, 'Time to reboot America', 23 December 2008, *The New York Times* (online edition), viewed 11 November 2013, http://www.nytimes.com/2008/12/24/opinion/24friedman.html?rref=collection%2Fcolumn%2Fthomas-l-friedman&action=click&contentCollection=opinion&region=stream&module=stream_unit&version=search&contentPlacement=4&pgtype=collection.

Fritz, HM, Blount, CD, Thwin, S, Thu, MK and Chan, N 2009, 'Cyclone Nargis storm surge in Myanmar', *Nature Geoscience*, vol.2, no.7, pp.448-449.

Fritz, CE and Williams, HB 1957, 'The human being in disasters: A research perspective', *The Annals of the American Academy of Political and Social Science*, vol.309, no.1, pp.42-51.

Fukuyama, F 1996, 'Trust: Social capital and the global economy', *Current*, no.379, pp.12-18.

Fuller, T 2012, 'A most unlikely liberator in Myanmar', *The New York Times* (online edition), 14 March viewed 14 March 2012, http://www.nytimes.com/2012/03/15/world/asia/a-most-unlikely-liberator-in-myanmar.html.

Furnivall, JF 1947, Foreward in Andrus, JR, *Burmese economic life*, Stanford University Press.

Furnivall, JS 1957, *An introduction to the political economy of Burma*, Peoples' Literature Committee and House, Rangoon.

Futamura, M, Hobson, C and Turner, N 2011, 'Natural disaster and human security', United Nations University, viewed 20 November 2013, https://unu.edu/publications/articles/natural-disasters-and-human-security.html.

Gaillard, JC and Mercer, J 2013, 'From knowledge to action: Bridging gaps in disaster risk reduction', *Progress in human geography*, vol.*37*, no.1, pp.93-114.

Gall, M 2013, 'From social vulnerability to resilience: measuring progress towards disaster risk reduction, *Interdisciplinary security connections publication series of UNU-EHS,* no. 13.

Gallup 2012, *Burma media use 2012*, Broadcasting Board of Governors, viewed 23 August 2012, https://www.bbg.gov/wp-content/media/2012/09/gallup-burma-brief.pdf.

Ganesan, N 2007, 'State-society relations in Southeast Asia', in Ganesan, N and Hlaing KY(eds) 2007, *Myanmar: state, society and ethnicity*. Institute of Southeast Asian Studies, Singapore.

Ganesan, N and Hlaing, KY (eds) 2007, *Myanmar: state, society and ethnicity*, Institute of Southeast Asian Studies, Singapore.

Gasper, D 2010, 'The idea of human security', in O'Brien, K, Clair, ALS and Kristoffersen, B (eds) 2010, *Climate change, ethics and human security*, Cambridge University Press, Cambridge, pp.23-46.

Gerstl, A and Helmke, B 2012, 'The Association of Southeast Asian Nations (ASEAN) and Climate Change: A Threat to National, Regime, and Human Security', in Guan, BTC (ed.), *Human security: securing East Asia's future*, Springer Netherlands, Amsterdam, pp. 135-156.

Gerard, K 2014, *ASEAN's engagement of civil society: Regulating dissent*, Springer.

Giarratano, G, Savage, J, Barcelona-deMendoza, V and Harville, EW 2014, 'Disaster research: a nursing opportunity', *Nursing inquiry*, vol.21, no.3, pp.259-268.

Giri, C, Long, J, Abbas, S, Murali, RM, Qamer, FM, Pengra, B and Thau, D 2015, 'Distribution and dynamics of mangrove forests of South Asia', *Journal of environmental management*, no.148, pp.101-111.

Glaser, B and Strauss, A 1967, *The discovery of grounded theory*, Weidenfield and Nicolson, London.

Golnaraghi, M (ed.) 2012, *Institutional partnerships in multi-hazard early warning systems: a compilation of seven national good practices and guiding principles*, Springer Science and Business Media.

Golnaraghi, M 2012, 'An overview: building a global knowledge base of lessons learned from good practices in multi-hazard early warning systems', in Golnaraghi, M.(ed.), *Institutional Partnerships in Multi-Hazard Early Warning Systems*, Springer Berlin Heidelberg, pp.1-8.

Golnaraghi, M, Douris, J and Migraine, JB 2009, 'Saving lives through early warning systems and emergency preparedness', in *Risk Wise*, Geneva, WMO, pp.137-141.

Gómez, O and Gasper, D 2013, 'Human security: a thematic guidance note for regional and national human development report teams', viewed 12 January 2014, http://hdr.undp.org/sites/default/files/human_security_guidance_note_r-nhdrs.pdf.

Good Practice Review 2017, Chapter 9, Disaster risk reduction, viewed 12 July 2016 http://goodpracticereview.org/9/livelihoods-and-drr/sustainable-livelihoods-approaches/.

Gorod, A, Sauser, B and Boardman, J 2008, 'System-of-systems engineering management: A review of modern history and a path forward', *IEEE Systems Journal*, vol.2, no.4, pp.484-499.

Gouveia, C, Fonseca, A, Câmara, A and Ferreira, F 2004, 'Promoting the use of environmental data collected by concerned citizens through information and communication technologies', *Journal of Environmental Management 71*, 135–154.

Gravers, M 2004, *Nationalism as political paranoia in Burma: an essay on the historical practice of power*, Routledge, London and New York.

Gravers, M, and Flemming, Y (eds) 2014, *Burma/Myanmar—Where now?*, Nordic Institute of Asian Studies, Copenhagen.

Greijn, H, Hauck, V, Land, T and Ubels, J 2015, *Capacity development beyond aid*. SNV, The Hague and ECDPM Maastricht.

Grey, D 2009, 'Aid and politics after Cyclone Nargis', *New Mandala* (online edition) viewed 11 November 2015, http://www.newmandala.org/aid-and-politics-after-cyclone-nargis/.

Guha-Sapir, D and Vogt, F 2008, Cyclone Nargis in Myanmar: lessons for public health preparedness for cyclones, *American journal of disaster medicine*, vol.4, no.5, pp.273-278.

Gupta, AK and Nair, SS 2012, *Ecosystem approach to disaster risk reduction*, National Institute of Disaster Management, New Delhi.

Gyi, MM 1983, *Burmese political values: the socio-political roots of authoritarianism*, Praeger Publishers.

Haacke, J 2008, 'ASEAN and political change in Myanmar: towards a regional initiative?', *Contemporary Southeast Asia: A Journal of International and Strategic Affairs*, vol.30, no.3, pp.351-378.

Haacke, J 2009, Myanmar, the responsibility to protect, and the need for practical assistance, *Global Responsibility to Protect*, vol.1, no.2, pp.156-184.

Habermas, J 1984, *The theory of communicative action*, Beacon, Boston.

Hagen, EE 1956, *The economic development of Burma*, no. 96, National Planning Association.

Hanifan, LJ 1916, 'The rural school community center', *The Annals of the American Academy of Political and Social Science*, vol.67, no.1, pp.130-138.

Harris, D 2012, 'The impact of cultural and religious influences during natural disasters (volcano eruptions)', September 27, *Earthquake-report* (online edition), viewed 15 January 2013, http://earthquake-report.com/2012/09/27/the-impact-of-cultural-and-religious-influences-during-natural-disasters-volcano-eruptions/.

Hattotuwa, S 2008, Cyclone Nargis: lessons and implications for ICTs in humanitarian aid, ICT for Peace Foundation, viewed 8 March 2014, http://ict4peace.org/?p=553.

Hawkins, RL and Maurer, K 2010, 'Bonding, bridging and linking: how social capital operated in New Orleans following Hurricane Katrina', *British Journal of Social Work*, vol.40, no.6, pp.1777-1793.

Hedley, PJ, Bird, MI, Robinson, RA 2010, 'Evolution of the Irrawaddy Delta region since 1850', *The Geographical Journal* 176, 138–149.

Hewitt, K (ed.) 1983, Interpretations of calamity from the viewpoint of human ecology, Allen and Unwin, Boston.

Hewitt, K 1995, 'Sustainable disasters', in Crush, JS (ed.), *Power of development,* Routledge, London, pp.115-128.

Hewitt, K 1997, *Regions of risk: a geographical introduction to disasters*, Longman, Harlow.

Hewitt, K 1998, Excluded perspectives in the social construction of disaster, in Quarantelli, EL (ed.), *What is a disaster*, Routledge, London and New York, pp.75-91.

Hlaing, MT 2014, 'Bogale-Thabaung river crossing bridge to allow traffic in late June', *The New Light of Myanmar*, 3 February, p.1.

Hlaing, KY, Taylor, RH and Than, TMM 2005, *Myanmar: beyond politics to societal imperatives*, Institute of Southeast Asian Studies, Singapore.

Hobson, C, Bacon, P and Cameron, R 2014, *Human security and natural disasters*, Routledge.

Hobson, C 2014, 'Human security and fortuna', in Hobson et al., *Human security and natural disasters*, Routledge, pp.181-187.

Holliday, I 2012, *Burma redux: global justice and the quest for political reform in Myanmar*, Columbia University Press, New York.

Holling, CS 1973, 'Resilience and stability of ecological systems', *Annual Review Of Ecology And Systematics*, vol.4, no.1, pp.1-23.

Htay, KM 2016, Mangroves in Myanmar: conflicts and Impacts, in *Politics of Autonomy and Sustainability in Myanmar*, Springer, Singapore, pp. 73-90.

Htut, KM, 2015, *Psychological Influences of Survivors after Disaster in Myanmar*, doctoral dissertation doctoral, Graduate School of Social Science, Yokohama National University.

Hubbard, S, Jimba, M, Sase, E, Suzuki, T and Otsuka, K 2011, 'Human security approaches for disaster recovery and resilience', *Japan Medical Association Journal*, vol.54, no.5, pp.338–341.

Human Rights Watch 2010, '*I want to help my own people': state control and civil society in Burma after Cyclone Nargis*, Human Rights Watch, viewed 1 April 2011, https://www.hrw.org/sites/default/files/reports/burma0410webwcover.pdf.

Hurricane Science 2008, '2008-Cyclone Nargis', Hurricane Science, viewed 9 October 2011, http://www.hurricanescience.org/history/storms/2000s/cyclonenargis/.

Index for Risk Management 2017, *Inform country risk profile: Myanmar*, Index for Risk Management, viewed 2 March 2017, http://www.informindex.org/Portals/0/InfoRM/2017/Country_Profiles/MMR.pdf.

Intergovernmental Panel on Climate Change 2012, 'Summary for Policymakers', in Field, CB (et al.), *Managing the risks of extreme events and disasters to advance climate change adaptation, a special report of working groups I and II of the intergovernmental panel on climate change*, Cambridge University Press, Cambridge, UK, and New York, pp. 1-19.

Integrated Regional Information Networks 2010, 'Nargis now a development issue, says Yangon', *IRIN News* (online edition), viewed 20 August 2010, http://www.irinnews.org/news/2010/08/20/nargis-now-development-issue-says-yangon.

International Crisis Group 2008, *Burma/Myanmar after Nargis: time to normalise aid relations*, International Crisis Group, viewed 21 October 2008, https://www.crisisgroup.org/asia/south-east-asia/myanmar/burma-myanmar-after-nargis-time-normalise-aid-relations.

International Dalit Solidarity Network 2013, Equality in aid: addressing caste discrimination in humanitarian response, International Dalit Solidarity Network, viewed 4 April 2015, http://idsn.org/wp-content/uploads/user_folder/pdf/New_files/Key_Issues/Disaster_response/EqualityInAid_web_version.pdf.

International Energy Agency 2012, *World energy outlook 2012*, International Energy Agency, viewed 7 November 2015, https://www.iea.org/publications/freepublications/publication/english.pdf.

International Federation of Red Cross and Red Crescent Societies 2012, *Community early warning systems: guiding principles,* International Federation of Red Cross and Red Crescent Societies, viewed 1 April 2013, http://www.ifrc.org/PageFiles/103323/1227800-IFRC-CEWS-Guiding-Principles-EN.pdf.

International Federation of Red Cross and Red Crescent Societies 2014, *IFRC framework for community resilience*, The International Federation of Red Cross and Red Crescent Societies, viewed 23 December 2014, http://www.ifrc.org/Global/Documents/Secretariat/201501/1284000-Framework%20for%20Community%20Resilience-EN-LR.pdf

International Media Support 2012, *Change is in the air: An assessment of media development challenges and opportunities in Myanmar*, International Media Support, viewed 12 March 2012, https://www.mediasupport.org/wp-content/uploads/2012/11/ims-change-myanmar-2012.pdf.

Integrated Regional Information Networks 2014, 'Myanmar storm warnings get better', *Integrated Regional Information Networks* (online version), 05 May, viewed 11 June 2015 http://www.preventionweb.net/news/view/37398.

Jackson, S 2008, 'Was Burma's cyclone predicted?', *BBC* (online edition), 6 May, viewed 1 July 2014, http://news.bbc.co.uk/2/hi/asia-pacific/7386695.stm.

Jacob, D 2008, 'Decrease Vulnerability through Early Warning', in *The community based last mile early warning system*, Southasiadisaster.net, no.46, viewed 4 October 2012, http://www.preventionweb.net/files/2975_46Sad.netearlywarningsystem.pdf

James, H 2005, *Governance and Civil Society in Myanmar: Education, Health and Environment*, Routledge.

James, H 2006, *Security and sustainable Development in Myanmar*. Routledge.

James, H and Paton, D 2015, 'Social capital and the cultural contexts of disaster recovery outcomes in Myanmar and Taiwan', *Global Change, Peace and Security*, vol. 27, no.2, pp.207-228.

James, H n.d, Health policy and practice in Myanmar: a civil society perspective, viewed 1 May 2015 http://www.burmalibrary.org/docs21/health_policy-Helen_James.pdf.

James, H 2012, 'Religion, disaster relief and reconstruction in the Burmese Delta after Cyclone Nargis: How can disaster foster enhanced social capital, community

empowerment, and socio-political transformation?', viewed 3 November 2014, http://rlp.hds.harvard.edu/files/hds-rlp/files/james-cyclone_nargis.pdf.

James, H and Paton, D 2015, Social capital and the cultural contexts of disaster recovery outcomes in Myanmar and Taiwan, *Global Change, Peace & Security*, vol.27, no.2, pp.207-228.

Japan International Cooperation Agency 2005, *The study on integrated mangrove management through community participation in the Ayeyawady Delta in the Union of Myanmar: final report;* vol. 1*,* Japan International Cooperation Agency, viewed 5 January 2016, http://open_jicareport.jica.go.jp/884/884/884_104_11784337.html.

Jagan, L 2010, *Burma dashes ASEAN and UN hopes of disaster cooperation*, The Irrawaddy (Online Edition) 1 September 2010, viewed 1 September 2010, http://reliefweb.int/report/myanmar/burma-dashes-asean-and-un-hopes-disaster-cooperation.

James, P 2014, 'Human security as a military security leftover, or as part of the human condition?' in Bacon and Hobson (eds), *Human security and Japan's triple disaster: responding to the 2011 earthquake, tsunami and Fukushima nuclear crisis*, Routledge, pp.72-88.

Jonjoubsong, L and Thammabunwarit, N 2016, 'A framework and tools for indigenous knowledge, *International Review of Management and Business Research*, vol.5, no.1, p.106.

Juliet, C and Anselm, S 1998, *Basics of qualitative research: Techniques and procedures for developing grounded theory*, SAGE Publications, Thousand Oaks.

Junk, J 2016, 'Boundaries: Cyclone Nargis in Myanmar and the scope of R2P', *Global Society*, vol.30, no.1, pp.78-93.

Kapferer, Jean-Noel 1990, *Rumors: uses, interpretations, and images,* Transaction Publishers, New Brunswick and London.

Kapucu, N 2011, 'Collaborative governance in international disasters: Nargis cyclone in Myanmar and Sichuan earthquake in China cases', *Int. J. Emergency Management*, vol. 8, no. 1, pp.1-25.

Keim, ME 2008, 'Building human resilience: the role of public health preparedness and response as an adaptation to climate change', *American journal of preventive medicine*, vol.*35*, no.5, pp.508-516.

Kelman, I. 2009. 'Don't Forget the People'. *Weather and society watch*, vol. 3, no. 2 (January), pp. 7-14.

Kelman, IIan 2012, The first mile of warning system, in Wisner et al., *The Routledge handbook of hazards and disaster risk reduction*, Routledge, London and New York, p.483.

Kelman, I and Glantz, MH 2014, 'Early warning systems defined', in Singh, A and Zommers, Z (eds), *Reducing disaster: Early warning systems for climate change*, Springer Netherlands, Amsterdam, pp. 89-108.

Kemple, S 2016, 'Myanmar's forgotten local elections', Myanmar Times, 16 February, viewed 16 February 2016, http://www.mmtimes.com/index.php/opinion/19009-myanmar-s-forgotten-local-elections.html.

Kempel, S and Tun, A 2016, *Myanmar ward and village tract administrator elections 2016: An overview of the role, the laws and the procedures*, Norwegian People's Aid, viewed 20 February 2016, http://www.themimu.info/sites/themimu.info/files/documents/Report_Ward_Village_Tract_Administrator_Elections_2016_NPA_Jan2016.pdf.

Khan, S and VanWynsberghe, R 2008, 'Cultivating the under-mined: Cross-case analysis as knowledge mobilization', in *Forum: Qualitative Sozialforschung/Forum: Qualitative Social Research*, vol. 9, no.1.

Kiel, LD 1995, Chaos theory and disaster response management: Lessons for managing periods of extreme instability, in *What disaster management can learn from chaos theory*, Conference Proceedings, pp.18-19, viewed 3 March 2014, http://www.library.ca.gov/CRB/96/05/over_2.html.

Kim, H, Han, SB, Kim, JH, Kim, JS and Hong, E 2010, Post-Nargis medical care: experience of a Korean disaster relief team in Myanmar after the cyclone, *European Journal of Emergency Medicine*, vol.17, no.1, pp.37- 41.

Konrad, C 2006, 'The Japanese approach: tracks of human security implementation', *Human Security Perspectives*, vol.1, no.3, pp.22-38.

Kovach, T 2013, 'The politics of disaster response: disaster diplomacy and the responsibility to protect after Cyclone Nargis', Working paper, Disaster Diplomacy, viewed 1 October 2015, http://www.disasterdiplomacy.org/pb/kovachnargis2013.pdf.

Kramer, T 2011, *Civil society gaining ground: opportunities for change and development in Burma*, Transnational Institute and Burma Center Netherlands, Amsterdam, viewed 1 November 2012,https://www.tni.org/files/download/tni-2011-civilsocietygaininground-web2.pdf.

Krantz, L 2001, The sustainable livelihood approach to poverty reduction, *SIDA, Division for Policy and Socio-Economic Analysis*.

Kravtsova, VI, Mikhailov, VN, and Kidyaeva, VM 2009, 'Hydrological regime, morphological features and natural territorial complexes of the Irrawaddy River Delta (Myanmar)'. *Water resources*, vol.36, no.3, 243-260.

Krause, K 1998. 'Critical theory and security studies: The research programme of "critical security studies"', *Cooperation and Conflict: Nordic Journal of International Studies*, vol.33, no.3, pp.298–333.

Kreft, S, Eckstein, D, Dorsch, L and Fischer, L 2015, *Global climate risk index 2016: Who suffers most from extreme weather events? Weather-related loss events in 2014 and 1995 to 2014*, viewed 1 September 2016, https://germanwatch.org/fr/download/13503.pdf.

Kreps, GA 2001, 'Sociology of disasters', in Smelser, NJ and Baltes, PB (eds), *International Encyclopedia of the Social and Behavioral Sciences*, Elsevier, Amsterdam, pp. 3718-3721.

Kunreuther, H and Michel-Kerjan, E 2013, 'Natural disasters' in Lomborg, B (ed.), *Global problems, smart solutions: costs and benefits*, Cambridge University Press, pp. 439-465.

Kwan, MP and Ding, G 2008, 'Geo-narrative: extending geographic information systems for narrative analysis in qualitative and mixed-method research', *The Professional Geographer*, vol.60, no.4, pp.443-465.

Kyed, HM, Harrisson, DAP and McCarthy, G 2016, *Local democracy in Myanmar*, Dansk Institut for Internationale Studier, Aarhus.

Lall, M 2009, Ethnic conflict and the 2010 elections in Burma, *Asia Programme Paper: ASP PP 2009/04*.

Lall, MC 2016, *Understanding reform in Myanmar: people and society in the wake of military rule*, Hurst.

Lambrecht, CW 2004, 'Oxymoronic Development, in Duncan', CR (ed.), *Civilizing the Margins: Southeast Asian Government Policies for the Development of Minorities*, NUS Press, Singapore.

Landis, RC 2003, Public communications of early warnings: role of government, in Zschau, J and Küppers, AN (eds), *Early warning systems for natural disaster reduction*', Springer Science and Business Media, *Berlin*, pp.71-72.

Larkin, E 2010, *Everything is broken*, Penguin Press, New York.

Lassa, JA 2008,'When heaven (hardly) meets the earth: towards convergency in tsunami early warning systems', in Proceeding of Indonesian Student's Scientific Meeting, Delft, The Netherlands, viewed 9 May 2014, http://zef.invorbereitung.de/module/register/media/d614_Lassa-Tsunami-Early-Warning-System.pdf

Lateef, F 2009, Cyclone Nargis and Myanmar: a wake up call, *Journal of emergencies, trauma, and shock*, vol.2, no.2, p.106.

Leake, JE 2013, *Cyclone Nargis, Myanmar: Risk Reduction in Natural Resource Management*, Thaksin University Press, The University of Melbourne.

Lin, II, Chen, CH, Pun, IF, Liu, WT and Wu, CC 2009, Warm ocean anomaly, air sea fluxes, and the rapid intensification of tropical cyclone Nargis (2008), *Geophysical Research Letters*, vol.36, no.3.

Lintner, B 1994, *Burma in revolt, Opium, and Insurgency since 1948,* White Lotus, Bangkok.

Liotta, PH and Owen, T 2006, 'Why human security'. The *Whitehead Journal of Diplomacy and International Relations,* vol.3, no.2.

Lwin, T 2015, *Nargis and I*, Aung Publication House, Yangon.

MacFarlane, SN and Khong, YF 2006, *Human security and the UN*, Bloomington, Indianapolis.

Mack, A 2004, The concept of human security, *BICC Brief - Promoting security: but how and for whom?*, no.30, pp.47-50.

Maguire, B. and Cartwright, S 2008, *Assessing a community's capacity to manage change: A resilience approach to social assessment*, Bureau of Rural Sciences, Canberra.

Mangrove Service Network 2006, *Progress report on ecological mangrove restoration project in the Ayeyarwady Delta, Myanmar*, Mangrove Service Network, viewed 1 March 2013, http://www.burmalibrary.org/docs13/MSNrestorationprogressreport.pdf.

Manuel-Navarrete, D, Gómez, JJ, Gallopín, G, 2007, 'Syndromes of sustainability of development for assessing the vulnerability of coupled human–environmental systems: The case of hydrometeorological disasters in Central America and the Caribbean', *Global Environmental Change*, vol.17, no.2, pp. 207-217.

Marr, S 2010, *Compassion in Action: The story of the ASEAN-led coordination in Myanmar*, ASEAN Secretariat.

Mathur, N 2014, '1971: A Global History of the Creation of Bangladesh', *Canadian Journal of History*, vol.49, no.2, p.33.

Martin, M and Margesson, R 2008, CRS report for congress: Cyclone Nargis and Burma's Constitutional Referendum, Congressional Research Service, viewed 10 May 2014, http://fpc.state.gov/documents/organization/105169.pdf.

Masters, J 2009, 'Top weather story of 2008: Cyclone Nargis', Weather Underground (online edition), viewed 28 February 2014 https://www.wunderground.com/blog/JeffMasters/top-weather-story-of-2008-cyclone-nargis.

Matelski, M 2015, 'Fulfilling the right to education? responsibilities of state and non-state actors in Myanmar's education system', in Mills, K and Karp, D (eds), *Human rights protection in global politics: responsibilities of states and non-state actors*, Springer, pp.201-220.

Mathieson, D 2009, *Burma's forgotten prisoners*, Human Rights Watch, viewed 2 June 2014, https://www.hrw.org/report/2009/09/16/burmas-forgotten-prisoners.

Matsui, M 2016, Mobile revolution lifts Myanmar out of telecom time warp, Nikkei Asian Review (online edition) 26 July, viewed 27 July 2016, http://asia.nikkei.com/Business/Trends/Mobile-revolution-lifts-Myanmar-out-oftelecom-
time-warp.

Matthew, RA, Barnett, J and McDonald, B 2009, *Global environmental change and human security*. MIT press, London.

Maung, L 1978, History of Dagon, Aye Yar and Tanintharyi. Sarpay Yadanar, Yangon.

Mayunga, JS 2007, Understanding and applying the concept of community disaster resilience: a capital-based approach, Working paper, no. 1, Summer academy for social vulnerability and resilience building, Munich, viewed 3 March 2015, https://www.u-cursos.cl/usuario/3b514b53bcb4025aaf9a6781047e4a66/mi_blog/r/11._Joseph_S._Mayunga.pdf.

McIvor, AL, Spencer, T, Möller, I and Spalding, M 2012, *Storm surge reduction by mangroves*, Working Paper 41, Natural Coastal Protection Series: Report 2, Cambridge Coastal Research Unit, Cambridge, viewed 1 March 2016, http://www.nacionmulticultural.unam.mx/mezinal/docs/3151.pdf.

Measham, T and Lockie, S 2012, *Risk and social theory in environmental management*, CSIRO Publishing, Canberra.

Mercycorps 2011, *Myanmar energy poverty survey*, Mercycorps, viewed 18 March 2016,https://www.mercycorps.org/sites/default/files/myanmar_energy_poverty_survey.pdf.

Miles, MB and Huberman, AM 1994, *Qualitative data analysis: An expanded sourcebook,* Sage.

Mileti, DS 1999, *Disasters by design: A reassessment of natural hazards in the United States*, Joseph Henry Press, Washington, DC.

Ministry of Education 2008, *Myanmar education development strategy focusing on inclusive education*, Ministry of Education, Union of Myanmar, viewed 5 March 2012, http://www.ibe.unesco.org/National_Reports/ICE_2008/myanmar_NR08.pdf.

Ministry of Information 2015, zsyk&d w;&Gbrf t Å;fMuKi fum;Ga&;t axmuf ulyKd&d;'PfcH t aqmuf t ksm;Equfpyf pDrHsm;} Ministry of Information, viewed May 28 2015, http://moigovnews.blogspot.com.au/2015/05/blog-post_529.html.

Ministry of Social Welfare, Relief and Resettlement 2010, *National progress report on the implementation of the Hyogo Framework for Action (2009-2011) – interim*, viewed 1 October 2013, http://www.preventionweb.net/english/hyogo/gar/2011/en/bgdocs/hfa/16315_mmr_NationalHFAprogress_2009-11.pdf.

Mizzima 2008, 'Coastal CDMA phone popular in Yangon', *Mizzima* (Online Edition) 13 November , viewed 1 February 2009, http://archive-2.mizzima.com/news/inside-burma/1292-coastal-cdma-phones-popular-in-rangoon.html.

Mizzima 2011, 'Human security is national security', *Mizzima*, viewed 12 August 2016, http://archive-2.mizzima.com/edop/editorial/5476-human-security-is-national-security.html.

Mizzima 2015a, 'How prepared is Myanmar for another natural disaster?', *Mizzima* (Online edition), 12 October, viewed 12 October 2015, http://www.mizzima.com/news-opinion/how-prepared-myanmar-another-natural-disaster.

Mizzima 2015b, 'Cyclone shelter construction stalled 7 years after Cyclone Nargis', *Mizzima* (online edition) 6 May, viewed 6 May 2015, http://www.mizzima.com/development-news/cyclone-shelter-construction-stalled-7-years-after-cyclone-nargis.

Moe, KS 2014, 'Myanmar needs independent media, not 'public service' propaganda', The Irrawaddy (online edition) 3 July, viewed 4 July 2014, https://www.irrawaddy.com/opinion/myanmar-needs-independent-media-public-service-propaganda.html

Mooney, CC 2007, *Storm world: hurricanes, politics, and the battle over global warming*, Houghton Mifflin Harcourt.

Mooney, CC 2008, 'My MSNBC Interview About Cyclone Nargis', *Scienceblogs* (online edition), 7May 2008, viewed 15 January 2013, http://scienceblogs.com/intersection/2008/05/07/my-msnbc-interview-about-cyclo/.

Morrow, BH 1999, 'Identifying and mapping community vulnerability', *Disasters*, vol.23, no.1, pp.1-18.

Muro, M and Jeffrey, P 2008, 'A critical review of the theory and application of social learning in participatory natural resource management processes', *Journal of environmental planning and management*, vol.51, no.3, pp.325-344.

Muttarak, R and Pothisiri, W 2013, The role of education on disaster preparedness: case study of 2012 Indian Ocean earthquakes on Thailand's Andaman Coast, *Ecology and Society* vol.18, no. 4.

Myanma Alin 2008a, 'The weather news', *Myanmar Alin*, 1 May, p.13.

Myanma Alin 2008b, 'The storm news', *Myanmar Alin*, 2 May, p. 13.

Myanma Alin 2008c, 'Local people urged to exert greater effort to improve socio-economic life Prime Minister inspects rehabilitation and reconstruction tasks in storm-hit regions of Yangon, Ayeyawady Divisions', in Myanma Alin, 18 August, viewed 12 December 2012 http://www.burmalibrary.org/docs5/NLM2008-08-18.pdf

Myanmar Information Management Unit 2009, *Bogale Township profile,* Myanmar Information Management Unit, Viewed 14 May 2015, http://www.themimu.info/search/document?search=Bogale.

Myawaddy 2016, '3000 farmers from five villages faces problem in acquiring land-use certificate', Myawaddy Daily (online version), 7 July, viewed 7 July 2016, http://myawady-myawady.blogspot.com.au/2016/07/blog-post_47.html

Myint-U, T 2001, *The making of modern Burma,* Cambridge University Press, Cambridge.

Myint-U, T 2006, *The River of Lost Footsteps: Histories of Burma*, Farrar, Straus and Giroux, New York.

Myint-U, T 2009, Prepared testimony by Dr Thant Myint-U before the East Asia sub-committee of the senate foreign relations committee, Speech delivered at Hearings on Burma, Washington DC, September, 30, viewed September 30, 2009, https://www.foreign.senate.gov/imo/media/doc/Myint-UTestimony090930p.pdf?.

Nakagawa, Y and Shaw, R 2004, 'Social capital: A missing link to disaster recovery', *International Journal of Mass Emergencies and Disasters*, vol.22, no.1, pp.5-34.

Nam, KY, Cham, MR and Halili, PR 2015, *Power sector development in Myanmar*, Asia Development Bank, viewed 12 January 2016, https://www.adb.org/publications/power-sector-development-myanmar.

Nam, KY, Cham, WM and Halili, PR 2015, *Developing Myanmar's information and communication technology sector toward inclusive growth*, Asian Development Bank, viewed 21 December 2016, https://www.adb.org/publications/developing-myanmar-ict-sector-toward-inclusive-growth.

National Aeronautics and Space Administration 2006, 'Recipe for a Hurricane', National Aeronautics and Space Administration, viewed 3 May 2011, https://www.nasa.gov/vision/earth/environment/HURRICANE_RECIPE.html.

National Aeronautics and Space Administration 2008, 'Hurricane Season 2008: Tropical Storm Nargis (Indian Ocean)', National Aeronautics and Space Administration, viewed 9 October 2009, https://www.nasa.gov/mission_pages/hurricanes/archives/2008/h2008_nargis.html.

National Aeronautics and Space Administration 2009, 'NASA study finds 'pre-existing condition' fueled killer cyclone', National Aeronautics and Space Administration, viewed 2 December 2012, https://www.nasa.gov/topics/earth/features/nargis-20090226.html.

National Governors' Association Center for Policy Research 1979, *Comprehensive emergency management: a governor's guide*, National Governors' Association Center for Policy Research, Washington, D.C.

Nishikawa, Y 2010, *Human security in southeast Asia*. Routledge, London.

Ni, Z 2007, 'Confronting Burma/Myanmar's security dilemma', in James, H (ed.), *Civil society, religion and global governance: Paradigms of power and persuasion*. Routledge, pp.202-212.

Nigg, JM 1995, 'Disaster recovery as a social process', *Preliminary Paper, no.219*, Disaster Research Center.

Norris, FH, Stevens, SP, Pfefferbaum, B, Wyche, KF and Pfefferbaum, RL 2008, 'Community resilience as a metaphor, theory, set of capacities, and strategy for disaster readiness', *American journal of community psychology*, vol.41, no.1-2, pp.127-150.

Nunan, F 2015, *Understanding poverty and the environment: Analytical frameworks and approaches*, Routledge.

O'Brien, G, O'Keefe, P, Gadema, Z and Swords, J 2010, 'Approaching disaster management through social learning', *Disaster Prevention and Management: An International Journal*, vol.19, no.4, pp.498-508.

O'Brien, K and Barnett, J 2013, 'Global environmental change and human security', *Annual Review of Environment and Resources*, no.38, pp.373-391.

Ochola, WO, Sanginga, PC and Bekalo, I 2010, *Managing natural resources for development in Africa: A resource book*, IDRC.

Office for the Coordination of Humanitarian Affairs 2008b, *Myanmar: Cyclone Nargis OCHA situation report No. 2*, United Nations Office for the Coordination of Humanitarian Affairs, viewed 22 May 2008, http://www.burmalibrary.org/docs5/OCHA-Situation_Report18-2008-05-22.pdf

Office for the Coordination of Humanitarian Affairs 2016, 'Myanmar: Natural disaster risks and past events' (as of 31May 2016), Office for the Coordination of Humanitarian Affairs, viewed 2 June 2016,

http://reliefweb.int/sites/reliefweb.int/files/resources/Natural%20disaster%20risks%20and%20past%20events_as%20of%2031May2016.pdf.

Oliver-Smith, A 1999, *What is a disaster? Anthropological perspectives on a persistent question*, Routledge, New York.

Olsson, L, Jerneck, A, Thoren, H, Persson, J and O'Byrne, D 2015, 'Why resilience is unappealing to social science: Theoretical and empirical investigations of the scientific use of resilience', *Science advances*, vol.1, no.4, viewed 2 July 2016, http://advances.sciencemag.org/content/1/4/e1400217.full

Osa, Y 2013, 'The growing role of NGOs in disaster relief and humanitarian assistance in East Asia', *A Growing Force: Civil Society's Role in Asian Regional Security*, pp.66-89.

Owen, T 2014, 'Human security thresholds', in Martin, M and Owen, T 2013, *Routledge handbook of human security*, Routledge, pp.58-64

Oxfam 2006, *Asian tsunami 2004: Myanmar (Burma)*, Oxfam, viewed 13 January 2015, https://www.oxfam.org.nz/what-we-do/emergencies/previous-emergencies/asian-tsunami-2004/burma.

Özerdem, A 2010, 'The 'responsibility to protect' in natural disasters: another excuse for interventionism? Nargis Cyclone, Myanmar', *Conflict, Security and Development*, vol.10, no. 5, pp.693-713.

Paisley, L and Richardson, D 1998, *Why the first mile and not the last*: t*he first mile of connectivity*, Food and Agriculture Organization, viewed 17 February 2016, http://www.fao.org/docrep/x0295e/x0295e03.htm.

Partnership for Environment and Disaster Risk Reduction 2010, *Demonstrating the role of ecosystem-based management for disaster risk reduction*, Partnership for Environment and Disaster Risk Reduction, viewed 6 June 2012, http://www.preventionweb.net/english/hyogo/gar/2011/en/bgdocs/PEDRR_2010.pdf.

Paton, D 2003, 'Disaster preparedness: a social-cognitive perspective', *Disaster Prevention and Management: An International Journal*, vol.12, no. 3, pp.210-216.

Pattanaik, DR and Rao, YR 2009, 'Track prediction of very severe cyclone 'Nargis' using high resolution weather research forecasting (WRF) model', *Journal of earth system science*, vol.118, no.4, p.309.

Pattie, D 2009, 'Cyclone Nargis', in Glantz, MH (ed.) 2007. *Heads Up! Early Warning Systems for Climate, Water and Weather*, United Nations University Press, Tokyo, pp. 38-42.

Paul, BK 2009, 'Why relatively fewer people died? The case of Bangladesh's Cyclone Sidr', *Natural Hazards*, vol.50, no.2, pp.289-304.

Payne, Stephen L 2000, 'Challenges for research ethics and moral knowledge construction in the applied social sciences', *Journal of Business Ethics,* vol.26, no.4, pp. 307-318.

Pelling, M and Dill, K 2006, 'Natural disasters as catalysts of political action', *Media Development*, vol.53, no.4, pp.4-6, viewed 12 December 2013, http://cdn.agilitycms.com/wacc-global/resources/md-index/issues-before-2013-3/2006-4%20Communication%20and%20Disaster.pdf.

Pelling, M and Dill, K 2010, 'Disaster politics: tipping points for change in the adaptation of sociopolitical regimes', *Progress in Human Geography*, vol.34, no.1, pp.21-37.

Peers, A 2013, 'Review of Myanmar's Disaster Management Law from the angle of inclusivity', Working paper, Oxfam Publishing, viewed 1January 2014, https://www.ciaonet.org/catalog/30454. 290983.

Perry, RW, Lindell, MK and Tierney, KJ (et al.) 2001, *Facing the unexpected: Disaster preparedness and response in the United States*, Joseph Henry Press.

Perdikaris, J 2014, *Physical security and environmental protection*, CRC Press.

Phillips, BD 2014, *Qualitative disaster research*, Oxford University Press, USA.

Phillips, BD 2016, *Disaster recovery*, CRC press.

Phong, T and Tinh, BD 2010, 'Housing sector considerations in disaster risk reduction and climate change adaptation', in Shaw, R, Pulhin, J.M, Pereira, JJ (et al.), *Climate Change Adaptation and Disaster Risk Reduction: Issues and Challenges (Community, Environment and Disaster Risk Management, Volume 4),* Emerald Group Publishing Limited, pp.291-302.

Phyu, AS 2012, 'Scientists fear Myanmar's disappearing mangroves', Myanmar Times (online edition) 9 November , viewed 9 November 2012, http://www.mmtimes.com/index.php/national-news/3009-scientists-fear-myanmar-s-disappearing-mangroves.html.

Phyu, AS 2013, 'Villagers in a township most heavily affected by natural disasters are to receive training in risk reduction', *Myanmar Times*, viewed 22 April 2013, http://www.mmtimes.com/index.php/national-news/6457-delta-village-gets-training-on-early-disaster-warning.html.

Platt, RH 1991, 'Lifelines: An emergency management priority for the United States in the 1990s', *Disasters*, vol.15, no.2, pp.172-176.

Preston, B, Yuen, E, Westaway, R 2011, 'Putting vulnerability to climate change on the map: a review of approaches, benefits, and risks', *Sustainability Science*, no.6, pp.177-202.

Public Entity Risk Institute 2001, *Holistic recovery*, Natural Hazards Center, Boulder.

Purvis, N and Busby, J 2004, 'The security implications of climate change for the UN system', *ECSP Report* no.10, pp.67-73.

Pursiainen, C 2007, 'Why early warning sometimes fails? The case of civil protection', Working Paper no.5, Nordic Centre for Spatial Development, viewed 8 August, 2012, https://www.researchgate.net/publication/241442946_Why_Early_Warning_Sometimes_Fails_The_Case_of_Civil_Protection.

Putnam, R 2000, *Bowling alone: the collapse and revival of american community*, Simon and Schuster, New York.

Pwint, A 2015, Owusef0 emnfcsif, Ngawun publication house, Yangon.

Quarantelli E 1954, 'The nature and conditions of panic', American Journal of Sociology 60:265-275.

Quarantelli, EL 1980, *Evacuation behavior and problems: findings and implications from the research literature*, Disaster Research Center.

Quarantelli, EL 1987, 'Disaster studies: An analysis of the social historical factors affecting the development of research in the area', *International Journal of Mass Emergencies and Disasters* no.5, pp.285-310.

Quarantelli, EL 1995, 'Patterns of sheltering and housing in US disasters', *Disaster Prevention And Management: An International Journal*, vol.4, no.3, pp.43-53.

Radio Free Asia 2015, 'Interview: retiree Than Shwe exerts 'no influence whatsoever' on Myanmar politics', Radio Free Asia, viewed 21 August 2015, http://www.rfa.org/english/news/myanmar/influence-08202015151523.html.

Relief and Resettlement Department 2009, '*Myanmar Action Plan on Disaster Risk Reduction (MAPDRR*) 2009-2015, Ministry of Social Welfare, Relief and Resettlement, viewed 11 October 2011, http://www.preventionweb.net/files/18657_myanmaractionplanondisasterriskredu.pdf.

Reliefweb 2007, 'Joint statement on Myanmar', Office for the Coordination of Humanitarian Affairs, viewed 19 October 2012, http://reliefweb.int/report/myanmar/joint-statement-myanmar.

Reporters without Borders 2010, *World press freedom index 2010*, Reporters without Borders 2010, viewed 22 February 2013, https://rsf.org/en/world-press-freedom-index-2010.

Ribot, JC 1995, 'The causal structure of vulnerability: Its application to climate impact analysis', *GeoJournal*, vol.35, no.2, pp.119-122.

Roberts, C 2014, Myanmar, Cyclone Nargis and regional intermediaries, *Disaster Relief in the Asia Pacific: Agency and Resilience*, no.44, p.86.

Ronan, K and Johnston, D 2005, *Promoting community resilience in disasters: The role for schools, youth, and families*, Springer Science and Business Media.

Ronan, KR, Johnston, D and Wairekei, T 2001, Hazards education in schools: Current findings, future directions, in *APEC workshop on dissemination of disaster mitigation technologies for humanistic concerns phase*, vol. 1, pp. 18-21, viewed 17 November 2016, http://www.preventionweb.net/files/7998_RonanJohnstonAPEC.pdf.

Rubin, CB, Saperstein, MD and Barbee, DG 1985, *Community recovery from a major natural disaster*, Institute of Behavioral Science, Boulder.

Saito, K, Kuroda, T, Kunii, M and Kohno, N 2010, 'Numerical simulation of Myanmar cyclone Nargis and the associated storm surge part II: ensemble prediction', *Journal of the Meteorological Society of Japan, Ser. II*, vol.88, no.3, pp.547-570.

Sari, AC 2012, 'Human security and Myanmar's response to Cyclone Nargis: more continuity than change', *Thammasat Review,* vol.15, p.118.

Satake, K, Aung, TT, Sawai, Y, Okamura, Y, Win, KS, Swe, W, Swe, C, Swe, TL, Tun, ST, Soe, MM and Oo, TZ 2005, 'Report on post tsunami survey along the Myanmar coast for the December 2004 Sumatra–Andaman earthquake', *Annual Report on Active Fault and Paleoearthquake Researches*, no.5, pp.161-188.

Satake, K, Aung, TT, Sawai, Y, Okamura, Y, Win, KS, Swe, W, Swe, C, Swe, TL, Tun, ST, Soe, MM and Oo, TZ 2006, 'Tsunami heights and damage along the Myanmar coast from the December 2004 Sumatra-Andaman earthquake', *Earth, planets and space*, vol.*58*, no.2, pp.243-252.

Save the Children 2009, *Evaluation of the Save the Children response to Cyclone Nargis*, Save the Children, viewed 15 December 2014, www.alnap.org/pool/files/erd-3691-full.pdf.

Saw, YM, Win, KL, Shiao, LWS, Thandar, MM, Amiya, RM, Shibanuma, A, Tun, S and Jimba, M 2013, 'Taking stock of Myanmar's progress toward the health-related Millennium Development Goals: current roadblocks, paths ahead', *International journal for equity in health*, vol.12, no.1.

Schendel, WV 1991, *Three deltas: accumulation and poverty in rural Burma, Bengal and South India*, Sage Publications India Pvt Ltd..

Scheuer, J 2012, 'What we call "natural" disasters are not natural at all', United Nations Development Programme, viewed 22 December 2014, http://www.undp.org/content/undp/en/home/ourperspective/ourperspectivearticles/2012/10/12/what-we-call-natural-disasters-are-not-natural-at-all-jo-scheuer/.

Schugurnesky, D 2000, *Citizenship learning and democratic engagement: Political capital revisited*, Ontario Institute for Studies in Education/University of Toronto, viewed 12 January 2013, http://debate.uvm.edu/idastraining2012/Teachers/Steve%20Llano's%20Materials/Teaching%20Handouts/schugurensky.pdf.

Schultz, TW 1961, 'Investment in human capital', *The American economic review*, pp.1-17.

Seekins, DM 2006, *Historical dictionary of Burma (Myanmar)*, Scarecrow Press.

Seekins, DM 2008, 'The social, political and humanitarian impact of Burma's Cyclone Nargis', *The Asia-Pacific Journal: Japan Focus*, vol.6, no.5, viewed 1 June 2009, http://apjjf.org/-Donald-M.-Seekins/2763/article.html.

Seekins, DM 2009a, State, society and natural disaster: cyclone Nargis in Myanmar (Burma), *Asian Journal of Social Science*, vol.37, no.5, pp.717-737.

Seekins, DM 2009b, Myanmar in 2008: hardship, compounded, *Asian Survey*, vol.49, no.1, pp.166-173.

Sein, T 2015, The monthly radio speech delivered by President U Thein Sein on 3 November 2015, Myanmar President office, viewed 30 November 2015, http://www.myanmarpresidentoffice.gov.mm/2015en/?q=node/6131.

Selth, A 2008, 'Even paranoids have enemies: Cyclone Nargis and Myanmar's fears of invasion', *Contemporary Southeast Asia: A Journal of International and Strategic Affairs*, vol. 30, no.3, pp.379-402.

Sen, A 1999, *Development as freedom*, Oxford: Oxford University Press.

Sen, A 2014, 'Birth of a discourse' in Martin, M and Owen, T (eds) 2014, *Routledge handbook of human security*, Routledge.

Seng Raw, L 2015, 'Too Many Lives Have Been Lost': Humanitarian Seng Raw on Kachin War', *The Irrawaddy*, 10 June, Viewed 12 August 2015, http://www.irrawaddy.com/contributor/too-many-lives-have-been-lost-humanitarian-seng-raw-on-kachin-war.html.

Shapley, D 2008, 'Tropical Cyclone Nargis will strike myanmar: downgraded, storm will still reach category 2 strength', *the Daily Green* (online edition), viewed 30 June 2008, http://preview.www.thedailygreen.com/environmental-news/latest/tropical-cyclone-nargis-47042903.

Shultz, JM, Russell, J and Espinel, Z 2005, 'Epidemiology of tropical cyclones: the dynamics of disaster, disease, and development', *Epidemiologic reviews*, vol.27, no.1, pp.21-35.

Shwe, TA, Zwi, AB and Roberts, G 2013, *Cyclone Nargis 2008 – Human resourcing insights from within the Myanmar Red Cross*, Human Resources for Health

Knowledge Hub, Sydney, viewed 6 May 2014, https://sphcm.med.unsw.edu.au/sites/default/files/sphcm/Centres_and_Units/PHEW_Cyclone-Nargis.pdf.

Simmance, A 2013, 'Environmental flows for the Ayeyarwady (Irrawaddy) River Basin, Myanmar', Unpublished paper, UNESCO-IHE Online Course on Environmental Flows.

Simons, H 2009, *Case study research in practice*, SAGE publications.

Skidmore, M 2005, *Burma at the turn of the 21st century*, Honolulu, University of Hawaii Press.

Skidmore, M and Wilson, T 2013, *Myanmar: state, community and the environment*, ANU Press, Canberra.

Smawfield, D 2013, 'Education and natural disasters: a selective overview', in Smawfield, D (ed.), *Education and natural disasters: Education as a humanitarian response*. Bloomsbury, London, pp.2-31.

Soe, HK 2016, 'Saving the mangroves', *Frontier* (online edition), 2 August 2016, viewed 2 August 2016, http://frontiermyanmar.net/en/saving-the-mangroves.

Sorensen, JH and Sorensen, BV 2007, Community processes: warning and evacuation, in Rodriguez, H, Quarantelli, EL and Dynes, R (eds), *Handbook of disaster research*, Springer Science and Business Media, Springer, New York, pp.183-199.

Soroos, SM 2010, 'Approaches to enhancing human security', in Matthew, RA, Barnett, J and McDonald, B (et al.), *Global environmental change and human security*, MIT press, Cambridge, pp.177-193.

South, A, Kempel, S, Perhult, M, Carstensen, N and Sudan, SS 2011, *Myanmar-Surviving the Storm: Self-protection and survival in the Delta*, Local to Global Protection, viewed 21 March 2013, http://www.local2global.info/wp-content/uploads/L2GP_Myanmar_Nargis_study.pdf.

Stallings, RA 2006, Methodological issues, in Rodríguez, H, Quarantelli, EL and Dynes, RR (eds), *Handbook of disaster research*, Springer, New York.pp.55–82.

Steinberg, DI 1981, *Burma's road toward development, growth and ideology under military rule*, Westview Press, Boulder.

Steinberg, DI, 2001, *Burma: the state of Myanmar*, Georgetown University Press.

Steinberg, DI 2010, 'Aung San Suu Kyi and US Policy toward Burma/Myanmar', *Journal of Current Southeast Asian Affairs*, vol.29, no.3, pp.35-59.

Steinberg, D 2013, *Burma/Myanmar: what everyone needs to know*, Oxford University Press.

Stiglitz, J 2014, Broadening our thinking on vulnerability, viewed 3 October 2015, http://hdr.undp.org/en/content/broadening-our-thinking-vulnerability

Stojanovic, T, McNae, H, Tett, P, Reis, J, Smith, H D and Dillingham, I 2016, 'The "social" aspect of social-ecological systems: a critique of analytical frameworks and findings from a multisite study of coastal sustainability', *Ecology and Society*, vol. 21 , no. 3, p.15.

Stover, E and Vinck, P 2008, 'Cyclone Nargis and the politics of relief and reconstruction aid in Burma (Myanmar)', *Journal of American Medical Association*, vol.300, no.6, pp.729-731.

Suhrke, A1999, 'Human security and the interests of states', *Security Dialogue*, vol.30, no.3, pp.265-276.

Swe 2009, 'Statement by Maj-Gen Maung Maung Swe, Minister for Social Welfare, Relief and Resettlement of the Union of Myanmar', Global Platform for Disaster Risk Reduction, viewed 1 October 2013, http://www.preventionweb.net/files/9950MyanmarStatement.pdf.

Swe, KK 2011, *Seismic and tsunami observations of Myanmar*, Department of Meteorological and Hydrology, viewed 1 October 2013, http://iisee.kenken.go.jp/net/shiva/update/Myanmar.pdf.

Szreter, S and Woolcock, M 2004, 'Health by association? Social capital, social theory, and the political economy of public health', *International Journal of Epidemiology*, vol33, no.4, pp.650-667.

Tadjbakhsh, S and Chenoy, A 2007, *Human security: concepts and implications*, Routledge.

Tanaka, A 2015a, 'Keynote speech at the third UN World Conference on Disaster Risk Reduction, Public Forum 'Disaster risk reduction and human security': added value of the human security approach to disaster risk reduction', Japan International Cooperation Agency, viewed 23 December 2015, https://www.jica.go.jp/english/about/president/speech/150317_01.html.

Tanaka, A 2015b, Toward a theory of human security, viewed 17 November 2015, http://repository.ri.jica.go.jp/dspace/handle/10685/154.

Tapscott, C 1997, Is a better forecast the answer to better food security? To better early warning? To better famine prevention? Internet Journal for African Studies, no.2, pp.19-24.

Taylor, RH 2007, 'British policy towards Myanmar and the creation of 'the Burma problem'', in Ganesan, N and Hlaing, KY (eds), *Myanmar: state, society and ethnicity*, Institute of Southeast Asian Studies, Singapore, pp.70-90.

Thakur, Ramesh 1997, From national to human security, in Stuart Harris and Andrew Mack (eds), *Asia-Pacific Security: The Economics- Politics Nexus,* Allen and Unwin, Sydney. pp.52-80.

Than, M 2001, *Changing faces of the Ayeyarwady (Irrawaddy) Delta (1850-2000)*, Institute of Southeast Asian Studies, Singapore.

Than, TMM 2007, *State dominance in Myanmar: The Political Economy of Industrialization*. Institute of Southeast Asian Studies, Singapore.

Than, TMM 2009, Myanmar in 2008: Weathering the storm. *Southeast Asian Affairs,* no.1, pp.195-222.

Than, TMM 2010, Tatmadaw and Myanmar's security challenges, *Asia Pacific Counties' Security Outlook and Its Implications for the Defence Sector, NIDS Joint Research Series*, no.5.

Thant, YM, Kanzaki, M and Than, MM 2010, 'Mitigation effects of forests as a natural shelter in the Cyclone Nargis in Myanmar', *Asian Journal of Environment and Disaster Management*, vol.*2*, no.2, viewed 1 July 2012, https://www.jstage.jst.go.jp/article/jfsc/121/0/121_0_262/_pdf.

Thawnghmung, AM 2004, *Behind the teak curtain: authoritarianism, agricultural policies and political legitimacy in rural Burma,* London: Kegan Paul.

The Fund for Peace 2016, *Fragile states index*, the Fund for Peace, viewed 13 January 2017, http://fsi.fundforpeace.org/.

The Global Facility for Disaster Reduction and Recovery 2014, *Another Nargis strikes every day,* The Global Facility for Disaster Reduction and Recovery, viewed 1 January 2014, https://www.gfdrr.org/sites/gfdrr/files/publication/Another-Nargis-Strikes-Every-Day.pdf

The government of Myanmar 2011, 'State will help flood victims, victims are to work even harder than before President tours Pakokku District', *Reliefweb* (online edition), 27 October, viewed 25 January 2013, http://reliefweb.int/report/myanmar/state-will-help-flood-victims-victims-are-work-even-harder-president-tours-pakokku.

Theilen-Willige, B and Pararas-Carayannis, G 2009, Natural hazard assessment of SW Myanmar-a contribution of remote sensing and GIS methods to the detection of areas vulnerable to earthquakes and tsunami/cyclone flooding, *Science of Tsunami Hazards*, vol.28, no.2, p.108.

The International Federation of Red Cross and Red Crescent Societies 2014, *IFRC framework for community resilience*, The International Federation of Red Cross and Red Crescent Societies, viewed 23 December 2014, http://www.ifrc.org/Global/Documents/Secretariat/201501/1284000-Framework%20for%20Community%20Resilience-EN-LR.pdf.

The New Light of Myanmar, 2008, ‘Weather map, The New Light of Myanmar, 2 May, p.15.

The New Light of Myanmar 2009, ‘Lt-General Ko Ko of Ministry of Defense inspects regional development tasks in Labutta, Myaungmya Townships’, *the New Light of Myanmar*,6 August, p.1.

The Irrawaddy 2015, ‘In the way they were trained to think everything is about security’, *The Irrawaddy* (online edition), 21 March, viewed 22 March 2015, http://www.irrawaddy.com/interview/dateline-irrawaddy/in-the-way-they-were-trained-to-think-everything-is-about-security.html.

The Voice 2008, ‘[kf;MDu Ref;o 8Dwn fepOu yi{ &m0wDkf;o Yf aMumif;Mum;Ekdif[k q,f’ *Living Color Media*, 12 May 2008, p.18.

Thein, M 2004, *Economic development of Myanmar*, Institute of Southeast Asian Studies, Singapore.

Tripartite Core Group 2010, *Post-Nargis social impacts monitoring: April 2010*, Tripartite Core Group, viewed 28 September 2012 http://reliefweb.int/report/myanmar/myanmar-post-nargis-social-impacts-monitoring-april-2010.

Thomas, C 2000, *Global Governance, development and human security*, Pluto Press, London.

Thuzar, M 2015, ‘Human security and development in Myanmar: Issues and implications’, JICA-RI Working Paper, no 96, JICA Research Institute, Tokyo, viewed 1 June 2016, http://jica-ri.jica.go.jp/publication/assets/JICA-RI%20WP%20No.96.pdf.

Timmerman, P 1981, ‘Vulnerability, resilience and the collapse of society: a review of models and possible climatic applications’, *Environmental monograph no.1*, Institute for Environmental Studies, University of Toronto, Toronto.

Tong, TMT, Shaw, R and Takeuchi, Y 2012, Climate disaster resilience of the education sector in Thua Thien Hue Province, Central Vietnam, *Natural hazards*, vol.63, no.2, pp.685-709.

Torres, JMR and Puig, MA 2012, ‘The tropical cyclone early warning system of Cuba’, in Golnaraghi, M (ed.), *Institutional partnerships in multi-hazard early warning systems: a compilation of seven national good practices and guiding principles*, Springer, Berlin, pp.9-28.

Transparency International 2010, *The 2010 corruption perceptions index,* Transparency International, viewed 22 February 2013, https://www.transparency.org/cpi2010.

Tripartite Core Group 2008a, *Post-Nargis Joint Assessment (PONJA)*, Tripartite Core Group, viewed 30 August 2008,

http://yangon.sites.unicnetwork.org/files/2013/05/post-nargis_joint_assessment_all_pages.pdf

Tripartite Core Group 2008b, *Post-Nargis Recovery and Preparedness Plan (PONREPP)*, Tripartite Core Group, viewed 30 December 2008, http://yangon.sites.unicnetwork.org/files/2013/05/PONREPP.pdf.

Tripartite Core Group 2008c, *Myanmar: Post-Nargis periodic review I*, Tripartite Core Group, viewed 30 December 2009, http://yangon.sites.unicnetwork.org/files/2013/05/PONREPP.pdf.

Tripartite Core Group 2008d, *Post-Nargis social impact monitoring (SIM 1)*, Tripartite Core Group, viewed 30 October 2008, https://emref.org/mm/publication/112

Tripartite Core Group 2010, *Post-Nargis periodic review IV: July 2010*, Tripartite Core Group, viewed 28 September 2012, http://reliefweb.int/sites/reliefweb.int/files/resources/B0F06845E98A406949257776001A4A56-Full_Report.pdf.

Tun, H 2016, *Improvement of meteorological observation system in Myanmar,* Department of Meteorology and Hydrology, viewed 9 January 2017,https://www.wmocimo.net/eventpapers/session4/posters4/P4(17)_Tun_Myanmar.pdf

Turnell, S 2012, 'Myanmar in 2011 confounding expectations', Turnell, S., 2012. Myanmar in 2011, *Asian Survey*, vol.52, no.1, pp.157-164.

Turnell, S and Vicary, A 2008, 'Parching the land?: The Chettiars in Burma', *Australian Economic History Review*, vol. 48, no.1, pp.1-25.

Turner, BL, Kasperson, RE, Matson, PA, McCarthy, JJ, Corell, RW, Christensen, L, Eckley, N, Kasperson, JX, Luers, A, Martello, ML and Polsky, C 2003, 'A framework for vulnerability analysis in sustainability science', *Proceedings of the national academy of sciences*, vol.100, no.14, pp.8074-8079.

Ungar, M 2003, 'Qualitative contributions to resilience research', *Qualitative social work*, vol.2, no.1, pp.85-102.

Ungar, M 2004, *Nurturing hidden resilience in troubled youth*, University of Toronto Press.

United Nations 2009, *Human security in theory and practice: an overview of the human security concept and the united nations trust fund for human security*, United Nations, viewed 11 June 2013,

http://www.un.org/humansecurity/sites/www.un.org.humansecurity/files/human_security_in_theory_and_practice_english.pdf.

United Nations Development Programme 1994, *Human development report*, United Nations Development Programme, New York.

United Nations Development Programme 2004, Reducing disaster risk: a challenge for development, UNDP-Bureau for Crisis Prevention and Recovery (BRCP), New York.

United Nations Development Programme 2010, 'Disaster risk reduction, governance and mainstreaming', United Nations Development Programme, viewed 20 April 2013, http://www.preventionweb.net/files/17429_4disasterriskreductiongovernance1.pdf.

United Nations Development Programme 2011, *Integrated household living conditions survey in Myanmar (2009-2010) - Poverty profile*, United Nations Development Programme, viewed 24 December 2011, http://www.mm.undp.org/content/myanmar/en/home/library/poverty/publication_1.html

United Nations Development Program 2015, *Local governance mapping: mapping highlights in Ayeyarwady region*, United Nations Development Program, viewed 8 January 2016, http://www.themimu.info/sites/themimu.info/files/documents/Highlights_Local_Governance_Mapping_Ayeyarwady_UNDP_Jan2015.pdf.

United Nations Economic and Social Commission for Asia and the Pacific 2010, *ICT for disaster risk reduction,* United Nations Asian and Pacific Training Centre for Information and Communication Technology for Development, viewed 12 September 2012, http://www.preventionweb.net/files/14338_14338ICTDCaseStudy21.pdf.

United Nations Economic and Social Commission for Asia and the Pacific 2015, *Strengthening regional multi-hazard early warning systems*, UNESCAP Committee on Disaster Risk Reduction, viewed 1 May 2016, https://www.unescap.org/sites/default/files/pre-ods/E_CDR4_2.pdf.

United Nations Economic and Social Commission for Asia and the Pacific 2016, Bridging the gap between development and finance, viewed 14December 2016, http://www.unescap.org/resources/bridging-gap-between-development-and-finance.

United Nations Educational, Scientific and Cultural Organization 2008, *Human security: approaches and challenges*, the United Nations Educational, Scientific and Cultural Organization, Paris.

United Nations Environment Programme, 2009, *Learning from Cyclone Nargis: investing in the environment for livelihoods and disaster risk reduction*, United Nations Environment Programme, viewed 12 June 2012, https://wedocs.unep.org/bitstream/handle/20.500.11822/14116/myanmar_cyclonenargis_case_study.pdf?sequence=1&isAllowed=y.

United Nations General Assembly 2009, *Implementing the responsibility to protect Report of the Secretary-General,* United Nations, viewed 9 May 2014, http://responsibilitytoprotect.org/implementing%20the%20rtop.pdf.

United Nations General Assembly 2012, *Resolution adopted by the General Assembly on human security*, United Nations, viewed 9 May 2014, http://www.un.org/humansecurity/sites/www.un.org.humansecurity/files/hsu%20documents/GA%20Resolutions.pdf.

United Nations Human Settlements Programme, 2011a, *Lessons learned and way forward for resilient shelter interventions in rural Myanmar*, United Nations Human Settlements Programme, viewed 9 December 2012, https://www.unisdr.org/we/inform/publications/19769.

United Nations Human Settlements Programme, 2011b, *Cyclone shelter Assessment*, United Nations Human Settlements Programme, viewed 9 December 2012, http://www.humanitarianlibrary.org/sites/default/files/2014/02/cyclone_shelter-_summary_final.pdf.

United Nations International Children's Emergency Fund 2013, *Towards more child-focused social investments: snapshot of social sector public budget allocations and spending in Myanmar*, United Nations International Children's Emergency Fund, viewed 8 May 2014, https://www.unicef.org/myanmar/Final_Budget_Allocations_and_Spending_in_Myanmar.pdf.

United Nations International Children's Emergency Fund 2008, *UNICEF external situation report Myanmar cyclone Nargis*, UNICEF, viewed 5July 2008, http://reliefweb.int/report/myanmar/unicef-external-situation-report-myanmar-cyclone-nargis-25-jun-2008.

United Nations International Children's Emergency Fund 2011, *Myanmar multiple indicator cluster survey 2009 – 2010,* United Nations International Children's Emergency Fund, viewed 8 October 2013, https://www.unicef.org/myanmar/MICS_Myanmar_Report_2009-10.pdf.

United Nations International Children's Emergency Fund 2015, *Myanmar child-centered risk assessment*, United Nations International Children's Emergency Fund, viewed 3 May 2016, https://www.unicef.org/myanmar/Myanmar_Child-Centered_Risk_Assessment_(ENG).pdf.

United Nations International Strategy for Disaster Reduction 2009, *Building a 'Terminology'*, United Nations, viewed 15 June 2012, https://www.unisdr.org/we/inform/terminology.

United Nations International Strategy for Disaster Reduction 2005, *Hyogo Framework for Action 2005-2015: building the resilience of nations and communities to disasters,* International Strategy for Disaster Reduction, viewed 12

December 2013, http://www.unisdr.org/2005/wcdr/intergover/official-doc/L-docs/Hyogo-framework-for-action-english.pdf.

United Nations International Strategy for Disaster Reduction 2015*, Sendai Framework for Disaster Risk Reduction 2015 – 2030,* United Nations International Strategy for Disaster Reduction 2015, viewed 19 March 2016 http://www.preventionweb.net/files/43291_sendaiframeworkfordrren.pdf

United Nations Security Council 2015, 'A vital and enduring commitment: implementing the responsibility to protect Report of the Secretary-General', United Nations, viewed 1September 2016, http://www.un.org/en/preventgenocide/adviser/pdf/N1521764%202015%20SG%20Report%20R2P%20English.pdf.

United Nations Trust Fund for Human Security 2009, 'Human security in theory and practice: an overview of the human security concept and the united nations trust fund for human security', United Nations Trust Fund for Human Security, viewed 14 October 2015, http://www.un.org/humansecurity/sites/www.un.org.humansecurity/files/human_security_in_theory_and_practice_english.pdf.

United States Agency for International Development 2010, *An introduction to triangulation*, United States Agency for International Development, viewed 3 September 2014, http://www.unaids.org/sites/default/files/sub_landing/files/10_4-Intro-to-triangulation-MEF.pdf.

Uy, N, Delfino, RJP and Shaw, R 2016, 'Ecosystem-based disaster risk reduction: experiences, challenges, and opportunities in the post-2015 development agenda', in Uitto, JI and Shaw, R (eds), *Sustainable Development and Disaster Risk Reduction*, Springer Japan, pp. 119-142.

Venture, NCJ 2014, *Earthquake resilient lifelines: NEHRP research, development, and implementation roadmap*, National Institute of Standards and Technology GCR, pp.14-917, viewed 24 December 2015, http://www.nehrp.gov/pdf/nistgcr14-917-33.pdf.

Victoria, LP 2002, 'Community based approaches to disaster mitigation', proceedings of Regional Workshop on Best Practices in Disaster Mitigation: lessons learned from the Asian Urban Disaster Mitigation Program and other initiatives, 24-26 September 2002, Bali, Indonesia.

Villagran de Leon, JC 2012, 'Early warning principles and systems', in Wisner, B, Gaillard, JC and Kelman, I, *The Routledge Handbook of Hazards and Disaster Risk Reduction,* London: Routledge, pp.481-492.

Vincent, K 2007, 'Uncertainty in adaptive capacity and the importance of scale', *Global Environmental Change*, vol.17, no.1, pp.12-24.

Vogel, C and O'Brien, K 2004, 'Vulnerability and global environmental change: rhetoric and reality', Aviso, 13, pp.1-8.

Voice of America 2009, 'Indian forecasters gave Burma advance warning of Cyclone Nargis', Voice of America (online edition), viewed 12 December 2015, http://www.voanews.com/a/a-13-2008-05-07-voa32-66819297/374351.html.

Volker, A 1964, 'Deltaic area of the river Irrawaddy in Burma. Dacca symposium paper, no.1,' United Nations Educational, Scientific and Cultural Organization, viewed 12 November, 2015, http://unesdoc.unesco.org/images/0015/001539/153941eb.pdf.

Wai, S 2015, *Researching post-emergency recovery for very young children*, Doctoral Dissertation, Macquarie University.

Walker, P 2002, *Professionalism and commitment: the key to cooperation?*, International Federation of Red Cross, viewed 13 March 2012, http://unpan1.un.org/intradoc/groups/public/documents/apcity/unpan010598.pdf.

Webb, EL, Jachowski, NR, Phelps, J, Friess, DA, Than, MM and Ziegler, AD 2014, Deforestation in the Ayeyarwady Delta and the conservation implications of an internationally-engaged Myanmar, *Global Environmental Change*, no.24, pp.321-333.

Webster, PJ 2008, 'Myanmar's deadly daffodil', *Nature Geoscience*, vol.1, no.8, pp.488-490.

Weiss, TG and Badescu, CG 2010, 'Misrepresenting R2P and advancing Norms: an alternative spiral?', *International Studies Perspectives*, vol.11, no. 4, pp.354-374.

Wenger, DE, Dykes, JD, Sebok, TD and Neff, JL 1975, 'It's a matter of myths: An empirical examination of individual insight into disaster response', *Mass Emergencies*, vol.1, no.1, pp.33-46.

Wisner, B, Gaillard, JC and Kelman, I 2011, Framing disaster, in Wisner, B, Gaillard, JC and Kelman (et al.), *Routledge handbook of human security*, Routledge, London and Newyork, pp.18-34.

World Food Programme 2005, *Impact of the tsunami on the lives and livelihood of people in Myanmar with special focus on Labutta Township, Ayeyarwady Division,* World Food Programme, viewed 12 January 2015, http://documents.wfp.org/stellent/groups/public/documents/ena/wfp047016.pdf?iframe

Wikileaks 2008a, 'Burma: cyclone damage assessment', Canonical ID: 08RANGOON600_a, Created 2008 July 29, Origin: Embassy Rangoon, Classification: Unclassified, for official use only, viewed 17 June 2015, https://wikileaks.org/plusd/cables/08RANGOON600_a.html.

Wikileaks, 2008b, 'Burma: preparations for Cyclone Nargis', Canonical ID: 08RANGOON306_a, Created 2 May 2008, Origin: Embassy Rangoon, Classification: Unclassified, for official use only. Viewed 17 June 2015, https://wikileaks.org/plusd/cables/08RANGOON492a.html.

Wildavsky, A 1991, *Searching for safety*, Transaction Books, New Brunswick.

Win, NW, Calkins, PH and Schoch, D 2011, 'Impacts of a natural disaster on well-being, happiness and social capital in two Nagis-affected areas in Myanmar', *วารสารเศรษฐศาสตร์ มหาวิทยาลัยเชียงใหม่ (Journal of Economics Chiang Mai University)*, vol.15, no.1, pp.112-141.

Winderl, T 2014, 'Disaster resilience measurements stocktaking of ongoing efforts in developing systems for measuring resilience', UNDP viewed 14 October 2015, http://www.preventionweb.net/files/37916_disasterresiliencemeasurementsundpt.pdf.

Winkworth, G 2007, *Disaster recovery: A review of the literature*, Institute of Child Protection Studies.

Wisner, B 2003, 'Sustainable suffering? Reflections on development and disaster vulnerability in the post-Johannesburg world', *Regional Development Dialogue*, vol.24, no., pp.135-148.

Wisner, B 2006, *Let our children teach us*, United Nations International Strategy for Disaster Reduction (UNISDR), viewed 9 May 2013, https://www.unisdr.org/2005/task-force/working%20groups/knowledge-education/docs/Let-our-Children-Teach-Us.pdf

Woolcock, M 2001, 'The place of social capital in understanding social and economic outcomes', *Canadian journal of policy research*, vol.2, no.1, pp.11-17.

Woolcock, M and Narayan, D 2000, 'Social capital', *World Bank Research Observer*, vol.15, no.2, pp.225-249.

World Bank 1999, *An economic and social assessment*, World Bank, viewed 3 March 2013, from http://www.burmalibrary.org/reg.burma/archives/199912/msg00702.html.

World Bank 2010, *Nutrition at a glance: Myanmar*, World Bank, viewed 5 September 2013, http://siteresources.worldbank.org/NUTRITION/Resources/281846-1271963823772/Myanmar.pdf.

World Bank 2014, *Ending poverty and boosting shared prosperity in Myanmar*, World Bank, viewed 15 December 2014, http://documents.worldbank.org/curated/en/871761468109465157/pdf/930500CSD0P150070Box385388B00OUO090.pdf.

World Food Programme 2005, *Impact of the tsunami on the lives and livelihood of people in Myanmar with special focus on Labutta Township, Ayeyarwaddy Division.*World Food Programme, viewed 12 January 2015 http://documents.wfp.org/stellent/groups/public/documents/ena/wfp047016.pdf?iframe.

World Health Organization 2014, 'The Republic of The Union of Myanmar health system review', *Health Systems in Transition*, vol.4, no.3.

World Meteorological Organization 2005, *Guidelines on integrating severe weather warnings into disaster risk management*, World Meteorological Organization, viewed 8 November 2011, https://www.wmo.int/pages/prog/amp/pwsp/pdf/TD-1292.pdf.

World Meteorological Organization 2008, *WMO network provided timely cyclone alerts to Myanmar, needs resources for improving storm surge warnings*, World Meteorological Organization, viewed 4 May 2012, http://reliefweb.int/report/myanmar/wmo-network-provided-timely-cyclone-alerts-myanmar-needs-resources-improving-storm

World Meteorological Organization 2009, *WMO fact-finding mission to Myanmar,* World Meteorological Organization, viewed 8 November 2011, https://www.wmo.int/pages/prog/dra/rap/documents/MyanmarMissionReport.pdf.

World Meteorological Organization 2010, *Guidelines on early warning systems and application of nowcasting and warning operations*, World Meteorological Organization, viewed 8 November 2011, https://www.wmo.int/pages/prog/amp/pwsp/documents/PWS-21.pdf.

World Meteorological Organization 2011, *Manual on flood forecasting and warning*, World Meteorological Organization 2011 viewed 12 May 2016, http://www.wmo.int/pages/prog/hwrp/publications/flood_forecasting_warning/WMO%201072_en.pdf.

Xinhua 2006, 'Myanmar to introduce global telecom system in data exchange', *Xinhua* (online edition), 20 October, viewed 11 June 2013, http://en.people.cn/200610/20/eng20061020_313815.html.

Yan, W 2016, 'Why Myanmar jailed mangrove activists', *Jstor Daily* (online edition), 20 April, viewed 11June 2016, http://daily.jstor.org/why-myanmar-jailed-mangrove-activists/.

Yin, RK 2004, *Case study methods*. COSMOS Corporation, viewed 12 August 2013, http://www.cosmoscorp.com/Docs/AERAdraft.pdf.

Young, KB, Cramer, GL and Wailes, EJ 1998, 'An economic assessment of the Myanmar rice sector: Current developments and prospects', *Research Bulletin*, no. 958, Arkansas Agricultural Experiment Station, Division of Agriculture University of Arkansas, viewed 7 July 2013, http://arkansasagnews.uark.edu/958.pdf

Zakour, MJ and Gillespie, DF 2013, *Community disaster vulnerability: theory, research, and practice*, Springer Science and Business Media.

Zarni, M 2005, 'An integrated approach to national and human security issues in Myanmar or Burma', paper presented at the International Conference on Civil Society, Religion and Global Governance, Australian National University, viewed 12 July 2014, http://www.freeburmacoalition.org/integratedsecurityapproach.htm.

Zaw, A 2000, 'Human security in Burma', *The Irrawaddy*. Viewed 1 July 2015, http://www2.irrawaddy.com/article.php?art_id=2060.

Zillman, JW 2003, 'Meteorological and hydrological early warning systems', in Zschau, J and Küppers, AN (eds), *Early Warning Systems for Natural Disaster Reduction,* Springer Berlin Heidelberg, pp.135-164.

Zin, M 2013, 'National security is no excuse for bad behavior', *The Irrawaddy* (online edition) 21 March, viewed 22 March 2015, http://www.irrawaddy.com/contributor/national-security-is-no-excuse-for-bad-behavior.html.

Zwitter, A and Lamont, C 2014, *Humanitarian action: global, regional and domestic legal responses,* Cambridge: Cambridge University Press, p. 349-374.