Impacts of multiple hazards on small island communities: Perspectives from North Sulawesi, Indonesia

Thesis submitted by
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PROLOGUE

Siau Island, together with other islands off the northern tip of North Sulawesi has distinct features as part of the Wallacea region. I first visited Siau Island in late 2000 in transit on my way to Sangihe Island to supervise a CBDP (Community-Based Disaster Preparedness) program led by the Indonesian Red Cross (PMI-Palang Merah Indonesia). I saw the magnificent active volcano, Mount Karangetang, for the first time and felt amazed and wondered why people who live on that island can survive with the continuous risk of eruptions and earthquakes.

When I was awarded the Australian Award Scholarship (AAS) in 2010, I decided to study small islands and the capacity of their inhabitants to deal with these multiple hazards. I decided to focus on Siau and other islands in North Sulawesi Province. As a Manadonese who grew and lived on the mainland of Sulawesi and having an academic background in marine studies and being an active member of the Indonesian Red Cross since 1988 the study of disasters on small islands had become a passion.

In December 2011, I finally visited Siau Island as a researcher. I also visited several other islands, including Ruang Island and Lembeh Island. The sea was often rough and sometimes dangerous for travelling in December and January. I became stranded for several days by bad weather on Tagulandang Island whilst trying to get a boat to Ruang Island. That experience motivated me to explore the lives and livelihoods of the people who live in that hazardous location. What are the resources the people use to face all the hazards that impact upon small island environments? This research is an attempt to answer that question.

STATEMENT OF THE CONTRIBUTION BY OTHERS

Publications

Chapter #	Details of publication(s) on which chapter is based	Nature and extent of the intellectual input of each author
3	*Engaging communities in managing multiple hazards: Reflections from small islands in North Sulawesi, Indonesia* Singapore Journal of Tropical Geography Accepted An earlier version of this paper was presented at the Institute of Australian Geographers & The New Zealand Geographical Society (IAG/NZGS) Conference 2014, University of Melbourne and was awarded an "Outstanding Presentation by a Postgraduate Student"	Rampengan, Law, Gaillard, Boedihartono and Sayer I designed the study, collected and analysed the data, developed the argument and wrote the article. Dr Lisa Law, A/Prof J. C. Gaillard, Dr A. K. Boedhihartono and Prof Jeffrey Sayer variously assisted with the argument, design of the study, developing the approach and assisted with the article writing and editing.
4	Rampengan, M. M. F., Boedhihartono, A., Law, L., Gaillard, J. C., & Sayer, J. 2014. *Capacities in Facing Natural Hazards: A Small Island Perspective*. International Journal of Disaster Risk Science, 5(4), 247-264. DOI: 10.1007/s13753-014-0031-4 An earlier version of this paper was presented at the Institute of Australian Geographers (IAG) Conference 2013 , University of Western Australia, Perth.	Rampengan, Boedhihartono, Law, Gaillard and Sayer I designed the study, collected and analysed the data, developed the argument and wrote the article. Dr A. K. Boedhihartono, Dr Lisa Law, A/Prof J. C. Gaillard and Prof Jeffrey Sayer variously assisted with the argument and design of the study and assisted with the article writing and editing.
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ABSTRACT

Communities on small islands are often characterized as vulnerable and marginalized. The small size and isolation of these islands allegedly exposes them to a wide range of internal and external hazards. Additionally, many small islands are located in peripheral geographical locations and are socioeconomically and politically marginal. Risks to communities inhabiting these places are thus understood as stemming from exposure to hazards, especially as compounded by a marginal status that reduces the ability to deal with emergencies and environmental changes – including those that have socio-economic impacts. In response to these 'problems', external intervention in these communities tend to portray "at risk" communities in particular ways, often failing to appreciate the specificity of the locality and of the community strategies that help buoy community strength.

Using mainly participatory methods and other conventional forms of data collection (semi-structured interviews, observation and secondary data), this research explores the capacities of three villages on three different small islands (Siau Island-Kinali village, Ruang Island-Laingpatehi village, and Lembeh Island-Mawali village) in North Sulawesi, Indonesia. The difference between these island villages is striking, especially the islands' geographical context and economic activities, which focus on fishing (Laingpatehi village), farming (Kinali village) and diversified strategies of wage labour/farming/fishing (Mawali village). Ruang is an active volcanic island, which results in limited physical space for housing and farming. Siau has one of the most active volcanoes in Indonesia: Karangetang. Mawali is close to Bitung on the mainland of Sulawesi with its international seaport and industries.

The conceptual framing of the research is bolstered by discussions of 'capacity' as a framework to understand locality and the interlinked nature of resources in communities. This capacity documented in this research was assessed from a sustainable livelihoods perspective that identified the 'assets' that enabled villagers to cope with hazards and other constraints. This overall research approach enabled communities to speak of their capacities, and promoted ways of speaking about the communities that focused on strengths and resourcefulness. This framework is a particularly useful approach for small island research. It moves beyond the standard 'vulnerability' or 'needs assessment' approach which tends to fuel undeliverable expectations of funding and focuses on a negative rather than a positive outcome.

A central tenet of community capacity in this research was a strong social cohesion enabling the community to organize and confront hazards and other constraints. A diversified livelihood

strategy drawing on the small island environment and its coastal and marine resources, on non-rural-based modes of livelihoods and on remittances from other parts of Indonesia (and abroad) underpinned people's lives. Government assistance only played a supporting role. In the case of small islands in North Sulawesi, remoteness -- rather than being a source of vulnerability -- provides access to valued resources and facilitates innovation. As such, these communities have adopted strategies that enable them to prosper in spite of the risks of living on a small island with an active volcano, limited arable land, plant diseases, depletion of fish resources and other natural hazards.

This research explores these issues in detail, making a case for appropriate responses to help small island communities to cope with disasters. I used participatory methods that position villagers as agents with capacities. In so doing, I made recommendations about future Disaster Risk Reduction (DRR) strategies, arguing there should be more emphasis on reinforcing the existing capacities of communities rather than on physical protection and post-disaster responses.

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CHAPTER 1

BACKGROUND AND OBJECTIVES OF THE STUDY

This chapter explains the background of my research on capacities of small island communities to face various hazards. It explores general studies of small islands and the importance of exploring local capacities based on islanders' understanding. This chapter also explores the potential role of local capacities in disaster risk reduction in the context of Indonesia and explains the research objectives.

1.1 Introduction

One of the overriding themes in disaster research about small islands is extreme susceptibility to hazards. This emphasis often entrenches pessimistic views regarding the capacity of small island communities to withstand current and future hazards. Understanding the constraints of small island living is important and necessary, but in casting the spotlight on weaknesses, researchers tend to neglect community strength. This presents an incomplete picture of the situation and any solutions offered for bolstering resilience rest on inadequately conceptualized ground. The subsequent image is of a vulnerable place in need of outside assistance and support to address their complex situation.

Markku Niskala, the Secretary General of the International Federation of Red Cross and Red Crescent (IFRC) has stated that "If we focus only on needs and vulnerabilities, we remain locked in the logic of repetitive responses that fail to nurture the capacities for resilience contained deep within every community" (IFRC 2005, 9). This study takes this assertion seriously and presents an alternative image for small island communities; that is, this study seeks out and identifies capacities that make up resilience. While it is extremely difficult to generalise within or across regions, this study draws on the experiences of small islands in eastern Indonesia presuming there are significant common issues facing other small islands in other places around the world.

1.1.1 Small island communities: Vulnerabilities and capacities

Many small islands face disadvantages associated with their small land area and susceptibility to more diverse and numerous hazards than larger islands and mainland areas (Briguglio 1995; Kelman & Lewis 2005; Lewis 2009). Several studies have documented the impacts of disasters

on small island regions (Briguglio 1995; Méheux, Dominey-Howes & Lloyd 2007) and concluded that small islands are more vulnerable than non-island locations. This consideration is even outlined in the Hyogo Framework for Action 2005-2015: "Disaster-prone developing countries, especially least developed countries and small island developing states, warrant particular attention in view of their higher vulnerability and risk levels, which often greatly exceed their capacity to respond to and recover from disasters" (International Strategy for Disaster Reduction 2006, 5).

Though classified as vulnerable places, small islands are also commonly neglected in disaster responses. Wisner et al. (2012) explain that small, isolated communities often receive no support or even acknowledgment that a disaster might have occurred. For example, the best known international data-based EM-DAT (The International Disaster Database-Centre for Research on the Epidemiology of Disaster) excludes disasters that happen in marginal areas such as small islands with small populations. Their data are based upon government declared emergencies and requests for international assistance and only include disasters where 10 or more people are reported killed and 100 or more people are affected. But small islands tend to play marginal economic and political roles and are removed from social, economic and political power. Indeed, their peripheral locations tend to exacerbate how affected they are by hazards. Therefore, community risk stems from exposure to multiple hazards in addition to a marginal status that reduces the ability to deal with emergencies and sustain livelihoods. These risks combine with other factors in disaster management such as the absence of warning systems and institutional delays in evacuation and the distribution of basic relief support (Terry & Goff 2012; Wisner et al. 2004). It is for this reason they are often portrayed as paralysed and helpless, saved only by the aid of outsiders (IFRC 2005).

However, small island communities have survived for generations in marginal, hazard-prone locations. They play the role of first responder and have endured a variety of hazards. Small island communities continue to live in coastal and small island situations because of the significant benefits they derive from the resources available. The benefits, in their view, outweigh the risks. Another reason perhaps they do not perceive alternatives. Nevertheless, the hazards that trigger disasters are regular occurrences and these communities have therefore developed capacities for co-existence with regular environmental shocks and risks. These hazards are regarded as a common fact of life (Kelman et al. 2011; Lewis 2009), and communities are aware that their survival in the longer term is dependent on these capacities.

Some data exist regarding the local capacities that help communities cope with hazardous events (cf Campbell 1984; Gaillard et al. 2008; McAdoo et al. 2006; Spillius 1957). Related literature suggests that communities living in disaster prone places have the capacity to survive and prosper in the face of potentially disastrous events and their aftermath (Burton, Kates & White 1993; Davis, Haghebeart & Peppiatt 2004). This dissertation builds on and

extends these dicussions, while at the same time holding the balance between vulnerability and capacity in tension.

1.1.2 Small island studies: Researching empirical evidence for disaster responses

The formal study of islands has evolved over centuries rather than decades. There is abundant evidence from many disciplines that island studies have made significant contributions to non-island situations. Darwin's theory of evolution, for example, was based upon the study of speciation amongst Galapagos finches (Francis 2007). The behaviour of the earth's surface studied by William Green in 1857, continent-ocean geometry by Mantovani in 1889 and the expanding earth hypothesis by Sam Warren Carey in 1976 are examples of islands-based studies (Nunn 2004). The study of culture and modernity by Margaret Mead (1901–78) in her first book *Coming of Age in Samoa* is another contribution of an island-based study (Mead 1923).

Island studies are rooted in different disciplines. These include studies of: natural resource management such as fisheries (Adams 1998; Ebbin 2009), forestry and agriculture (Arnberger & Arnberger 2001; Drew 2008; Vergara & Nair 1985); biodiversity and conservation (Baldacchino & Niles 2011; Fordham & Brook 2010; Pungetti 2012); economies (Briguglio 1995; Grydehøj 2011; Hein 1990); migration and culture (Connell 2010; Julca & Paddison 2010; King 2009); and the study of islands on their own terms, better known as 'nissology' (Baldacchino 2008; Christensen & Mertz 2010; Hay 2006; McCall 1994). Of particular relevance here is the literature focusing on hazards and disasters in island contexts (Gaillard et al. 2008; Kelman et al. 2011; Lewis 1990, 1999; Maceda et al. 2009; Pelling & Uitto 2001). Indeed, the studies of island contexts are numerous and Bayliss-Smith et al (1988, 283) argue that: "Islands offer an exceptional opportunity to study, under relatively controlled conditions, the entire spectrum of ecological, demographic, economic and social factors that influence population-environment relationships".

While island studies have wider relevance, and provide an excellent context for integrated studies of managing and understanding multiple hazards and their impacts, it is also important to remember the need to study islands from the perspective of the islanders themselves. As Nunn (2004, 311) has observed "... oceanic island environments have been interpreted for the global community through the eyes of continental dwellers rather than by the inhabitants of these islands". The present study therefore explores the capacities of island communities in facing hazards through the lens of local voices and perceptions.

1.1.3 Local voices, local capacities: A capacities framework for understanding how small island communities deal with multiple hazards

Grant McCall has suggested the term 'nissology' for island research, defined as "the study of islands on their own terms" (McCall 1994). Nissology derives from the Greek words for island (*nisos*) and study of (*logos*) and McCall (1994) suggests there are eight characteristics that provide a framework for island research. The first four elaborate the geo-physical setting while the last four address the social context of islands, although McCall argues that the physical nature of islands cannot be separated from their social and cultural environments. These characteristics of islands will be elaborated more fully in the next chapter.

Nissology is a science dedicated to better understanding islands and their related issues (Hay 2006) with the objective of researching islands 'on their own terms'. This difference from classical studies by continental dwellers is stressed by Epeli Hau'ofa, a professor from the University of the South Pacific, who argues: "There is a world of difference between viewing the Pacific as 'islands in a far sea' and as 'a sea of islands'. The first emphasizes dry surfaces in a vast ocean far from the centers of power. Focusing in this way stresses the smallness and remoteness of the islands. The second is a more holistic perspective in which things are seen in the totality of their relationships" (Hau'Ofa 1993). Hau'Ofa's profound insight underlines the importance of local community perceptions.

Of relevance to this study is the fact that island peoples often have no vocabulary/term for 'vulnerability' in their local dialects (Heijmans 2004). This is despite the fact that hazards are regular occurrences and disaster responses are integrated into day-to-day lives and livelihoods (Bankoff, Frerks & Hilhorst 2004; Kelman et al. 2011; Lewis 2009). Island people instead have traditions that underpin the fabric of their societies and enable them to cope with disasters. This study therefore adopts an approach that focuses on the resourcefulness and strength of such communities. Such an approach also strengthens people's self-confidence, which can be helpful in developing positive feedback loops, a 'virtuous circle/cycle', in a way that contrasts with the 'vulnerability' and 'needs assessment' approaches common to government and non-government organisations. As discussed in more detail below, the ethos of these organisations tends to focus their research on determining needs and weaknesses in the community. This can sometimes fuel undeliverable expectations of funding.

The undergirding approach of this study is guided by an assumption that disaster risk management must be based on an in-depth understanding of community capacities. This approach was enabled partly through the use of participatory methods embedded in data collection but also through the study's conceptual framing around 'capacity'. Participatory methods were 'used with' rather than 'applied to' local communities, and thus took into account the priorities and perspectives of the communities (Chambers 1994, 1997; Chambers 2002; Rahman & Fals-Borda 1991). Top-down approaches may fail to take into account locality and

context (Chambers 1994; Ivanitz 1999). Participatory methods have been widely used for research on small island communities (Kelman et al. 2011; Mercer et al. 2008). This enables engagement with 'at risk' people and embraces their local knowledge (Mercer et al. 2009; Mercer et al. 2010). Participatory methods also enable people to use their own words and frameworks to investigate particular topics (Chambers 1994b).

Capacity is also a central concept for this study, as it helps frame the research around local perceptions and livelihoods. Capacities in this study are understood as "the set of knowledge, skills and resources people resort to in dealing with natural hazards and disasters" (Cadag & Gaillard 2013, 269). How communities utilize such resources in facing hazards is an integral part of day-to-day life and these resources are interlinked (Sayer & Campbell 2004). Capacities are therefore a combination and integration of resources that enable households/communities to face hazards. This study adapts a framework developed by Wisner et al. (2012) to understand these issues through the prism of sustainable livelihoods. The capacity to deal with multiple hazards is thus understood through community livelihood strategies (Binternagel et al. 2010; Cannon, Twigg & Rowell 2003; Chambers & Conway 1992; Coulthard 2008; Ellis 1999; Gaillard & Le Masson 2007; Gaillard et al. 2009; Mula 1999; Sanderson 2000; Scoones 1998; Twigg 2001). These strategies enable a reduction in risks, so households/communities can continue their lives and maintain their culture. Culture itself acts as social glue that holds local communities together in facing disturbances (Anckar & Anckar 1995; Giavelli & Rossi 1990; Skelton 2007). Indeed, and as this thesis goes on to show, livelihood diversity combined with socially cohesive communities enables communities to "live with risk" (Tobin 1999; UNISDR 2004). A more detailed explanation of the framework will be discussed in the next chapter.

1.2 Potential role of local capacities in disaster risk reduction (DRR): The Indonesian context

Earthquakes, volcanic activity, tsunamis, floods, landslides, erosion, droughts, and extreme weather events are regular occurrences in the Indonesian archipelago (Badan Nasional Penanggulangan Bencana 2010; Badan Perencanaan Pembangunan Nasional 2010; Kurniawan et al. 2011). Indonesia is situated at the meeting point of three active tectonic plates, the Indo Australian plate (south), the Euro Asian plate (north) and the Pacific plate (east). The three plates are moving to create a seismic line and a ring of active volcanos along Sumatera, Java, Bali and Nusa Tenggara Islands, turning north to the Moluccas and North Sulawesi (Badan Nasional Penanggulangan Bencana 2010). Indonesia is therefore one of the top countries for suffering disasters in the world (see the "Annual disaster statistical review 2012: The numbers and trends", published by EM-DAT [The International Disaster Database-Centre for Research

on the Epidemiology of Disaster]) (Guha-Sapir, Hoyois & Below 2013). In 2012, Indonesia accounted for 38.1% of total world disasters together with China, the United States, the Philippines and Afganistan (Guha-Sapir, Hoyois & Below 2013). As discussed above, EM-DAT reports tend to exclude marginal areas in Indonesia, which only strengthens the report's assertion that Indonesia is a seriously disaster-prone area.

The government of Indonesia has disaster management strategies and plans and many international agencies have made significant contributions to disaster preparedness programmes, response activities, hazards mitigation and vulnerability reduction in Indonesia in recent years (Badan Nasional Penanggulangan Bencana 2010; Badan Perencanaan Pembangunan Nasional 2010; Telford, Cosgrave & Houghton 2006). However much of the disaster response has been criticised for its high cost and relative ineffectiveness. The response to the 2004 Tsunami in Sumatera was particularly problematic with slow response times, duplication of efforts, inappropriate investments and general inefficiency (Mashni et al. 2005; Pomeroy et al. 2006). Set against this is the considerable evidence that the local communities' response to the tsunami was relatively effective (Gaillard et al. 2008; Kurita et al. 2007; McAdoo et al. 2006). The community in Simeulue Island, about 100 km off the shore of Sumatera, used local knowledge and experience passed down through generations to manage the tsunami's impact. Indeed, small island communities inhabiting hazard-prone areas exhibit adaptive strategies that help them deal with environmental phenomena, based on their own capabilities, skills, local knowledge, technologies and solidarity networks (Campbell 1984; Gaillard 2007; Gaillard & Le Masson 2007; Hovgaard 2000). These strategies are part of their traditions and culture.

The Indonesian National Development Planning Board (Bappenas) moreover acknowledges government limitations, identifying fields that are particularly lacking: human resources; dissemination of disaster management laws and regulations; disaster management plans and regional action plans for DRR at the level of local governments; and DRR mainstreaming in development planing and training (Badan Perencanaan Pembangunan Nasional 2010). Therefore, there is a lack of government capacity to reach and respond in a timely manner to all hazardous events that occur throughout the Indonesian archipelago (Pribadi & Mariany 2007; Sirimorok & Puthut 2010). These limitations serve to underline the need to exploit existing capacities of local communities. This is important as local people are the first responders to disaster events and the success of their response is dependent on their endogenous capacity.

1.3 Thesis objectives

Given the issues presented above, the purpose of this study is to explore small island communities' capacities in facing multiple hazards. It presents insights into how these

communities marshall their resources, especially how livelihoods adapt to hazardous situations. The thesis is organised around four research objectives/questions:

1. What are the best methods for understanding the 'livelihood capacity' of communities in disaster prone regions?
2. How can disastrous events inspire innovations in livelihood systems?
3. What specific contributions can agroforestry, and its management by communities, offer disaster prone regions?
4. What are the changing economic and social/cultural dynamics shaping livelihood capacity?

These questions rest on an assumption that small island communities have well developed capacities in facing multiple hazards through the use of their livelihood resources. A capacity framework and various participatory methods have therefore been employed, and a livelihood approach entails an overall analytical process that examines livelihood strategies and their dynamics over time.

1.4 Structure of the thesis

This thesis is presented as a series of chapters that have been written in a format that facilitates publication in peer-reviewed international journals. This thesis includes one published, two accepted and one submitted papers, each of which addresses components and dimensions of the capacities of small islanders when facing multiple hazards. The papers analyse fishing, farming and the mobility of small islanders as a basis for livelihood strategies. Each paper can be seen as providing a different insight into livelihoods of small island communities. Taken together the papers provide a broad picture of islanders' capacities and their interrelationships, as well as the diverse activities that take place on different islands (Figure 1.1).

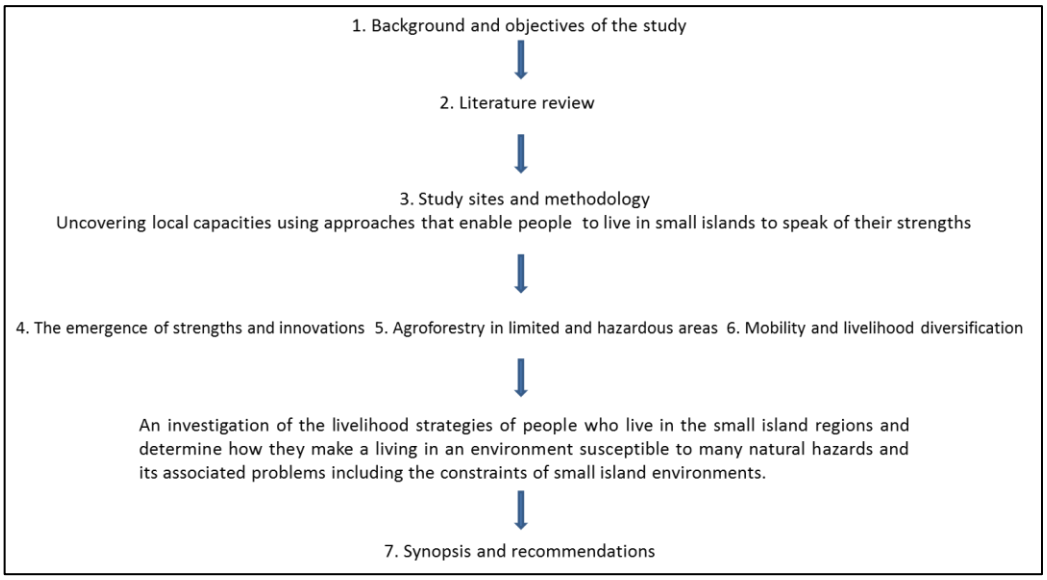


Figure 1.1 Outline of this thesis

Chapter 1 is an introduction to the general backround and rationale of the study, including the thesis objectives.

Chapter 2 is a literature review that examines the nature of small island environments, sustainable livelihoods and natural hazards, as well as perspectives on small islanders' vulnerability and capacity in disaster studies.

Chapter 3 describes the study locations as well as the methodology used for the research. The study is primarily based on three fieldwork periods on small islands in North Sulawesi Province, eastern Indonesia, and this chapter sets out their geographical position and biophysical environment, and historical background of the villages where fieldwork was carried out. Part of this chapter has been accepted for the *Singapore Journal of Tropical Geography*. I analysed the data, developed the argument and wrote the article. Dr Lisa Law, A/Prof J. C. Gaillard, Dr A. K. Boedhihartono and Prof Jeffrey Sayer variously assisted with the argument, design of the study, developing the approach and assisted with the article writing and editing.

The next three chapters present various capacities of small island communities in Ruang, Siau and Lembeh Islands respectively.

Chapter 4 describes the capacity of Laingpatehi village on Ruang Island in facing multiple hazards. It describes the constraints of a volcanic island environment and shows how such constraints facilitate the innovations and strengths in livelihood strategies. This chapter has been published in the *International Journal of Disaster Risk Science* (2014) 5:247–264. I designed

the study, collected and analysed the data, developed the argument and wrote the article. Dr A. K. Boedhihartono, Dr Lisa Law, A/Prof J. C. Gaillard and Prof Jeffrey Sayer variously assisted with the argument and design of the study and assisted with the article writing and editing.

Chapter 5 focuses on agroforestry resources and their traditional management in Kinali village, Siau Island. Through these agroforestry resources and distinctive traditional agroforestry management, Kinali villagers are able to cope with volcanic eruptions and associated hazards. This chapter has been accepted for the *Geographical Research*. I designed the study, collected and analysed the data, developed the argument and wrote the chapter. Dr A. K. Boedhihartono, Prof C. Margules, Prof Jeffrey Sayer, Dr Lisa Law, and A/Prof J. C. Gaillard variously assisted with the argument and design of the study and assisted with the article writing and editing. Ong Thi Ngan Tien and Tran Thi My Linh assisted the initial draft of the article and supported the transect walk data during the last field work.

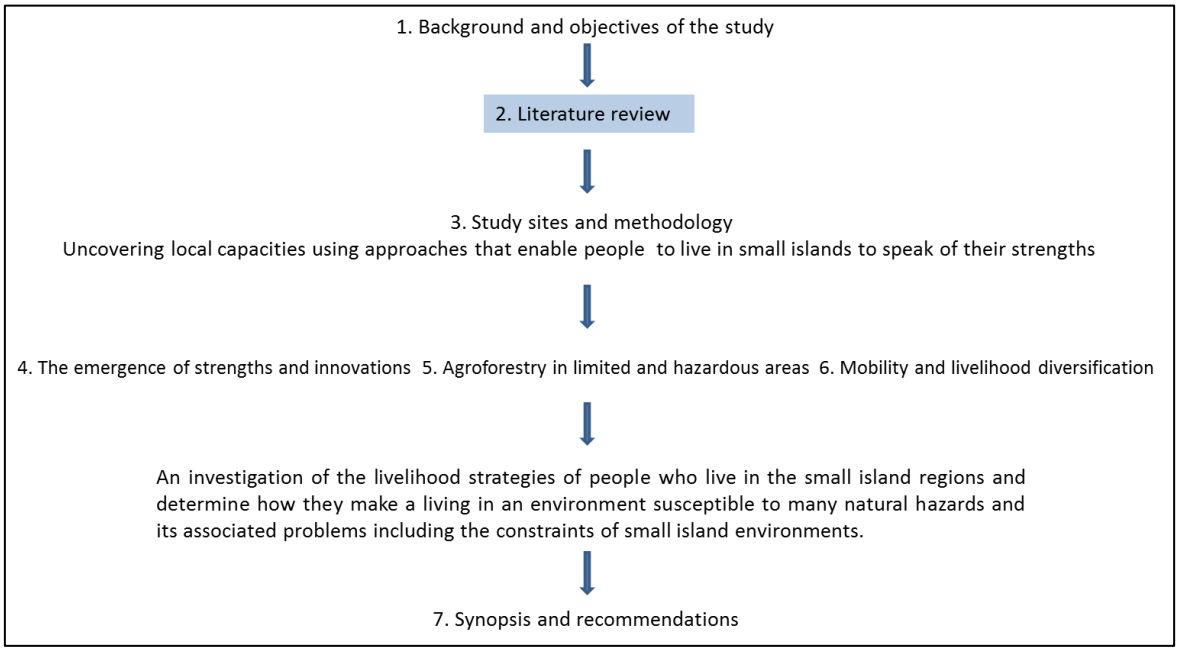
Chapter 6 examines the socio-cultural dynamics of Mawali villagers on Lembeh island and the hazards and environmental constraints faced by the population. The role of mobility in diversifying livelihood resources is examined. This chapter is in review in *Asia Pacific Viewpoint*. I designed the study, collected and analysed the data, developed the argument and wrote the chapter. Dr Lisa Law, A/Prof J. C. Gaillard, Prof C. Margules, Dr A. K. Boedhihartono and Prof Jeffrey Sayer variously assisted with the argument and design of the study and assisted with the article writing and editing.

Chapter 7 provides a synopsis, conclusions and recommendations. The synopsis sets out the overall framework of small island communities' capacities in facing multiple hazards in the context of environment constraints.

In the next chapter (Chapter 3), I introduce the field sites, methods, research framework and approaches used for the thesis. Because parts of Chapter 3, as well as Chapters 4, 5 and 6, are published, accepted or under review, the description of study sites and methods are compiled in Chapter 3 to avoid redundancy.

CHAPTER 2

NATURE OF SMALL ISLAND ENVIRONMENTS: NATURAL HAZARDS AND LOCAL CAPACITIES



Chapter 1 explained the background and objective of this thesis. In this chapter, I review the literature related to the nature of small islands, as well as past research on small islands, vulnerability and the capacities of people who live on small islands in facing various hazards. The chapter concludes with a discussion of livelihoods and how this focus helps address these issues.

2.1 Introduction

Although small tropical islands share many characteristics with the mainland, they are obviously confronted with additional specific environmental constraints including hazards. On these small land units, limited resources such as fresh water, arable land, and vegetation are able to be utilized by humans. These resources are also fragile and closely interconnected. To understand the way small island communities can survive under such complex conditions, especially facing hazards, it is important to know their capacities and how they deploy them in ways developed over centuries. In exploring these local capacities, it is important that the social dimension of the island's community is not separated from the geo-physical setting of the area

(McCall 1994). This chapter will therefore focus on the physical conditions of small tropical islands, as well as studies that examine vulnerabilities, capacities and the livelihoods of such communities.

2.2 Small islands in the tropics

The word 'tropics' is derived from the Greek word *trope* which means solstice (Arnberger & Arnberger 2001). The tropical area is situated between the Tropic of Capricorn and the Tropic of Cancer with an isotherm condition, meaning the daily fluctuation of temperature is higher than the annual ones (Arnberger & Arnberger 2001). However, other climatic features such as rainfall, in the tropics, are far from constant and have dynamic weather patterns including destructive forces such as tropical cyclones (Falkland 1992). In terms of geology, there are many different types of islands (Arnberger & Arnberger 2001; Falkland 1992; Thaman & Clarke 1993a), but for simplicity, in the tropics, small islands can be classified as being either volcanic, coral atoll, limestone, bedrock, unconsolidated or mixed in nature. According to their topography, small islands can be classified as being either high or low (Falkland 1992). Volcanic islands are commonly classified as high while atolls are low in elevation. The type of small island determines the structure of the land, which in turn will affect the livelihood resources of the people.

An island is defined by Cambers (2006) and King (2009) as an area of land surrounded entirely by sea regardless of its size. The term 'island' is defined further by Arnberger and Arnberger (2001). Discussion about the definition of island can also be followed in www.islandvulnerability.org. In this study, a definition from the International Convention on the Law of the Sea (UNCLOS) will be used. UNCLOS Article 121 of Part VIII defines 'island' 'as a naturally formed piece of land surrounded by water on all sides emerging above the surface of the sea at the highest tide, capable of sustaining human habitation or economic life on its own and whose dimensions are smaller than those of a continent' (Granger 1996). Several scholars subsume the term small tropical island (Bayliss-Smith et al. 1988; Beller 1990; Maul 1996) into the broader category of small islands. Though this study will focus on small tropical islands, some of the characteristics may be true for small islands in general.

The classification of the size of the islands however is not as simple as the classification of the island itself. Kakazu (2007) and Hau'ofa (1993) argued that smallness is a relative thing and not an absolute idea. Many authors have discussed the term 'small' using various criteria such as land area, population size, GNP/GDP (Gross National Product/Gross Domestic Product), etc. (Armstrong et al. 1998; Crowards 2002; Falkland 1992; Hess 1990; Kakazu 2007) depending upon the purpose of study. For this study, which focuses on small island communities' capacity to face multiple hazards in regards to their livelihood capacity; land and population size of an island are regarded as the most significant factors to classify smallness.

The size classification of 'small island' in this study is based upon a classification by the Indonesia Coastal and Small Island Management Act 2007 which considers small islands to be any island equal or less than 2,000 km^2 in area (Indonesia-CSIM 2007). This study has followed the common practice of referring to islands as small when they are less than 200 km^2 in area (Falkland 1992). This is consistent with the use of the Indonesian CSIM Act 2007. The categorization of islands based on their size is based upon the observation that because of their size they have special geological and distinct environmental features and unique problems, different to those commonly found on the continents (Falkland 1992). Moreover, the population size used in this study is based upon a classification used by Hess (1990). Hess categorized an island with approximately 500,000 or fewer people (in the context of islands with approximately 10,000 km^2 in size) as a small island (Hess 1990).

Most small tropical islands share common characteristics, in terms of size and isolation of the islands away from continents. They are the product of geologic structures and tectonic activities in origin (Granger 1996). These factors create distinctive biophysical conditions compared to the continental areas as Hess (1990) explains that small islands are specialized environments. This is because they have a larger proportion of endemic species, experience wave action from all sides to the land area, limited freshwater catchment areas, and fragile ecosystems (Briguglio 1995; Brookfield 1990; Falkland 1992; Fordham & Brook 2010; Giavelli & Rossi 1990; Hess 1990; Lugo 1990). Among co-existing ecosystems, there is strong interaction in such limited land area. The resource productivity and the environmental services that natural resources provide are therefore tightly connected to the neighbouring ecosystems (Giavelli & Rossi 1990; Lugo 1990; McElroy, Potter & Towle 1990). Lugo (1990) gives an example of that phenomenon through his study in the Eastern Caribbean relating to deforestation that in turn affects the estuarine and marine resources because of increasing soil erosion and sedimentation. So, agricultural success is achieved at the expense of a loss in fisheries. That phenomenon obviously will immediately negatively affect the area within a shorter time to reach ecological limits than on a bigger island or continent. It can be seen from the fact that in regards to extinction rates, there is a greater loss proportionally of endemic species in small island areas than in continental regions (Giavelli & Rossi 1990). This is because endemic species on small islands are very susceptable to extinction as discussed by Giavelli & Rossi (1990).

Hess (1990, 4) points out therefore that 'insular natural resources-waters, vegetation, soil, air, near shore systems and wildlife-ultimately dictate the capacity of an island to accept and sustain development'. Some small islands' natural resources have been severely depleted and great damage has been inflicted on their environment as a consequence of over-exploitation (Falkland 1992). Moreover, the limited supply of ground water of many coral atolls and limestone islands is susceptible to overpumping which can lead to unwanted increases in

salinity (Falkland 1992). This is a common feature of an island despite the developmental success of several islands with environmental resources playing an important role, such as for tourism (McElroy 2003; Scheyvens & Momsen 2008a) though there are many scholars who have studied the problems (i.e. environmental, agroforestry and agriculture, social and cultural issues) associated with tourism in general (i.e. Belsky 1999; Brigand, Fichaut & Le Demezet 1990; Butler & Hinch 2007; McElroy, Potter & Towle 1990; Stonich 1998).

Moreover, Briguglio (1995) discussed specifically the major economic vulnerabilities to forces outside their control faced by Small Island Developing States (SIDS) given by their islands' characteristics such as: *small size* (limited natural resources endowment and high import content, limitations on import-substitution possibilities, small domestic market and dependence on export markets, dependence on a narrow range of products, limited ability to influence domestic prices, limited ability to exploit economies of scale, limitations on domestic competition, problems of public administration), *insularity and remoteness* (high per-unit transport, uncertainties of supply, large stocks), *proneness to hazards* (cyclones/hurricanes/typhoons, earthquakes, landslides, volcanic eruptions), *environmental factors* (pressures arising from economic development, environmental characteristics of SIDS), and *other characteristics of SIDS* (dependence on foreign sources of finance and demographic factors). Another scholar, James Lewis explains that vulnerability of an island community may be exacerbated by the action of others and even from past exposure to hazards (Lewis 2009). Vulnerability has its roots in socio-economic and political conditions (Comfort et al. 1999; Torry 1978). Lewis (2009) argues that the dynamics of hazards in a small island situation interact synchronously even though they may originally have been asynchronous, such as in the case of how current vulnerabilities in Antigua and Tonga were driven by past activities. Therefore current policies and activities will in turn affect future vulnerabilities. This observation underlines the powerlessness of many island communities to protect themselves against the past and present actions of others who determine the exogenous hazards to which they are exposed (Campbell 2009; Lewis 2009). These biophysical, economic and political constraints are the common features of small islands discussed in much of the literature.

Around the Pacific, Atlantic, Indian Oceans and the Caribbean, there are an immense number of small islands. A number of nations especially in the tropics consist entirely of island archipelagos, such as Indonesia and the Philippines in South East Asia; the Cook Islands, the Federated States of Micronesia, Fiji, Kiribati, Solomon Islands, Tonga, Tuvalu, Western Samoa, and several others in the Pacific; the Maldives and Seychelles in the Indian Ocean and the Turks and the Bahamas in the Caribbean. The tropical islands in the Pacific and Indian Oceans are located in the southern hemisphere where a quarter of the population in the world live (Arnberger & Arnberger 2001) and most of the humid tropical island countries are among the

less wealthy countries with Singapore and Hong Kong being the exception (Falkland & Brunel 1993).

2.3 Islands and islanders: Researching small islands

The appropriateness of a small island to be studied for their islanders' livelihoods can be seen from a statement from Brookfield (1981) who focussed on processes coupling human beings, environment and development in the Outer Islands of Fiji. He states that: 'Islands are also considered very appropriate locations to study, under relatively controlled and finite conditions of human population dynamics, development and environment' (Brookfield 1981, 59). Another scholar, E. Clark from Lund University, Sweden points out the rationale behind focusing on islands as an appropriate field of study because of the islands' differences in size, diversity of natural resources, transport and relations to a hinterland (Clark 2009).

Baldacchino (2004) also explains another dimension of how to research and perceive islands by stating that, 'Island studies are not the mere study of events and phenomena on sites which happen to be islands – or, for better or worse, small islands…. Islands do not merely reproduce on a manageable scale the dynamics and processes that exist elsewhere. Islandness is an intervening variable that does not determine, but contours and conditions physical and social events in distinct, and distinctly relevant, ways' (Baldacchino 2004, 278). Communities of islands therefore cannot be perceived as locally bound, self-contained communities, they constitute instead part of the world of interconnected processes (Clark 2009). Therefore, Malm (2006) argues that Oceanian diasporas assure that their communities are not identical with people living in certain places, therefore 'Any analysis of the human ecology and development of contemporary Oceania must be made in light of the historical background and the relationship between the islands and the modern world system' (Malm 2006, 278)

To understand islands and their people, there are therefore eight characteristics of islands and islanders, which define and create a common ground for islands and people living on the islands, as suggested by McCall (1994) based primarily upon Pacific island examples. These characteristics are explained in his paper which introduces the term 'nissology' as the study of islands on their own terms. Nissology derives from the Greek word for island (*nisos*) and study of (*logos*) (McCall 1994). Further discussion about nissology is moreover expanded by several scholars ((Baldacchino 2008; Hay 2006). The island characteristics proposed by McCall (1994) could be divided into two parts. The first part is the geo-physical setting (characteristics one to four) and the social dimensions of the island's identity (the last four characteristics).

He argued that the physical nature of islands cannot be separated from their social and cultural influences. These characteristics are: (1) The land borders for islands are usually clearer

than for non-islands with the shore being a natural delimiter; (2) The sea resources of islands have a significant importance to their livelihood and constitute more surface area than the land resources; (3) Islands have a strategic position for continental dwellers as an outpost of influence and advance guard protection from other continental states; (4) The scarcity of land in the islands mirrors the scarcity of its terrestrial resources. It is a fundamental task of islanders to cope with these environmental constraints; (5) 'Island identity' is a social construct bound to the reality of discrete geographic existence of land. As such, the identity is conducive for an us vs them attitude for islanders when they relate to non-islanders. This intensifies when island sizes decrease; therefore he argues that (6) There is a sense of limitation socially and culturally bounded in the small size and scale of islands and this is emphasised when the people on small islands realize and mirror the outside world. However, the people of small islands do not perceive themselves as isolated by the sea as the sea is not a barrier but a part of their lives. But the contemporary global media village and the carving up of the world into sovereign states increases the sense of smallness and freedom of movement is less than it used to be; (7) They have high 'particularistic' social relations, such as regional, ethnic and kinship characteristics which strongly affect social interactions; and finally (8) Migration (either emigration or immigration) is a major preoccupation of islands. This activity is a systemic imperative built into the nature of islanders' ecological and social systems, thus migration is not an option, as they are aware of their boundedness in limited land areas and the increasing population.

McCall (1994) concludes that nissological knowledge should be multi-dimensional in its approach and duties, involving all four dimensions (height, width, depth and time) of the world in which we live. This is again because the physical and social characteristics of an island cannot be separated. "Height" means the results of this knowledge should be communicated to politicians and statesmen/women, national and international. The 'width' dimension means its work should be disseminated to the wider society. The dimension of 'depth' means this knowledge will deeply investigate even to the basic level of research, questions in the spirit of international science and the best traditions of collaborative academic scholarship. The last dimension is "time" which means publishing and explaining the findings for next generations.

The study of small islands has been evolving for centuries rather than decades. Many lessons learnt were achieved from island studies and can be valuable even for non-islanders in so many different directions and expressed through various disciplines (see Chapter One). All disciplines and studies demonstrate the diversity of island situations and can be useful for exploring differences from continental situations. In particular, related to the disaster research on islands, the pioneer scholars that focused on the advantages of studying islands are at the Bradford Disaster Research Unit. This unit was founded in the 1970's by the University of Bradford, UK by the Project Planning Centre under the head of Michael Gane, and James Lewis supported by the Leverhulme Trust (Lewis 2008). Ilan Kelman with other scholars, moreover

discussed disaster research on islands and its history in more detail in their paper entitled 'Participatory action research for dealing with disasters on islands' (Kelman et al. 2011).

2.3 Vulnerability of small islands to natural hazards

Small islands are nearly wholly coastal zones, and are identically well known as places of limited natural resources, remote and isolated areas, small population sizes, and vulnerable places, but they do not all share these characteristics to an equal extent. Newitt (1992) gives the example that one of the poorest people in the world live in Comoros while peoples from Bermuda or the Cayman Islands are among the richest. Nonetheless, many small islands are inherently classified as more vulnerable to natural hazards than continental areas (Briguglio 1995; Goff et al. 2011; Méheux, Dominey-Howes & Lloyd 2007).

The small size and scale of these islands makes them also fragile natural systems (Campbell 2009). This means that there is little space for miscalculation in the utilization and management of their resources, thus generally, they are thought to need a special status and require permanent support. This is reflected in the United Nations Framework Convention on Climate Change (Campbell 2009) and Sendai Framework for Disaster Risk Reduction (SFDRR) 2015 (UNISDR 2015).

There are several causes of the intrinsic vulnerability in small island developing states (Pelling & Uitto 2001) which is applicable generally to other small islands apart from very specific and individual conditions to be found among them. They summarized six distinct intrinsic vulnerabilities:

- Small size: lack of natural resources base, complex land use problems, tight links between human and environment systems, and spatial concentration of productive assets;
- Insularity and remoteness: high transportation costs, high price and time delays of goods from outside, lack of information access, and geopolitical weakness;
- Environmental factors: dominance of the coastal zones and small exposed interiors;
- Disaster mitigation capability: lack of hazards prediction capacity and lack of insurance;
- Demographic factors: lack of human resources, small population but population change is rapid, urban distribution is uneven and mostly people are concentrated in the coastal areas, high cost for building infrastructure and services; and
- Economic factors: small economies and internal markets, dependence on external financial support and natural resources, production is restricted to a small number of goods.

Despite the existence of small island stories in the different kinds of media that are mostly related to their beauty and romance and other stereotypical perceptions of island environments and their people, much academic literature describes small islands with their vulnerable status as their main characteristics (i.e. Briguglio 1995; Falkland & Brunel 1993; Lewis 2009; Méheux, Dominey-Howes & Lloyd 2007). For example, in the 1990s, small island literature started to give attention to environmental and economic vulnerabilities (Campling & Rosalie 2006). Their small size, remoteness, lack of natural resources and isolation allegedly exposes them to a wide range of hazards. Several studies have documented impacts of disasters on SIDS (Small Island Developing States) (Briguglio 1995; Méheux, Dominey-Howes & Lloyd 2007); these studies concluded that small islands are more vulnerable than non-small island areas. Pelling and Uitto (2001) developed an index of vulnerability of small islands using data from the EMDAT database from the Centre for Research and Epidemiology of Disasters, Louvain Catholic University, Belgium. The data show a higher disaster frequency and vulnerability status for small island populations. They are at risk not only because they are exposed to various hazards, but also because their marginal status (geographical periphery, socio-economic and politic) reduces their ability to deal with emergencies. They therefore tend to get no support or even acknowledgment of the occurrence of a disaster as stated by Wisner et al. (2012).

Much of the literature about small islands however appears to be informed by non-island people (Baldacchino 2008; Nunn 2004) which could overlook and give little appreciation to the value of resourcefulness of small island communities in responding positively, collectively and responsibly to various challenges including hazards. Vaioleti (2006) argues that research by local people allows more pure, real and authentic information that has more value and reality on local issues than research done by outsiders. In terms of the environment, small islands therefore have possibly been misunderstood, misrepresented and mismanaged thus causing the current threatened condition, adding more constraints for people who live in this limited land size. .

2.4 Capacities of small island communities in facing hazards

Are small islanders thus accursed by limited space and have no capacity to cope with all these various hazards? Hazards alone do not necessarily lead to disasters (O'Keefe, Westgate et al. 1976; Paton 2006; Kelman 2007; Ewing, Flick et al. 2010). This is because hazards themselves are regarded as a common fact of life (Lewis 2009; Kelman, Lewis et al. 2011). Hazards are normal and important for ecological and societal functions, such as a flood fertilizing land and providing water resources (Kelman 2007). Therefore, Kelman (2007) explains such events are termed hazards from a human viewpoint when people cannot cope with those events. Hewitt

(1983) describes each disaster as a disruption of the harmony of the relationship between humans and their habitat or natural resources. Disaster is thus the actual consequence or effect of hazard to humans, their livelihoods and environments. How about the capacity of people who live on small islands?

Discussion in the previous section has highlighted the weaknesses, victimhood and vulnerable conditions facing small island communities, but in fact fails to identify their capacities, strengths and innovations. This presents an incomplete picture of their situation and thus potential solutions which may be posed are unlikely to deal adequately with various constraints they face. This because we fail to explore the positive sides of islanders, which is their resourcefulness which enables them to survive and prosper. If small island communities are always described as a 'vulnerable' group of people, it implies a state of permanent dependency on outside assistance and support.

Small islanders can endure all the constraints of the small island environment including natural hazards depending on their local capacity. The capacity to reduce the impact of natural hazards has been recognized in several studies (Campbell 2006, 2009; Gaillard & Le Masson 2007; McAdoo et al. 2006; Schwarz et al. 2011; Veitayaki 2006). It is suggested that communities have traditions that have been built on beliefs and behaviours over long periods and underpin the fabric of their societies (Campbell 2009; Paton 2006) which enables them to cope with disasters (Campbell 2006). Capacity in this study is understood as 'the set of knowledge, skills and resources people resort to in dealing with natural hazards and disasters' (Cadag & Gaillard 2013. 269). Through their capacities, communities living in hazardous locations are able to persist and prosper (Burton, Kates & White 1993).

There are few references related to the small island communities' capacity to cope with hazardous events. The capacity of local communities in Papua New Guinea to reduce risk from natural hazards was described by Mercer et al. (2007), Kelman el al. (2009) and Waddell (1975, 1983). Several traditional societies such as in Tonga, the Philippines, Indonesia and the Solomon archipelago have also been shown as having the capacity to deal with various hazards (Gaillard 2007; Gaillard et al. 2008; Gaillard & Le Masson 2007; Lewis 1981; McAdoo, Moore & Baumwoll 2009). The small island community of Faroe Island deals with their isolation using their own resources (Hovgaard 2000). Other references can be found in several articles from various scholars (Campbell 2006, 2009; McAdoo et al. 2006; Schwarz et al. 2011; Veitayaki 2006).

Small islands have endured multiple hazards; nonetheless, they persist and prosper in living in coastal and small island situations, suggesting that they have the capacity to cope. Nevertheless, such hazards that sometimes create disasters are regularly occurring events for them (Bankoff 2004b; Kelman et al. 2011; Lewis 2009). They have distinctive strategies through their traditional measures that enable them to cope with disasters (Campbell 2006).

Essential strategies of small island communities, especially in the Pacific, rely on food security (storage and preservation, famine foods, production of surpluses, land fragmentation and agro-ecological biodiversity), settlement security (safe places and resilient structures), and inter/intra-community cooperation (inter-island exchange, ceremony and consumption control), therefore they were traditionally sites of people with capacities in facing hazards (Campbell 2009). Their everyday social lives form distinctive capacities of these communities in facing hazards. Therefore, social resources should be acknowledged as an important asset of these communities.

Small island communities commonly evolved distinctive cultures and retain a strong allegiance to their homeland and culture (Beller 1990; Giavelli & Rossi 1990; Hanson & Lamson 1990; Tuan 1974b). This social identity undoubtedly provides social advantages in facing disturbances whether these are cultural or natural (Giavelli & Rossi 1990), even though exogenously driven forces such as social, economic and technological intervention affect and often erode these cultures (Brookfield 1990; Campbell 2009; McElroy, Potter & Towle 1990). Social resources are clearly the strongest support and proven as a robust factor in helping people in small island to face hazards (i.e Gaillard et al. 2008; McAdoo et al. 2006). This social asset is often overlooked in the efforts and programs to deliver necessary physical and material aid to disaster affected people, and also in response and preparedness to disasters. Therefore, a study of social resources of small island communities may provide insight into the ability of these people 'to respond quickly and flexibly to exogenous changes and shocks' and 'provide an insight into the 'resilience' which counters the alleged structural vulnerabilities of such sites' (Baldacchino 2005, 34).

The role of culture as a social resource in forming the human-hazards interaction in hazard research, however is often rejected (Hewitt 1983, 2007) despite the progress in considering socio-political perspectives rather than only the technocratic ones (Wisner et al. 2004). Communities commonly perform strong local cultures that facilitate concerted social action (Mitchell 1995) to address an inherently difficult environment. Mercer et al. (2012) moreover explain that culture plays a significant role in shaping the concern and action in risk reduction action. Social action, formed by both physical and psychological experiences, is important in understanding at-risk communities (Becker et al. 2008; Cronin et al. 2004; Kelman & Mather 2008). It means that culture is a social characteristic that directs, motivates and decides people's behaviour during times of crises in hazardous situations and allows communities to respond to hazards (Becker et al. 2008; Cronin et al. 2004; Kelman & Mather 2008; Reenberg et al. 2008). The small size of land area and isolation are variables that have been seen to contribute to a spirit of solidarity and a sense of community (Anckar & Anckar 1995) among people who live in small islands. If we fail to recognise the significant role of culture, there is the possibility of making the same mistake from previous events and

misunderstanding the underlying causes of disasters (Hewitt 1983; Nunn et al. 2007) as well as appropriate intervention in the communities.

Many examples of how culture shapes action are provided by several scholars. The 2004 tsunami in Aceh was responded to in different ways because the culture that was embedded in their daily lives was different. People in the small island of Simeulue survived due to their cultural heritage based on the past experience of a tsunami in their area dating back to 1907, however, other ethnic groups living in mainland (cities) Sumatera suffered the most loss of life as most of the affected people had no such culture embedded in their daily life (Gaillard et al. 2008). In affluent countries, Chester et al. (2008) have discussed the role of religion among residents living around Mt.Vesuvius and Mt. Etna, Italy during the eruption of these volcanoes. This literature shows how both cultures are shaped by hazardous events, and how culture plays an important role in dealing with such events.

2.5 Livelihoods of small island communities

In this study, the capacity of small island communities is appreciated from a sustainable livelihoods perspective that identified the assets or resources, including culture, that enable them to cope with hazards through the use of a capacity framework from Wisner et al. (2012). Livelihoods have been a focus of research and have become the basis of policy since the publication of the IDS discussion paper in 1992 by Robert Chambers and Gordon Conway "Sustainable rural livelihoods: practical concepts for the 21st century" (Chambers & Conway 1992). This study adopted their definition of livelihood, which 'Comprises people, their capabilities and their means of living, including food, income and assets. Tangible assets are resources and stores, and intangible assets are claims and access. A livelihood is environmentally sustainable when it maintains or enhances the local and global assets on which livelihoods depend, and has net beneficial effects on other livelihoods. A livelihood is socially sustainable when it can cope with and recover from stress and shocks, and provide for future generations' (Chambers & Conway 1992, i). Their livelihood framework was introduced to counter the pessimism of many household poverty studies, which they felt also tended to undervalue future livelihoods in that period of time through conventional analyses. Several objectives of their livelihoods concept are stated such as to provide policy and action to enhance capabilities, equity and increase social sustainability. Other objectives are better understanding of livelihood intensity of local economies together with the intensity, complexity and diversity of their farming system. This approach afterwards was adopted by many international aid agencies and NGOs (UNDP, DfID, Oxfam, CARE) (Ashley, Carney & Britain 1999).

The livelihoods concept as an arrangement for making a living emphasises the resources required to fulfil peoples' basic needs. It thus implies the importance of sustaining its availability. Therefore, the existence of multiple hazards in small island areas may become a

potential threat factor to the islanders' livelihoods. Their capacity to cope with such hazards can therefore be understood through their livelihood strategies (Binternagel et al. 2010; Cannon, Twigg & Rowell 2003; Chambers & Conway 1992; Coulthard 2008; Ellis 1999; Gaillard & Le Masson 2007; Gaillard et al. 2009; Mula 1999; Sanderson 2000; Scoones 1998; Twigg 2001). This livelihood strategies perspective helps to understand the capacity of communities in facing hazards. Livelihoods diversity becomes a strategy that enables communities to spread risks and cope with hazards while maintaining the availability of resources that are essential to their lives (Ellis 1999; Gaillard et al. 2009). This is obvious as livelihood strategies are mostly complex, contextual, diverse and dynamic, so local needs can be fulfilled (Chambers 1995; Scoones 2009). This diversity is therefore believed to provide flexibility and stability in coping with changing conditions which are essential for sustainability over time (Ellis 1999; Gaillard et al. 2009).

The idea about sustainable livelihoods in correlation with facing hazards by local communities is discussed in several references (see Binternagel et al. 2010; Cannon, Twigg & Rowell 2003; Chambers & Conway 1992; Coulthard 2008; Ellis 1999; Gaillard & Le Masson 2007; Gaillard et al. 2009; Mula 1999; Sanderson 2000; Scoones 1998; Twigg 2001). Twigg (2001) therefore argues that a sustainable livelihoods approach can be used for DRR by focusing on the household livelihood resources and vulnerability. This means that DRR is the activity of protecting these resources that are most at risk or that could give benefits during a crisis. Scoones (1998) argues that the context, as well as humans' access to the resources varies continuously, which means that there is a need for capacity including access to resources in order to cope with risks. This sustainable livelihoods framework therefore can be used to analyse the livelihood resources and strategies, and institutional processes that are important in determining the livelihoods of different groups of people (Scoones 1998) including for small islander people who live under the shadow of multiple hazards.

This livelihood concept integrates the dimensions of economic, social and ecological sustainability (Sayer & Campbell 2004). In this regard it is important to emphasise that, although the main focus can be on any part or component of livelihood, it can be difficult to isolate any one dimension, which is exactly the point of the livelihood approach. Discussing a single component only makes sense, therefore, if at the same time we acknowledge that it may cohere with other components of livelihood. There are many determinant factors of livelihood as explained by Chambers and Conway (1992): accident of birth (e.g. in village India: caste factor), gender, an inherited livelihood (as a cultivator, pastoralist, forest dweller, fishers, shopkeeper, etc.), choice of livelihoods through education and migration, etc. They also furthermore explain that people with high levels of wealth mostly have a broader choice of finding their means of living and that options thus depend on economic status.

Though small island communities are living within obvious borders of a land mass surrounded by water along the shorelines, their livelihoods clearly as explained before cannot be understood in that restricted physical land context, as the waters surrounding the islands are perceived as 'part of their lives, not an isolating barrier' (McCall 1994, 103). Traditionally, subsistence production, predominantly farming and fishing among others, has been the main livelihood strategy of small island communities (i.e. Arnberger & Arnberger 2001; Christensen & Mertz 2010; Gaillard et al. 2009; Hess 1990; Mantjoro 1999). In some parts of small islands in the Pacific, agroforestry has evolved over millennia and contributing, at one time, to Pacific islanders being among the most self-sufficient and well-nourished people in the world (Thaman & Clarke 1993a). Agroforestry, both annual crops and trees, has contributed significantly to the livelihoods of Pacific islanders for generations because the traditional agroforestry rested on 'seven principles of permanence' (Thaman & Clarke 1993b, 17). However the lack of understanding of the ecological and economic value of agroforestry in Pacific island settings has resulted in significant environmental damage and concomitant economic costs (Storey & Murray 2001). The principles include: did not depend on external energy subsidies or fertilizers; did not receive poisonous pollutant materials; had strongly positive net energy yields; used of renewable resources; resources supporting agriculture were equitably spread throughout the community; productive resources are preserved for the next generations and based on polyculture and diversity of tree and non-tree crops, wild plants and animals. These culturally-specific ways of managing natural resources have helped bring about the success of managing limited land size. Limited land area, encroachment of settlements on arable land and threats from various hazards moreover provide incentives for market-oriented agroforestry (Noordwijk et al. 2012; Pachauri 2012; Thaman 1993). This helps islanders to purchase their staple foods and other necessities, which are unavailable or of limited availability (Thaman & Clarke 1993a). The attraction of cash crop farming therefore comes from its ability to support livelihoods beyond simple subsistence. On the other hand, marine resources have long been viewed as an inexhaustible supply of resources for human population. The increasing pressure on the natural resources and arable land areas due to increasing population growth and globalisation will affect the more diverse and complex livelihood strategies as new solutions, due to the fact that the conventional resources are in fact limited. Marine catches have plateaued, some fisheries have been closed entirely, and the price of agroforestry products are not stable.

These current threats to the natural resources of small islands support the existence of the role of migration, wage labour and remittances, which have become increasingly important aspects of local livelihood strategies to gain income in small island communities (Connell 2010; Connell & Conway 2000; Curran & Agardy 2002; Le De, Gaillard & Friesen 2013; Naylor et al. 2002) as well as cash crops and tourism (de Burlo 1989; Mercer et al. 2007; Milne 1992;

Scheyvens & Momsen 2008a). In the context of the Pacific Islands, these are known as MIRAB (MIgration, Remittances, Aid and Bureaucracy) strategies (Bertram & Watters 1985; Bertram & Watters 1986).

The strong cultural and social values of natural resources as well as the island landscapes encourage tourism activities. Armstrong & Read (2006) explain that cultural and natural resources are obviously a drawing card for tourism. These resources provide a natural attraction to be experienced by tourists, such as beaches, waterfalls, rainforests, animal biodiversity, cultural performances and arts, traditional culinary events and the like. Scheyvens & Momsen (2008b) show that tourism is important for economic development (tourism receipts as a percentage of GDP) of small island developing states based on a report from the World Bank and International Tourism Receipts (ITR) as tourism facilitates a higher rate of growth than that of other commodities. It indicates that those nations whose economies are dependent on tourism income, are among the richest of such states (McElroy 2006). However, it is important to consider that tourism patterns are dynamic and unstable, in both the long and short term (Wilkinson 1987). It is therefore difficult to predict their trends for the future.

One way that people living on small islands are able to solve the problems created by their island environments and the existing endogenous hazards is also through being continually on the move; that is mobile. Small island communities are not defined anymore by a specific place, or by dependence only on their local resources. Mobility is the strategy (Bertram & Watters 1985; Bertram & Watters 1986; Julca & Paddison 2010; Le De, Gaillard & Friesen 2013; Tacoli 2009) which, in combination with others such as local cultural adaptability and local knowledge, enables them to diversify their livelihoods and persist or even prosper while living in such hazardous places (Burton, Kates & White 1993; Campbell 2009; McAdoo, Moore & Baumwoll 2009; Mercer & Kelman 2010; Reenberg et al. 2008). Mobility therefore for small island communities has played a significant role as an integrated part of island livelihoods (Chapman et al. 1991; Connell & King 1999) and is mostly driven by social and economic reasons and hazards (Bremner & Perez 2002; Locke 2009).

2.6 Conclusion

Instead of being vulnerable communities, people living in small islands inherently have various capacities that enable them to cope with various hazards. It is important to consider in disaster study as they are the first responder to the hazards. In exploring their capacities, the social dimension of the island's community can not be separated from the geo-physical setting of the area. To understand the capacities of small island communities, a capacity framework is used. The capacity framework adapted in this study is assessed from a sustainable livelihood framework for analysing the ways in which island communities deal with hazards. This framework shows the connections and/or trade-offs (the fluidity of assets) among resources

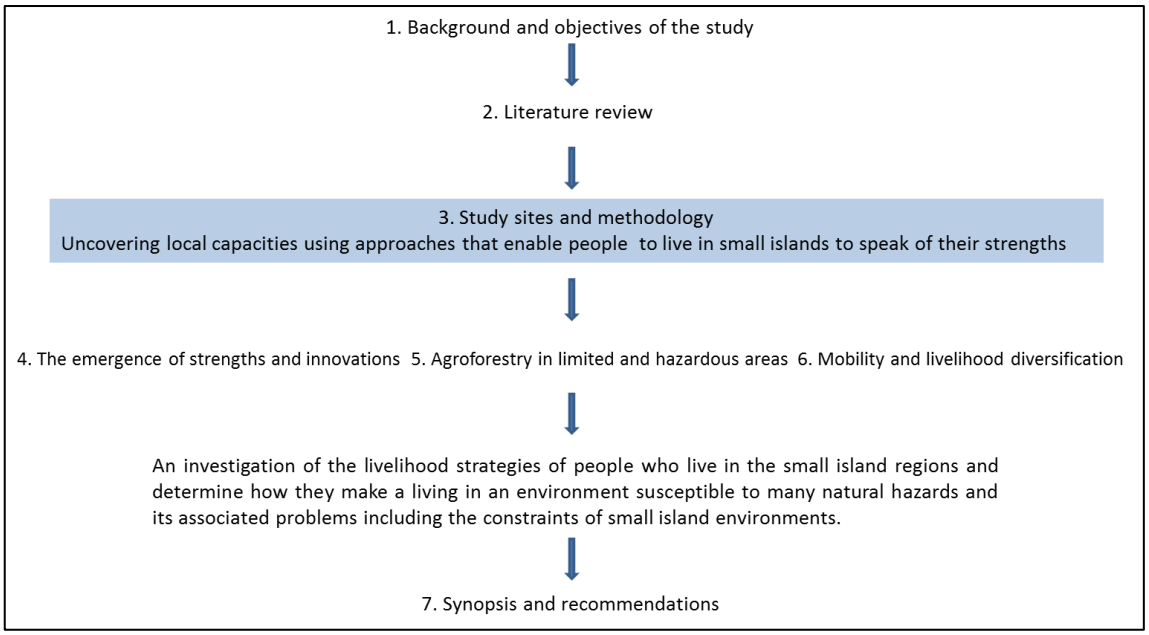
(natural, political, economic, social, physical, and human resources) and allows the use of livelihood resources to understand local capacities. Capacity is thus, through this framework determined by the combination and integration of the assets or attributes that provide the ability to face hazards. Capacities are not only related to the existence of resources in the island context but include the ability to either use or access resources outside the island's physical boundaries. How the small island populations utilize their resources in facing hazards is an integral part of day-to-day life, and these understandings are important to exploring local capacities, reflected in the use of participatory tools.

The use of participatory methods highlights a bottom-up approach, taking into account locality and context (Chambers 1994; Ivanitz 1999) to recognize people's perspectives and priorities (Rahman & Fals-Borda 1991; Scoones 2009). This uses interactive and collaborative methods, and focus on local capacity to uncover small island communities' capacities. This is because the important elements of using participatory tools are the level of engagement with participants and the attitudes and behaviour of the practitioners involved (Chambers 1994; Kumar 2002), thus the methods need appropriate and flexible approaches to achieve the objectives of the study.

In the next chapter, the use of participatory methods will be explored in detail together with the description of the nature of three study sites within three different small islands.

CHAPTER 3

STUDY SITES AND METHODOLOGY



Part of this chapter (Section 3.3) has been accepted for the Singapore Journal of Tropical Geography as follows: "Rampengan, MMF, Law, L., Gaillard, JC., Boedhihartono, AK., Sayer, J.. Engaging communities in managing multiple hazards: Reflections from small islands in North Sulawesi, Indonesia". An earlier version of this article was presented at the Institute of Australian Geographers & The New Zealand Geographical Society (IAG/NZGS) Conference 2014, University of Melbourne and was awarded an "Outstanding Presentation by a Postgraduate Student".

Chapter 2 reviewed the literature on the nature of small islands, and the vulnerability and capacity of communities on small islands in facing various hazards and building their livelihoods. In this chapter, I explain the study sites of the research and the use of methods in uncovering capacities of the small island inhabitants. This chapter answers the first objective of this thesis: What are the best methods for understanding the 'livelihood capacity' of communities in disaster prone regions? I explore the inherent capacities that exist within small island communities through the use of approaches that enable the community to speak of their strengths rather than weakness and victimhood.

3.1 Introduction

This chapter has three different purposes, first to describe the study sites and second to justify the approaches taken for collecting and analysing data in this thesis. Third is to critically reflect upon how this study was undertaken and in doing so establish generalisable approaches for better understanding local capacities in facing multiple hazards. I will answer the question of what are the best methods for engaging with communities in disaster prone regions in order to learn jointly with the people about their existing capacities.

3.2 Overview of study sites

This section provides an overview of the geographical position and biophysical-social environment of the study locations as these are important factors that shape the livelihoods of the communities. The Province of North Sulawesi lies in the east of the Indonesian archipelago and stretches between 0°15' – 5°34' North latitude and 123°07' – 127°10' East longitude and bounded by the Sulawesi Sea, Republic of the Philippines and the Pacific Ocean to the north and the Maluku Sea to the east. To the south and west, the province is bounded by the Gulf of Tomini and the Province of Gorontalo. North Sulawesi covers a total of about 15,272.44 km² and consists of 11 districts and 4 cities with 258 small islands (Sarundajang 2011).

Three provincial districts are composed entirely of small islands: Siau Tagulandang Biaro (Sitaro) Archipelagic District, Sangihe Archipelagic District and Talaud Archipelagic District. These three districts were subdivided from the Sangihe-Talaud District in mid-2000. 'District' is a level of region with autonomous regional government (*kabupaten*). The three island case studies were selected as representative of the islands in the province. Two of the islands, Siau and Ruang are part of the Sitaro Archipelagic District and the third island, Lembeh, is part of Bitung City (Figure 3.1).

The difference between these three island villages is striking, especially in terms of geographical context and economic activities. Village (*Desa*) in this study refers to the rural territory of one village and the surrounding areas that maintain traditional administration over certain local affairs. Laingpatehi is a village on Ruang Island where the lives of inhabitants are mostly centred on fishing. The existence of an active volcano and limited physical space for housing and farming has compelled Laingpatehi villagers to diversify their livelihood strategies. Kinali villagers in Siau Island are mostly involved in cultivating several varieties of cash crops, notably cloves, coconuts and nutmeg. The third village, *Kelurahan* Mawali (referred to as Mawali village hereafter), is located on Lembeh Island, close to the city of Bitung on the mainland of Sulawesi. *Kelurahan* is the territory of regional government under *Kecamatan* (Sub-District) that replaces autonomous *desa* when an area becomes urbanized. Mawali used to be a producer of several agriculture products, mainly chilli, but has recently shifted to

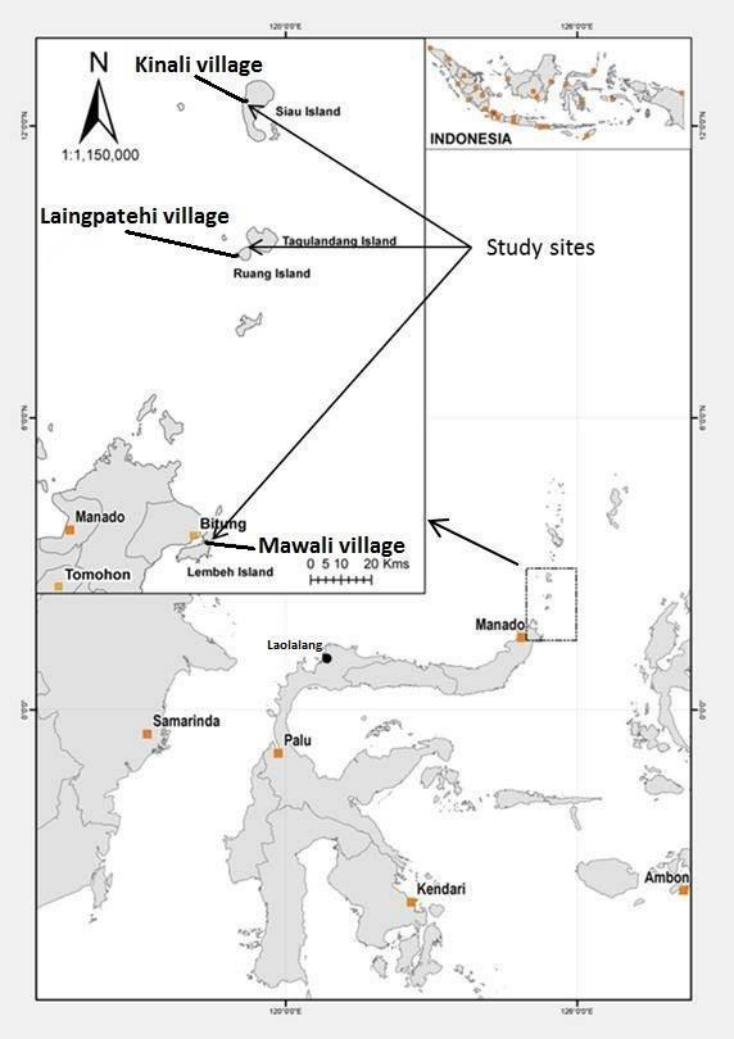


Figure 3.1 Map of study sites. Kinali village in Siau Island, Laingpatehi village in Ruang Island and Mawali village in Lembeh Island. Manado is the capital city of North Sulawesi Province. Tomohon and Bitung are satellite cities within North Sulawesi Province. Principal cities in neighbouring provinces are also shown

agroforestry (nutmeg, cloves and copra) in response to unresolved pest problems in their traditional agricultural practices. Mawali is exposed to dry-season water shortages, landslides and rock avalanches. The majority of the people in all three villages are of Sangir ethnicity while most others are connected through marital status thus making cultural integration less difficult. These three villages on three different small islands provide opportunities to examine the interactions between a diversity of livelihood activities and a range of local natural hazards and so reveal the capacities of the different communities.

The islands lie on the Sangihe Arc where two tectonic plates collide (Morrice et al. 1983) and produce frequent earthquakes and volcanic eruptions (Figure 3.2). The Sangihe Arc is 550 km long and up to 70 km wide and extends from southern Mindano, Philippines to

northeast Sulawesi, Indonesia. In 2007, there were 2,107 earthquake events in North Sulawesi with 270 earthquakes ≥ 4 Richter Scale (BPS Sulawesi Utara 2008).

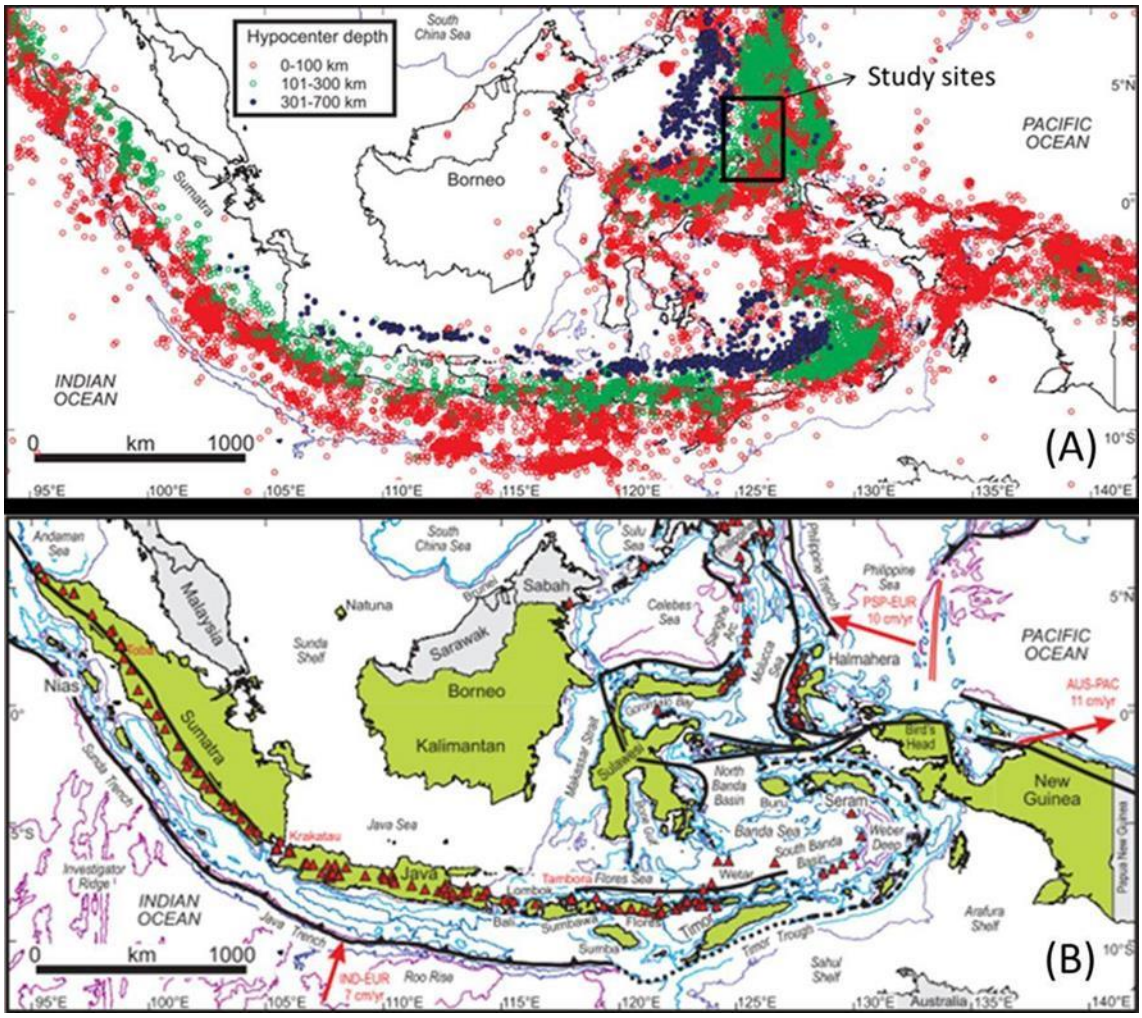


Figure 3.2 Study sites are within Indonesian seismic locations (A) (between 1964 and 2000) and tectonic boundaries and volcanic activity (B) (Hall 2009)

3.2.1 Kinali village, Siau Island

The land area of the Sitaro District covers 2.53% of the total North Sulawesi Province (Badan Pusat Statistik Propinsi Sulawesi Utara 2008). Sitaro consists of 47 small islands, of which 10 are permanently inhabited. Sitaro District has a total area of 3,066.22 km^2, of which only 9 % is land mass (275.96 km^2) (Badan Perencanaan Pembangunan Daerah Kabupaten Kepulauan Sitaro 2010b). The population is approximately 63,801, of whom 64 % (40,758) live on Siau Island, the administrative principal island of Sitaro (Badan Pusat Statistik Kabupaten Kepulauan Sitaro 2012a). The distance from Siau Island to the provincial capital city, Manado, on the mainland is 146 km (Badan Pusat Statistik Kabupaten Kepulauan Sitaro 2012a). Siau Island is only accessible currently by sea and is located roughly midway between the Sulawesi mainland

and the larger island district of Sangihe. An airport is currently under construction on Siau Island. Siau is a high volcanic island (Shekelle et al. 2008) with a steep mountainous interior culminating at its highest point 1,320 m above sea level named Mount Karangetang. Karangetang means "the highest" in the local dialect (Makasar 2011).

Kinali village is part of the North West Siau Sub-District (*Kecamatan Sibarut*) and is about 4 km from Ondong, the capital city of the Sitaro District. It has an area of 387 ha and in 2013 had a population of 445 people in 125 households. The village is about 5 km from the top of Mount Karangetang to the east and faces the Sulawesi Sea to the west. Karangetang is one of the most active volcanos in Indonesia and has experienced 53 major eruptions between 1675 and 2012 and a continuous series of smaller eruptions. Molten lava has been continuously visible on top of the volcano since 1973 (Global Volcanism Program 2013; Wattiri 2008). Kinali village is located in an area exposed to eruptions from Mount Karangetang and is classified as both category 2 (high risk of lava, lahars, dense volcanic ash, and the possibility of pyroclastic flows) and category 3 (frequently affected by pyroclastic flows, lava, lahars, dense volcanic ash) by the Indonesian government (Figure 3.3). Frequent small eruptions are not perceived to be hazardous by the Kinali villagers except during the rainy season.The volcanic materials on the top of Karangetang become lahars and turn into mudflows during the rainy season. Lahars flow through dry river channels (Figure 3.4). There are 4 dry river channels around Kinali village: Pangi, Sesepe, Kinali and Sempihi Rivers. Pangi and Sesepe rivers are always flooded during the rainy season. The danger of this lahars is that sudden surges rapidly transport large volumes of volcanic sand and rocks downstream, and damage roads and bridges. Land transportation is disrupted during the rainy season and at times of eruptions. Emergency access at these times is only possible by boat. The volcanic materials trapped along the rivers become a source of raw materials for infrastructure development in the village and its neighbourhood and provide jobs for local villagers as sand and rock miners.

The soil in Kinali village is very fertile as a result of the frequent ejection of volcanic ash from Mount Karangetang. This enriches the soil and sustains a profitable agroforestry system yielding nutmeg, cloves and coconuts together with other subsistence crops. At present the price of nutmeg is relatively high, whilst the prices of cloves and copra are low.Villagers are therefore replacing clove and coconut trees with nutmeg. Volcanic ash is seen as a "gift" from Mount Karangetang and is a natural fertiliser and pesticide (Arnberger & Arnberger 2001; Edwards & Schwartz 1981; Mercer & Kelman 2010; Philogene 1972).

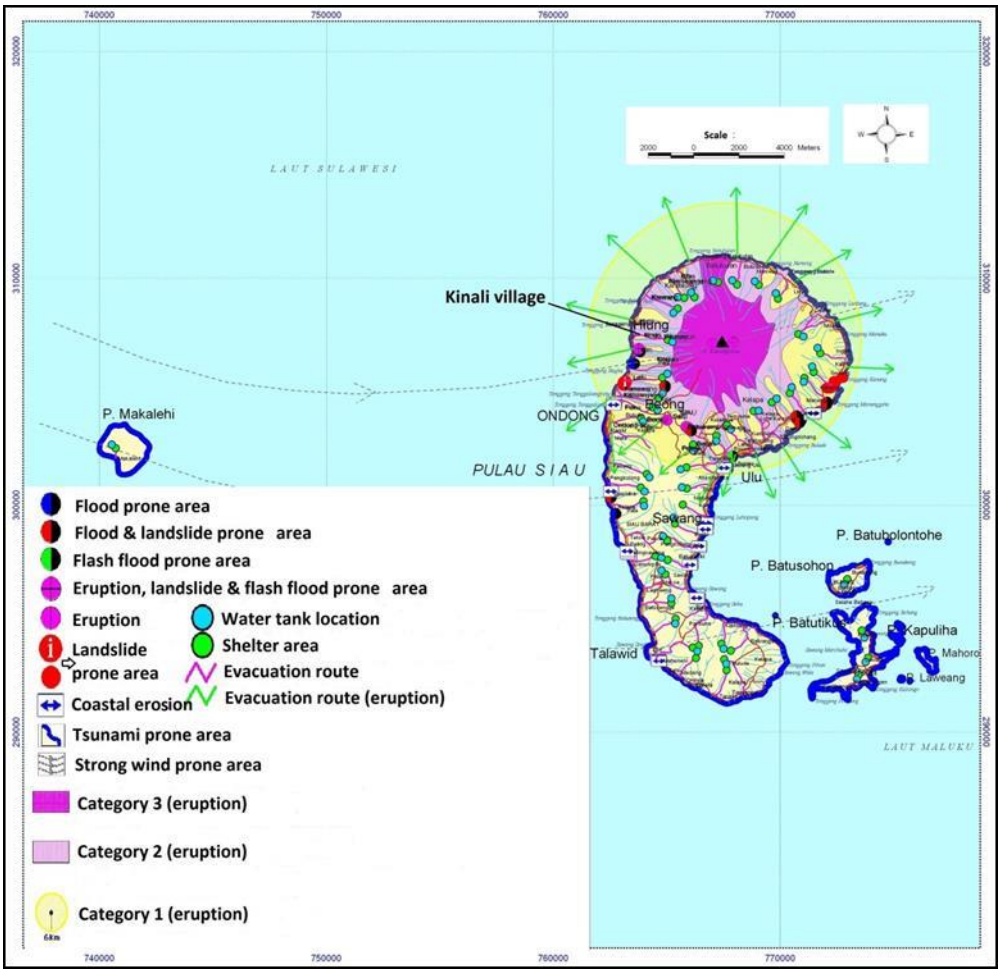


Figure 3.3 Map showing the position of Kinali Village and the vulnerability categories of Siau Island (*Pulau Siau*) and areas prone to tsunamis (Adapted from a map of the vulnerable areas of Sitaro District by Bappeda Sitaro 2013)

Although Kinali village directly faces the sea, very few Kinali villagers use marine resources as their main source of livelihood, but as a supplement to their food supplies only. The reason for this might be that there is only a narrow area available to land boats as they have a steep rocky beach. Also the benefit from nutmeg harvests outweigh the fishing activity.

The hydrological situation of Kinali village is characterized by fresh water being provided mainly from rain water. Additional hot water springs in several areas along the beach become an alternative source of clean water during the long dry season. Also there is an available supply of fresh water based on demand from other parts of the island such as Ondong town via water tank trucks. All the villagers have cisterns around their houses for catching and holding rainwater for all household uses. For the other villages and towns near the capital city of Sitaro (Ondong town) and centre of trade (Ulu town) with its surroundings areas, the clean water is managed and distributed by PDAM (*Perusahaan Daerah Air Minum* - drinking water

regional company-owned by the local government). The sources of water are from Akelabo and Karalung spring waters and Lake Kapeta (Pemerintah Kabupaten Kepulauan Sitaro 2012a).

Figure 3.4 Dry river in Kinali village. Inserted photo shows the condition of the dry river just after being flooded by lava during the eruption in 2011. Photograph by Mercy M.F. Rampengan, July 2012. Inserted photo is reproduced with kind permission from PNPM Kec. Sibarut

Kinali in Sangir language means 'they have to dig up the land before building a house' (Brilman 2000; Pemerintah Desa Kinali 2011b). This is because Kinali is located in a hilly and mountainous location on the foot of Karangetang volcano (Figure 3.5). Until 1994, Kinali was part of Hiung village. Its status in Hiung village was *dusun* (sub-village/hamlet). From 1995 to 1998, Kinali became a candidate new village (preparation) under supervision from Hiung village. Based on the Decree of the Governor of North Sulawesi Province Number 298/1998 (16 December 1998), Kinali became a new permanent village, including *Dusun* of Winangun. Winangun in 2010 became a new permanent village. In the past, villagers in Kinali inhabited the Winangun area to avoid conflict on the coastal area with people from Mindanao, Philippines who travelled around Siau Islands as pirates (Makasar 2011).

Figure 3.5 Kinali village in a hilly and mountainous location, showing the condition of the village with a relatively good road and houses surrounded by trees. Photograph by Mercy M.F. Rampengan, July 2012

The education sector is an important factor for community development. It can be seen from the establishment of a primary school owned by the local church (GMIST) in 1882. The establishment of that school was together with the development of the church (part of GMIST-the Christian Evangelical Church in Sangir Talaud Synod) 'Galilea'. Galilea is the name of the church and means *Gali* (Indonesian word means digging up) and *Lea* adopted from a story in the Bible (Genesis 29:32). The local interpretation of these meanings is that villagers should take pains first in establishing the location of the church and in building it, like an effort of Lea in the Bible (Pemerintah Desa Kinali 2011b).

The first tarmac road connecting this village with other villages and towns was in 1998 (Figure 3.5). This land transportation access is impassable during heavy rain and lava flows. This is because access to the other villages and to the towns is bounded by the routes of 4 dry rivers (Sasepe, Pangi, Kinali and Sumpihi Rivers). Before the availability of the tarmac road, previously, the community used a small footpath to get access to other places, but mostly used boats. The use of boats was preferable as it was more comfortable to carry goods (from towns) and crop products (to sell to towns) (all big towns-Ulu and Ondong- are located on the coastal areas). There was no horse or cow in the village until now. To carry goods from the road to houses in the past people helped each other in the spirit of *mapalus* - local communal work. Currently, they use motorbike taxi *ojek* because the settlement area of the village is connected by concrete footpath, even though in some places it is rather steep (Figure 3.6). However, they modified the motorbike engines to adjust to the condition of the footpath. Electricity has been available in the village since 1995. The source of electricity was from town, generated by diesel generator until now. During storms, the electrical connection could be interrupted because of fallen trees.

Figure 3.6 The narrow and steep footpath in Kinali village. Photograph by Mercy M.F. Rampengan, July 2012

The Sangir people are the main ethnic group in Kinali village and in the whole Siau Island as well as the Sitaro Archipelagic District. The other ethnic groups in Kinali are Minahasan (9 people), Jawa (4 people), and Gorontalo (1 person) (Pemerintah Kecamatan Sibarut Kabupaten Kepulauan Sitaro 2012b). However, people in Siau Island prefer to be described as Siau ethnicity only, based on the island's name to distinguish them from Sangihe people living on Sangihe islands.

3.2.2 Laingpatehi village, Ruang Island

The other study site village in the Sitaro district is Laingpatehi, located on Ruang Island (2°20' N 125°30' E) (Arnberger & Arnberger 2001) (Figure 3.7). Laingpatehi is approximately 110 km from Manado (Paris et al. 2014), the capital city of North Sulawesi Province, 40 km from Siau, the district capital, and 4 km from the closest town Bahoi (town of Tagulandang Sub-District, which is the center of the administration area of Laingpatehi village) on the island of Tagulandang. Ruang has an area of 1,426 ha and has only two villages, Laingpatehi and Pumpente with a total population of 843 (Pemerintah Kecamatan Tagulandang 2011). Pumpente was part of Laingpatehi village until 1998. Both villages share the same biophysical condition of Ruang Island, hazards, and disaster impacts (Figure 3.7). For logistic and time constraint reasons, Laingpatehi was chosen as our study location. Laingpatehi village occupies 8 ha and has 103 ha of cropland. Laingpatehi has 122 households with 522 community members, of whom 266 are male and 256 female (Pemerintah Kecamatan Tagulandang 2011).

Fishing is the key viable means of obtaining food for the villagers of Laingpatehi. They obtain fish as a source of daily protein as well as for sales, mostly in the market in Tagulandang

Island. Data from the village office indicated that of the total 178 working people, 90 people are fishers, 49 are farmers and the remaining are local traders, civil servants, carpenters, animal husbands, pensioners and a midwife (Pemerintah Desa Laingpatehi 2012). However, this data is for administration purposes only as all the fishers are mostly farmers and doing other jobs, particularly during stormy seasons when they can not go fishing. The motorbike taxi (*ojek*) drivers are also not listed in the village data. Remittances from villagers who work as sailors, mostly in Kalimantan, also provide a source of income and support local church development. In recent years people from the village have made seasonal migrations to Laolalang, a satellite village (some villagers visit seasonally, and some villagers live there permanently) which the people of Laingpatehi established approximately 550 km away in Toli–Toli, Central Sulawesi Province (Figure 3.1) where they farm cloves and nutmeg.

The source of fresh water in Laingpatehi is mainly from rain water. All the villagers have cisterns around their houses for catching and holding rainwater from their rooftops. There are 2 wells privately owned but used by their neighbours as well. The water (rather salty) from the wells is dependent on the tides, and is only available during high tides. Since 2010, the government built a bore water pump, however the community preserves it for use during the dry season only. However, based on observation during the village meeting, the use of this bore water for drinking purposes is still challenging, as most of the villagers prefer to use rain water for drinking. Before the availability of that bore water, during the long dry season, the villagers purchased fresh water for drinking from Tagulandang Island. For washing and bathing, they use the water from wells.

The average maximum monthly rainfall of the Sitaro District is in January (>200 mm) which falls in the middle of the rainy season from November to March, and the minimum was in September, while the average monthly rainfall from the 2000 - 2008 period was in the range of 100 mm to 450 mm. The average temperature was in the range of 27°C to 28.5°C with the highest temperature in August and the lowest in July during the period of the year 2005 to 2008 (Pemerintah Kabupaten Kepulauan Sitaro 2012a). The humidity was relatively high during the period of 2005-2008, with the lowest being 79% in June and the highest was in January (81%) (Pemerintah Kabupaten Kepulauan Sitaro 2012a).

The different landscapes between Siau and Ruang Islands have shaped different major livelihoods for these communities. People in Kinali village are mostly involved in the cultivation of several varieties of cash crops, mainly nutmeg, supported by the fertile soil which is enriched by the ash from Mount Karangetang. In contrast, volcanic activity on Ruang has been a source of great hardship for the people of Laingpatehi village as well as Pompente village in regards to benefiting from increased productivity of the island. Laingpatehi is a village where the lives of inhabitants are mostly centred on fishing rather than farming; this village in the district of Tagulandang is well known as the “fishers village”. The crop area

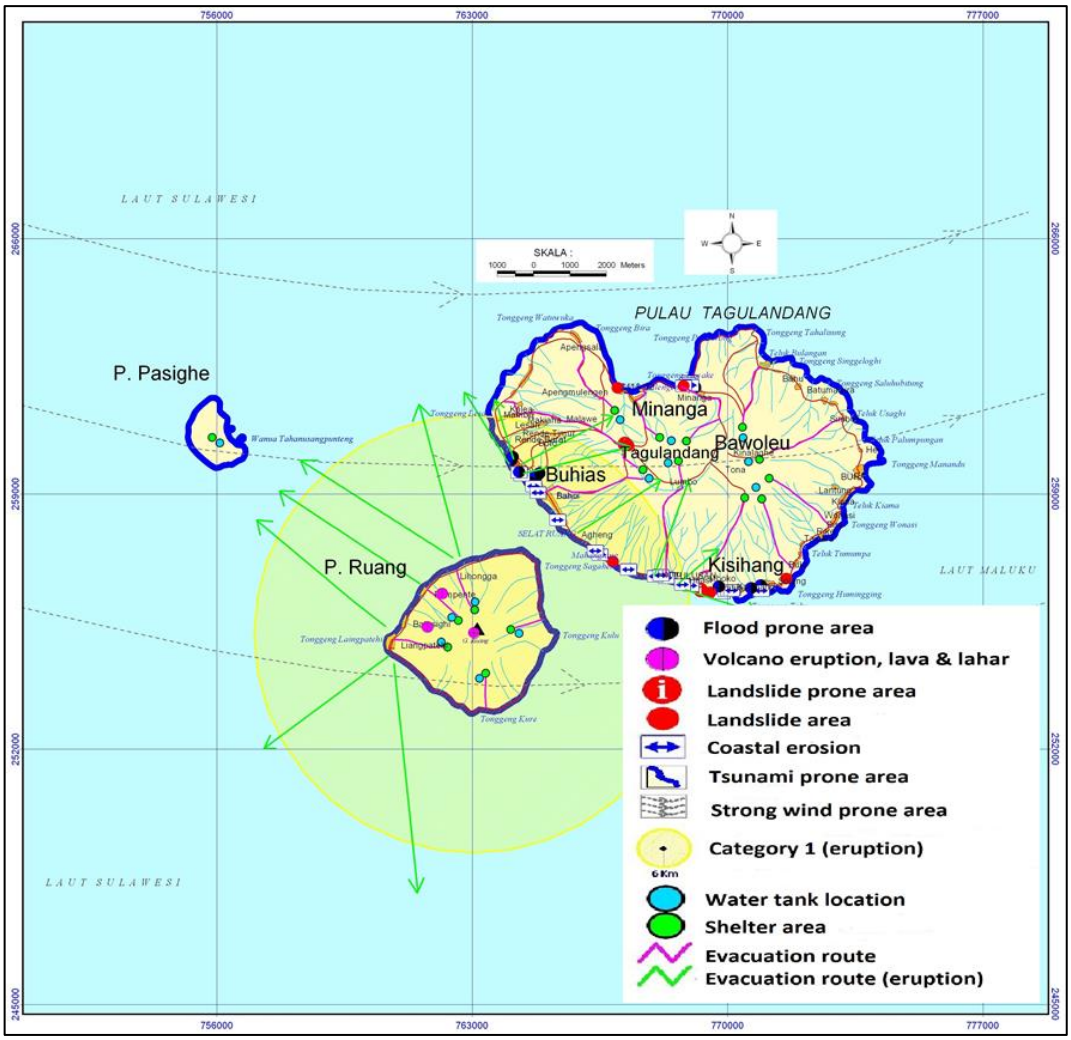


Figure 3.7 Map showing the position of Laingpatehi Village and the vulnerability categories of Ruang Island (*P. Ruang*) (Adapted from a map of the vulnerable areas of Sitaro District by Bappeda Sitaro 2013)

was planted mainly with coconut trees and subsistence crops such as cassava, sweet potatoes, banana trees, etc. The last eruption in 2002 devastated the village and the crops area. The soil is not suitable for planting most cash crops and subsistence food crops, as the structure consists of deep, gravelly impenetrable layers of rock substrate. Currently, they are trying to grow cassava in particular areas in order to make cassava flour to sell on Tagulandang Island. Planting coconut trees is also another effort by the villagers to increase their income. However, several bush fires have threatened the growth of coconut trees. The fires resulted from the uncontrolled burning activities of several villagers to clear the land during the dry season. However, it is not the main concern of the villagers compared to the threat from eruption.

Laingpatehi takes its name from the Sangir language, *Laing* means cape and *Patehi* means observation, to describe that the area of this village is a cape where people in the past used to observe the weather on their fishing grounds (Taman Budaya Manado 1991). From

1800s to early 1900s, fishers from Tagulandang Island used the area of this village as a transit and temporary shelter area during their fishing trips. Several people from Tagulandang Island also use Ruang Island to grow several subsistence crops and coconut trees (Brilman 2000). The existance of temporary shelters (*daseng*-local name) in this area encouraged the establishment of the village. Officially, the village was established in 1937, but the community built a church and primary school owned by the church a year before (1936). Laingpatehi has been a fishing village since then and until the current time. In 1998, a new village was established, Pumpente village, an administrative separation from Laingpatehi. Both villages are connected by a concrete footpath which is maintained regularly by the villagers (Figure 3.8).

Laingpatehi village has been totally reconstructed after a massive eruption of Ruang volcano in 2002. That eruption damaged the village and forced them to live in temporary shelters provided by the district government on Tagulandang Island for about 3 years. Initially, the district and provincial government banned them from returning to the island, but the villagers organized themselves through the traditional *mapalus* system to clean and rebuild the church and houses. They did this together, without the use of modern equipment using only simple hand tools, such as shovels and crowbars. Subsequently, the district government provided them with corrugated tin for roofing and some other building materials. The rebuilding process was helped by the availability of building materials on the island from the volcanic eruption such as rock and sands.

Figure 3.8 Villagers of Laingpatehi, with the spirit of *mapalus*, maintain the foothpath by cleaning it up regularly. Photograph by Mercy M.F. Rampengan, July 2012

Even though on Ruang Island there are only 2 villages, the education facilities are complete. In Laingpatehi village, there is pre-school, primary school, secondary school and currently just developed a high school with cooperation from a high school on Tagulandang Island. All of these facilities were developed or re-developed after the return of villagers to the island from temporary shelter in Tagulandang Island in 2005. There is a local health centre (*Poskesdes*) with one midwife and regular visits by health practitioners/doctors from Tagulandang Island. Electricity is generated by diesel engine generator managed by the village government, available only 4 hours daily (6 pm -10pm) because of the limitation of fuel and engine capacity. Previously they used solar cells with support from the district government in cooperation with provincial and central government for a few years but use was discontinued because of poor maintenance.

Almost 100% of the community members in Laingpatehi village are part of the Sangir ethnic group (Pemerintah Desa Laingpatehi 2012). They originally came from Tagulandang Island. Christianity is the major religion.

3.2.3 Mawali village, Lembeh Island

Another study location is on the island of Lembeh (1°30'N 125°10'E) (Arnberger & Arnberger 2001), where Mawali village is located. Lembeh Island is the only inhabited island in the Bitung City region. The land area of the Bitung City region is 33,279 ha in total, divided into 8 sub-districts (Badan Pusat Statistik Kota Bitung 2012). Lembeh Island is divided into only 2 sub-districts, and Mawali is part of the Lembeh Utara Sub-District. The other district is Lembeh Selatan Sub-District. There are 10 villages in Lembeh Utara Sub-District. It is about a 30 minute water taxi ride from Mawali to the port in Bitung City. The area of Lembeh Utara Sub-District is 3,061 ha, and the total area of the island is 5,414 ha (Badan Pusat Statistik Kota Bitung 2012). Bitung is the city of Bitung City, in the mainland of Sulawesi.

In Bitung, there is a natural sea port with good shelter from the wind and waves as it is blocked by Lembeh Island (M. J. Lomban, Vice Mayor of Bitung, pers. comm., 28 November 2012).The port is one of the deepest ports in the Asian region with a minimum depth of 16 metres, enabling big cargo ships to anchor (Sarundajang 2011). It is currently an international trade port and a likely future international hub-port for wider eastern Indonesia as it has several advantages compared to the sea port of Makassar in South Sulawesi, such as the length of channel, width of channel and other hydro-oceanographic features that support its performance as an international sea port (Sarundajang 2011). In Bitung there are 36 fishing companies, 21 fish canneries including seven tuna canneries, 10 shipyards, and several copra/dried kernel industries (Pemerintah Kota Bitung 2012). The economic health of Bitung city is therefore mainly driven by industrial factors (fisheries and copra processing industries) (Badan Perencanaan Pembangunan Daerah and Badan Pusat Statistik Kota Bitung 2009). The existence

of such facilities and industries and the ease of travel from the island to Bitung on the mainland, means that a large number of Mawali villagers find work in Bitung. They live in Mawali and commute to Bitung on a daily basis.

On the mainland, on the opposite side of Lembeh Island, separated by a narrow strait, there is an active volcano, Mount Tangkoko (Morrice et al. 1983). This volcano rises to an elevation of 1,149 m above sea level on the northeast tip of Sulawesi, with a parasitic cinder cone on the eastern flank of Tangkoko, known as Batuangus, facing close to Lembeh Island, which therefore can be seen clearly from Mawali village. The last eruption was in 1880. No information is available about any impact of that volcano on the people of Lembeh Island even though Lembeh Island is situated in its vulnerable areas (Badan Pusat Statistik Propinsi Sulawesi Utara 2008). Lembeh Island was formed by parent materials originating from volcanic rocks (Karamoy et al. 2013; Whitten, Mustafa & Henderson 1987).

The area of Mawali village is 500 ha, but the settlement area is only 15 ha (Pemerintah Kelurahan Mawali 2012), occupying the flat area close to the beach facing Bitung. The hills that surround the settlement area consist of rocks. This original location of Mawali was on the other side of the island, but in the 1960s, the government of Bitung City relocated them to the current location to make easy access for government services and support. In that time there was no land transportation to link all the villages on the island. The only access was using boats, but there were no motorized boats available until the mid-70s. Currently, a ring-road is under development to connect all the villages.

The climate in Lembeh Island is similar to other regions of Bitung City as the location is reasonably close. Humidity in the Bitung City region is relatively high, with a monthly average of about 75 to 81% in 2011 (Badan Pusat Statistik Kota Bitung 2012). In 2011, the average temperature was 27.95°C, with the highest being 29.3°C in April and the lowest of 27.5°C occurred in February and June (Badan Pusat Statistik Kota Bitung 2012). The average rainfall from 2000 to 2009 was 152.03 mm/year, with the lowest rainfall being in September (35.26 mm/year) and the highest in January (241.24 mm/year) (Pemerintah Kota Bitung 2011).

The source of clean water in Mawali is dominantly wells (Figure 3.9a) and spring water for Mawali Kecil Sub-Village (Figure 3.9b, 9c). One well can supply water for more than 10 households with the use of an electric water pump. In Mawali Kecil, they do not use wells as the settlement area used to be a swamp, and the water is salty. That area was covered by soil as a result of a big flood in the early 1970s. At that time, their houses were scattered around the hills. They moved to the current area several years after the flood when the soil became dry and hard. They take water from springs and have built water tanks to collect the water and distribute it to the houses. Currently, villagers in Mawali purchase drinking water from Bitung, as it is cheaper and easier than boiling local water (Figure 3.9d).

Mawali village was well known in the past as a producer of chilli, tomato and onion for markets in Bitung and Manado cities in the mainland of Sulawesi. The existing plants in Mawali area besides cash crops (clove, nutmeg and coconut trees) are chillies, peanuts, brown onions, bananas, cassava, mangoes and corn (Pemerintah Kelurahan Mawali 2012). Most of these products are for family consumption. The current production of chillies, onion and tomatoes is limited, different from in past times.

Harvesting of nutmeg, coconuts, cloves and other subsistence crops is completed by hand and products are transported in traditional woven backpacks from the field to the village. Nutmeg and cloves are dried on mats under the sun. Dried products are then transported by motor bike to commercial transport boats and eventually to market in Bitung, mainly to the traders in the port area.

Mawali Kecil Sub-Village is a fishing site. The target fish is mostly tuna. There are 35 tuna boats (*pamboat*) in Mawali Kecil. They learnt to catch tuna and build tuna boats from Filippino fishermen who used their location as a place to maintain their boats in early 2000. Previously they only caught small fish around the village and along the strait. The availability of a market for tuna in Bitung and the relatively high price of tuna and lower availability of fish in the area close to the village encouraged them to focus on catching tuna.

Figure 3.9 A typical well in Mawali village with many water pumps (a) and water tanks in Mawali Kecil Sub-Village (b, c). Both well and water tanks are connected to many households through water pumps and hoses. Drinking water in bottles on a taxi boat from Bitung to be delivered to Mawali village (d). Photograph by Mercy M.F. Rampengan, August 2012

Mawali originated from the Sangir language *Mawali* means *returning*. That word is based on the experience of the villagers during the Second World War. The Japanese army built an army base on Lembeh Island; therefore Mawali villagers were temporarily moved to several places in Bitung on the mainland of Sulawesi. After the war, they returned to the village, and use that word as the name of the village. Until 1975, Mawali was part of Lembeh Tengah village. In 1975, as the status of Bitung was change from sub-district to district, Mawali was officially established as a village. In 1982, Mawali became *Kelurahan* Mawali as the status of Bitung changed from district to city.

There are two pre-schools, one primary school and a secondary school in Mawali village. There is a high school in the other village, approximately 3 km away. There are currently 27 villagers with higher degrees (bachelor's degree and certificate from universities and institutes) (Pemerintah Kelurahan Mawali 2012). There is one local health centre (*Puskesmas*) with one midwife and regular visits from doctors/medical practitioners. They tend to go to Bitung for health treatment however, as the access is currently easier (Figure 3.10). There are 12 boat taxis to travel to the mainland of Bitung and for local transport in the village and to other villages; there are about 72 motorbike taxis. There are two jetties in the village for taxis and fishing boats.

The ethnic majority is Sangir. Interestingly, villagers who live on the coastal part are in the majority from the Sangihe region and predominantly traditionally work as fishers and villagers who live on the upper side of the village are mainly from the Siau region and work as farmers, mostly coconuts, nutmeg and cloves. However, currently their occupations do not identically follow that situation anymore.

Figure 3.10 Taxi boats in the harbour of Bitung. Lembeh Island is in the background. Photograph by Mercy M.F. Rampengan, August 2012

3.3 Research framework and methods

This sub-section is a critical engagement with the endogenous capacity of local people to face natural hazards and disasters. An underlying assumption is that threatened people are capable of helping themselves in facing hazards, in rebuilding their livelihoods and reducing future disaster risks should a disaster occur, and that this needs to be officially recognised in development policy and research (Anderson & Woodrow 1989; Chambers 1994b; Gaillard 2010). The aim should be to position local communities as agents with the ability to cope with hazards and build their livelihoods with their own resources. Scholars such as Campbell (2009) argue that small island communities have a high capacity to deal with various hazards through using their 'traditional knowledge'. Baldacchino (2005) likewise explains island advantages in terms of strong social capital that facilitates 'good governance' practices and in many cases allows island people to achieve an enviable standard of living. Indeed, small island peoples commonly evolve distinctive cultures and retain a strong connection to their homeland and culture (Beller 1990; Giavelli & Rossi 1990; Hanson & Lamson 1990). This undoubtedly provides social advantages in facing disturbances whether these are cultural or natural (Giavelli & Rossi 1990).

Identifying inherent capacities in small island communities is critical to putting in place any risk reduction strategy. As argued in more detail below, this approach is far more strategic than the more familiar practice of government and nongovernment organisations of documenting vulnerability. Although research addressing the root causes of vulnerability is obviously needed (Wisner et al. 2004) it is not the focus here. Instead it is suggested that recognising and valuing capacity can help reduce risks in the long run (Cannon 2008a; Gaillard 2010; Wisner, Gaillard & Kelman 2012), and that reinforcing local capacities should be a key element of any DRR program (Mercer et al. 2007; Mercer et al. 2009). The recent proliferation of various Community-Based Disaster Risk Management programmes (i.e. CBDP-Community-Based Disaster Preparedness; CBDRR-Community-Based Disaster Risk Reduction; ICBRR-Integrated Community-Based Risk Reduction, etc.) as an alternative to top-down approaches in disaster risk management is one manifestation of the importance of endogenous capacities in decision making and other activities to enable people to deal with natural hazards. These programs promote participation and the involvement of local people, thus facilitating an understanding of the locality and situation of a community through the use of various participatory methods.

In the past decade, various participatory methods have contributed to the awakening of local communities to their potential capacities in reducing risks. Without wanting to diminish the usefulness and significance of participatory tools, it is the more general 'approach' toward research participants adopted by the researchers that is perhaps most important (Chambers 1994; Kumar 2002). This study therefore examines how different approaches even when using the same participatory tools, shape the kind of data collected; it calls into question the assumed

alignment between epistemology and methods. These issues came to the fore when a local Red Cross project conducted surveys in the same areas a few months after the research described in this thesis. The Red Cross project adopted a similar participatory approach, but was designed around the objectives of identifying potential interventions for the Red Cross. This research was less constrained and sought to improve our fundamental understanding of the livelihood strategies of the people.

Capacities in this study are understood as 'the set of knowledge, skills and resources people resort to in dealing with natural hazards and disasters' (Cadag & Gaillard 2013, 269). These capacities are understood through a livelihood perspective that emphasises the resources required to fulfil people's basic needs (Sayer & Campbell 2004), and that stresses the tangible and intangible resources people utilize in their daily lives – including during the occurrence of hazards (Ashley, Carney & Britain 1999; Chambers & Conway 1992). Davis et al. (2004) similarly define capacities in terms of the assets people own which enable them to resist, cope with and recover from disasters. Assets are thus the basis for coping with threats and uncertainties and responding to opportunities (Bebbington 1999; Chambers & Conway 1992), and improving relief and reducing disaster risks (Le De, Gaillard & Friesen 2013). Small island communities have survived for generations in hazard prone locations. They have endured coastal storms, high waves, storm surges, typhoons, tsunamis and erosion. These hazards are regular occurrences and are regarded as common facts of life (Kelman et al., 2011; Lewis, 2009). Communities therefore develop capacities to live with hazards through diversifying livelihoods and maintaining strong social capital. Such capacity to reduce the impact of harmful natural events has been widely recognized in the literature (Gaillard, et al., 2008; Gaillard & Le Masson, 2007). Finally, capacity is based on traditional social resources and belief systems that enable communities to cope with hazards and disasters (Campbell 2006; Gaillard et al. 2008; Giavelli & Rossi 1990). A bottom-up approach is therefore required to recognize people's perspectives and priorities (Scoones 2009) and for outsiders to better understand the local context (Chambers 1994). However, Shah (2006) explains that appropriate techniques must be used to reach the right threatened people with the right strategies for disaster, risk and vulnerability. Therefore, in this approach, communities are required to be positioned at the centre of the disaster research (Mercer et al. 2010) as well as, ultimately, the main beneficiaries of this research (Freire 1970). As Obersteiner (2002, 76) argues, "disaster schemes and programs still treat people as 'clients' in disaster management processes where science and technology do things to them and for them, rather than together with them".

Following on from these discussion, this sub-section provides the research framework of this study and a reflection upon the tools and processes used for such research, and is organised as follows. The first part describes the research framework used in this study, including a description of the process for selecting appropriate qualitative research methods

especially the individual methods applied during the fieldwork. The second part reviews some of the literature on participatory methods for disaster. The third part turns to a discussion of approaches in disaster research, evaluating the importance of participatory tools in uncovering community capacity. Finally, this sub-section comments on how the data collection was conducted in the field and the related ethical considerations to appropriately uncover local capacities. It will critically reflect upon how the research was undertaken. This reflection of the use of participatory methods concludes by stressing the importance of the research approach for researchers and policy makers alike, and the importance of the spatial and temporal issues at play in participation.

3.3.1 Research framework

A capacity framework developed by Wisner et al. (2012) was utilized in this study (Figure 3.11). This framework was used to understand people's capacities based on a sustainable livelihood framework. The elements of capacity are natural, political, economic, social, physical, and human resources (Wisner, Gaillard & Kelman 2012). The framework accomodates "non-western, oral and vernacular understandings" as claimed by Wisner et al. (2012, 28), though that framework follows the very Western categorisation of resources that is difficult for local communities to understand. To be easily understood by local communities, this conceptual framework has been adapted with additional links (arrows) among resources to show the connections and/or trade-offs (the fluidity of assets) among resources (Sayer and Campbell 2004; Scoones 2009). These understandings are important to exploring local capacity in this study, and are reflected in the use of participatory methods. The framework also allows the use of livelihood resources to understand local capacity. The way in which communities utilize their resources in facing hazards is an integral part of day-to-day life, and is reflected in the framework. Therefore it fits the core focus of this study.

Additional layers have been added to the framework to show the livelihood outcomes based on the various resources identified. These resources determined the strengths and capacities of the livelihoods of local communities, which in turn shape multi-outcomes within the context of small island environments. Capacity is thus determined by the combination and integration of the assets or attributes that provide the ability to face hazards. Capacities are not only related to the existence of resources but include the ability to either use or access resources (Kuban & MacKenzie-Carey 2001; Sen 1981; Watts & Bohle 1993). Availability and access to resources defines how diverse and sustainable people's livelihoods are and determines their ability to face hazards (Gaillard et al. 2009). Therefore, the pathway from livelihood resources to livelihood outcomes through livelihood strategies can be described (Scoones 2009).

3.3.2 Qualitative research methods

Qualitative studies contain rich descriptions and explanations of processes in identifiable local contexts (Miles & Huberman 1994). Qualitative studies "can preserve chronological flow, see precisely which events led to which consequences, and derive fruitful explanations" (Miles & Huberman 1994, 1). Qualitative studies collection methods were chosen due to the flexible and exploratory nature of this research to give "voice" to local perceptions in regards to their capacities; therefore this research methodology is embedded mainly within participatory methods. The methodology adopted is that of field observation, semi-structered interviews, and mainly group discussions using participatory tools (Figure 3.12).

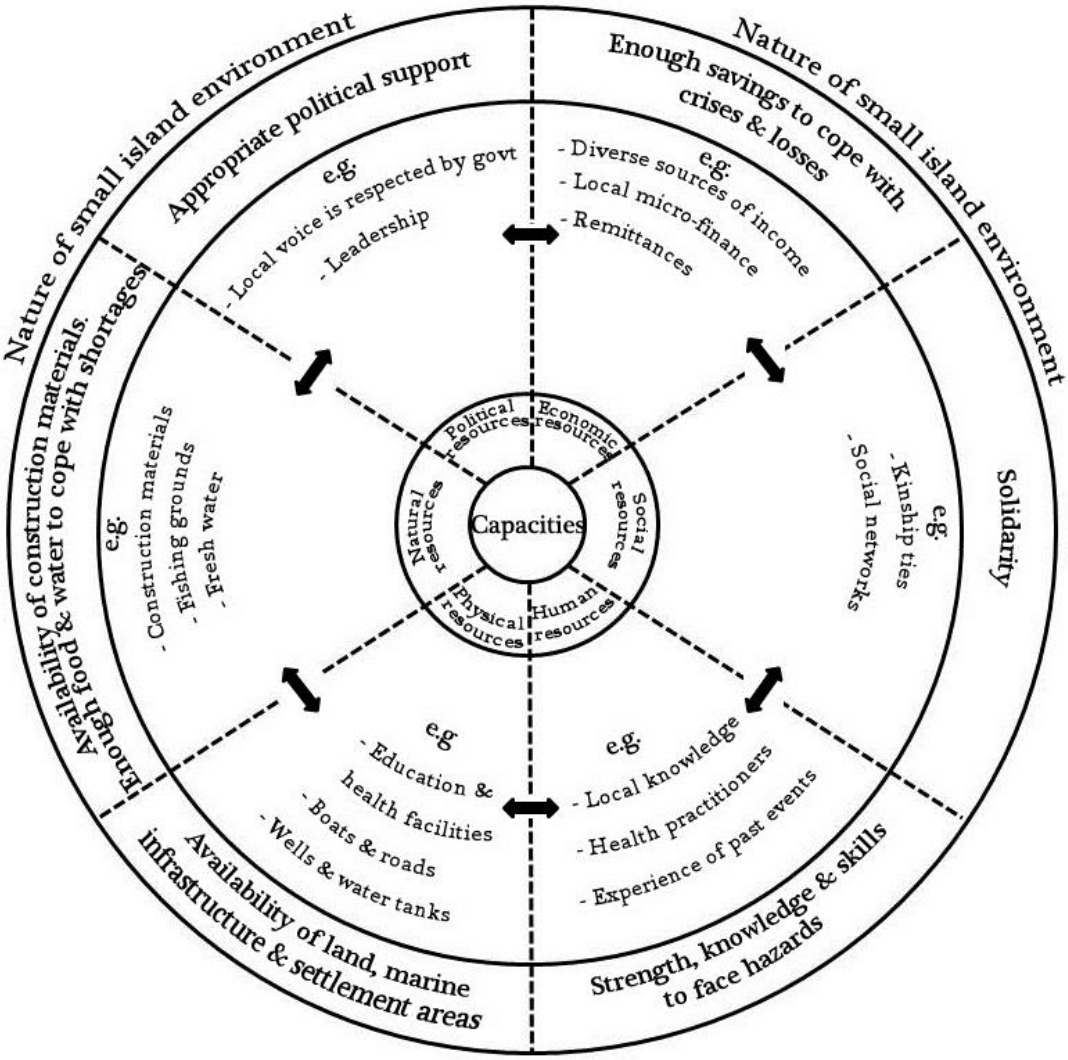


Figure 3.11 Conceptual framework for analyzing the capacity of small island communities to cope with hazards. Source: Adapted from Wisner et al.(2012, 28)

Qualitative research methods deal with the collection of conversations conducted through an intense and/or prolonged contact with the subjects' everyday lives (Miles & Huberman 1994). Qualitative studies can be used in order to "explicate the ways people in particular settings come to understand, account for, take action, and otherwise manage their day-to-day situation" (Miles & Huberman 1994, 7). This quote supports the aims of this research; to explore the local capacities in facing multiple hazards within their day-to-day lives through their livelihood strategies. By using qualitative methods, this study thus relies primarily on human perceptions and understanding (Stake 2010). The findings from qualitative research, through words, organized into incidents or stories "have a concrete, vivid, meaningful flavour that often proves far more convincing to a reader – another researcher, a policymaker, a practitioner –.....than pages of summarized numbers" (Miles & Huberman 1994, 1).

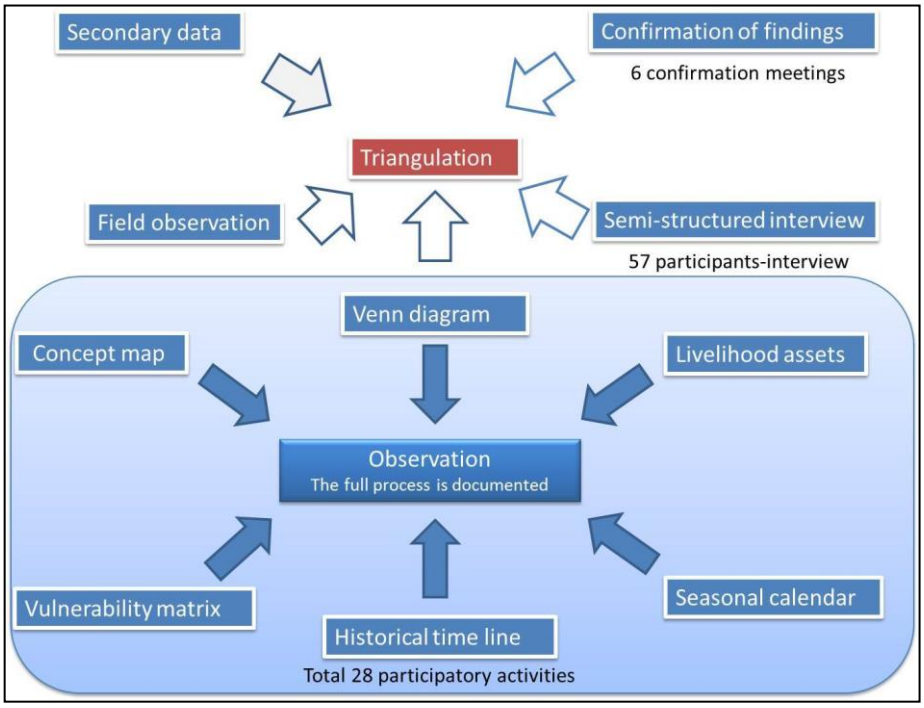


Figure 3.12 Diagram of methods used in this study

Harris and Johnson (2000) explained that qualitative research produces a portrait of people that cannot be gained through the use of quantitative techniques. It means qualitative research methods are potentially suitable techniques to fulfil the research objectives.

Miles and Huberman (1994) explain however that there are limitations in qualitative research methods, including the labour intensiveness and extensiveness (over months or years) nature of data collection and the possibility of research bias and lack of generalization as well as the potential for poor quality of the work produced. The quality of research could be critized for lack of scientific rigour and replicability. But the use of qualitative methods allowed a deep understanding of the reality of the local situation (Chambers 1994). Therefore, in the paper

attached within this chapter, these issues are explored in more detail. Despite the debate over the validity of qualitative methods, moreover, there is an argument that "qualitative research is socially concerned, cosmopolitan, and, above all, objective" (Kirk & Miller 1986, 10).

3.3.3 Semi-structured interviews

Semi-structured interviews complement participatory activities in that they help explore additional community resources and provide access to information that is too sensitive to discuss in group activities. They can also provide more detailed information, such as personal beliefs about phenomena that happen during disasters or particular experiences and past stories. As Solana et al. (2008) explain, interviews enable respondents to express spontaneous personal comments. Semi-structured interviews in this research facilitated the elaboration, spontaneity, and insightful stories which reflected how they felt and experienced particular issues.

This method uses guided questions based on issues raised during participatory activities. This activity therefore was only held after participatory activities when issues needing further exploration were identified. The semi-structured interview can delve further into the local capacities of small island communities as there is room for comments and explanations. The interview used a mixed sampling method combining opportunistic and snowball techniques (Kemper, Stringfield & Teddlie 2003) which facilitated a better flow of information and helped identify appropriate informants for specific issues. It means the target participants were questioned in their available time in a comfortable location and were recommended from a previous interviewee. The recommendations enabled knowledgeable participants in particular issues to be identified easily. For example, some participants were known by some villagers to have specific information about past experiences of disastrous events, while others were knowleadgeble about past stories of particular important events in the village. Most frequently the interview would occur in the participant's home (Figure 3.13) although it was common for an interview to be combined with an activity such as maintaining fishing nets. In some cases, the interviews were held multiple times to follow up on points that were unclear or required more discussion or clarification.

Interviews were carried out either with individuals or small groups of two to three people. The participants often feel more comfortable when together than in an intensive one-on-one interview situation and commonly family and friends would come and go, contributing intermittently throughout the interview. Most interviews lasted for one to one and half hour.

Interviews were recorded by hand-written notes. A field note entry was written following each interview, if possible, or at least during the evenings then elaborated with information from participatory activities. The field notes included personal reflections on participant responses to the questions, people present and points to follow up. The advantage of

a semi-structured interview format was that it enabled focus on and direct discussion around specific content relating directly to the issues raised in participatory activities. The disadvantage however was that there was less room for new issues to be revealed (Dunn 2005). Another disadvantage of the semi-structured interview is that it is not standardised, though it does give participants the freedom to express the issues in their own way. All the interviews were carried out in the Manadonese language. In Laingpatehi, these interviews involved 25 participants, Kinali had 15 participants and in Mawali 17 participants were involved (Table 3.1).

Figure 3.13 An interview held in Kinali village involved one farmer/fisherman/carpenter/elder in the backyard of his house. Photograph by Mercy M.F. Rampengan, October 2012

Table 3.1 Profile of participants in semi-structured interviews from 3 research sites

	Laingpatehi	**Kinali**	**Mawali**
Gender			
M	18	13	12
F	7	2	5
Education			
Primary	10	4	4
Secondary	5	0	3
High	4	9	9
Tertiary	6	1	1
Age			
Younger (≤35)	1	2	6
Middle-age (36-60)	16	8	8

Older (≥61)	8	5	3
Place of birth			
In the village	19	14	10
Outside the village	6	1	7

3.3.4 Observation

Participant observation was conducted in tandem with participatory activities as well as in some of the daily activities of villagers (fishing, farming, attending church, communal work). Participant observation is a strategy for collecting information which involves "researchers moving between participating in a community – by deliberately immersing themselves into its everyday rhythms and routines, developing relationships with people who can show and tell them what is 'going on' there, and writing accounts of how these relationships developed and what was learned from them – and observing a community: by sitting back and watching activities which unfold in front of their eyes, recording their impressions of these activities in field notes, tallies, drawings, photographs and other forms of material evidence" (Cook 1997, 167-168). The involvelment in regular household routines and community activities -- such as fishing, attending church, church-group fellowship, communal work (*mapalus*) and village meetings -- facilitated immersion in community life and provided a valuable opportunity to observe issues in the community and how they expressed their capacities.

Participant observation provides a full engagement in experiencing the daily life of the people (Patton 2002). Understanding everyday community life was an integrally important part of the information collected in this study, alongside the participatory activities and semi-structured interviews. These observations enabled an understanding of how local people understand and make sense of their daily life situations. Information was recorded via field notes, when appropriate, as often it would disrupt the 'normal flow' of participation in the situation involved.

3.3.5 Participatory methods for understanding local capacities in disaster research

Using participatory methods contributes to an awakening of local communities to their potential capacities in reducing risks from multiple hazards. Participatory methods are perceived as beneficial as they are 'used with' rather than 'applied to' local communities, and thus tend implicitly to take into consideration local priorities and perspectives (Chambers 1994, 1997; Chambers 2002; Rahman & Fals-Borda 1991). Participatory approaches to disaster risk reduction (DRR) tend to be critical of top-down strategies, and instead focus on soliciting the perspectives of people affected by hazards as a starting point for research (Wisner et al. 2004). Indeed, top-down approaches are thought to fail as a result of ignoring the importance of community capacities (López-Marrero & Tschakert 2011; Weichselgartner & Obersteiner

2002). This failure happens because top-down approaches involve limited interaction with communities and do not exploit their knowledge and experience of realities in the field. This leads to failure to take into account locality and context (Chambers 1994; Ivanitz 1999).

Participatory methods such as mapping, historical trend analysis, matrix ranking, Venn and network diagrams, seasonal calendars, etc. (Kumar 2002) are interactive and collaborative ways of investigating problems rather than simply posing questions (Ivanitz 1999). Chambers (1994) and Kumar (2002) moreover emphasise that the most important element of a participatory dimension of the methods is the level of engagement with the participants and the attitudes and behaviour of the practitioners involved. Thus, various participatory methods clearly need appropriate and flexible approaches to achieve the objectives of a study.

Participatory methods are widely acknowledged as an effective way of undertaking research with marginalized people (Kesby 2000; Pain & Francis 2003), including small island communities (Kelman et al. 2011; Mercer et al. 2008). Small island populations are categorized as marginal as they tend to inhabit geographically isolated locations that can impair their economies, politics and social networks (Gaillard 2010). Participatory methods aim to involve the most 'at risk' people and take into account their local knowledge and enable them to use their own words and frameworks of understanding (Chambers 1994b; Mercer et al. 2009; Mercer et al. 2010). But in practice it proves very difficult to provide opportunities to every community member, and it is difficult for alien researchers to fully understand local power relations and get those usually excluded from regular community affairs, such as women, engaged in research activities that are often organized with the help of local, powerful leaders (Le De, Gaillard & Friesen 2014). Therefore, despite efforts to broaden participation, participatory methods may still not provide equal access to all section of a community (Mosse 1994).

Much emphasis has been placed on the involvement of women in participatory activities in disaster studies (Cronin et al. 2004; Gaillard & Maceda 2009; Mayoux 2006; Wisner 2006). Women might choose not to participate or might participate in participatory activities but not be willing to express their views (Cornwall 2000). Nonetheless, women were key informants throughout the research activities conducted for this study. Women were present in large and small group activities, but gender did not present itself as a key variable in terms of how the community voiced its concerns. This study therefore took insights from Cornwall's (2000) "optimum participation" where participants may not have reflected the full social diversity of local communities but rather an optimum in the context of the objectives of the study (Bradshaw & Stratford 2005; Patton 2002). A more in-depth involvement with fewer but more diverse participants (including women and the elderly) was seen as ideal to collect comprehensive information but it was impossible to give everyone an equal voice in the process.

This study trialled and modified a range of participatory tools to document how small island communities respond to multiple hazards, as discussed below. The basic principles of participatory methods include offsetting biases, rapid progressive learning, triangulation, etc., with the possibility of finding out what principles of participatory methods work best through various experimental practices (Chambers 1994; Chambers 2002). While there are advantages to using these methods, some critics argue that participatory methods are unreliable, impressionistic and biased (Cornwall & Jewkes 1995). Despite these criticisms, participatory methods do have significant benefits and advantages. Pain and Francis (2003) even suggest that criticisms of participatory methods can often lead to positive progress in research, development and policy-making (see also Blaikie 2006). Since the key elements of participatory methods might lie in the disposition of the researchers rather than the methods themselves, the application of this approach creates personal, political and professional challenges that must be carefully addressed (Cornwall & Jewkes 1995). This study reflects on these issues as one goal of the research.

3.3.6 Research approach

This sub-section gives a general overview of the research process. Because "Gaining access to sites – receiving formal approval..... – requires time, patience and sensitivity to the rhythms and norms of a group" (Marshall & Rossman 2006, 77), appropriate procedures were followed throughout the fieldwork, which was conducted in several stages. Preliminary visits were organised in November 2011 and January 2012. These visits were important to gain a basic understanding of the communities and their environment. The first visit was also aimed at developing links with -- and getting support from -- local government institutions. The second stage visit was from June to December 2012, and aimed at collecting data from communities, government offices and the local Indonesian Red Cross (PMI), as well as from local newspapers. The final visit spanned August to October 2013, and confirmed the findings from previous visits, while at the same time deepening the validity of the findings and preliminary analysis.

Being accepted and gaining access to small island communities in Indonesia can be challenging. The first contact is an important part of research facilitation so meetings with the heads of villages and church leaders were held (cf Swanson 2008). The use of the Manadonese language helped gain access and trust. In all villages people were predominantly Christian and members of one of the biggest local church denominations: GMIST synod the local church in Laingpatehi and Kinali villages; and GMIM synod, the local church in Mawali village) (GMIST stands for Gereja Masehi Injili di Sangihe Talaud/Christian Evangelical Church in Sangihe Talaud: and GMIM stands for Gereja Masehi Injili di Minahasa/ Christian Evangelical Church in Minahasa). GMIST serves the area of Sitaro, Sangihe and Talaud districts which used to be

one district in the past (Sangihe Talaud District) while GMIM serves the area of Manado, Bitung, and Tomohon cities as well as Minahasa and three other districts. Participation in church services and other church-related events was crucial and so the presentation of the purpose of this study was made during a Sunday service in the local church. This approach was important because the Church plays such an important role in facilitating activities in the village. The tradition in these villages is to avoid farming and fishing activities on Sundays.

The participatory methods used for this study were drawn from various community participation toolkits (Boedhihartono 2012; Dazé, Ambrose & Ehrhart 2009; IFRC 2007; Kumar 2002), and were trialled and modified during the course of fieldwork. This study carried out 28 participatory group activities in total and 6 confirmation meetings across three different locations. Details of these activities is described in Table 3.2. The series of these participatory activities (Table 3.2) (Figure 3.14) conducted with community members of three villages included mapping people's knowledge of their livelihood assets and their perceptions of the hazards they encounter. Venn diagrams were drawn to understand the roles, services and suitability of various institutions as well as the suitability of their assistance. Historical timelines were used to track changes in the history of the environment, livelihoods and village development. Vulnerability matrices were developed to determine important hazards that affect the most important livelihood resources. A seasonal calendar to explore the activities taking place in the community over the period of one year, and the livelihood assets framework, were used to identify important resources. The map and discussions during the participatory activities were documented and later analyzed together with observations of daily life and other secondary documents.

Group activities used existing community groupings (usually church related) and typical informal convening places (i.e. on the beach, under a tree and in the garden) to limit intrusiveness to daily activities. Working with larger groups, as an initial approach, yielded good information, but this activity rapidly became seen as a disruption to daily subsistence and commercial activities as the meetings required lengthy and in-depth discussion about issues (i.e. mapping). Although the date, time and location were determined with village officers, elders and church leaders, participants often did not turn up on time. The atmosphere in the Church tended to inhibit participants to talk freely in an informal way, which ran counter to the purpose of digging deeper into the people's knowledge. Impromptu meetings were therefore held with people going about their daily routine in various locations such as on the beach, in front of houses, under a tree and in the garden where participants felt more comfortable, had no work scheduled and could talk freely. This enabled participants to continue with their daily

Table 3.2 Detail of the series of participatory activities and confirmation meetings held in three villages

Laingpatehi				
Meetings	**Frequency**	**Location**	**Date**	**Participants**
Concept mapping	5	Church, house & under a tree	1/07-2012 3/07-2012 4/07-2012 9/07-2012 23/10-2012	13 10 9 5 5
Historical timeline	1	On the beach	13/10-2012	7
Seasonal calendar	1	In a garden	13/10-2012	7
Venn diagram	3	House, on the beach & in a kiosk	6/07-2012 6/07-2012 13/10-2012	10 5 7
Livelihood assets	1	Under a tree	18/10-2012	6
Vulnerability matrix	2	Church & under a tree	4/07-2012 18/10-2012	9 6
Confirmation of findings	2	Under a tree & primary school building	9/09-2013 11/09-2013	15 33
Kinali				
Meetings	**Frequency**	**Location**	**Date**	**Participants**
Concept mapping	3	Village office, in a house & under a tree	23/07-2012 24/07-2012 27/10-2012	15 6 4
Historical timeline	1	House	19/07-2012	4
Seasonal calendar	1	In a garden	18/07-2012	5
Venn diagram	1	House	19/07-2012	6
Livelihood assets	1	Under a tree	28/10-2012	7
Vulnerability matrix	1	Under a tree	25/07-2012	5
Confirmation of findings	2	Church and in a house	03/09-2013 02/09-2013	42 8
Mawali				
Meetings	**Frequency**	**Location**	**Date**	**Participants**
Concept mapping	3	In a house (2) & under a tree	11/08-2012 14/08-2012 11/10-2012	7 9 6
Historical timeline	1	In a house	06/10-2012	7
Seasonal calendar	1	In a garden	13/08-2012	5
Venn diagram	1	In a house	14/08-2012	9
Livelihood assets	1	Under a tree	07/10-2012	6
Vulnerability matrix	1	In a house	06/10-2012	7
Confirmation of findings	2	Village office & in a house	02/10-2013 01/10-2013	17 8

activities such as cleaning fishing equipment, looking after their small kiosks and gardening while engaging in participatory activities.

The change of place and time for participatory activities therefore helped create a more accommodating and 'comfortable' atmosphere for participants to share their knowledge. This helped avoid the 'unjust exercise of power' where people feel compelled to be involved in participatory activities (see Cooke & Kothari 2001, 4), a scenario which can produce unreliable, subjective and biased results (Blaikie 2006; Cornwall & Jewkes 1995). Indeed, participatory activities can sometimes achieve the opposite of the principle of equality, sustainability and the empowerment of the less powerful people, and thus create a tyranny of decision making and control (Cooke & Kothari 2001). In this research, when participants did not participate in activities organized by the village head, they were likely expressing their resistance to formal participation that intruded on their lives and livelihoods. While this may not have been a "tyranny of control" type scenario, it did mean the research was not being responsive to the routines or priorities of participants and they were resenting or ignoring the ways in which the times and places of the research were being planned for them. The research thus changed its approach to connect with more everyday spaces and times in participants' routines.

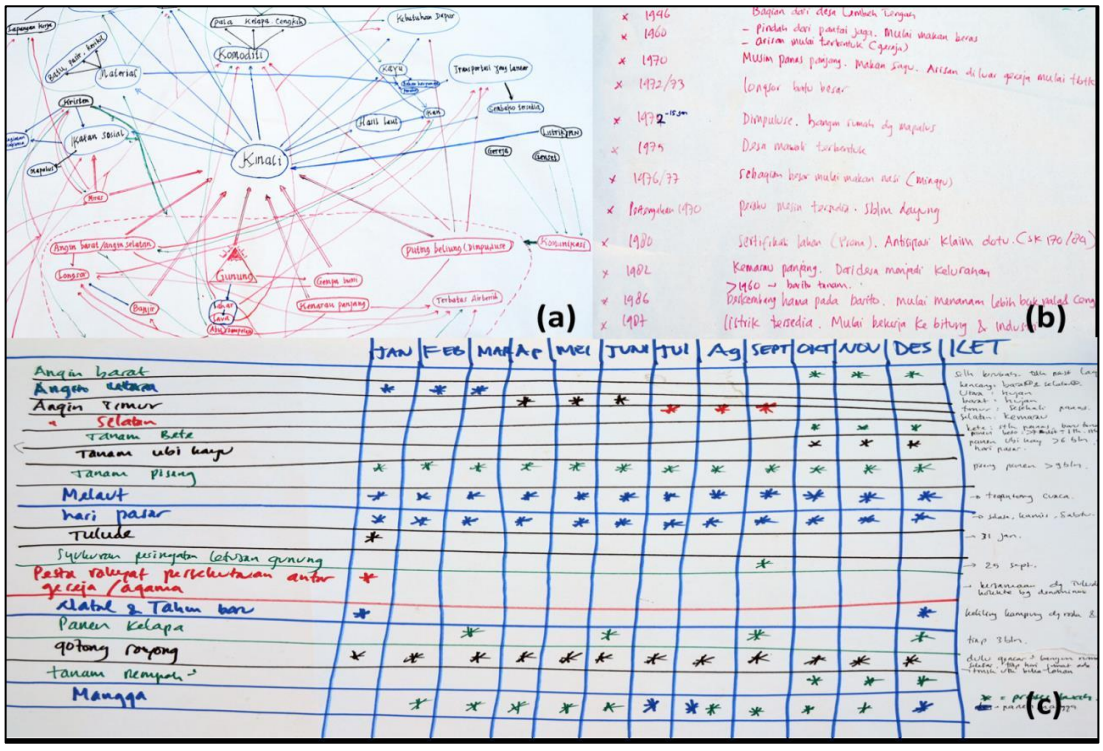


Figure 3.14 Several examples of the results from participatory activities. A concept map built by villagers from Kinali (a); historical timelines built by Mawali villagers (b); and seasonal calendar built by Laingpatehi villagers. Photograph by Mercy M.F. Rampengan, July and August 2012

Several formal and informal meetings were held with the communities during the last visit to confirm findings. This provided opportunities for knowledge to be shared and discussed. Incomplete information from previous visits was finalised, and meetings in different groups provided an opportunity for triangulation. Smaller groups were used to reach people who did not attend the bigger group meetings and get more in-depth feedback especially from elders and religious leaders. These meetings often continued well into the evening. During these meetings the participants were introduced to the way the research framed their histories and capacities, and all the information from different participatory methods, interviews, observations and secondary data were shared with them. As most villages lack written documentation, the meetings were an opportunity for participants to reflect on their village stories and capacities in new ways. Some villagers took notes at these information sharing events, and some others, including church leaders, requested a copy of the final thesis to become a community resource.

3.3.7 Capacity research in action

"Language" of the research and project-based participatory methods

Meeting villagers on their own terms, and focussing research on their capacities, encouraged many villagers to feel pride. As suggested by Scheyvens and Momsen (2008a), the inhabitants of small islands have a strong sense of their economic and cultural resources and desire for that value to be recognised. They also tend to have strong social cohesion and rich natural resources (Armstrong & Read 2006) and social/cultural identity is a glue that holds them together in the face of any threats or disasters (Giavelli & Rossi 1990; Skelton 2007). Approaching the community in a positive manner, and recognising their assets, enables them to speak of their strengths rather than vulnerabilities. This in turn promotes a discourse of resourcefulness rather than weakness and victimhood. In Butler's (1997) terms, different ways of speaking to and engaging with the community encourages different kinds of 'subjection'. It provides villagers with a different way of understanding themselves and presenting themselves as 'subjects'. In disaster research, communities are often labelled as 'vulnerable' (Bankoff 2001); that is they are labelled as vulnerable subjects prior to and through the process of research. While it is important to acknowledge that different members of the community have different needs and capacities and that this depends on power relations in the community (which are shaped by class, gender, ethnicity, age, ability, immigration status etc.) it is also important to acknowledge that this more general approach to communities has implications for the kind of data collected. Researchers who focus on vulnerability find needs; those who focus on capacity tend to find 'resourcefulness' (cf Cahill 2008; Gibson, Law & McKay 2001; McGregor 2009). This distinction is not merely semantic.

In the case of typhoon Ondoy (2009) in the Philippines, a funding agency that focused on local community capacities and encouraged local communities to play active roles in the

rebuilding process avoided dependence on outside relief (Hill & Rom 2011). McGregor (2009) and Cahill (2008) similarly argue that a language of hope and possibilities is important in encouraging communities to seek out opportunities and to re-imagine themselves in terms of their strengths thereby enabling them to explore their options for development.

Respect and recognition are thus crucial factors in exploring people's capacities. When the capacity of the community was a priority to be explored, people tended to be enthusiastic in explaining their capacity. For instance, meetings during this study could last until evening, be very lively and enjoyed by participants and lead to intense discussion. They appreciated the respect shown by an outsider towards their strengths. A similar scenario is examined by Cannon et al. (2003) who document the positive impact of relief projects when development staff show respect for local capacities. Moreover, the importance of focusing on the capacity possessed by vulnerable communities can lead to positive socio-economic development outcomes (Cameron & Gibson 2005). It encourages people to take a self-determined development pathway (Escobar 1995) as these communities were positioned as agents with ability to address hazards with their own resources (Anderson & Woodrow 1989). Scheyvens and Momsen (1999) likewise stress that by focusing on capacity one can gain insights into the ability of island communities to enhance their standard of living despite the challenges facing them.

Participatory methods were used in this study to explore livelihood strategies and capacities in facing multiple hazards. While discussions of community strength produced information that was useful on its own terms, it was interesting to observe that the participatory methods used by the local Red Cross, who engaged the same communities several months after the conclusion of this research, produced different insights. In these communities (Laingpatehi, Kinali and Mawali villages) and several others, there was an ICBRR (Integrated Community-Based Risk Reduction) project directed by the local Indonesian Red Cross (PMI) program. PMI utilized participatory methods such as transect walks, seasonal calendars, Venn diagrams, mapping, etc. (see Table 3.3), and these methods were also used to address the needs of disaster prone communities. The ICBRR project aimed to mobilise and motivate the villages to develop and complete village action plans that would establish mitigation measures in reducing disaster risks. Their objective was to reduce vulnerability and increase the capacity of communities to cope with disasters, hazards & associated risks (Palang Merah Indonesia Kabupaten Kepulauan Sitaro 2013a, 2013b; Palang Merah Indonesia Kota Bitung 2013).

Despite the use of similar methods with similar communities and the broad agreement and complementary nature of the findings, the PMI research did not uncover as much detail about community assets as our work revealed. Indeed, even though the PMI used a much larger suite of participatory research tools for their project (18 participatory tools rather than the 6 used for this study), and enrolled locals in collecting the data, it was surprising that a few relatively major assets were hidden from their final assessment. A comparison of the major assets

uncovered by both research projects is shown in Table 3.4. The table first documents the assets found in both projects, and then lists some assets uncovered in this project that were surprisingly missed by the PMI. Sometimes these are small and additive, other times they are more significant in terms of community livelihood strategies. In Laingpatehi village, for example, some major livelihood developments uncovered through this research included: the existence of a satellite village in Central Sulawesi Province as an alternative source of income from agroforestry; the changing of the community's fishing boats to access fish pontoons at the temporary camp in Tagulandang Island (where they lived after the eruption of 2002); rent-free use of land among the locals; the rebuilding of the village after the 2002 eruption; and the role

Table 3.3 Methods used by the local Red Cross (PMI-Palang Merah Indonesia) and in this study

No.	Local Red Cross (PMI)	This study
1	Historical profile of disaster & diseases events	Historical timeline
2	Transect walk to document risks & capacities	Concept map
3	Seasonal calendar (monthly)	Seasonal calendar
4	Venn diagram	Venn diagram
5	Transect map of village infrastructure & environments	Livelihood assets
6	Risk & vulnerability assessment	Vulnerability matrix
7	Daily activities (hourly)	
8	Village changes (yearly)	
9	Calendar of income (monthly)	
10	Listing & ranking (wealth)	
11	Map of village	
12	Strategies to eliminate social problems	
13	Internal & external vulnerabilities	
14	Disasters and diseases calendar (monthly)	
15	Coping strategies of disasters & diseases	
16	Risk, vulnerability & capacities assessment	
17	Problem tree	
18	Solution tree	

of remittances from sailors. These are just some important examples of local strength and innovation that were not recorded in PMI's results. In Kinali village, different community strengths were likewise neglected: a local culture of collecting and sharing fallen nutmeg; and a rotating ownership system for crops. In Mawali, the PMI did not collect information on the changing of crops and fishing boat types. There is clearly a difference in information obtained from the same community within a relatively close time period of data collection.

These different findings can at least partly be attributed to the difference in approach toward the community. How the community is understood and known is a key factor shaping the results obtained through this research as well as in PMI activities. The PMI activities in these villages are very likely perceived by communities as a 'project', where the portrayal of

Table 3.4 Capacities in three villages, differentiated by research projects, this study and local PMI (Sources for PMI: Palang Merah Indonesia Kabupaten Kepulauan Sitaro 2013a, 2013b; Palang Merah Indonesia Kota Bitung 2013)

		Kinali	Laingpatehi	Mawali
Physical	This Study & Red Cross (TS & RC)	- Health, education & village office facilities - Loud speaker for early warning - Water tanks (rain water) - Public toilet - Church buildings - Evacuation road - Drainages - Temporary shelters - Cars for transportation/evacuation	- Health, education & village office facilities - Loudspeakers for early warning - Water tanks (rain water) - Public toilets - Church buildings - Evacuation road - Drainages - Temporary shelters - Electricity generator	- Health, education & village office facilities - Loudspeaker for early warning - Water tanks (from spring water) - Public toilets - Church buildings - Evacuation road - Temporary shelters - Cars
	Only this study (TS)	- Handy Talkie for communication - Private toilets - Concrete houses (dominant) - Transportation roads - Motorbikes/boats for transportation/fishing/ evacuation - Temporary shelters - Bridges - Electricity (24 hours)	- Wells & bore water - Private toilets - Concrete houses (dominant) - Transportation roads - Boats & motorbikes for fishing/transportation/evacuation - Temporary shelters - Electricity generator (4 hours/day) - Satellite village in Central Sulawesi Province	- Wells, water pumps - Private toilets - Concrete houses (dominant) - Island ring-road (on-going development) - Motorbikes/boats for transportation/fishing/ evacuation - Drainage - Temporary shelters - Electricity (22 hours/day) - Local security guardhouse - Boat jetties (2) - Mobile communication tower - Garbage truck fom govt (weekly) - Gasoline engine for boats instead of kerosene
Social	TS & RC	- *Mapalus* (communal work)	- *Mapalus* (communal work)	- *Mapalus* (communal work)
	TS	- Health, education & village office facilities - Loud speaker for early warning - Water tanks (rain water) - Public toilet - Church buildings - Evacuation road - Drainage - Cars for transportation/evacuation - Temporary shelters	- Social networks - Neighbourhood ties - Kinship ties (Sangihe ethnic dominant) - Connected to the land - Pride - No fishing & farming activities on Sunday - Traditional system of renting land without payment	- Social networks - Neighbourhood ties - Kinship ties (Sangihe ethnic dominant) - Connected to the land - Less activities on Sunday except for religious activities - Traditional system of renting land without payment - Local health fund system - Local building housing fund system
Human	TS & RD	- Strong faith because of intensity of religious activities - Various skills - Active role of village staff, villagers & religious leaders in village development & disaster responses - Health services	- Strong faith because of intensity of religious activities - Various skills - Active role of village government staff, villagers and religious leaders in village development & disaster responses - Health services	- Various skills - Active role of village staff, villagers (incl. PMI volunteers) & religious leaders in village development & disaster responses - Health practitioners & services
	TS	- Local knowledge & experience of past events - Health practitioners - Improved health status - Higher educational attainment - Strong culture related to the existence of a volcano	- Local knowledge & experience of past events - Health practitioners - Improved health status - Higher educational attainment	- Strong faith because of intensity of religious activities - Local knowledge & experience of past events - Improved health status - Higher educational attainment
Economic	TS & RC	- Diverse sources of income	- Diverse sources of income	- Diverse sources of income
	TS	- Community-based rotating scredit schemes (including for savings) - Remittances - Markets for agroforest products - High tax payments - Relatively continous production of crops throughout the year - Government development projects available in the village (i.e. PNPM) - Mortgaging crop trees yearly - Relatively high price for nutmeg & mace - Savings program in primary school - Rotating crop ownership within a family - Collecting loose nutmeg - Early reactivation of agricultural activities No cost for crops (agroforest & subsistence) fertilizer & pesticides	- Community-based rotating credit schemes (including for savings) - Remittances - Markets for fish & crops product - High tax payments - Relatively continous production of copra, cassava & others throughout the year - Government development projects available in the village (i.e. PNPM) - Less expenditures - Controlling fish price - Access to fish pontoons - Diverse sources of income	- Community-based rotating credit schemes (including for saving) - Remittances - Markets for tuna, copra, nutmeg & clove - High tax payments - Relatively continuous production of crops throughout the year - Government development projects available in the village (i.e. PNPM) - Local private creditor - Easy access to mainland for selling local products - Access to special gasoline station for fishers provided by government - Availability of several resorts, ship yards on the island and many industries on the mainland - Diverse sources of income mostly work outside the village - Tourism industry (resorts)

Politics	TS & RC	- Government development projects	- Government development projects	- Government development projects - The existence of a local NGO
	TS	- Local voice is respected by government - Relatively high budget allocation fund from government - Relatively good relationship between village leader & district government - Leadership	- Local voice is respected by government - Relatively high budget allocation fund from government - Relatively good relationship between village leader & district government - Leadership	- Currently local voice is respected by government - Relatively good relationship between village leader & city government
Natural environment	TS & RC	- Construction materials - Agroforestry trees	- Construction materials	- Construction materials - Subsistence crops
	TS	- Subsistence crops - Local fruit & nuts - Fire wood - Local livestock feed - Fishing grounds - Local role to ban cutting particular trees - Fertile soil - Natural fertilizer & pesticide (volcanic dust) - Hot spring water resources	- Agroforestry tree (coconuts) - Subsistence crops - Local fruit - Fire wood - Local livestock feed - Fishing grounds - Hazard resistant plants - Fresh water (1 bore water)	- Agroforestry trees (nutmeg, coconuts & cloves) - Local fruit - Fire wood - Spring water - Local livestock feed - Fishing grounds - Local role to ban cutting trees in the steep hills - Diving spots - Tourist destination areas - The strait is relatively calm for transportation access

vulnerability is promoted by participants as a means of attracting support. The community would be seen by the PMI as a 'beneficiary' of the project and as having 'needs'. By way of contrast, in this study the community is understood as a complex entity with 'capacities' in building livelihood resources. Because this study was not linked to any specific project, there were no on-going activities such as establishing a particular project related to a DRR program. This situation, which differs from research carried out by government and non-government organisations that may have some 'deliverables' for communities, was clearly explained to the participants during the introduction to the research. The PMI 'project', which had the potential to deliver outcomes and funding, encouraged a focus on vulnerability, weakness and needs. The communities could have played down their capacities to benefit from any future resources the PMI might provide (eg physical mitigation measures). In the process, however, the PMI research failed to uncover some of the strengths of these small island communities, instead uncovering needs in the community that might be deserving of support. By contrast, this study set out to uncover strengths rather than weaknesses, though it can be argued that both studies are important to comprehensively understand both capacities and vulnerabilities of small islanders.

The misuse of participatory methods is another possible factor that could have caused the different findings between this research and PMI activities (see Wisner 2010). There could have been insufficient time for the Red Cross project officers and trainers to comprehensively explain the use (or misuse) of various tools of participatory methods and how to properly describe the results in their reports. This lack of explanation could result in a confusing and improper implementation of participatory tools thus affecting the quality of information received. Projects where a tight timeframe is a priority often have this problem. The

International Relief Development Project (IRDP) noted that insufficient time in running a project caused ignorance of local capacity and a focus only on disaster affected peoples' needs and problems (Cannon, Twigg & Rowell 2003).

The role of group size and place of participatory activities

Group size and the type of meeting are also issues that impact results. Group size, meeting place and meeting time are all important factors when conducting participatory activities. Bigger group activities were difficult for a number of reasons, one of which was the inflexible meeting time; schedules were set-up in advance, so participants had to adjust to the meeting time schedules. Another reason is that natural hazards are regular occurrences and regarded as a common fact of life for small island communities who have been dealing with such disruptions for generations (Kelman et al. 2011; Lewis 2009). The main community concerns revolve around fulfilling daily needs, not dealing with hazards themselves, so interest in bigger group activities was often low.

There are no direct material benefits to the community from 'academic' research: in other words, the material benefit for the community could not be weighed up against their participation. There could be no promise of externally facilitated follow-up activities as compensation for this intrusion into their busy daily lives, and the only value returned to the community would be in the form of written documentation of their capacities – including of their pride as islanders – (both the documentation of participatory activities themselves, but also any formal written documents produced – including this thesis). Such documentation can facilitate more soundly based future projects to strengthen their capacities and address future risks, either by villagers, government or other organisations.

By not attending the 'scheduled' meetings they could simply do something else in addition to their main activities (farming, fishing or wage labour) that would yield a more tangible benefit such as maintaining boats and fishing nets, cleaning up the land around their agroforestry areas and maintaining the trees, collecting building materials around the village or driving *ojeks* (local motorbike taxis). Based on field observations at several regular village meetings, more villagers tended to attend meetings they saw as directly affecting their life (i.e. regarding clean water management, PNPM/Program Nasional Pemberdayaan Masyarakat-National programs for community empowerment, for farmer or fishing groups, etc.).

Small group activities with more convenient places and times for meeting were more successful in facilitating participant-researcher knowledge sharing. A relaxed and informal research situation encouraged many stories and discussions. Figure 3.15 shows one of the participatory activities in a smaller group held in Laingpatehi village, during the second stage of fieldwork. The participants were village staff, farmers, fishers, construction workers and teachers. The activity was run in a 'natural' way, meaning nobody was reluctant to interact or

engage in the discussion as people felt relaxed and comfortable. Meetings often lasted until late into the evening without concern that it was disrupting their activities. Participants' perspectives were thus allowed to be more naturally reflected as they talked around the issue in the relatively friendly atmosphere of the meeting. Opinion sharing and exploring community capacities were the most important part of these meetings, not the detailed map or other exercises. Villagers were more comfortable discussing issues rather than writing or drawing. Makasar (2011) explains that people of Sangir ethnicity have strong oral traditions, often relying on the written documents about their history from western people who visited or occupied their islands in the past, which might explain this propensity toward dialogue. Therefore, it was often the discussion behind the drawings and maps during the participatory activities that provided the most important information. Notes on important matters raised during these discussions were taken and emerging themes were later discussed and confirmed with participants (either participatory activities, interviews or confirmation meetings).

Figure 3.15 Participatory exercise with a small group at a convenient place and time. This activity was held in Laingpatehi village, Ruang Island during the second phase of fieldwork. Photograph by Mercy M.F. Rampengan, October 2012

3.3.8 Confirming the findings: Data validation and respecting the islanders

The final stage of the research, confirming the findings with the community, facilitated triangulation and validated the data gathered during fieldwork. This stage also helped minimize any misunderstanding or miscomprehension about particular issues discussed in prior

conversations. As the lead author is Indonesian but not an 'insider', this position can shape a different understanding of the issues. It can influence the observation of phenomena, but the researcher him or herself can also influence the outcome of participatory meetings through use of language, behaviour, and culture. Simply by entering 'the field', the researcher changes the social world under study (Mauthner & Doucet 2003). These potential issues were acknowledged and minimized by the use of local Manadonese language; respect of and adherence to local roles and customs; listening to and respecting all villagers, village leaders and elders together with religious leaders; and finally, by personally disseminating the results of the study to the local communities during the last field visit. All the maps drawn and notes taken in the second round of field work were shared, explained and then comments were invited from participants. Discussions about important issues added by participants were recorded. Triangulation aims to ensure a greater confidence, and corroborate findings by using another method to check the initial findings (Darlington & Scott 2002). In this research triangulation was facilitated through semi-formal meetings which generally had high attendance. Most expressed an appreciation for this activity as they felt positioned as an 'important' source of information; this had not occurred before in these communities. Moreover, although participatory methods are a bottom-up approach aiming to reduce the subjective nature of interpretation, the results and conclusions remain the researcher's interpretation (Miles & Huberman 1994). Therefore, these confirmation meetings clarified local viewpoints and helped counter any potential bias. Confirmation gives more confidence to the findings while at the same time respecting the local communities across the research process, from beginning to end. Spontaneous notes taken by villagers during the meetings provide significant new documentation to their village stories and capacities as they have no proper written documentation. All documents related to the participatory activities were left for these communities. The documents could help them to identify the resources and potential resources they can use for future village development programs.

3.3.9 Conclusion and limitation of the approaches used in this study

To sum up, the use of participatory methods does not guarantee bias-free, objective research, and this chapter has suggested how participatory methods can yield different results depending on different approaches to the community. It should be stressed from the outset that research conducted by large organisations is often under time constraints, whereas this research could be more attuned to issues of place and group size, and how they affect the quality of data. But the point is not to suggest that these methods were superior or better executed than the PMI; there was much overlap in the data and the overall findings were similar. The rather different assertion is that the tone or approach of the research enables particular kinds of community identities to be enabled in participatory activities. For the research documented in this paper, the community was considered to have capacities and assets which enabled positive reflections on

livelihood strategies for island life. Conversely, in PMI and other disaster project activities, these same community members were constructed as vulnerable which encouraged villagers to speak of their vulnerabilities – which may have been at the expense of documenting some important livelihood activities.

Uncovering local capacities using approaches that enable local communities to speak of their strengths has many benefits. When approached in this way, communities tend to articulate pride in activities that can be usefully bolstered by any Disaster Risk Reduction (DRR) program. Conversely, existing capacities of communities can be overlooked in research that focuses on needs and vulnerabilities. This case is made explicit in the parallel research done by the PMI where communities portray themselves in particular ways to attract project funding. In other words, the power relations of the researchers and participants shape the kind of information offered. Approaching communities in positive ways can reveal the benefits of appreciating local capacities as a means to achieve better results in disaster managment programs, which are better able to be sustained for future generations because they build on what the community is already good at. Wisner et al. (2012) argue that capacities are often easier to enhance than are efforts to reduce vulnerability. This paper thus suggests an ethical way of doing research that provides considerable potential benefits for governments and agencies wishing to make a positive impact in the realm of development and disaster management for communities.

It is also important to stress some of the limitations of this study. Most limitations stem from difficulties associated with being an independent researcher without the ability to join in with livelihood activities or provide follow-up assistance to the communities involved. However, a combination of the flexible meeting places and a different ‘language’ of research was applied to overcome some of these limitations. This more flexible research approach maximised the voice of local people, and focused energy on portraying local livelihood flexibility and innovation that is often played down in most project-based research. Villagers were interested in the approach as it helped and facilitated them to explore more about their own capacities thus reflecting their pride as islanders and the strengths they have demonstrated for generations in facing various hazards.

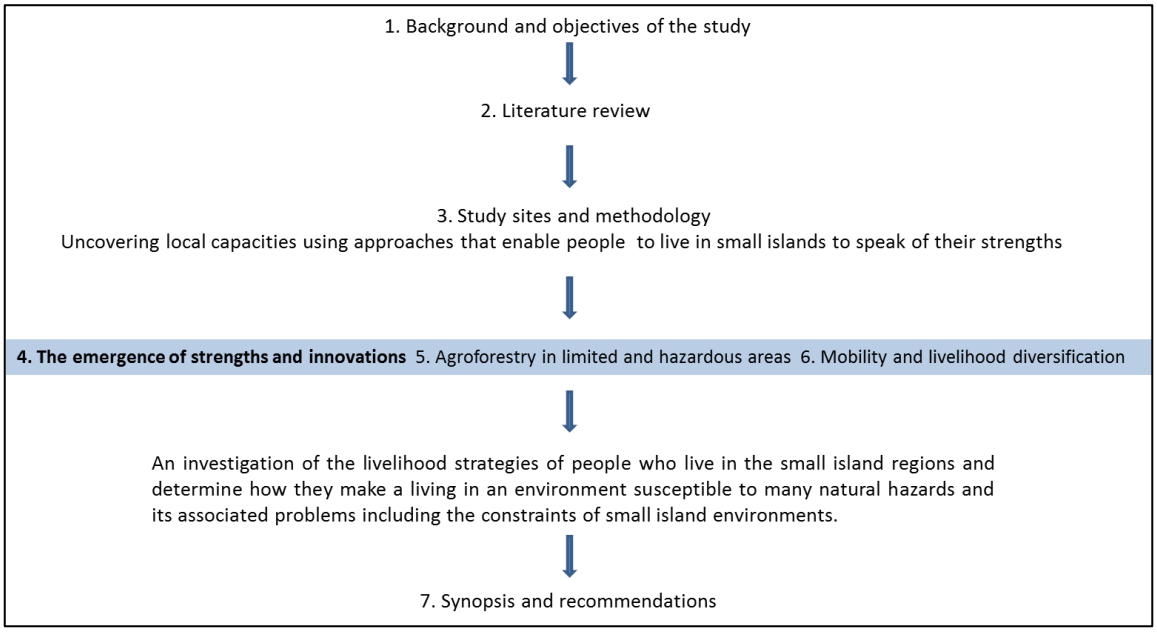
3.5 Conclusion

This chapter has introduced the field sites and methods used, and reflected on how participatory methods help to uncover the local capacities of people living on small islands in facing various hazards. The overall research approach promoted a discourse of strengths and resourcefulness, providing a contrast to 'vulnerability' and 'needs assessment' approaches common to government and non-government organisations which tend to focus on weaknesses and can sometimes fuel

undeliverable expectations of funding. This study thus provides a critical reflection on participatory methods and their significance for researchers, policy makers and funding agencies working with communities in hazard prone regions. The next three chapters (Chapter 4, 5 and 6) examine the capacity of three different villages on three different islands to face various hazards. Each chapter addresses a different research objective.

CHAPTER 4

CAPACITIES IN FACING NATURAL HAZARDS: A SMALL ISLAND PERSPECTIVE



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Chapter 3 describes the study sites and examined the methods used in this study to uncover the capacities of inhabitants of small island areas in facing multiple hazards. In this chapter, I describe the strengths and innovations of the community in Laingpatehi village, Ruang Island to show that the marginalization-vulnerability nexus can be offset by capacity and social cohesion to enable sustainable livelihoods. This chapter fulfils the second research question: how can disastrous events inspire innovations in livelihood systems?

4.1 Introduction

Vulnerability to multiple hazards is thought to be a characteristic of small, remote island communities (Lewis 2009). Their small size and isolation allegedly expose them to a wide

range of internal and external hazards. Several studies have documented impacts of disasters on Small Island Developing States (SIDS) (Briguglio 1995; Méheux, Dominey-Howes & Lloyd 2007); these studies concluded that small islands are more vulnerable than non-island locations. An indicator of vulnerability of small islands has been developed by Pelling and Uitto (2001) based on the United Nations Human Development Index (UNDP 2000). They present data on disaster impacts and losses collected by the Centre for Research on the Epidemiology of Disasters. The data suggest relatively high frequencies of disasters and increased vulnerability for small islands and their populations. Additionally, many small islands are located at the geographical periphery and are socioeconomically and politically marginal (Kelman 2010; Wisner & Gaillard 2009). Their risk stems from their exposure to hazards in addition to their marginal status that reduces their ability to deal with emergencies. Some factors that contribute to their marginal status include the absence of warning systems, and institutional delays in evacuation and distribution of basic relief support (Terry & Goff 2012; Wisner et al. 2004). Wisner et al. (2012) show that small, isolated communities often receive no support or even acknowledgment of the occurrence of a disaster.

However, some data exist regarding local capacities to cope with hazardous events. Gaillard (2007) explains how an indigenous community on Niuafo'ou in Tonga and the Aeta Negrito communities of the Philippines have coped with volcanic eruptions, and how the Tikopia in the Solomon archipelago have dealt with typhoons and famine through changes in their traditional ways of life. Experiences passed down through generations also strengthen the local capacities of Simeulue islanders who have faced many hazards, including the tsunami in Aceh on 26 December 2004 as described by Gaillard et al. (2008) and McAdoo et al. (2006). The potential for integrating local knowledge with more well-documented scientific knowledge has also been examined by several scholars (Kelman, Mercer & West 2009; Mercer et al. 2009). The use of alternative foods, as shown by a study in Fiji, reduced the likelihood of total devastation from hurricanes (Campbell 1984). Among wealthier small island regions, the Faroe Islands stand out as an example where islanders have been able to deal with isolation using their own resources (Hovgaard 2000). The Faroe Islands perform relatively strongly economically, have high levels of social services and strong municipal institutions. The people inhabit an area where the climate is relatively harsh and transportation is costly. Their economy relies heavily on fisheries. However, in the face of isolation and the associated problems with hazards, they utilize creative livelihood strategies based on local tradition, identity, and history, together with international networks to overcome threats (Hovgaard 2000).

There is a rich literature on the diverse capacities of communities—in mainland and small island communities, and in affluent and less affluent countries—in facing hazards. Wisner et al. (2012) argue that these capacities are often easier to enhance than are efforts to reduce vulnerability. Capacities are often rooted in resources that are endogenous to a community

(traditional knowledge, social networks, and indigenous skills). By contrast, the vulnerability of a population often depends on access to resources that are exogenous to the community (that is, inequitable distribution of wealth and resources within the society, market forces, political systems and governance) (Gaillard 2010; Wisner, Gaillard & Kelman 2012). Therefore capacities must be recognized and used to strengthen people's strategies to face hazards. The evidence suggests that communities living in disaster prone places are able to survive and prosper in the face of potentially disastrous events and their consequences (Burton, Kates & White 1993). They therefore must be equipped with an array of capacities, despite their vulnerabilities (Davis, Haghebeart & Peppiatt 2004).

Yet, the positive implications hazards might have for communities are not always fully considered for small islands. Challenges can strengthen communities (Taleb 2012) and encourage them to adopt strategies that are key to building their capacities. Therefore it is important to explore how communities, particularly on the small islands of less affluent countries, use hazards and disasters to be more innovative—and how this can lead to greater prosperity. This analytical move enables a more complete picture in defining the capacities that can be beneficial in facing hazards and daily hardship. Moreover, successful community facilitation that acknowledges the strengths of a community can help craft better solutions in facing hazards and disasters.

This chapter contributes to understanding how communities can use hazards and disasters to strengthen their livelihoods and capacities in the realm of small island environments. It uses the case of a small community, Laingpatehi on the remote tropical island, Ruang, in North Sulawesi, Indonesia. Laingpatehi fits both the UNESCO (Falkland 1992) and Indonesian Coastal and Small Island Management Act 2007 (Article 1 item 3 Law 27/2007) definitions that categorize ''small islands'' as those with an area equal to or less than 2,000 km^2. This study examines the qualities that have enabled this community to deal with a series of natural hazards. I describe the ways in which the people of Laingpatehi have coped with the dynamics of their small island environment. I argue that more attention needs to be given to strengthening existing local capacities to face internal and external hazards and less to post-disaster responses or physical protection measures.

4.2 Capacities of small island communities

Many small island communities have survived for generations in remote, hazard-prone locations (Campbell 2009; McAdoo, Moore & Baumwoll 2009; Mercer & Kelman 2010; Reenberg et al. 2008). Campbell (2009) lists natural hazards that Pacific islanders have endured for generations, such as storms, tidal surges, typhoons, tsunamis, erosion of coastal materials, and a diversity of other hazards. Nonetheless, they continue to live in coastal and small island places. This suggests that the benefits they derive from the resources found there outweigh the risks

(Cannon 2008b; Kelman & Mather 2008). Yet hazards that trigger disasters are regular occurrences. Communities have thus developed the capacity to face hazards, where capacity is understood as ‘‘the set of knowledge, skills and resources people resort to in dealing with natural hazards and disasters’’ (Cadag & Gaillard 2013, p.269). The capacity to reduce the impact of extreme events has been recognized by several scholars (Campbell 2006, 2009; Gaillard et al. 2008; Gaillard & Le Masson 2007; McAdoo et al. 2006; Schwarz et al. 2011; Veitayaki 2006). It is suggested that communities have traditions that enable them to cope with disasters (Campbell 2006). These traditions have been built on beliefs and behaviors over long periods and underpin the fabric of their societies (Campbell 2009; Paton 2006). Hazards are a common part of life (Bankoff 2004a; Campbell 2009; Kelman et al. 2011; Lewis 2009) and people are able to persist and prosper in hazardous situations (Burton, Kates & White 1993).

The importance of culture in dealing with disasters has been well documented in both affluent and less affluent countries (Hewitt 2009). Chester et al. (2008) have shown the role of religion among residents living around Mt. Vesuvius and Mt. Etna, Italy during the eruption of these volcanoes. Lavigne et al. (2008) provide evidence of the role of cultural beliefs in influencing the behavior of people subject to volcanic activities around Mt. Merapi in Central Java, Indonesia. Such culture is shaped by the nature of human environments (Cosgrove 1996). This literature shows both how culture is shaped by hazardous events, and how culture plays an important role in dealing with such events.

Communities generally have strong local cultures that allow for concerted social action (Mitchell 1995) to address an inherently difficult environment. Social action, shaped by both physical and psychological experiences, is important in understanding at-risk communities (Becker et al. 2008; Cronin et al. 2004; Kelman & Mather 2008). Small size and isolation are variables that have been seen to contribute to a spirit of solidarity and a sense of community (Anckar & Anckar 1995). Failing to recognize the local cultural context reduces the effectiveness of DRR (Hewitt 1983).

The capacity to deal with natural hazards can be usefully understood through livelihood strategies (Binternagel et al. 2010; Cannon, Twigg & Rowell 2003; Chambers & Conway 1992; Coulthard 2008; Ellis 1999; Gaillard & Le Masson 2007; Gaillard et al. 2009; Mula 1999; Sanderson 2000; Scoones 1998; Twigg 2001). Scoones (1998), for example, identifies three important livelihood strategies: agricultural intensification/extensification, livelihood diversification, and migration. Such strategies enable communities to spread risk and cope with shocks while maintaining the availability of resources that support their lives. Ellis (1999) and Gaillard et al. (2009) argue that these strategies provide the flexibility and stability important for sustainability over time and enable people to cope with changing conditions.

These strategies enable a reduction in risk, so they can continue their lives and maintain their culture.

Local culture that supports sustainable livelihoods thus plays an important role in allowing people to cope with multiple hazards. Culture is part of a community's livelihood resources and shapes local perceptions, concerns, and behaviors in times of disasters (Mercer et al. 2012). Culture allows members of communities to act in concert to cope with changing environments (Duncan & Duncan 1996). Cultural values allow communities to respond to hazards (Becker et al. 2008; Cronin et al. 2004; Kelman & Mather 2008).

A community's capacity to face hazards is not isolated from government support, across various scales (Wisner 2003). Government support is needed to strengthen local capacity. Wisner (2001) illustrates this point with an example from the recovery process in El Salvador after Hurricane Mitch in 1998. The community's capacity is dependent upon accessibility to resources that can often be under government control (Chambers 2006; Wisner et al. 2004). If government support is not in-line with the community's needs, this could be a catalyst for further hazards. One example is the experience of survivors of the Payatas trash slide in the Philippines (Gaillard & Cadag 2009). Even though they have an intrinsic capacity to cope with and recover from disasters, the victims were not involved in decision making about the government rehabilitation program. This resulted in slow recovery and the creation of new problems for the community. Another example is documented by Campbell (1984) who explains how the introduction of unsuitable, imported foods created new vulnerabilities for Pacific island communities facing future hurricanes. The case presented here supports the importance of considering local perceptions that have implications for the methodology of this study.

4.3 Historical account and livelihood dynamics

The name ''Laingpatehi'' comes from the local Sangir language. ''Laing'' means cape and ''Patehi'' means observation. So Laingpatehi means the cape where people were able to observe the weather on their fishing grounds (Taman Budaya Manado 1991). The villagers reported that, from the1800s to the early 1900s, fishers from Tagulandang Island used Ruang as a transit area and for temporary shelter during their fishing trips. They built temporary houses called *daseng* on the island. The village was established officially in 1936 and 1937 when a church and primary school were built. Figure 4.1 summarizes the livelihood history and village development of Laingpatehi. It shows the dynamic livelihood strategies adopted by the villagers to cope with the natural hazards their island is subjected to. Volcanic eruption was the biggest concern of the villagers, although other hazards (such as strong winds) were acknowledged by villagers as a fact of life for people living on a small island.

Sitaro is claimed to produce the world's best quality nutmeg (Badan Perencanaan Pembangunan Daerah Kabupaten Kepulauan Sitaro 2010a) (Figure 4.2). Indonesia is the biggest producer of nutmeg in the world, and between one- third and one-half of its production comes from Siau Island alone (Marks & Pomeroy 1995). Siau is a center of nutmeg diversity

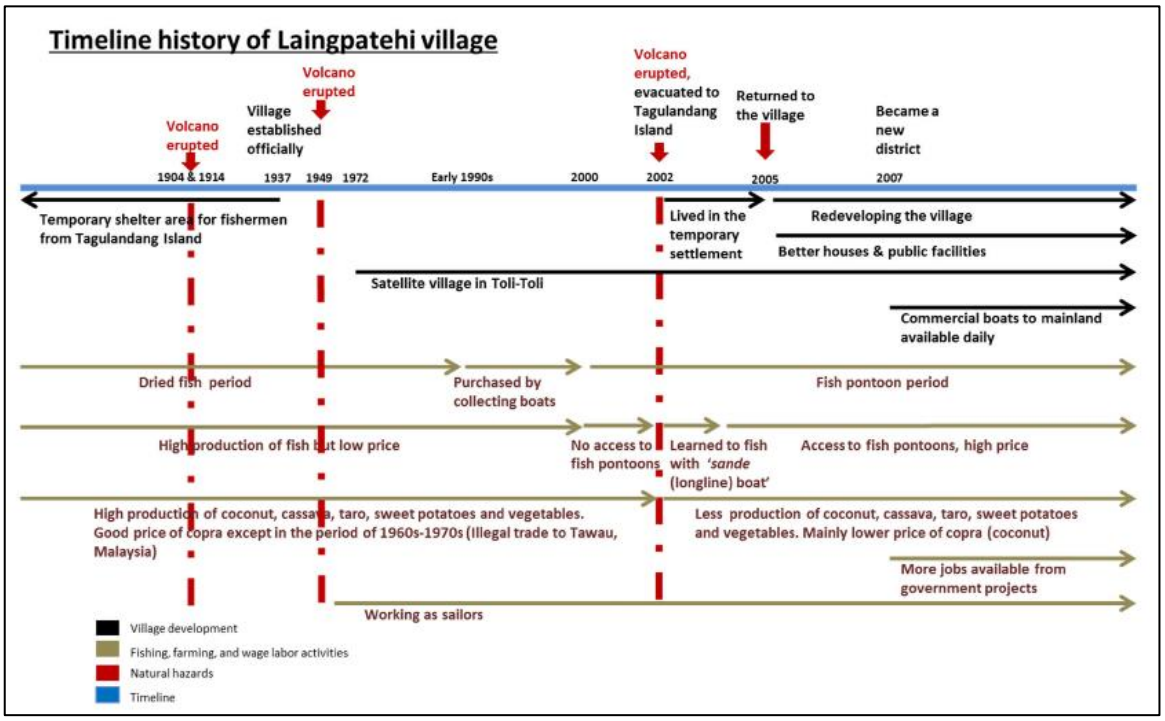


Figure 4.1 Historical events influencing Laingpatehi village, Ruang Island, North Sulawesi Province, Indonesia, 1904–2007 (derived from historical timeline activities with the villagers)

Figure 4.2 Nutmeg, here shown on Siau Island, North Sulawesi Province, Indonesia, is a main source of income on the other islands in the Sitaro Archipelago. Photograph by M. Irfansyah Lubis, August 2013. Reproduced with the kind permission from M. Irfansyah Lubis

(Hadad & Hamid 1990), with the best quality and highest productivity among other regions in Indonesia (Novarianto 2010).

Villages in the Sitaro islands therefore derive significant income from nutmeg, in addition to other agroforest products. In contrast, Laingpatehi has always been a fishing village and has no nutmeg plantations because the soils are unsuitable. Villagers' reports, government documents, and observations made during the fieldwork all suggest the soil is not suitable for planting most cash crops because it consists of a deep gravelly, impenetrable layer of rock substrate. In order to exploit the income earning possibilities of nutmeg and to provide a larger area for settlement, the people of Laingpatehi established a satellite community on the mainland of Central Sulawesi Province in 1972. This village is called Laolalang and is located in the District of Toli–Toli (Figure 3.1). This was an entirely local initiative with no support from government, and reflected a lack of arable land on Ruang. In interviews and participatory activities, Laingpatehi people suggested they had become familiar with Toli–Toli when they were involved in the illegal trade (1960s–1970s) of copra, nutmeg, and cloves purchased from other islands. These products were being smuggled to Tawau in Malaysia where prices were higher and not subject to Indonesian government controls. Traders from Tawau strengthened the villagers' cooperation by providing them with boat engines, temporary accommodation in Tawau, help with logistics, and households goods. In this way the villagers diversified their economy and were able to gain income from tree crops at times when fishing was less profitable. After the introduction of increasingly strict border controls from both countries' government agencies this activity was stopped.

Villagers reported that people moved to Laolalang when fishing was poor or to harvest their tree crops. People from Laingpatehi also migrated to Halmahera Island (North Maluku Province) in 1952 and Bolaang Mongondow District (mainland-North Sulawesi Province) in 1976 as part of government resettlement programs, but these people now have reduced links with Laingpatehi. People from Laingpatehi now live in many parts of Indonesia (Figure 4.3). Most of these migrants remain in regular contact with Laingpatehi and many remit money to their families in the village. That tight connection and high commitment to their homeland (Le De, Gaillard & Friesen 2013; Tuan 1974a) is a common distinctive cultural feature of small island inhabitants (Beller 1990; Giavelli & Rossi 1990).

The strong social fabric among villagers of Laingpatehi village also provided job opportunities for villagers. About 30 villagers work on ships, mostly in Kalimantan. When people get jobs away from the island, they facilitate the entry of other villagers to this specialized labour market. Villagers explained that remittances from workers on ships support the church and enabled villagers to purchase building materials and household appliances. However, it was ethically problematic to attempt to quantify the remittances as villagers were reluctant to provide details. Remittances take many forms and are difficult to track,

especially as sailors bring money or building materials and household appliances to their families during their visits.

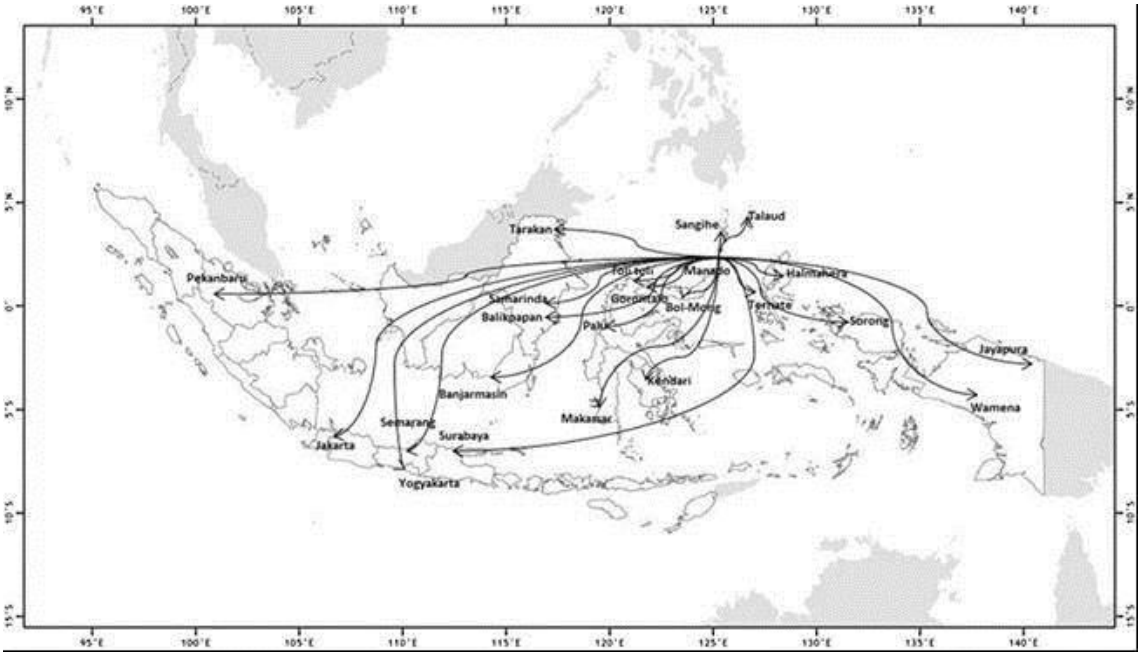


Figure 4.3 The distribution of out-migrants from Laingpatehi village, Ruang Island, North Sulawesi Province, Indonesia, throughout Indonesia (based on participatory activities and interviews with the villagers)

Figure 4.4 Ruang Island as seen from Tagulandang Island, with a pamo boat (left) (purse seine fishing) and sande boat (right) (longline fishing). Photograph by M. Irfansyah Lubis, September 2013. Reproduced with kind permission from M. Irfansyah Lubis

Until the early 1990s, Laingpatehi village produced salted and dried fish (Figure 4.1) caught by purse seining (known locally as pamo) (Figure 4.4), and cultivated a limited amount of copra. Villagers organized themselves into groups because purse seining requires teams of people. They salted and dried the fish, but at times the fish were so abundant that the villagers were unable to process everything they caught, and the excess was buried on the beach. Fish prices at this time were low because of the absence of markets close to their island, and there was no ice or cold storage or electricity on the island. Thus their level of economic development was low. As Brookfield (1990) argues, the development of the economy may be hindered in small island areas if producers are local but consumers are not. So distance and access to markets in the case of fishing production in Laingpatehi were the key constraints of economic development in that era.

Processed fish and copra were taken to mainland Sulawesi by sailboats and some villagers drowned because of storms. Since the 1990s, traders in the mainland towns of Bitung and Manado have sent collecting boats to buy fresh fish (Figure 4.1). Since 2000, people from the mainland of Sulawesi have begun to develop fish pontoons around the traditional fishing grounds of Ruang (Figure 4.1). A fish pontoon is a kind of fish aggregation device comprised of three parts: the buoy on the surface of the sea; the line and attracting device (coconut leaves) that hangs in the middle and sways in the current to attract fish; and the anchor that sits on the seafloor to ensure the pontoon does not float away. This has reduced fish populations in the pamo fishing area. Villagers reported that fish pontoons block the access of target fish to the catching area of the pamo boats. Pamo fishing is therefore no longer profitable. Respondents reported that conflicts occurred with mainland Sulawesi fishers when they prevented the Laingpatehi people from purse seining around the fish pontoons.

4.4 Livelihood dynamics and natural hazards

Ruang is a volcanic island. Mt. Ruang is 722 m above sea level, 1,700 m above the ocean floor (Fig. 4.4), and is active (Morrice et al. 1983). Eruption records go back to 1808. There were 13 major eruptions from 1808–2002 (Table 4.1). The eruption in 1871 triggered a tsunami that struck Tagulandang Island and killed about 400–450 people, including the King of Tagulandang (Brilman 2000; Global Volcanism Program 2013; Manginsela-Tiendas 2001; Paris et al. 2014).

Villagers reported that the last eruption in 2002 was preceded by earthquakes on 24th September, followed by a thick volcanic ash emission the next day. All villagers from Ruang Island were forced to evacuate to Tagulandang Island and one died during the evacuation. On the night of 24th September, before they evacuated to Tagulandang, the villagers congregated in their local church, prayed together, and discussed the organization of their evacuation. Elders, women, people with disabilities, and children were evacuated first. They used all the boats

in the village and additional boats from Tagulandang Island. Several villagers initially refused to move, but approaches from other villagers and government officers finally resulted in their agreeing to leave. The evacuation was completed a few hours before the main eruption on the afternoon of 25th September.

Table 4.1 History of Mt. Ruang eruptions (1808-2002) (Adapted from Brilman 2000; Manginsela-Tiendas 2001; GVP (Global Volcanism Program) 2013). VEI (Volcanic Explosivity Index)

Date	Events	Impact/Response	VEI*
1808	Explosion, pyroclastic flow		
22–24 Apr 1836	Explosion		2
1840	Explosion, pyroclastic flow		2
Sept 1856	Explosion, formation of lava dome		1
27–28 Aug 1870	Explosion	Evacuated to Tagulandang Island	3
2–14 Mar 1871	Explosion, pyroclastic flow, earthquake, and tsunami (partial collapse of lava dome)	Generated tsunami. 400–450 people died (Tagulandang Island), including the King of Tagulandang	
15 Nov 1874	Explosion & pyroclastic flow		2
Jun 1889	Formation of lava dome		1
22 Apr 1904–27 May 1905	Explosion, pyroclastic flow, lava, lahar		3
29 May 1914–28 Feb 1915	Explosion, pyroclastic flow, lava & ash	Evacuated to Tagulandang Island	2
5–19 Jan 1949	Explosion, lava flow, formation of lava dome	Evacuated to Tagulandang Island	2
27 Jun 1996	Explosion		
25–29 Sept 2002	Explosion, ash, pyroclastic flow & lahar	One person died (shock). Lived in temporary settlement for 3 years. 27 people died during the temporary settlement period	4

The entire population of the village lived in a temporary settlement on Tagulandang for three years before officially returning to Ruang in 2005. The village officer and villagers explained that about 27, mostly older, people died during the temporary settlement, reportedly from acute depression-related diseases. These depression-related deaths were a direct result of the material and emotional impacts of the disaster: homes destroyed; coconut trees obliterated; familiar places left for ‘‘temporary’’ (but in reality multiyear) quarters; spiritual separation from the gravesites of loved ones and the home of ancestral spirits; lives and social connections altered and interrupted; independence replaced by a dependent status .

The people reported that the government provided adequate basic support (that is, food, clothes, blankets, and health services) when they lived in the temporary settlement on Tagulandang Island. The government had planned to relocate all the villagers to Biaro Island

(Makanoneng 2012). This plan was rejected by the community because of a lack of facilities, access to markets, and arable land on Biaro. The people preferred to return to Ruang. It appears from the villagers' explanations that the main reason was the desire to maintain the integrity of the community.

While they were living in the temporary settlement the villagers met fishers from Ternate (North Maluku Province) as well as fishers from other islands. Laingpatehi people learned from them how to build and use longline boats (known locally as sande) (Figure 4.4). The new ability to use this longline fishing technique enabled the Laingpatehi people to access fish pontoons and has provided them with increased income. In addition they were able to target fish species through the use of sande that pamo fishers were not able to catch and were thus able to dictate fish prices in Tagulandang market. Fishers from Tagulandang Island mostly focus on reef fish. Purse-seine fishers who did not convert to longline fishing became carpenters, builders, boat taxi operators, or fish dealers.

In spite of government attempts to prevent them from doing so, the villagers decided to return to Laingpatehi three years after the eruption. They organized themselves through the traditional *mapalus* system to begin cleaning the village site and rebuild the church and houses. All the houses and buildings (church, primary and secondary schools, village office, and other public facilities) were buried in thick layers (~4 m) of dust and gravel. The villagers demonstrated the strength of their social organization in restoring much of the village to standards higher than those prevailing before the eruption. The local availability of gravel, sand, and rocks helped this process. Subsequently villagers reported that the government did provide additional corrugated tin for roofing and some other building materials, but only after the villagers had finished cleaning and rebuilding many of the houses.

The area available for planting tree crops and vegetables had been damaged by the eruption. Few coconut trees survived and the volcanic debris that now covered the island was not suitable for growing the traditional vegetables—spinach, snake bean, chilli, tomatoes, and Chinese vegetables. The people were only able to grow cassava, bananas, and an edible hibiscus used as a vegetable. The result of the eruption was that their terrestrial cash crop production was limited to small quantities of copra and limited amounts of cassava (processed into flour) to sell on Tagulandang Island. The strategy for coping with these constraints is influenced by the spirit of togetherness. Villagers who have insufficient land are allowed to grow cash or subsistence crops on the other villagers' land. This has allowed villagers with insufficient land to plant and benefit from coconut palms. They agree to plant coconut trees for the land owner in exchange for the right to cultivate vegetables between the palm trees, or share the coconuts production. The trees became the property of the land owner once they had grown big enough to shade out the vegetables beneath them.

The villagers thus demonstrated an ability to identify and exploit new income generating opportunities and strategies in facing environmental stresses and space limitations. Figure 4.5 shows how the different assets interacted to enable the community to cope and succeed. The capacity framework for Laingpatehi village resulted from various methods applied in this study, mainly participatory activities. The key asset identified by villagers during participatory activities and later confirmed in the second period of fieldwork was the degree to which social cohesion was reinforced by Church activities. This finding was also confirmed by the head of the sub-district (Makanoneng 2012). The community has the ability to self- organize to deal with new challenges. Strict observance of the Sabbath (on Sunday, the day of rest in Christianity, all villagers focus on Church-related activities), with a total unwritten ban on farming and fishing, and observance of the spirit of *mapalus* is an indication of the role of the church in facilitating social cohesion. All villagers said their faith and togetherness helped them cope with difficulties and hazards in living on their small island.

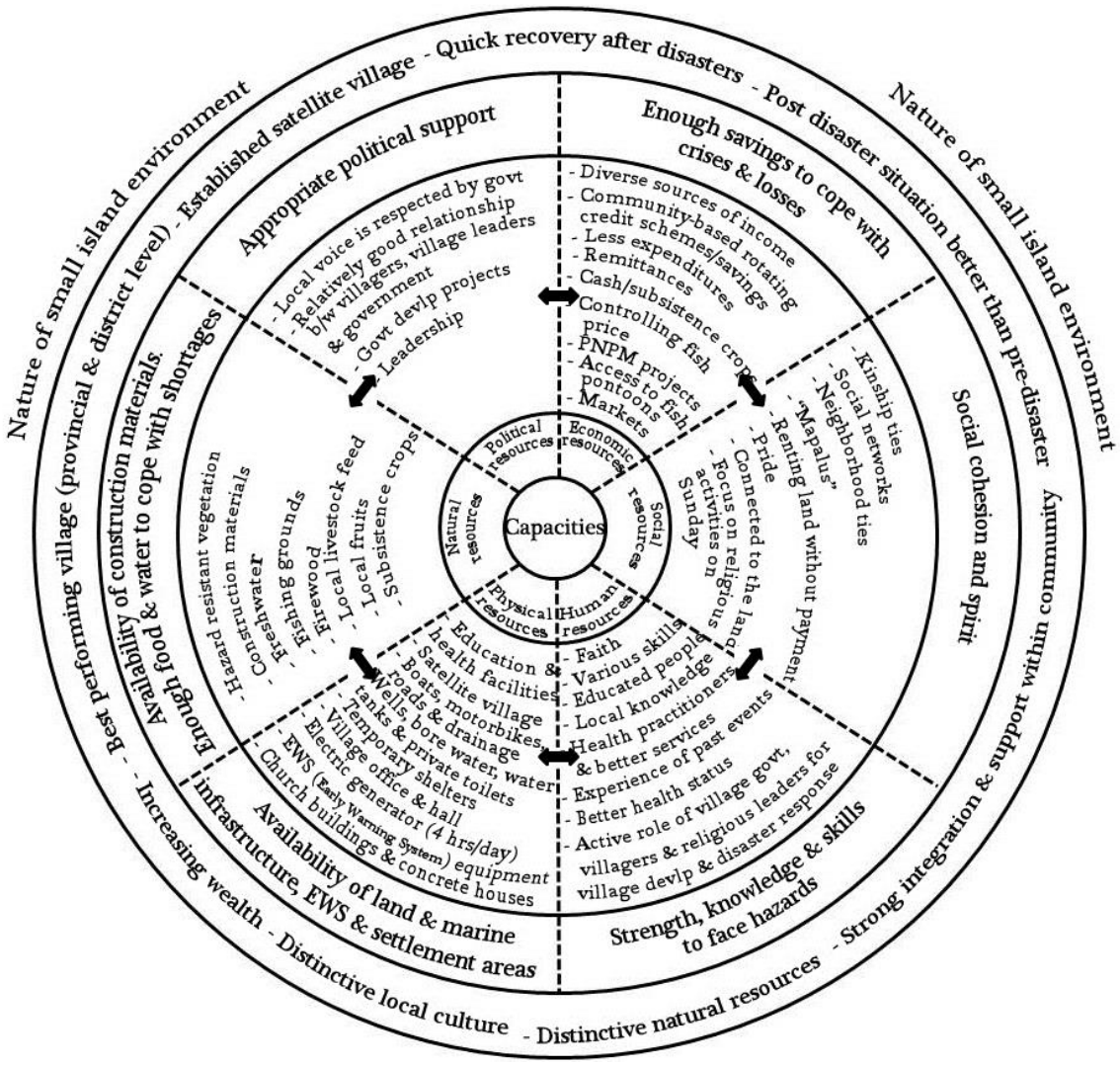


Figure 4.5 Capacity framework for Laingpatehi village, Ruang Island, North Sulawesi Province, Indonesia

Decentralization and the establishment of the district administration for Sitaro in 2007 was a significant positive development in Laingpatehi. This enabled better district government services to reach the island (Tamudia 2012). Commercial transportation, vital for small island regions, from district headquarters on the main islands of Siau, Tagulandang, and Biaro to Manado is now available daily (Figure 4.1), whereas in earlier times ferries only ran three times a week. Additional ferries to the international seaport in Bitung on mainland Sulawesi have also aided the islanders. Development budget allocations from the central government to the Sitaro Archipelagic district government increased significantly from IDR 133.3 billion in 2012 (USD 12 million) to IDR 370.5 billion in 2013 (USD33 million) (1 USD = 11,000 IDR, Indonesia rupiah) (Supit 2012). This enabled the district administration to increase the development budget allocations to all the villages in the district (Supit 2012). Laingpatehi village, for example, received a significant increase in its annual budget for village development (ADD—Alokasi Dana Desa, Village allocation funds) from IDR 25 million in 2010 (USD 2,200) to almost IDR 300 million in 2013 (USD 27,200) (Pemerintah Kecamatan Tagulandang 2013). These funds enabled them to develop village facilities including a new village office and community hall. Government indicators of economic growth in Sitaro District increased from 4.88 % in 2006 to 8.11 % in 2012. The district level Human Development Index increased from 72.58 in 2009 to 75.88 in 2012 (Badan Perencanaan Pembangunan Daerah Kabupaten Kepulauan Sitaro 2010a; Badan Pusat Statistik Kabupaten Kepulauan Sitaro 2012a). These achievements have led to reduced poverty in the district (Manado Post 2013; Pemerintah Kabupaten Kepulauan Sitaro 2012b). The district governance contribution to the development processes was recognized by awards from the central government in 2008, 2009, 2011, and 2012 (opinion report from BPK RI—The Audit Board of The Republic of Indonesia) (Tribun Manado 2013). This indicates relatively good and clean governance.

In the years following the return to Laingpatehi, the village received several regional awards (2009 and 2010) for high levels of achievement in the governance system, health, economic and education status, security, local institutional performance, local participation, and family welfare (PKK—women's family welfare organization. This is a hierarchal organization of government officers' wives working at all level of government institutions, including village offices) (Figure 4.5). These awards facilitated and motivated the improvement of village government services, *mapalus* and local group activities, and attracted additional funding from district authorities (Makanoneng 2012). Villagers also reported support for fishers and farmers in the village such as fishing boats, boat engines, seeds, and tools for fishing and farming. A national program for community empowerment (PNPM) contributed to many village improvements, including a diesel generator for electricity, footpaths to crop areas, drainage ditches, and loans for community-based rotating credit and savings schemes.

4.5 Small island communities' capacities in facing multiple hazards: Their strengths and innovations

The main lesson from this account of the events in Laingpatehi is that the strong social cohesion of the villagers, much of it centered on their church, enabled them to return and reconstruct their village to a better standard than its pre-eruption 2002 level: concrete houses, most with tiled roofs and indoor toilets, improved standards of sanitation; and a concrete village road and concrete footpath to Pumpente, provided safe access to the boats going to Tagulandang Island during periods of strong winds (Figure 4.6). The networks the villagers established while living in the temporary settlement enabled them to learn new fishing techniques that

Figure 4.6 The main street of Laingpatehi village in 2012—everything visible has been totally reconstructed by the community since the volcanic eruption of 2002. Photograph by Mercy M.F. Rampengan, July 2012

allowed further diversification of their livelihoods. This diversification strategy enabled them to cope with hardship situations (Scoones 1998) and to rebuild their lives.

Diversity and social cohesion alone would not be sufficient to enable Laingpatehi to prosper. Substantial support came from the district government at critical times. Support in the form of building materials, daily transportation services to connect with the mainland and district government center, sufficient village budget allocations, and other current government projects (secondary and high school building with its facilities) enabled the people of Laingpatehi to develop stronger livelihoods. The village was able to be rebuilt by the strength and determination of the villagers combined with the district government policy that was

heavily focused on community development (Badan Perencanaan Pembangunan Daerah Kabupaten Kepulauan Sitaro 2010a).

The villagers' strong spirit and strength in working together to find solutions after the disaster, in spite of the limitations of the island environment, demonstrates the claims of Anderson and Woodrow (1989) that those affected by disasters have the capacity to rebuild their lives. The faith and togetherness of islanders reflect their social resources that act as a social glue that holds them together in facing disturbances (Anckar & Anckar 1995; Giavelli & Rossi 1990; Skelton 2007).

The Laingpatehi community exploits rich fishing grounds close to the island and has access to distant plantations. The income and seasonal employment availability from the satellite village in Laolalang and from remittances all strengthen the community in ways described by Tobin (1999), that is, social networks contribute to sustainability of communities in facing hazards. Livelihood diversity is an essential ingredient of local capacity as in the case of people living around Mt. Pinatubo in the Philippines (Gaillard 2006). Diverse but socially cohesive communities are able to ''live with risk'' and build resilience to external shocks (Tobin 1999; UNISDR 2004).

The ''endogenous hazards'' and ''intrinsic vulnerability'' that exist on the island (Lewis 2009; Pelling & Uitto 2001) can be understood as a complex reality. This condition cannot be avoided under the limited space and biophysical constraints of small islands, but can become a source of strength and innovation for the community.

Taleb (2012) has described the way in which exposure to challenges can strengthen individuals, communities, and organizations. Laingpatehi has such qualities that have been strengthened by the challenges to which they have been exposed. Davis et al. (2004) use social vulnerability and capacity analysis to investigate how a vulnerable community may succeed. This underlines the fact that vulnerable people have the capacity to support themselves in times of hardship. The experience of Laingpatehi villagers, who are vulnerable to volcanic eruptions and other hazards, of rebuilding their village with their own resources after the 2002 eruption and subsequently receiving government awards for their achievements in 2009 and 2010, shows how they have been resilient and have rebuilt their settlement. They benefited from their ''uncomfortable'' living experience in the temporary settlement by learning how to change their fishing strategy and use fishing pontoons. These perspectives are significant and should be considered in future disaster studies. People living in hazard prone areas can use hazards and disasters as a chance and motivation to find better livelihoods. The spirit and strategies help them to persist and prosper in the face of adverse conditions.

Cooperation does not always occur when people are challenged, although it is more difficult to document these instances in the shadow of Laingpatehi's success in performing cooperative actions. It has been argued that marginal people may be excluded in cooperation

because of poor relationships and lack of integration of these people within a society (Susman, O'Keefe & Wisner 1983). This may lead to these people being rejected (Shields 1991) and possibly further marginalized socially (Wisner 1993; Wisner et al. 2004). The research in Laingpatehi, despite the extensive use of qualitative methods, did not uncover instances of exclusion.

The villagers' willingness to learn and flexibility and readiness to adjust to changing conditions were crucial ingredients for successful livelihoods. This diverse portfolio of activities, in conjunction with their strong social cohesion, enabled them to not only survive, but to construct better physical and social structures. This is a result of the livelihood diversification strategies as identified elsewhere by Ellis (1999). Inhabitants of small islands perceive the surrounding sea as integral to their lives, not as an isolating barrier (McCall 1994). This encourages the continuing construction of a diverse livelihood portfolio that has proven successful in the past.

The initiative taken by the villagers in establishing a satellite village in Central Sulawesi for the exploitation of nutmeg and cloves as cash crops shows an ability to exercise collective entrepreneurialism. This is consistent with the argument put forth by Sandler (1992) who has shown that in particularly demanding circumstances groups of people will act in a cooperative manner. Pungetti (1995) has shown similar social bonding in Sardinia in managing agricultural activities.

The strategies utilized and exhibited by the Laingpatehi villagers, in tandem with government support, created a comprehensive combination and interaction among resources that determines local capacity. This can be seen in the outcomes they have achieved (Fig. 4.5). Achieving quick recovery following a disaster is a livelihood outcome that is closely associated with natural, human, political, and social forms of resources. These outcomes are under the constraints of a small island environment. But such constraints can be media for a small island community to be stronger and innovative in developing sustainable livelihoods.

4.5 Conclusion

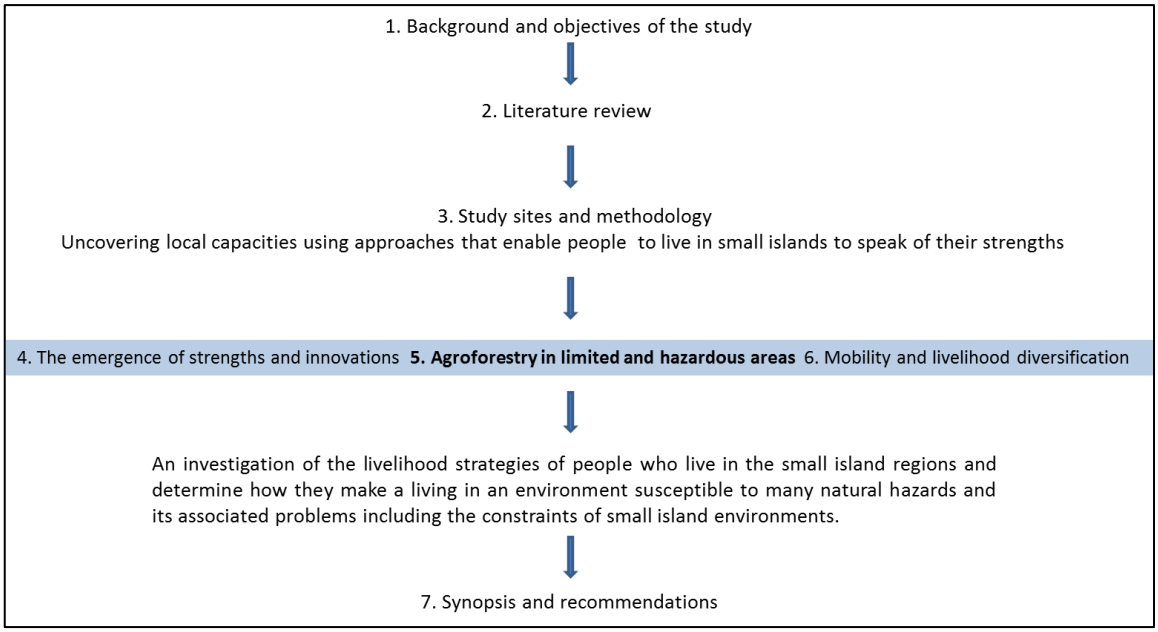
Access to resources, attachment to places, lack of alternatives and aesthetics are the main reason why people live in dangerous areas (Cannon 2008b; Collins 2010; Duncan, Chester & Guest 1981; Gaillard & Cadag 2009; Jackson 2001; Tuan 1974a, 1977). The Laingpatehi community inhabits an area that others might consider excessively hazardous. While living in the shadow of hazards they have taken initiatives that have resulted in stronger, diversified livelihoods. Therefore, remoteness, limited natural resources, and hazardous risks, rather than just being sources of vulnerability, can be sources of innovation and strength and have helped to create diverse livelihoods.

The social, cultural, and economic dynamics of Laingpatehi villagers in fulfilling their livelihood needs shows how strong a small island community can be in facing natural hazards. By living with hazards, the community has been forced to diversify its livelihoods, thus increasing their capacity by being more innovative. Support from the government was also important and a combination of local strength and external support helped to achieve positive outcomes.

This study has shown that the marginalization-vulnerability nexus can be offset by capacity and social cohesion towards improved livelihoods. Disaster risk reduction (DRR) strategies should give greater emphasis to building livelihood resources as a basis for strengthening local capacity and vice versa. The conventional approach of seeking to reduce risks through building protective infrastructure should be combined with approaches that increase local capacity (Allen 2006; Bankoff, Frerks & Hilhorst 2004; Gaillard 2010; Gaillard & Mercer 2012; Hewitt 1983, 2007; Mercer et al. 2007; Weichselgartner & Obersteiner 2002; Wisner, Gaillard & Kelman 2012). In particular, the complex reality of small island environments that brings vulnerability to the fore can in fact facilitate the emergence of strength and innovation in the communities. Therefore, physical mitigation should be de-prioritized, and supporting livelihood resources to increase flexibility and diversity is of the utmost concern.

CHAPTER 5

AGROFORESTRY ON A SMALL, ACTIVE, VOLCANIC ISLAND: PROSPERING WITH ADVERSITY



This chapter has been accepted for the Geographical Research as follows: "Rampengan, MMF., Boedhihartono, AK., Margules,C., Sayer, J., Law, L., Gaillard, JC., Ong, T. and Tran L.. Agroforestry on a small, active, volcanic island: Prospering with adversity". An earlier version of this article was presented at the 51st Annual Meeting of the Association for Tropical Biology & Conservation (ATBC) 2014, Cairns.

Chapter 4 presents the findings from Laingpatehi village, Ruang Island. The chapter presents the qualities that have enabled Laingpatehi villagers to deal with various hazards, compete for marine resources with mainland-based fishermen and prosper in the face of these complex situations. Chapter 5 draws on studies of agroforestry, disaster risk reduction and livelihoods in small islands to present a case study of prospering with adversity. The case study is Kinali village on Siau Island, Indonesia, an island that produces the majority of nutmeg and mace exported from Indonesia. This chapter provides an explanation to answer the third research question: what specific contributions can agroforestry, and its management by communities, offer disaster prone regions?

5.1. Introduction

Limited natural resources and high vulnerability to multiple hazards are common characteristics of small islands (Arnberger & Arnberger 2001; Briguglio 1995; McCall 1994). Communities living on small tropical islands are geographically separated from the mainland and can be prone to volcanic eruptions, earthquakes, tsunamis, landslides, coastal erosion, sea level rise and climate change (Campbell 2009; Nunn 2009; Wisner & Gaillard 2009). Small islands share issues with continental landscapes but experience additional constraints such as small land area, limited freshwater resources and fragile ecosystems. However, small island communities manage to survive and often flourish in these risky environments (Campbell 2009; Mercer & Kelman 2010; Reenberg et al. 2008).

Villagers on tropical islands produce and market specialised food crops and agroforestry products (Arnberger & Arnberger 2001; Barbier 1989). This enables them to purchase their staple foods and other necessities, which are otherwise unavailable (Thaman & Clarke 1993a). Cash crop farming allows islanders to enjoy livelihoods beyond simple subsistence. Land scarcity, encroachment of settlements on arable land and threats from natural hazards provide additional incentives for investment in tree crops (Noordwijk et al. 2012; Pachauri 2012; Thaman 1993).

The ecological and social aspects of natural resource management cannot be de-coupled in any landscape but on small islands this is brought into sharp focus (McCall 1994). Here I analyse the strategies that the people of Kinali village on Siau Island, Indonesia, have adopted that enable them to prosper in spite of the risks of living on a small, isolated island with a very active volcano. Traditional natural resource management based upon strong social networks and a strong culture are the factors that have enabled them to do so. These strategies treat the volcano as a source of opportunities and not just a threat. I highlight the role of agroforestry as a livelihood strategy and ask how successful this has been and if there are lessons that apply more widely. The first section of the chapter defines the aspect of living with risks on small active volcanic islands and describes agroforestry in small volcanic islands. The second section describes the research location in more detail and outlines the methodology for the research. I then explore agroforestry in Kinali village and describe the community's way of coping with hazards through adoption of environmentally sound and sustainable management practices for their agroforestry. I conclude by describing the importance of local natural resource management practices and culture in DRR.

5.2 Living with volcanic risks

The risks of volcanic eruptions to people and their environment have been widely documented (i.e. Cronin et al. 2004; Dibben & Chester 1999; Dominey-Howes & Minos-Minopoulos 2004;

Johnston et al. 1999; Ward & Day 2001). However, less is known about the potential benefits of living in volcanic regions when the rich volcanic soils can support highly productive agriculture. An example of the contribution of a volcano to local livelihoods is described by Duncan et al. (1981) who studied the positive contribution of Mount Etna, the largest continental volcano in the world, to the wealth and status of people living nearby when compared to those living in other regions of Sicily. Mount Etna provides fresh water and fertile volcanic soils, which account for the intensive agricultural activities and expanding settlements on the lower slopes of the volcano. On many small, active, volcanic islands, the periodic addition of volcanic ash to the soil contributes essential nutrients that increase soil fertility (Arnberger & Arnberger 2001).

Kelman and Mather (2008) suggest four options for balancing the dangers of living in, or near, volcanos with the benefits or potential benefits of volcanic eruptions. These options are: 1. do nothing, 2. protect society from hazards, 3. avoid hazards, and 4. live with the hazards and risks. In the context of small islands, the fourth option is often favoured. As Kelman and Mather (2008) explain, the do-nothing option will lead to disaster, the scale of which will depend on the extent and characteristics of an eruption and the vulnerability of the local communities. If the risk is known and there is a willingness to accept the consequences of taking the risk, this option could be appropriate. The second option, protection by building defensive structures, can increase risk in the long term as people who become reliant on physical protection may become overconfident and not adopt adequate alternative precautions. The third option, to avoid the hazard by relocating, is also not necessarily favoured because it may lead to increased vulnerability to other natural hazards or social challenges associated with moving to a location which is already inhabited. This chapter documents a community who have adopted the last option, living with the risks, by organising themselves to find a balance between the environmental hazards and opportunities.

5.3 Agroforestry on small volcanic islands

Conflict over forest land throughout the tropics is a major global environmental issue (Bass & Dalal-Clayton 1995; Thaman & Clarke 1993a). Agroforests contribute to addressing this conflict by providing some of the environmental benefits of forests together with the production benefits of agriculture. We have used the definition of small islands from the Indonesian Coastal and Small Island Management Act 2007, which defines small islands as being equal to or less than 2,000 km² in area (Article 1 item 3 Law 27/2007), and having a population size of approximately 500,000 or fewer people (Hess 1990). Agroforestry is defined as "a sustainable land management system which increases the overall yield of the land, combines the production of crops (including tree crops) and forest plants, and/or animals simultaneously or sequentially, on the same unit of land, and applies management practices that are compatible with the cultural

practices of the local population" (Nair 1989: 13). This definition emphasises the interactions of production and sustainability.

Volcanic small islands have distinctive biophysical conditions compared to continental areas and these dictate the island's capacity to sustain human communities (Hess 1990). Inhabitants of small islands have distinctive cultures and strong connections to the land (Beller 1990; Giavelli & Rossi 1990; Hanson & Lamson 1990). Therefore, for agroforestry to be practised on small islands it has to be socially acceptable, practical and contribute significantly to the farmers' livelihoods. This point is highlighted by Dove (1992) who stresses that the functionality of agroforestry for farmers has greater significance than classifying land suitability for agroforestry on the basis of purely biophysical criteria.

This study is based on the social-cultural dynamics of people in Kinali village, Siau Island, who depend heavily on the production of nutmeg and to a lesser extent coconuts and cloves for export while living on the edge of one of the most active volcanoes in Indonesia: Mount Karangetang. Siau Island produces between one-third and one-half of all nutmeg and mace exported from Indonesia (Marks & Pomeroy 1995). In 2006, Indonesia is the biggest nutmeg producer in the world (75%), and most of it came from smallholder farmers (98%) (Novarianto 2010).The best quality nutmeg, mace and nutmeg oil in Indonesia comes from three small islands, where it is planted on or around active volcanos, Mount Karangetang on Siau Island, Mount Gamalama on Ternate Island and Mount Banda on Banda Island (Novarianto 2010). Nutmeg productivity is highest on Siau (Novarianto 2010). This chapter specifically asks how local coping mechanisms based on agroforestry have assisted Kinali villagers to deal with recurring multiple natural hazards and constraints arising from the bio-physical characteristics of their island.

5.4 Kinali village nutmeg agroforestry

Nutmeg, coconuts and cloves are the three main crops in Kinali (Figure 5.1 and Figure 5.2) as well as elsewhere on Siau. Nutmeg is the most important cash crop. Coconuts and cloves, which sell for less than nutmeg, provide additional income – but coconuts and clove trees are old

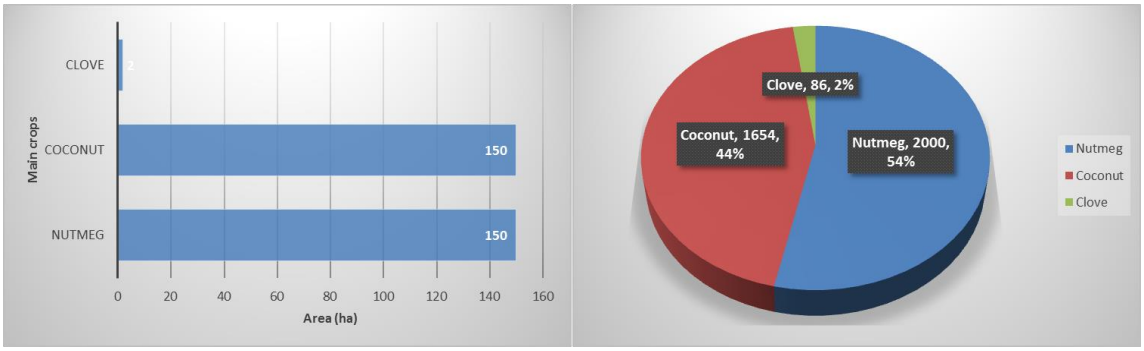


Figure 5.1 Area of main crops and number of crop trees in Kinali village. (Pemerintah Desa Kinali 2011a; Pemerintah Kecamatan Sibarut Kabupaten Kepulauan Sitaro 2012a)

and unproductive and are slowly being replaced by nutmeg. The agroforestry system of Kinali village includes a range of different types of fruit and shade trees including durian (*Durio sp*) and kenari (*Canarium sp*). The function of shade trees, especially during the early growth stage of nutmeg, is to protect the nutmeg from strong winds which can uproot nutmeg seedlings and cause unripe fruits to fall. Kenari trees also give additional income to the farmers as they produce valuable nuts and durian is a popular local fruit fetching a good price in local markets. When these canopy trees reach sufficient diameter, their owners sell them for timber to Siau villagers as well as to inhabitants of neighbouring Makalehi Island as raw materials for building fishing boats (kenari) or for use in building construction (durian).

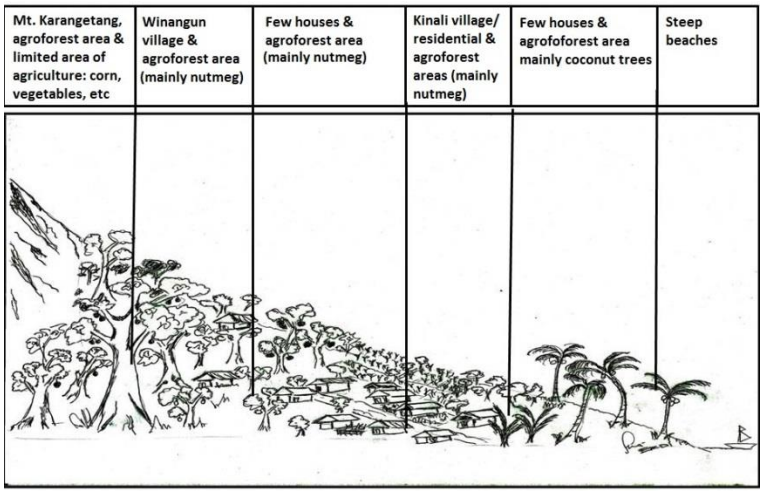


Figure 5.2 Overview of the village landscape (Transect walk in Kinali in September 2013).

Even though tree crops in Kinali village are threatened by volcanic eruptions, farmers are more concerned about the volatility of the price of nutmeg in world markets (Ong & Tran 2013). These fluctuations are a major determinant of income. The volcanic activity itself is perceived as a benefit because it provides natural fertiliser and protects the crop against fungal pests. These factors are believed by local people to account for the high yield and quality of nutmeg on Siau (Marks & Pomeroy 1995; Novarianto 2010) and for the low cost of its maintenance (Marks & Pomeroy 1995). Low maintenance costs free up villagers for other work outside the main harvesting seasons in March and from August to October. Lower levels of harvesting are possible throughout the year. The nutmeg price is beyond the control of local or national government as it depends on international trade and exchange rates.

Land and water limitations have led Kinali villagers to use rotating ownership mechanisms in harvesting and maintaining nutmeg and other crops. Each family member has the right to harvest and maintain all of the crop trees that belong to a family for two years, after which time this role is rotated to another family member. This mechanism allows all family members to benefit from collectively owned trees. While waiting for the peak harvesting period

or their scheduled turn to harvest and maintain the crops, villagers work in other activities (gleaning fallen nutmeg, collecting building materials, driving *ojeks*, etc.). Kinali villagers use bamboo tubes to inject water into the soil adjacent to nutmeg trees during droughts. This technique allows them to use water effectively as they only make a small hole in the bamboo and allow a small amount of water to flow continuously to the tree. This traditional form of drip irrigation makes efficient use of limited fresh water during long dry seasons.

Ownership of the trees in any location is divided amongst family members. Therefore, on one piece of land, different people own different trees (nutmeg, coconuts and clove). People have a kind of 'tree-tenure' system rather than land-tenure, as there is no formal land-titling in the village. Moreover, nutmeg, coconuts and clove trees can be exchanged for services. People give trees to non-family members in exchange for help: for example, to a midwife for help with a birth. Transactions are not recorded in writing, however, and there is potential for conflict related to future ownership claims.

Since land and trees in any location commonly belong to different people, it is difficult for outsiders to acquire land. This enables local people to maintain their limited natural resource assets. If a member of the family moves to another village or island, that person will only give their land to their relatives. In this village there is no public cemetery because there is not enough land, the land is steep and is entirely planted with trees. The tradition is to bury family members close to their houses. This practice strengthens land claims and means that outsiders will not be able to acquire land holdings in Kinali.

Another socio-cultural practice in Kinali is that non-family members are allowed to collect fallen nutmeg. This provides important income to other villagers. All village members therefore benefit from gleaning fallen fruit but may not pick nutmeg directly from trees. The owner of the trees also benefits because the gleaners clean the land while picking up the fallen nutmeg. Gleaning contributes to the more equitable distribution of income among households in the village when compared to villages in other parts of Indonesia.

5.5 How social networks help Kinali villagers to cope with hazards

Kinali villagers are dependent upon their environment for their livelihood and have developed an in-depth knowledge enabling them to identify signs of impending volcanic activity. Any signs of activity, such as tremors and earthquakes that suggest an eruption is likely, are communicated to the rest of the community. If no molten lava has been visible on top of the volcano for a long period then the next eruption is likely to be powerful. Although determining the accuracy of these warning signs is beyond the scope of this study, Kinali villagers claim confidence in their predictive ability. Villagers also monitor the response of people from the small village of Winangun (Figure 5.2) which lies closer to the crater. If Winangun villagers evacuate to Kinali village this usually means a serious eruption is about to occur.

Mount Karangetang was named by a German Pastor, F. Kelling, who worked in Siau in the late 1800s to early 1900s. It was given the name *Yohannes Tamugagolo* which means the volcano that will not harm villagers. This information was confirmed during the last visit by the head of the GMIST Church Galilea, who is also the chair of elders of Kinali village and was head of Kinali village from 1990–2000 (J. Kalombang, Head of GMIST Galilea, pers. comm., 7 August 2012). If Karangetang erupts, all villagers across Siau believe a violation of morality has occurred in one of the villages surrounding the volcano. Villagers are also cognizant that an eruption will not harm them as long as they correctly evaluate whether to stay at home or move to another location. During the eruption in 2011, for example, 13 households were surrounded by lava in two dry rivers that encircled them but did not harm them (Figure 5.3). Villagers reported that the death of one family during an eruption in 2010 occurred because they decided to attempt to escape by crossing a dry river which then filled with lahars (Figure 5.3).

Before the Asian economic crisis in 1998 when the price of nutmeg was relatively low, Kinali village was well known as a producer of several local agriculture products such as sweet potatoes, taro and vegetables (Figure 5.3). Villagers focused on these agricultural products because of the availability of suitable land on the area of the village close to the creater. Villagers worked together to plant, clean and harvest the crops in the spirit of *mapalus*, a local name for informal cooperative social work in the community. *Mapalus* represents a form of social network that supports villagers in times of hardship as well as in building private houses. When the price of nutmeg increased significantly from 1998 onwards and the lava covered the area previously used for vegetable production, villagers focused entirely on nutmeg and that situation has continued until the present.

In the context of such risks and village perceptions of risks, the Kinali villagers consulted in this research described their obligation to care for their plantations and for their animals. Villagers wanted to protect their sources of livelihood and treated nutmeg as a prime asset. The existence of nutmeg as a factor encouraging people to live in hazard prone areas was emphasised by the Chair of Sitaro Parliament (DPRD Sitaro) (D. Tamudia, Chair of Sitaro Parliament, pers. comm., 12 November 2012) and the Head of the Education Department of Sitaro (S. W. Kathiandagho, pers. comm., 14 November 2012) who argued that high yields, good quality and relatively high prices for nutmeg together with their attachment to the land justified people's decisions to live in locations exposed to major volcanic hazards. Consequently, if faced with the need to evacuate, they have a dilemma: to abandon their tree crops or not. Their experience of past eruptions suggests that lava and lahars only follow dry rivers to the sea, therefore only houses and plantations close to the rivers are at risk (A. Raule, Head of Sibarut Sub-District/former Kinali Head of Village, pers. comm., 22 July 2012). The spirit of *mapalus* is manifest in all activities during hazard events. It is common for villagers to

warn each others, evacuate old or sick people who live on the uphill side of the village, provide food in the temporary shelter, and maintain the road and village infrastructure.

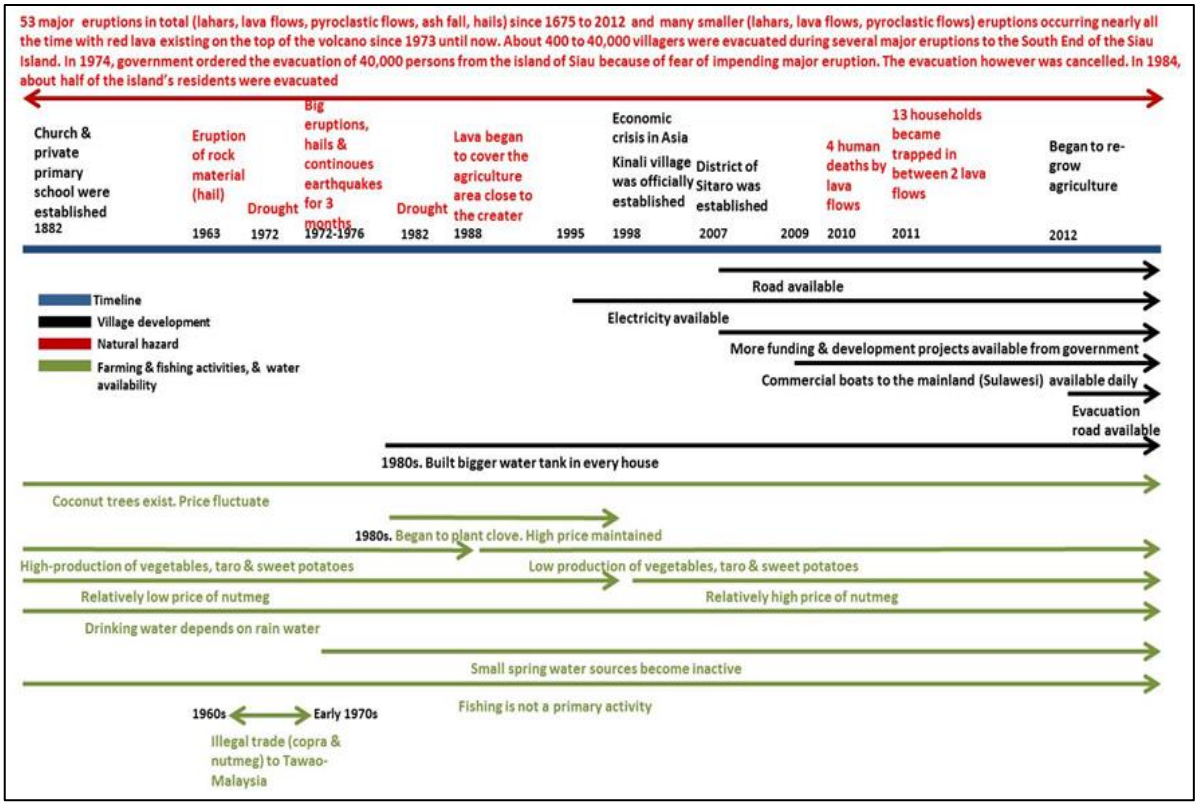


Figure 5.3 Historical events influencing Kinali village, Siau Island, North Sulawesi Province, Indonesia, 1882–2012 (derived from historical timeline activities with the villagers)

Pyroclastic flows are known to follow the lava's path and occur subsequent to lava flows (Karangetang-type eruption) and can travel 1- 2 km downhill (Wattiri 2008). During ash falls associated with eruptions, all the water tanks in the village are covered. When the need to protect plantations is combined with the belief that their homes are safe, villagers see no reason to evacuate. Even if ordered to evacuate by the government the villagers will return to plantation areas during the day to check on their crops and return to evacuation shelters in church buildings at night.

In the past (<1980) (Figure 5.3), during eruptions, earthquakes and hail storms, most of the villagers had to move temporarily to the southern part of the island. They lived with their relatives. They experienced a continuous period of earthquakes for about 3 months in 1974. That event caused significant difficulties for villagers in conducting their routine activities such as cooking, farming and caused damages to their houses. The government ordered the entire population of 40,000 people of Siau to be evacuated, though the evacuation was cancelled because of a reduction in volcano activity (Figure 5.3). Recently, they experienced mostly minor eruptions except in the year 2011 and 2012 when they had to stay for several days in a

temporary shelter in local church buildings. In that times, the access to the village was disrupted because the lahars damaged the road. Though the villagers claimed that food was sufficient and available in several local shops, government supplied supplementary food with the use of boats. In 2012, with funding support from government, villagers built an evacuation road, connecting Winangun village and Kinali village through the nutmeg plantation to provide access to a temporary shelter in the local church (GMIST Galilea). The road will be upgraded later to provide access to the coastal area of the village where the government has a plan to build a jetty. However, Several villages on the other slopes of the volcano recently experiencing major threats because lava and pyroclastic flows approached their dwellings.

5.6 Discussion

Just as McCall (1994) has stressed that studies of islands must consider both their physical and socio-cultural factors, this study suggests that understanding agroforestry on small tropical volcanic islands requires understanding how cultural and social adaptations to the volcanic environment are shaping a crucial set of diverse economic practices. Each of these aspects contributes to how Kinali villagers have flourished in the face of apparent adversity, and have helped Siau to become the centre of nutmeg production in Indonesia, both in terms of quality and productivity (Hadad & Hamid 1990; Marks & Pomeroy 1995; Novarianto 2010).

Nutmeg is originally from Banda island in eastern Indonesia (Joseph 1980), an island with similar physical conditions to Siau. Both have active volcanoes that produce rich soils and natural pesticides that nutmeg, and other crops depend on. Indeed, nutmeg trees are well suited to the ecological characteristics of the island where there is a limited availability of arable land. Yet the cultural practices that support agroforestry activities in Kinali, e.g. communal ownership, 'tree tenure', collaborative hazard knowledge, are key assets also ensuring nutmeg's viability as a crop. As Scheyvens & Momsen (2008a: 499) suggest, the "high level of cultural, social and natural capitals" is a key strength of small island communities. Lowenthal (1992) likewise stresses that islanders' control their environmental and cultural assets and this helps safeguard both natural resources and social cohesion more effectively than in mainland communities. Of particular relevance here is Lowenthal's (1992: 27) insight that "Communal ownership and control ... help to promote insular conservation measures". Communal ownership promotes effective management of limited natural resources within the limited space available on small islands.

Despite all the environmental and economic risks of living on a small volcanic island, Kinali villagers have prospered by growing and selling nutmeg. The results of this study show that traditional knowledge and a traditional, culturally-specific way of managing natural resources has helped bring about this prosperity (Figure 5.4). The rational management of

limited land and natural resources combined with strong social cohesion and strong cultural links to the island are keys to success (Figure 5.4).

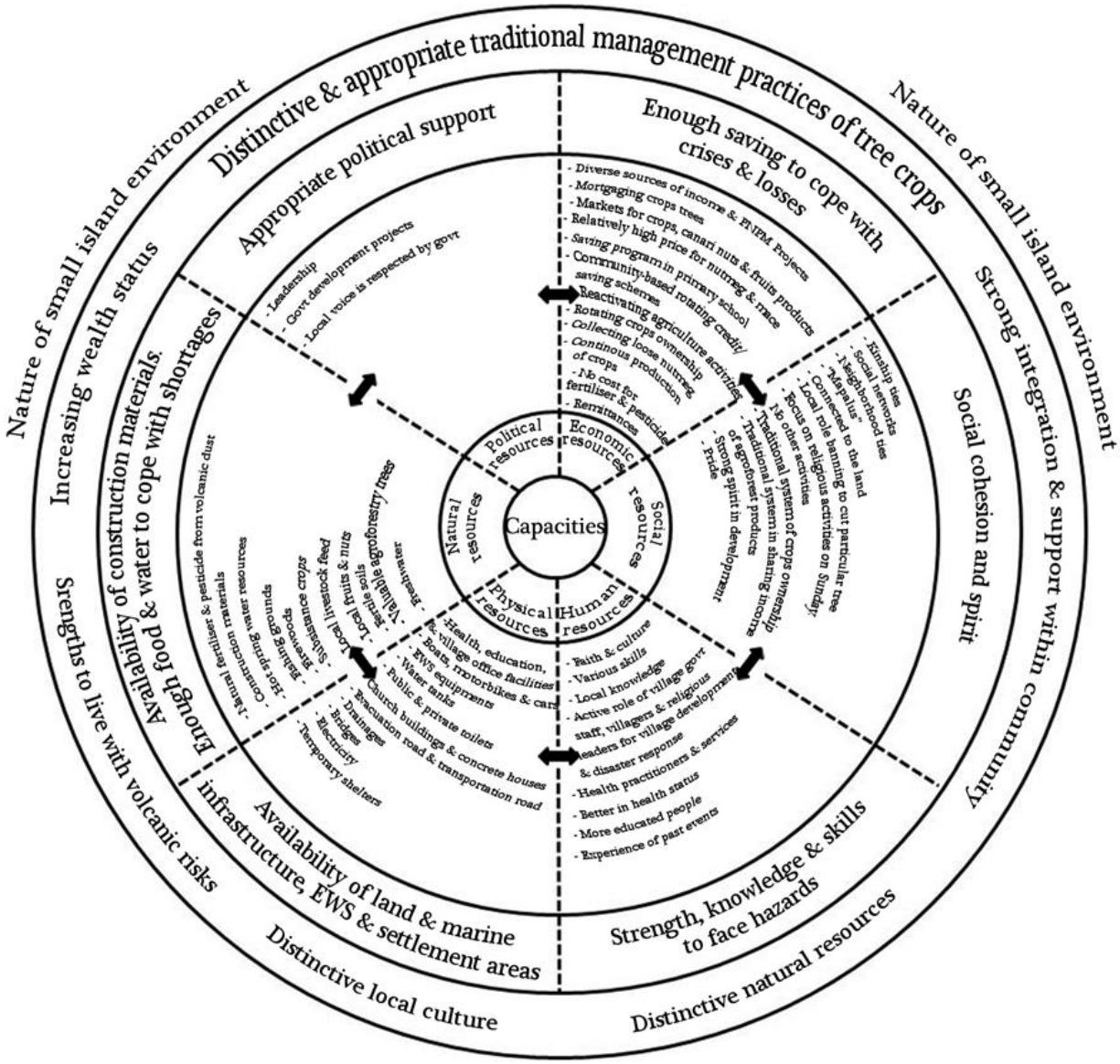


Figure 5.4 Capacity framework for Kinali village, Siau Island, North Sulawesi Province, Indonesia

The income from agroforestry, in conjunction with a traditional agroforestry management system and local resource tenure, has enabled Kinali villagers not only to survive in the face of hazards, but to build a better life and create wealth. Only four families in the village in October 2012 were below the poverty line set by the Indonesian government (Kinali Head of Village R. Kanine, pers. comm., 2012) compared to a national average of 11.25% and 8.7% in North Sulawesi Province (Badan Pusat Statistik 2014). The production of nutmeg and other crops gave Sitaro the lowest poverty level amongst all districts in the North Sulawesi Province (Badan Pusat Statistik Kabupaten Kepulauan Sitaro 2012b; Manado Post 2013;

Pemerintah Kabupaten Kepulauan Sitaro 2012b). Therefore, Mount Karangetang is materially significant to the villagers in providing fertile soils but this is complemented by ethical values and complementary cultural norms and customs.

The fact that nutmeg has an international market enabled Kinali and other Siau villagers to prosper during the Asian economic crisis of 1998. The Mayor of Sitaro explained that people from Siau made significant profits as the price of nutmeg rose in that year as a result of the appreciation of the US dollar against the Indonesian rupiah (T. Supit, Mayor of Sitaro, pers. comm., 26 November 2012). The ability of people on Siau to benefit from nutmeg while living with such environmental constraints encouraged people on Lembeh Island (Mawali village), near Bitung city and about 150 km away (Figure 3.1), to replace coconuts and other trees with nutmeg (K. Lombonaung, pers. comm., 7 August 2012). Currently, in order to help protect the income of farmers in Kinali and Siau, the district government is attempting to establish an association to empower small farmers in Sitaro district to better access foreign markets and to promote 'Siau nutmeg' as an international brand (T. Supit, Mayor of Sitaro, pers. comm., 26 November 2012).

Nutmeg requires less time and labour to maintain and harvest than other tree crops. This makes the crop attractive in the small island context where labour is limited (Giavelli & Rossi 1990). There is no cost for fertiliser and pesticides as these functions are replaced by the 'gift' of volcanic ash (Arnberger & Arnberger 2001; Edwards & Schwartz 1981; Mercer & Kelman 2010; Philogene 1972) from Mount Karangetang. Villagers can harvest nutmeg throughout the year although the peak harvest times are March and from August to October. This means they have relatively continuous incomes and can undertake other activities that provide additional income between the main harvesting periods.

Mercer et al. (2007) stress that indigenous communities have adjusted their livelihood strategies to adapt to environmental and social changes for centuries. When livelihoods are sustainable, communities are equipped with capacities and are less vulnerable in facing hazards. Gaillard et al. (2009) describe how local communities are able to resort to a range of adjustments in their daily lives and this relates to the strength and diversity of their livelihoods. Nutmeg has been grown on Siau Island since the trade between Siau villagers and people from the Kingdom of Ternate in North Maluku began several centuries ago. Siau villagers sold copra in Ternate and brought nutmeg seedlings to Siau (Suara Manado 2011). Kinali villagers have thus adopted agroforestry practices that maximise production and have adapted social and cultural practices that share the benefits throughout the community. Nutmeg agroforestry and its traditional management therefore provide a basis for sustainable land use. Traditional management practices must be considered in any community based sustainable development plans, and it is therefore essential that local knowledge is drawn upon in developing disaster risk management plans for communities living in hazard prone places (Mercer et al. 2007). Villagers

perceive the landscape in which they live as “their land of life” and have a cultural attachment to it (see also Dibben & Chester 1999).

Kinali villagers have evolved a distinctive culture which retains strong connections between the land, natural resources and people. Moreover, the physical characteristics of the island, such as its small size can contribute to a spirit of solidarity and a sense of community (Anckar & Anckar 1995; Rampengan et al. 2014). This accords with conclusions from several scholars who have studied sustainable development and environmental management on small islands in various regions (see Beller 1990; Giavelli & Rossi 1990; Hanson & Lamson 1990). In the context of hazards, including volcanic hazards, local traditions and beliefs can significantly influence local reactions during and prior to the hazard events (Cashman & Giordano 2008; Dove 2008; Gaillard 2006; Gaillard et al. 2008; Gaillard & Le Masson 2007; Mei & Lavigne 2012; Schlehe 1996). In Kinali, there is a belief that their village is safe because Mount Karangetang has been baptized and because rivers act as drains for lahars and lava. So far the present houses and nutmeg trees near dry rivers have only experienced minor damage. Their responses are expressed as a cultural adaptation by way of belief or warning messages in ways described by Reser (2007) and Gaillard (2007). These issues deserve serious attention in disaster risk management (Chester 2005; Gaillard & Dibben 2008; Lavigne et al. 2008). Ignoring the local cultural context will reduce the effectiveness of any DRR program (Hewitt 1983).

Kinali villagers also demonstrate that responses to disasters in traditional societies are varied, and usually rooted in morality, ethics and sin. This kind of reasoning exists in many places (for detail: Bode 1977; Cashman & Giordano 2008; Chester & Duncan 2010; Dove 2008; Lavigne et al. 2008; Mei & Lavigne 2012; Oliver-Smith 1996). Villagers justify their decision to live where they do in the belief that it is a safe place — that the threat only occurs elsewhere. As a result, people feel they can live ‘normally’ and there is no need to relocate (Chester, Dibben & Duncan 2002). The community’s volcanic risk perception thus plays a significant role in disaster risk management since the perception of risk and the success of actions to minimize risk are correlated (De la Cruz-Reyna & Tilling 2008).

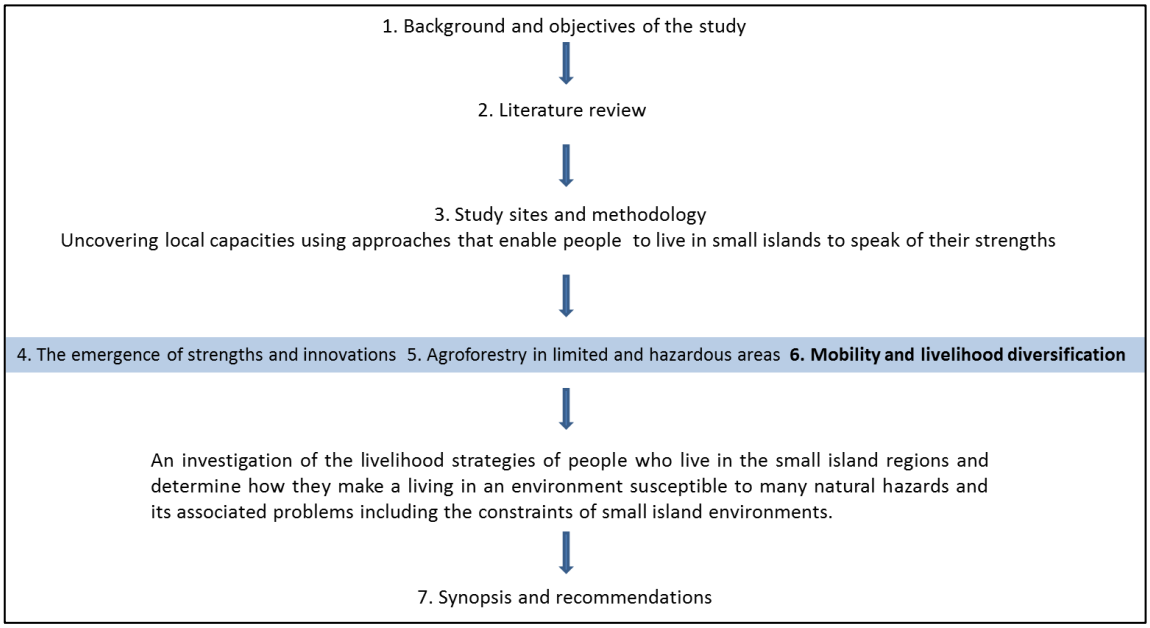
5.7 Conclusions

Kinali, a seemingly small and marginalized village on a small Indonesian island, expresses strong socio-cultural dynamics in the face of a significant natural hazard and limited natural resources. Volcanic eruptions, apparently the biggest threat, turn out to be advantageous as they bring high fertility to the soil – and in so doing prosperity to the villagers. The suitability of Kinali village’s volcanic soil for agroforestry production, especially the production of nutmeg, has resulted in high yields and a unique crop quality recognised nationally and world-wide. Kinali village has over time adopted environmentally sound and sustainable management

practices that address the constraints of a limited land area. The community's strong social cohesion has enabled the benefits to be shared widely amongst the villagers. For all these reasons, Kinali villagers do not merely cope with the natural hazard that the volcano represents; they prosper in the face of this adversity. This needs to be taken into account in developing more informed responses to managing volcanic risk (Kelman & Mather 2008).

CHAPTER 6

MOBILITY AND LIVELIHOODS: A SMALL ISLAND PERSPECTIVE



This chapter is in review in Asia Pacific Viewpoint as follows: "Rampengan, MMF., Law, L., Gaillard, JC., Boedhihartono, AK., Margules, C., Sayer, J".

Chapter 5 presented the potential benefits of living in volcanic regions by adopting suitable traditional coping strategies with the support of strong social cohesion among the community members of a small island. This chapter examines the role of mobility and social cohesion in local livelihood development in a small island in eastern Indonesia. Empirical evidence is drawn from Mawali village on the island of Lembeh. Mawali villagers are exposed to natural hazards, plant diseases, and a variety of external and internal drivers of change, such as population growth, migration, and industrialisation that in turn influence their livelihoods. This chapter provides an explanation to answer the last research question: what are the changing economic and social/cultural dynamics shaping livelihood capacities?

6.1 Introduction

Traditionally, farming and fishing have been the main livelihood resources for small islands (Arnberger & Arnberger 2001; Hess 1990). In the face of growing population pressure on natural resources and increasing vulnerability to natural hazards, more diverse and complex livelihood strategies have emerged. Migration, wage labour, cash crops, tourism and remittances

from workers overseas have all become important components of small island economies (Connell 2010; Connell & Conway 2000; Curran & Agardy 2002; de Burlo 1989; Le De, Gaillard & Friesen 2013; Milne 1992; Naylor et al. 2002; Scheyvens & Momsen 2008b; Tacoli 1998, 2009). The diversification of livelihoods and a willingness to embrace new opportunities help ensure sustainability (Chambers 1995; Scoones 1998, 2009) and are crucial in bolstering the capacity of people to face hazards (Gaillard et al. 2009).

It has long been recognised that small islanders' mobility is an integral part of, and has always played an essential role in, the generation of island livelihoods (Chapman et al. 1991; Christensen & Mertz 2010). The small size, insularity and remoteness of most small islands mean that mobility is a crucial factor in responding to population increase and threats from various environmental hazards (Anckar & Anckar 1995; Baldacchino 2004; Campling & Rosalie 2006; Falkland 1992; Newitt 1992; Pelling & Uitto 2001; Scheyvens & Momsen 2008a; Srinivasan 1986). The most prominent discussion of the significance of mobility to small island development was originally put forward in the MIRAB literature (ie a discussion of MIgration, Remittances, Aid and Bureaucracy). The MIRAB model was introduced by Bertram and Watters (1985) to explore the external forces driving economic and social development in the Pacific. These perspectives evolved in a particular moment in places such as Kiribati, Tokelau, Cook Islands and Tuvalu (Connell 2010), and while they offer important insights to mobility and development, the MIRAB model misses some key endogenous capacities in island communities like the ones examined in this research. This study therefore extends MIRAB understandings of external resources by supplementing them with perspectives from the sustainable livelihoods literature, which already considers mobility and local livelihood strategies as part its core understanding.

The research presented below draws on the experiences of the people of '*Kelurahan*' Mawali (referred to as Mawali village hereafter) on the island of Lembeh, North Sulawesi, Indonesia (Figure 3.1). Mawali village is exposed to natural hazards, plant diseases, and a variety of external and internal drivers of change such as population growth, migration, and industrialisation that in turn influence local livelihoods. This chapter reflects on the characteristics of this small island community, whose Sangirese population has a long history of being mobile in the region as a means to diversify their livelihoods (Bandiyono 2006; Velasco 2009). Mobility continues to be a constitutive part of everyday life, although their mobility may not physically transcend national borders as in the MIRAB model. Instead mobility is a way to flexibly adapt to changing circumstances of island life. To explore these themes the chapter is organized as follows. The first section defines mobility and outlines previous research on MIRAB and sustainable livelihoods. The next section focuses on how this community weaves together a set of proximate and more distant resources as part of their livelihood development. Being mobile enables villagers to modify their livelihood strategies and solve problems

particular to their island environment through a willingness to learn and flexibly adjust to changing conditions. This is a different argument to that advanced by the MIRAB model, and is more reflective of the Indonesian small island context. The chapter concludes by stressing the importance of mobility in conjunction with social cohesion for small island communities facing various hazards and constraints.

6.2 Mobility and livelihoods on small islands

People living on small islands are often characterised as having impoverished economies, a lack of opportunities to access resources needed to sustain livelihoods, and being vulnerable to multiple hazards (Briguglio 1995; Farbotko 2005; Lewis 2009; Roy & Connell 1991). However, as several studies have shown (Bridges & McClatchey 2009; Connell & King 1999; Malm 2006; Reenberg et al. 2008), one way that small island communities are able to solve the problems created by island environments is by being continually on the move; that is, being mobile in ways that help diversify their livelihoods. Mobility among people who adopt this strategy is a normal part of daily life, with immobility being unusual and anomalous (Dijk, Foeken & Til 2001). The concept of mobility reflects local processes of daily transportation, movement through public space and the movement of material things within everyday life – including large-scale movements of people, objects, capital and information in the global context (Hannam, Sheller & Urry 2006). Hannam et al. (2006) also claim that through mobility all places are connected to at least thin networks that stretch beyond each place; as such, nowhere is an island. Malm (2006) and Connell and Conway (2000) argue that Oceanic diasporas demonstrate that a 'society' of islands is not synonymous with people living only in a certain place, therefore should include relationships between islands as well as outside of islands. Indeed, small island community livelihoods cannot be understood in the 'restricted' physical island land context, and must include the waters surrounding the island that are managed for their connectivity to the wider world as well as for resources to be harvested. Mobility for small island communities has therefore played an essential role as an integrated part of island livelihoods (Chapman et al. 1991; King & Connell 1999) and is mostly driven by both social and economic causes, as well as hazards (Bremner & Perez 2002; Locke 2009).

Island societies are therefore not defined by a specific place, or by dependence only on local resources. In this context, mobility is one strategy (i.e. Julca & Paddison 2010; Le De, Gaillard & Friesen 2013; Tacoli 2009) which, in combination with others such as local cultural adaptability and indigenous knowledge, enables them to diversify their livelihoods and persist or even prosper while living in what some would consider hazardous terrains (Burton, Kates & White 1993; Campbell 2009; McAdoo, Moore & Baumwoll 2009; Mercer & Kelman 2010; Reenberg et al. 2008). The MIRAB strategies in the Pacific are one well-illustrated example of this.

Bertram and Watters (1985) and Bertram (2006) understood the significance of mobility, and defined the MIRAB model as a development process where migrant remittances and foreign aid were the main resources of small Pacific islands—ones which underwrote the development of sizable government bureaucracies. The MIRAB model attempted to explain the decline of village agriculture as it was no longer the main player in economic development. It instead focused on exogenous factors shaping island economies. Endogenously-driven development was downplayed since the process of social and economic change was understood in terms of local adjustment to external forces (Bertram & Watters 1985). Bertram and Watters (1985) argued that through this strategy small islands could follow economic development, thus eliminating the economic constraints of living on small islands (as long as the flow of remittances and international aid continued). The role of social cohesion in MIRAB economic strategies was an important part of the model (Bertram 2006; Bertram & Watters 1985; Bertram & Watters 1986; Evans 1999). Strong kinship ties enabled families to work in a variety of places thus cushioning regionally-specific shocks (Bertram & Watters 1986). In the main, however, MIRAB strategies depend mostly on outside support, making the local community vulnerable. The importance of access to -- and control of -- resources is crucial in defining the sustainability of lives and livelihoods, but the MIRAB conversation has less to say about these issues.

This chapter therefore takes cues from the MIRAB model, but supplements them from a sustainable livelihood perspective. Sustainable livelihoods have been a focus of research and policy since the 1980s, and gained popularity with the publication of a report entitled "Sustainable rural livelihoods: practical concepts for the 21st century". The report, authored by Chambers and Conway (1992, i), defined livelihoods as "comprising people, their capabilities and their means of living, including food, income and assets... A livelihood is socially sustainable which can cope with and recover from stress and shocks, and provide for future generations". The livelihoods approach, which emerged from the concept of sustainable livelihoods, was developed to counter the pessimistic outlook of many household studies, which tended to undervalue future livelihoods (Chambers & Conway 1992).

Livelihood refers to the means and capacities needed to sustain people's daily needs, and depends on the assets or resources of households (Gaillard et al. 2009). Livelihoods require complex, contextual, diverse and dynamic strategies if they are to be sustainable (Chambers 1995; Scoones 1998, 2009) and more than just income, including social institutions (Ellis 1998; Lipton & Maxwell 1992). The sustainability of livelihoods has always been associated with the livelihood strategies people utilize to spread risk and cope with shocks while maintaining the availability of resources (Ellis 1999; Gaillard et al. 2009). In small, resource-constrained island communities like Mawali village, it is crucial that they manage their island resources well, and supplement them with resources from other areas to survive and produce adequate livelihood

outcomes. As we go on to show, this livelihood 'mobility' is an important part of this management strategy.

6.3 Mobility and changing livelihoods at Mawali village

Data collected on the hazardous events, changing livelihoods and mobilities of Mawali are synthesised in Figure 6.1. The constraints and opportunities of this small island environment – including multiple hazards (land slides, rock avalanches, long dry season, floods) and pests, as well as mobility and social networks – are set out in terms of how they have facilitated livelihood changes in the social context of this community. Being mobile to gain livelihood resources is a key approach in this community. The difference between these strategies in Mawali and those elaborated in MIRAB is significant because the income earners themselves remain on the island, with villagers supplementing their income by introducing new crops and drawing on wage labour. Moreover, whereas the Pacific islands suffered decline and stagnation in agricultural production, in Mawali mobile villagers have innovated in local agroforestry production to cope with such decline. In this section of the paper we chart the significance of mobility to the transition of livelihoods from chilli and traditional fishing techniques to growing nutmeg and cloves, tuna fishing and labouring for wages.

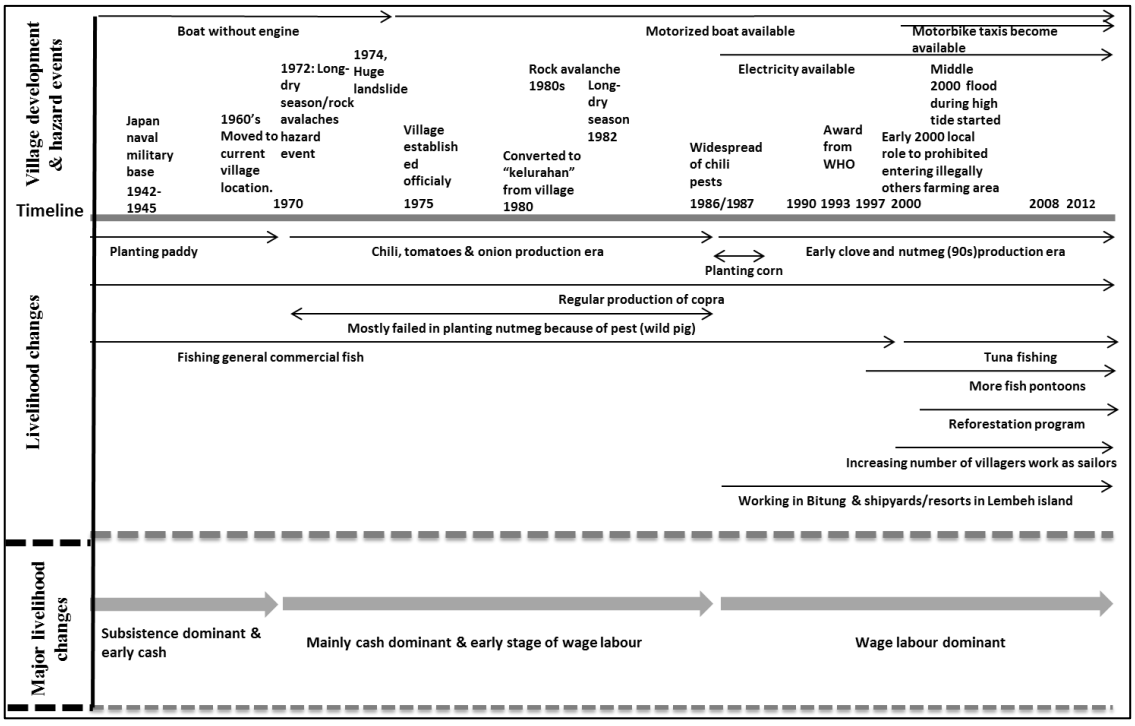


Figure 6.1 Historical events in influencing livelihood changes in Mawali village (source: mainly from historical timeline with additional information from interviews and participatory mapping)

Mawali village has a long history of mobility and transformation, including the entire village's relocation from the other side of the island in the 1960s. Relocation was initiated by the government to provide better access to government services because at that time only canoes without engines were used to reach the mainland. Before this, during the Second World War (1942-1945), Japanese invaders forced villagers to move to the mainland as the island became a military base. When they returned in 1946, Mawali was part of Bitung Tengah village, but it became a village in its own right in 1975 and its status as "*Kelurahan*" was gained in 1982 when the status of Bitung changed from a district to an "administrative city". It is worth noting that the word 'Mawali' is derived from a Sangir language word meaning 'returning', reflecting their return from the mainland back to the island (Pemerintah Kelurahan Mawali 2012).

Today the livelihoods of Mawali villagers are clearly built upon three main pillars: tree crop production, wage labour, and tuna fishing (with some additional income from remittances). The main source of cash income since the establishment of the village has been agriculture, starting with copra and followed by chilli, tomatoes and onions. It has more recently diversified into nutmeg and cloves, especially since experimenting with the seeds of nutmeg from Siau Island and cloves from Minahasa (in the mainland of Sulawesi) to eliminate pest problems. A secondary source, and one growing in significance, is income from paid jobs in various industries both in Bitung and on the island, although remittances from sailors who work internationally also have a role (remittances are commonly used for purchasing building materials, paying education-related costs, and supporting particular family events). Embracing new fishing strategies, especially catching tuna, has become another key livelihood strategy. These three pillars of livelihood cannot be separated from the existing social cohesion which supports the continuity of their livelihoods under the threat of hazards and constraints of the small island environment.

From 1970 to 1987 Mawali village produced chilli, tomatoes and onions (Figure 6.1). The villagers, with their own funds and through *mapalus* (informal communal/shared labour), even built a "chilli night market building" close to a boat jetty. Customers and traders from the mainland (Bitung and Manado) came to the island to buy these agricultural products. The relatively easy access and close distance between the village and the mainland facilitated trade. Thus, there were no transportation costs for villagers to sell their products. During that era, they did not use any fertilisers or pesticides, so the cost of maintenance was low. However, the failure of these crops in 1986/1987 because of widespread pests (Figure 6.1), which continues today, pushed Mawali villagers to the mainland. There were several surveys and research projects initiated by government agencies to try to solve the problem in 1997 with no adequate results (M. J. Lomban, Vice Mayor of Bitung, pers. comm., 28 November 2012). Crop failure and increasing contact with elsewhere facilitated livelihood change, however, especially the shift to planting tree crops (clove and nutmeg) (Figure 6.1).

Clove seeds have been brought from the mainland of Sulawesi to Mawali, mainly from the Minahasa region. People from Mawali village work on the mainland during the harvesting season, as harvesting and processing cloves is labour intensive. This temporary labour migration of Mawali's ethnic Sangir people to Minahasa for farm work has occured since the Dutch colonial era (Bandiyono 2006). Nutmeg seeds, on the other hand, were brought to Mawali from Siau Island. Most of the villagers who live on the upper side of Mawali village originally came from Siau, so mobility between these two sites is also long-established. They migrated to Lembeh Island centuries ago, and there are several stories about the migration. One version suggests that in the 17th century, the king of Siau VI, Don Fransiscus Xaverius Batahi (1670-1696) was awarded an island in the Minahasa region (Lembeh Island) by *Tonaas Minahasa* (the customary leader of Minahasans) because Commander Hengkengunaung and his troops (Commander of the Kingdom of Siau) supported Minahasa's troops in a war against troops from Mindanao (locally known as *Mangindanao*) (The Philippines) in the Kasuang area, Minahasa. The island was given in order to be inhabited by people from Siau as a symbol of friendship between Siau and Minahasa (S. Gagola, personal communication, former Head of Village of Mawali and Pintu Kota 1982-1993, former teacher, August 9, 2012). This story was based on a document entitled "Menjingkap Tabir Pulau Lembe" (or "Uncover the story of Lembeh Island", written in old Indonesian language by Johan Rahasia in 1967). Other possible explanations include trade, employment and escape from volcanic hazards on Siau, as many people from Siau have migrated to places on the mainland of Sulawesi or other island surroundings (Bandiyono 2006). People from Siau are of the Sangir ethnic group, a group recognized for their mobility for centuries. Their travel extends from nearby islands and the mainland of Sulawesi to places further afield such as the nearby islands in the Philippines (Bandiyono 2006; Velasco 2009).

The villagers explained that nutmeg was planted after the economic crises in 1997/1998, when the price of nutmeg increased significantly while prices for all other commodities fell drastically. A combination of persistent vegetable pests, lower labour requirements for nutmeg and high nutmeg prices initiated this shift in agriculture. Mawali villagers can harvest nutmeg throughout the year with the peak harvest times being March and from August to October. This means they have relatively continuous incomes and can undertake other activities that provide additional income on the island (ie working in the shipyards or at tourist resorts) and on the mainland between the main harvesting periods. Villagers explained the tree crops as a kind of 'savings' while they fulfilled their daily needs with income as labourers.

The villagers have also sought positions as wage labourers on the mainland in Bitung, for example in the canning, copra and cement industries and as dock workers as well as on the island itself (shipyards and resorts) (Figure 6.1). This kind of wage labour is now a dominant livelihood resource for most villagers, forming another important pillar of livelihood.

Participants in this research explained that there are no highly qualified skills needed for these jobs, with on-the-job training commonly provided. Taxi boats (Figure 6.2) transport villagers from the island to the mainland daily to engage in these activities.

Figure 6.2 Taxi boat in a jetty in Mawali village, transporting passengers and goods including motorbikes. Photograph by Mercy M.F. Rampengan, August 2012

In the past, Mawali villagers utilized a traditional collective fishing practice locally known as *soma dampar* (Figure 6.3). This type of fishing technique can only be used along shallow coastlines, although few fishers continue to use this technique. Most fishers now fish for tuna with a different kind of boat (Figure 6.4). It is believed that this change has been caused by fewer fish occurring in the vicinity of the village because of the increasing activities of ships along the strait, the development of shipyards on the coastline of the island and on the mainland, the existence of fish pontoons on the area surrounding the island and the intoduction of new tuna fishing techniques. But good landing spots for tuna boats were also facilitated by a huge landslide in the early 1970's (Figure 6.1). Alluvium deposited by the corresponding flood provided additional land/settlement areas for villagers in Mawali Kecil Sub-Village. Lembeh sits on typical volcanic rock (Whitten, Mustafa & Henderson 1987) and has few flat areas, so villagers welcomed the expansion of level areas on the island.

Mawali fishers learnt tuna fishing techniques from visiting Filippino fishermen, and now only catch tuna which is sold to tuna canning companies in Bitung city. This coastal area is suitable for landing tuna boats and in early 2000 became a well-known location for Filippino fishermen to land for boat maintenance and repair. The Filippino fishermen also have family

Figure 6.3 *Soma dampar* fishing technique. The background shows various sizes of taxi boats at one of the jetties in Mawali. Photograph by Mercy M.F. Rampengan, November 2012

Figure 6.4 Mawali Kecil Sub-Village, a tuna fishing community. The fishing boat is a typical tuna fishing boat. Background mountain in the right side is mainland Sulawesi. Photograph by Mercy M.F. Rampengan, November 2012

connections with the villagers as their common ancestors were mostly Sangirese (Bandiyono 2006; Velasco 2009). This connection facilitates their acceptance in Mawali, along with subsequent marriages between locals and Filippino fishermen. Initially, the villagers worked for the Filipinos catching tuna using Filippino boats. When they did this they frequently travelled to General Santos in the Philippines to sell the tuna. Recently, they have begun building boats themselves and there are now 35 tuna boats owned by the villagers (Figure 6.4). It costs about IDR 80 million (about AU$8,000) to build a boat. During the strong windy season when they cannot go fishing, the local government provides fishers with basic daily needs such as rice, cooking oil, instant noodles, and sugar. Children of fishers can also get scholarships from the government if they want to continue their study at APB (Akademi Perikanan Bitung) Bitung (Fisheries Academic of Bitung) (M. J. Lomban, Vice Mayor of Bitung City, pers. comm., 28 November 2012). The current emergence of tuna fishing demonstrates how Mawali villagers are able to identify and embrace new opportunities that help ensure the sustainability of their livelihoods. Learning new skills like tuna fishing was a response to perceiving opportunities in the local fish canning industry, for example. The government of Bitung City is clearly aware of the vital role Mawali fishers play in supporting the canning industries for this region, evidenced in their support for daily needs and education.

6.5 Discussion and conclusion

As the preceding sections suggests, Mawali village has a long history of adjusting livelihood strategies to cope with environmental and social change. Since the 1970s villagers have adopted new agroforestry practices (ie growing cloves) that maximise crop production and income, while at the same time eliminating persistent pest problems. Nutmeg is another addition to agroforestry practices, and is an attractive crop in the small island context where labour is limited (Giavelli & Rossi 1990). The Mawali community furthermore adopted new fishing techniques from Filippino fishermen, so they were able to cope with the depletion of fish along the strait close to their village. The new fishing technique provides them with tuna, sold at a relatively higher price compared to the previous traditional fish. Such livelihood diversification is not strictly island-bound, as it relies on resources from the mainland of Sulawesi as well as social networks reaching as far as the Philippines. The livelihoods of Mawali villagers are thus not isolated or purely dependent on external support, since villagers themselves are typically mobile and able to work across multi-spatial scales, from the island itself (tuna fishing), the mainland (wage labour, new seed varieties) or even further afield (Filippino technologies, sailors). In other words, they are part of the world of interconnected processes (Clark 2009; Connell & Conway 2000; Malm 2006) and demonstrate the interconnectedness of a wide range of social and economic resources in sustaining people's livelihoods.

The changing livelihoods and mobility of Mawali villagers illustrate what Malm (2006) refers to as a changing context of global migrations and flow of resources. Small islands may be remote and insular, but they are not absolutely isolated. Being separated from the mainland is not a concern when islanders are actively mobile. Making a living on small islands involves coping with the constraints imposed by small areas, natural hazards and farming setbacks, as well as taking advantage of opportunities that arise. Capacities to diversify livelihoods and longer histories of mobility and connection are two characteristics that give island people an advantage. People whose livelihoods are sustainable prove to be equipped with the capacity to face hazards through diversifying their livelihoods (Ellis 1999; Gaillard et al. 2009). This study of Mawali village emphasizes that the three pillars of their livelihood with support from socio-cultural forms of resources (Figure 6.5) enable the diversification of activities and thus lessen the villagers' dependence on current limited production and low prices of tree crops in the markets, mainly coconuts, while waiting for the nutmeg to produce in the near future.

When Lembeh Island is compared to islands in the Pacific, the MIRAB model does not adequately elucidate the livelihood and mobility of Mawali villagers. The Mawali community tends to remain on the island, for example, and has innovated in local agroforestry production to cope with pest problems. Moreover they are not directly dependent on aid/support from outside regions; although their livelihoods are now enmeshed with the international market for agroforestry and fish products (nutmeg, copra and tuna). This creates different vulnerabilities because they cannot control the market price. Exploring new opportunities that arise beyond the border of their small island area to diversify their livelihoods, on the other hand, emphasises the Mawali villager's capacity for making a living (Figure 6.5).

This study therefore contributes to a more general understanding of the complexity of islanders' livelihoods. This complexity is born of their ability to respond to different opportunities and constraints and to develop livelihood strategies in the face of environmental, social and economic drivers of change that are both internal and external. This study has further shown that mobility is a cornerstone of livelihoods in Mawali village. Mobility enables villagers to modify their livelihood strategies so that they are more able to solve the problems created by their island environments including various hazards, through their willingness to learn and their flexibility to adjust to changing conditions. This is consistent with the argument put forth by Gaillard et al. (2009) who have shown that changing strategies provide flexibility and stability, features important for sustainability over time and to enable communities to cope with changing conditions.

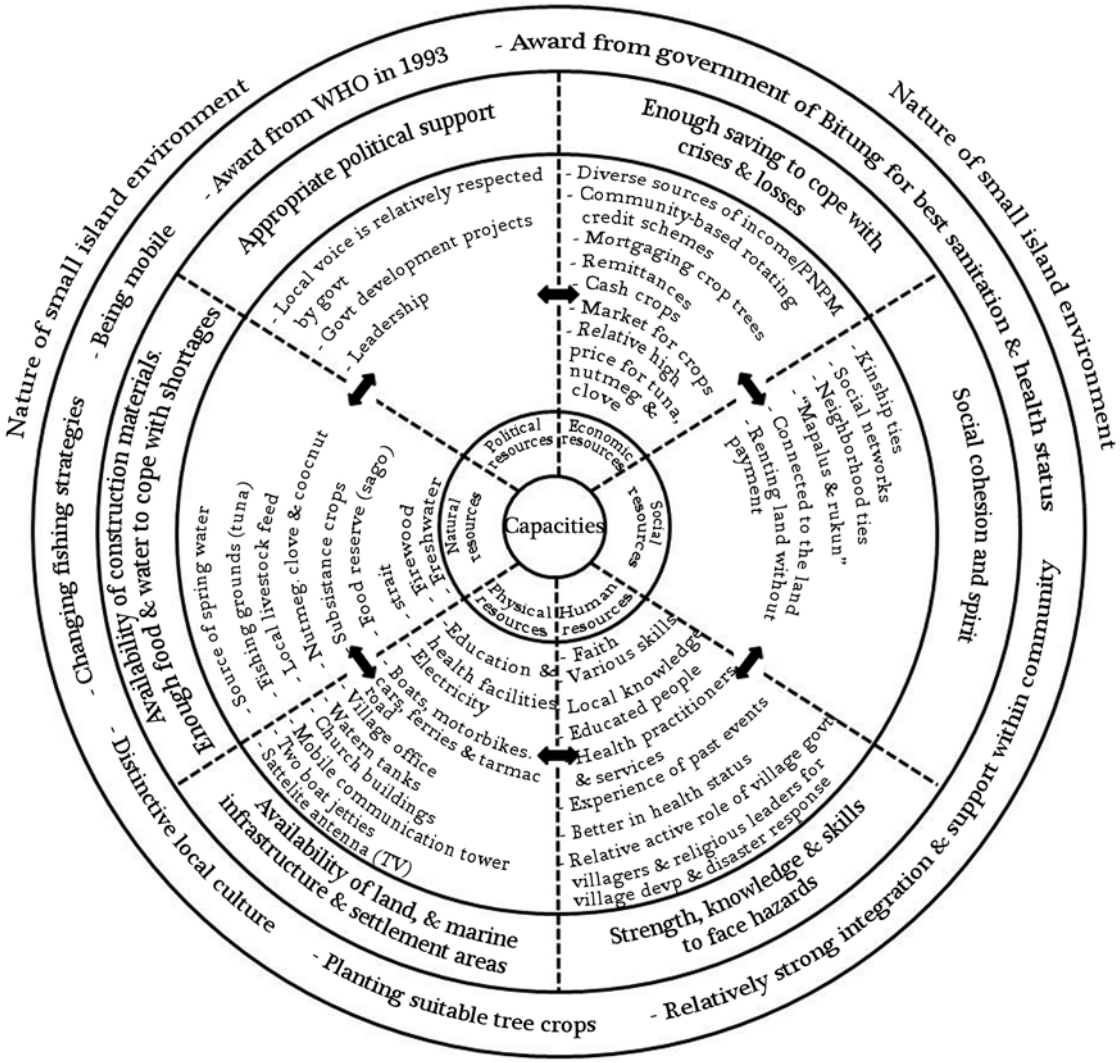


Figure 6.5 Capacity framework for Mawali village, Lembeh Island, North Sulawesi Province, Indonesia

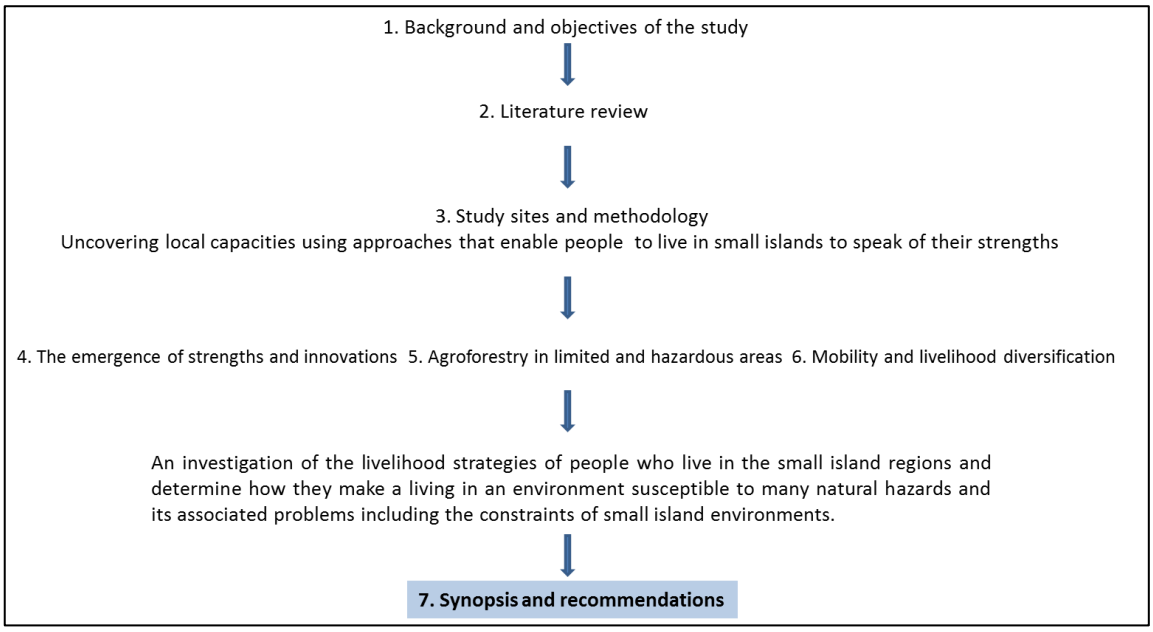
Connections between places and peoples facilitated the diversification of livelihoods and thus contributed to sustaining people's everyday needs. Mawali villagers have shown a remarkable ability to benefit from, as well as respond to and cope with, various hazards and economic opportunities (Figure 6.5). Social networks facilitate this success, especially connections with other Sangirese people from Siau, the Philippines and other regions. They do not live out or even spend most of their lives in island settings, however. On the contrary, they pursue livelihood opportunities across geographical scales, making use of and drawing upon resources across rural and urban contexts, and between islands. Thus they utilize a dynamic livelihood strategy to meet their various needs in diverse spaces, beyond the physical bounderies of island.

Mawali villagers show that their livelihoods cannot be understood in the realm of the "small island" only, but must be understood to include the water surrounding them, which

facilitates connections to many places and resources and supports strong livelihoods in facing various hazards. They perceive the surrounding sea water as integral to their lives, not as an isolating barrier (cf McCall 1994) as in the Pacific islander context. The mobility of Mawali villagers has played an essential role as an integrated part of island livelihoods as identified elswhere by Chapman et al. (1991) and King and Connell (1999). This is important as it contributes to a broader understanding of the responses of small island communities to hazards and changes, which can in turn contribute to a better approach for disaster risk reduction programs and village development.

CHAPTER 7

DISCUSSION, CAPACITY FRAMEWORK, CONCLUSIONS AND RECOMMENDATIONS



Chapters 3-6 described participatory approaches for uncovering local capacities in facing hazards; the strengths and innovations of the people studied in this research; the role of agroforestry and local culture in forming the local capacities to cope with limited land size and a hazardous area; and the importance of mobility in diversifying livelihood resources. In this chapter, I synthesise the key findings of the four chapters and discuss the implications of my study for disaster risk reduction (DRR) strategies, particularly for small island regions. A capacity framework of three research sites is generated and actions are recommended.

7.1 Introduction

The research presented in this thesis contributes to ongoing discussions of small-islands in disaster studies, but its conceptual framing around livelihoods to explore the capacity of island inhabitants is distinctive. Moreover, current disaster research lacks a unique island case study approach; although in the past decades mono-disciplinary disaster-related research has often used case studies (Kelman et al. 2011). Few researches explore how livelihoods interplay with

people's capacity in the face of hazards, although Gaillard et al. (2009) provides an important exception. Moreover, while Maceda et al. (2009) document the use of participatory methods in Community-Based Disaster Risk Reduction, they do not develop this into a more generalized research approach. This current study therefore weaves together disaster studies, livelihood studies, small island research and participatory methods in a new way. This enables new conceptual insights for approaching disaster-impacted communities (ie a 'capacities approach'), while at the same time connecting to the profound survivability of these communities for generations in both academic research and DRR programs.

This final chapter formulates the conclusions of the study, linking back to the aims and objectives set out in Chapter 1 and pointing forward to potential areas of future study. The overall aim of the study was to investigate the livelihood strategies of people who live in the small island regions of eastern Indonesia and investigate how they make a living in the context of their environmental constraints. The data required to address these issues of livelihood and capacity were collected through a range of participatory methods and more conventional forms of data collection (semi-structured interviews, observation), using case studies from three different small islands in North Sulawesi Province. The study has yielded three general findings, which are worth repeating here. First, approaching the community not as vulnerable but as resourceful encourages research participants to re-imagine themselves in terms of their strengths and capacities in facing various hazards. This is not merely a question of methods or methodology, and points to the significance of foregrounding epistemology in undertaking disaster research. Second, strong social cohesion (ie *mapalus* and gleaning fallen nutmeg) currently enables the community to organize and confront hazards and other constraints exacted by small island environments. In the islands dicussed here, social cohesion helps facilitate the use of appropriate/traditional management practices in the agroforestry (ie rotating ownership mechanisms and 'tree-tenure' system) and fishing (long-line fishing/*sande* boat) industries and enables innovations in the field. The last general finding is that a diversified livelihood strategy, enabled through mobility and communal work, underpins people's livelihoods. Such mobility helps the community face the hazards and constraints of their small island environment.

The main conclusions of the research presented in the four chapters are summarised under four headings: Engaging communities in managing multiple hazards: reflections from small islands in North Sulawesi, Indonesia (study sites and methodology – Chapter 3), capacities in facing natural hazards: a small island perspective (Laingpatehi village, Ruang Island - Chapter 4), agroforestry on an small, active, volcanic island: prospering with adversity (Kinali village, Siau Island – Chapter 5) and Mobility and livelihoods: a small island perspective (Mawali village, Lembeh Island – Chapter 6). These chapters addressed the research objectives outlined in Chapter 1. Chapter 3 answered objective one, Chapter 4 satisfied objective two, Chapter 5 fulfilled objective three and finally Chapter 6 addressed objective four.

The four chapters represent different dimensions of livelihood strategies and the methods used to identify them. The chapters are diverse in content, ranging from the more general underpinnings of methodology to different livelihood strategies on each island. Each chapter provides a different insight into small island livelihoods in eastern Indonesia, and by employing a capacity approach/framework, the chapters come together to provide a broader picture of livelihoods and the complex interrelationships and processes that take place on small, volcanic islands. In examining the capacities and innovations in communities facing hazards, the research emphasised the diversification of livelihood resources. While investigating these capacities from a livelihood perspective, people's socio-cultural, natural and economic resources, as well as access and availability, were prime concerns. These chapters also chart the methods used to explore island capacities, thus achieving the research objectives of the thesis.

7.2 Discussion

Small island communities are often categorized as vulnerable and marginalized but as this study shows, they have capacities to deal with hazardous situations. The most distinctive features of how these communities cope include the mobilisation of their resources both inside and outside their islands and the strong socio-cultural ties which enable them to achieve positive livelihood outcomes. The livelihood strategies exhibited by the communities examined in this research reveal a comprehensive combination and interaction among resources that influences their capacities in facing hazards. This can be seen from the various livelihood outcomes they have achieved, especially under the constraints of small island environments (Figure 7.1). These constraints can be mediated, so that small island communities are stronger and more innovative in developing sustainable livelihoods. The diversification of livelihoods enable the communities to spread risk and cope with changing conditions while maintaining access to resources. This in turn reduces risks so they can support and continue their lives. More detail is provided in the sub-section below.

7.2.1 Approaching small island communities in disaster studies

Small island communities can endure various hazards for generations through utilizing their local capacities embedded in their day-to-day lives and livelihood strategies (Campbell 1984, 2009). Identifying the inherent capacities that exist within these communities is thus critical to putting in place any risk reduction strategy and development programs. Through valuing local capacities, better results in disaster management and development programs are able to be achieved based on what the community is already good at. This approach is far more strategic than the more familiar practice of government and nongovernment organisations solely documenting vulnerability. These depictions fail to appreciate the complete picture, and any

solutions which are posed are unlikely to deal adequately with various hazards they face. Indeed, overlooking local capacities can result in unsuccessful programs (Sayer & Campbell 2004) including DRR programs, as the positive sides of small island communities are neglected and the resourcefulness that has enabled them to survive and prosper for generations is unexpressed. Moreover, attending to capacity is reasonable to achieve as it is easier to enhance capacity than to reduce vulnerability (Wisner, Gaillard & Kelman 2012). In the complex reality of small islands hazards and environmental constraints cannot be avoided but can become a source of strength and innovation for the community (Rampengan et al. 2014). While research addressing the root causes of vulnerability is obviously needed to complement disaster studies and development programs, it is only one of many possible approaches to understanding livelihoods in small island communities.

One of the distinctive aspects of this thesis is its capacity framework/approach, and this was enabled by the choice of methods used in this study. Participatory methods were drawn from various community participation tool kits (Dazé, Ambrose & Ehrhart 2009; IFRC 2007; Kumar 2002), and were trialled and modified during the course of fieldwork as the key elements of participatory methods might lie in the disposition of the researchers rather than the methods themselves (Chambers 1994; Kumar 2002). The application of this approach thus creates personal, political and professional challenges that have been carefully addressed through the changing of group size, place, time, confirmation of findings and approach to community' strengths and resourcefulness instead of their vulnerable status.

Working with larger groups was seen as a disruption to daily subsistence and economic activities as the meetings required lengthy and in-depth discussion about particular issues but the main concern of the people was to fulfil their daily needs. The change of place and time for participatory activities created a more accommodating and 'comfortable' atmosphere for participants to share their knowledge. Group activities used existing community groupings (usually church related) and typical informal convening places to limit intrusiveness to daily activities. Confirmation of findings to the communities provided opportunities for knowledge to be shared and discussed. Incomplete information from previous visits was finalised and provided an opportunity for triangulation thus enhancing the validity of the findings. Approaching the community in a positive manner, and recognising their resources through various participatory methods, enables them to speak of their strengths rather than their vulnerabilities. The community is thus understood as a complex entity with 'capacities' in building livelihood resources. This in turn promotes a discourse of resourcefulness rather than weakness and victimhood for the kind of data collected. Researchers who focus on vulnerability find needs; those who focus on the capacity of local communities will tend to find the 'resourcefulness' of people living under the shadow of various hazards. Positive recognition is thus a crucial factor in exploring people's capacity.

7.2.2 Strong social cohesion and the complex reality of small island environments facilitated the emergence of strengths & innovations of the inhabitants

How small island communities can use hazards and disasters to strengthen their livelihoods and capacities in the realm of the complex reality of small island environments was explored in this study. Vulnerability to multiple hazards is thought to be a main characteristic of small, remote island communities – more so than non-island regions (Briguglio 1995; Lewis 2009; Méheux, Dominey-Howes & Lloyd 2007). However, in the face of various hazards and constraints of small island environments, small island communities utilize creative livelihood strategies based on local tradition, identity, knowledge and history, together with the ability to access resources outside the physical boundaries of islands to overcome these threats (Bertram & Watters 1985; Campbell 1984; Chapman et al. 1991; Connell 2010; Gaillard 2007; Gaillard, Clavé & Kelman 2008; McAdoo et al. 2006; Mercer et al. 2009; Rampengan et al. 2014). Small island households therefore have capacities that are often rooted in resources that are endogenous to a community such as traditional knowledge, social networks, and indigenous skills. In many studies, scholars generally focus on the negative impacts of hazards upon the community, thus failing to identify the strengths of the people, presenting an incomplete picture of their situation. Thus, the solutions which may be posed are unlikely to deal adequately with challenges. Existing hazards can encourage innovation and strength in developing sustainable livelihoods of the inhabitants (Rampengan et al. 2014). Even in the context of a bigger island in an affluent country, Aldrich (2010, 2012) found that local capacities in the form of social resources are the strongest support for communities, and are a robust indicator of population recovery. After the 1995 Kobe earthquake in Japan, social resources were compared to all other factors and were deemed more important than controlling for damage, economic conditions, inequality and others. This social asset is often overlooked in the efforts and programs to deliver necessary physical and material aid to disaster affected people.

The up-side of being exposed to hazards and the constraints of small island environments are not always fully considered, even though challenges can strengthen communities and encourage them to adopt strategies that are keys to building their capacities. Their small size and isolation are variables that contribute to a spirit of solidarity and a sense of community (Anckar & Anckar 1995). People living under the shadow of hazards can use hazards and disasters as a chance and motivation to find better livelihoods. The strong spirit and appropriate strategies help them to persist and prosper in the face of adverse conditions.

Scheyvens & Momsen (2008a, 499) suggest that a 'high level of cultural, social and natural capitals' are key strengths of small island communities. This study shows that traditional knowledge and local cultural ways of managing natural resources have helped small island communities prosper. The rational management of limited land and natural resources combined with strong social cohesion and strong cultural links to the island are keys to success. The

people have adjusted their livelihood strategies to adapt to environmental and social changes for centuries; this has helped them build the capacity to benefit from the existing threats.

7.2.3 A diversified livelihood strategy through mobility and communal work underpinned people's livelihood in facing hazards

The small size, insularity and remoteness of most small islands has given rise to a view that small islanders' mobility has been a crucial factor in responding to population increase and threats from various environmental hazards (Anckar & Anckar 1995; Baldacchino 2004; Campling & Rosalie 2006; Falkland 1992; Newitt 1992; Pelling & Uitto 2001; Scheyvens & Momsen 2008a; Srinivasan 1986). This study has shown that mobility is a cornerstone of livelihoods as it enables villagers to modify their economic strategies so that they are more able to solve problems through their willingness to learn and flexibility to adjust to changing conditions while still living on the island. Connections between places and people on and outside of their island facilitated the diversification of livelihoods and thus contributed to sustaining people's everyday needs including in times of hardship associated with the occurrence of hazards. They pursue livelihood opportunities across geographical scales, making use of and drawing upon resources across rural and urban contexts. Thus they utilized a dynamic livelihood strategy to meet their various needs at diverse spaces, beyond the physical boundaries of their islands. In this way it posits Indonesian small island responses to environmental and socio-economic changes beyond the usual MIRAB (Migration, Remittances, Aid and Bureaucracy) strategies in the Pacific, while at the same time providing insights to small island development trajectories.

Livelihoods in this study cannot be understood as "small island" only. Instead they must be understood as including the water surrounding them, which facilitates connections to many places and resources and supports strong livelihoods in facing various hazards. The strength and diversity of people's livelihoods are the root of the way these people resort to a range of adjustments on their daily lives (Gaillard et al. 2009). Diverse livelihood strategies enable communities to spread risk and cope with shocks while maintaining the availability of resources that support their lives (Ellis 1999; Gaillard et al. 2009).

7.3 Capacities framework of small island communities

Based on the study from three villages in three different small islands, a general framework can be proposed based on the common resources found among these villages (Figure 7.1). This framework shows the ways in which resources are interlinked and combined to determine capacities. The arrows between resources show the connections and/or trade-offs between resources. These in turn produced various livelihood outcomes. Capacities are thus determined

by the combination and integration of the resources that provide the ability to face hazards including facing various constraints of small island environments. Their capacities are not only related to the existence of resources in the island setting but include the ability to either use or access resources outside the boundaries of the island areas. The framework shows that there are significant common resources utilized by small island communities, while they have distinct conditions in terms of geographical context and economic activities. Most of the resources are centered in social cohesion and supported by the natural resources. The people living on small islands show their willingness to learn and flexibility and readiness to adjust to changing conditions in conjunction with their strong social cohesion, which enabled them to have successful livelihoods.

The nature of small island environments as a complex reality can become a source of strength and innovation for the community. Taleb (2012) argues that challenges can strengthen the community. Small island communities can therefore be strengthened by the challenges to which they have been exposed for generations. Their social resources moreover act as a social glue that holds them together in facing disturbances (Anckar & Anckar 1995; Giavelli & Rossi 1990; Skelton 2007). Threats from hazards are advantageous in that they force villagers to adopt environmentally sound and traditional sustainable crop management practices, ones that can address the constraints of limited land area. When livelihoods are sustainable, they are equipped with capacities in facing hazards (Ellis 1999; Gaillard et al. 2009). Small islands also may be remote and insular, but they are not absolutely isolated, as they are actively mobile. Mobility is a cornerstone of livelihoods of small island communities that enables them to modify their livelihood strategies so that they are more able to solve the problems created by the complex reality of their environment. Sea water is not understood as an isolating barrier, but as an integral part of their lives (McCall 1994) and their mobile activities have played an essential role as an integrated part of island livelihoods (Chapman et al. 1991; King & Connell 1999).

Support from government agencies is also important in enabling small island communities to develop stronger livelihoods. Government support is needed to strengthen local capacity as accessibility to resources can often be under government control (Chambers 2006; Wisner 2003; Wisner et al. 2004). The strength of the people of small islands combined with in-line policies of the government facilitated the strong achievement of villagers in pursuing sufficient livelihood resources. The formal support from government agencies in this region was related to a degree of respect between villagers and the government, thus providing relief and development programs that were needed by the communities.

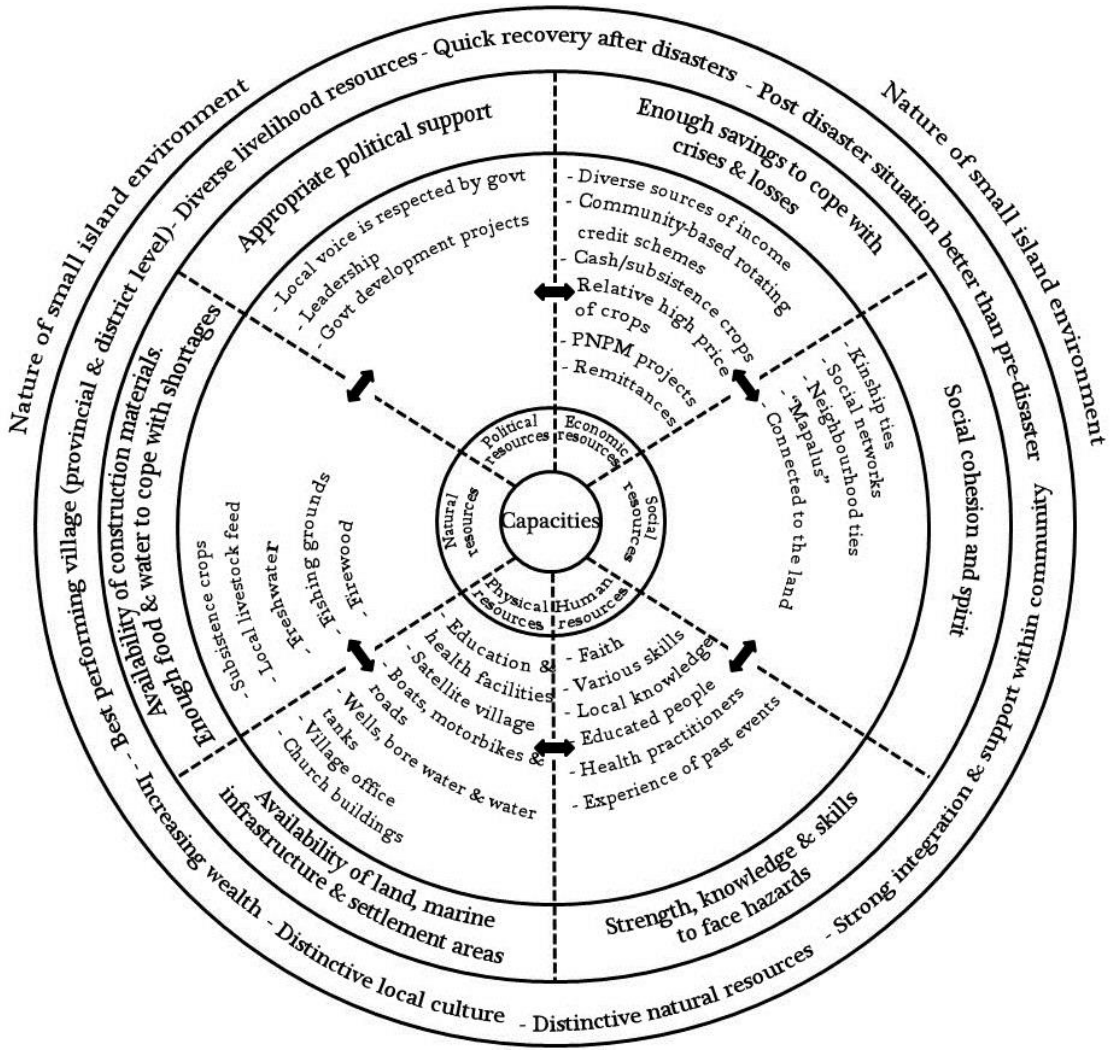


Figure 7.1 Over-arching capacity framework of three research sites. All the resources existed in all study sites and produced a variety of livelihood outcomes

7.4 Conclusion

Though small island communities are generally classified as vulnerable to various hazards, they nevertheless have capacities to face their complex situations. The informants for this research have access to available resources on and outside the island and a strong attachment to place, underlying why they live in such a 'dangerous' place. While living in the shadow of hazards, the communities on these islands have taken initiatives that have resulted in stronger, appropriate agroforestry and fishing strategies and diversified livelihoods. Remoteness, limited natural resources, hazard risks and other constraints of small island environments therefore rather than just being sources of danger, can also be sources of innovation, strengths and the spirit to create diverse livelihoods and thus support quick recovery from a disastrous event. By living with hazards and various constraints of small island environments, the community has

been forced to diversify its livelihoods even outside the boundary of the small island area, thus increasing their capacity by being more innovative and stronger.

In conclusion, this study makes a valuable contribution to disasters literature by showing how the small island communities in eastern Indonesia have adopted and maintained strategies that enable them to prosper in spite of the risks of living on small islands. This study presents rich empirical data, and thoroughly describes both the geographical context and localized responses. Its crucial contribution is that it demonstrates that co-existing with hazards and other small island environment constraints is not only possible but crucial in creating a set of circumstances from which the small island communities derive resilience and socio-economic wellbeing. Given that people living in small islands have various capacities in facing hazards, it is logical that the capacities of local people should remain at the forefront of future DRR and development programs. The fact that small island communities have grappled with various hazards and disasters over generations indicates that capacities to face hazards and solutions are available and possible.

7.5 Recommendations

This thesis identifies the need to hear local voices through an appropriate approach, which enables communities to speak of their capacities, and promote a discourse of strength and resourcefulness, so DRR can better meet local needs and eliminate the image of dependency of small island communities on outsider support. This is an important area requiring further research.

When considering DRR programmes, this research advocates focussing on the capacities of the people rather than on their sole vulnerability. Based on the results of this study, it is crucial to move beyond mere vulnerability assessments to implementing risk reduction actions. However, it is important that risk reduction action is supported by in-depth, critical, applied research as there remains a need for research that challenges and improves the way vulnerability and capacity are assessed in small island communities.

This thesis provides a platform for small island communities' voices in the eastern part of Indonesia regarding capacities in facing various hazards, though there is a distinct need to expand the approaches used in this study to other regions including non-island areas. Similar research approaches could be undertaken in more communities of less wealthy countries particularly where there is a lack of resources in time of disaster. Publishing this type of research in peer reviewed international journals, although of no direct benefit to small island communities themselves, is a way to feed local voices up into the international discourse, in particular through risk reduction programmes held by many governments and non-government organizations in less wealthy country regions.

Focussing on the resources available to the communities which are also embedded in their local culture will provide the communities, as the disaster's first responder, more capacity to face and recover from a disastrous event. Therefore physical mitigation should be de-prioritized in many risk reduction programmes. Such support should appear from the capacities' perspectives of local people, not driven by outsiders. Cultural aspects therefore need to be taken into account in developing more informed responses to managing natural hazards, so the interventions from government and non-government organizations are in line with local needs. Local traditions and beliefs can significantly influence local reactions during and prior to the hazardous events and their responses are expressed as a cultural adaptation. Taking into account the local cultural context will increase the effectiveness of any DRR programme.

Livelihoods of small island communities also cannot be understood in the realm of the physical boundary of the "small island", but must be understood to include the resources that are accessible from the islands. Small island communities cannot be understand only in the context of doomsday scenarios such as pictured in terms of future unpredicted hazards including climate change associated problems, but should be questioned in terms of local livelihood opportunities and responses in the context of experiences in the recent past. It requires therefore more understanding of small island narratives and complex livelihood systems, not least in the face of climate-induced changes that may erode the foundations of local capacities and sustainable small island livelihoods.

Above all, this thesis shows how the small island communities in North Sulawesi Province, eastern Indonesia exhibited incredible capacities in facing various hazards for generations and prosper under the shadow of many hazards.

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