

# **Disaster Management in Resource-Constrained Economies: Lessons for Laos**

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## **Attestation of Authorship**

I hereby declare that this submission is my own work and, that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution or higher learning.

Nilada Pherngmeuang

Signature:



Date: 22/07/2019

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## **Abstract**

Natural disasters cause a huge loss of lives and property, and many nations are making efforts to mitigate the risk of disasters. Laos, a country that increasingly relies on hydropower, has suffered a major dam collapse due to increased rainfall and poor-quality construction by international companies. This event highlighted the lack of preparedness of the Lao government and community to national disasters. This research explores the experience of other countries to draw lessons on disaster prevention and management best practices that Laos could adopt. This research will examine multiple cases and policy documents to review other countries' disaster risk management. The research findings will offer recommendations for Laos to improve the management of natural and man-made disaster risks.

# Table of Contents

<b>Attestation of Authorship</b> .....	<b>ii</b>
<b>Acknowledgements</b> .....	<b>iii</b>
<b>Abstract</b> .....	<b>iv</b>
<b>List of Tables</b> .....	<b>vii</b>
<b>List of Figures</b> .....	<b>viii</b>
<b>Chapter 1: Introduction</b> .....	<b>1</b>
1.1 Aims of study .....	2
1.2 Format of dissertation .....	2
<b>Chapter 2: Literature Review</b> .....	<b>4</b>
2.1 Understanding natural risks .....	4
2.2 Laos, resource constraints and disaster risks .....	7
2.3 The importance of disaster management .....	10
2.4 Disaster management and analysis of Laos .....	13
2.5 Summary and research gap .....	16
<b>Chapter 3: Research Methodology</b> .....	<b>17</b>
3.1 Philosophical assumptions .....	17
3.2 Research paradigm.....	18
3.3 Research design.....	19
3.4 Research methods .....	25
<b>Chapter 4: Findings</b> .....	<b>28</b>
4.1 Nepal earthquake 2015 – history .....	28
4.2 China flood 2016 – history.....	30
4.3 Key themes from China and Nepal .....	32
4.4 Christchurch earthquake 2011 – history .....	34
4.5 Kaikōura earthquake 2016 – history .....	37

4.6 Japan tsunami 2011 – history.....	40
4.7 Kinugawa River flood 2015 – history.....	43
4.8 Key themes from New Zealand and Japan.....	45
4.9 Summary .....	49
<b>Chapter 5: Discussion .....</b>	<b>51</b>
5.1 Reinforcing natural disaster risk education programmes.....	51
5.2 Advanced warning system .....	52
5.3 Enhanced local community resilience capacities and improved self-management .....	53
5.4 Fast emergency announcement and response .....	54
5.5 Strong collaboration and relationships amongst organisations and all related agencies ...	55
5.6 Transport route facilitation to reach disaster-affected areas .....	56
5.7 Prompt response on setting up shelters for evacuees.....	57
5.8 Increased security and quality in infrastructure building, such as housing programmes ..	57
<b>Chapter 6: Conclusion .....</b>	<b>59</b>
6.1 Dissertation summary .....	59
6.2 Research contribution .....	59
6.3 Research limitations.....	60
6.4 Future research area .....	60
<b>Reference.....</b>	<b>61</b>

## List of Tables

Table 1: Data collection criteria & sources .....	20
Table 2a: Disaster management themes from resource-constrained economies .....	32
Table 2b: Disaster management themes of four events .....	45

## List of Figures

Figure 1: Research gap .....	16
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## Chapter 1: Introduction

The hazards that arise from natural disasters are unpredicted and unavoidable; this has resulted in an increase in the number of mortalities in some parts of the world (Alexander, 2006). These natural events demand attentions from climatologists; these are people who have the geophysical knowledge to understand how these incidents affect each location (Smith, 2006). The affects are also directly related to how well societies or communities in the areas that can potentially experience these situations prepare, respond and deal with the problems before and afterward (Smith, 2006). Alexander (2006) states that from the 1950s the death tolls, monetary losses and the relocated numbers arising from disasters has jumped 15- or 16-fold. The developing economies may experience a greater death toll than the richer nations as they endure a larger number of disaster events or a larger number of losses per shock (Kahn, 2005).

Disaster management practice has been a critical area of research in the field of international business. This study observed how resource-constrained economies and developed countries responded during disaster events, which enables business enterprises to be prepared and to make suitable plans for the continuation of operations. Natural or human-made catastrophes have disrupted business activities in many locations across the world; whenever a natural disaster has occurred, it causes losses for all businesses in affected areas. Having proper disaster management practice can minimise the risk of damage from disasters for business operations and can facilitate more rapid recovery and business continuity. In the case of significant disasters many businesses rely on government support and how well the necessary resources (medical, humanitarian, financial), can be mobilised and deployed, affects the length of time business confidence and activities are disrupted. Furthermore, states that have effective disaster management systems, and have demonstrated resilience, are likely to attract both foreign support for short term recovery, and foreign direct investment, for longer term revival.

The developed countries can provide better and faster solutions for disaster events owing to the resources, capabilities and investments they can access. According to a 2017 report from the United Nations International Strategy for Disaster Reduction (UNISDR) organisation, developing countries are most affected by natural disasters with over 606,000 lives lost and 4.1 billion suffering homelessness and reduced standards of living due to the weather-related disaster events between 1995 and 2015 (UNISDR, 2017). In regard to the UNISDR (2017b) report, it also highlighted the challenge for the least developed countries that are fighting climate change and poverty, which has contributed to losses in economic productivity. Laos, a less developed country in South-East Asia, has experienced such problems (Vos, Rodríguez, Below, & Guha-Sapir, 2010). The economic damage caused in Laos by natural disasters has been estimated as 1.2% of

the country's gross domestic product (GDP) in 2009, the number of deaths was 716 persons and there were 7.7 million victims (Vos et al., 2010).

In 2018, the Lao dam collapse greatly impacted the South-Eastern provinces of Laos. For example, in Attapeu (Southern Laos), there were 100 lives lost, and several thousand families left homeless (Hunt, 2018). This recent disaster raised the question of what the best practices should be for Laos as a resource-limited nation to manage risks and impacts associated with such events. Laos is a small landlocked country located in South-East Asia, and it is one of the least developed countries in the world. Part of Laos's economic development strategy is to build several hydro-power stations to increase the country's energy security and export activity. However, several disastrous national flooding events between 1980 and 2018 in Laos suggest that the country faces a high probability of further disastrous events in the next 20 years.

## **1.1 Aims of study**

The increase in the number of disaster incidents has sparked research interest in what the best practices are for Laos to adopt in managing the risks associated with natural disasters and, in the process, enhance foreign investment opportunities for infrastructural development. Disaster risk reduction organisations have gathered substantial information on research trends in the past; however, disaster management practices in resource-constrained countries such as Laos has not been fully explored. The purpose of this research is to draw from the lessons of best practice disaster management in other countries and examine their applicability to Laos.

Research on disaster management in resource-limited countries can contribute to improved emergency-preparedness, more robust planning and construction of infrastructure, pre-planning, and education, all factors they can impact the speed and effectiveness of national responses to hazardous events. This research adopts a broad view of disaster management suggesting that it is not just preparedness and the effectiveness of responses that are critical, but also the quality of responses effects. This means that in some cases corruption, opportunistic behaviour, and poor communication can add to the costs of disaster management and these are also considered in this study.

The selection of the research timeframe and the choice of cases studies in this research are explained in the methodology chapter.

## **1.2 Format of dissertation**

The dissertation consists of six chapters, as follows.

Chapter One describes the reason for and background to this research. The study begins by raising the issue of natural disaster event impacts. The challenges of disaster management due

to the limited resources of the least developed countries are also pointed out. Hence, this chapter includes a consideration of how countries such as Laos might confront their vulnerability to disaster events in the next two decades.

Chapter Two reviews the disaster management strategies, policy, and practices that underpin this research. The chapter explains the disaster management types, characteristics, impacts and the importance of managing disaster risks. In addition, this chapter provides background information on Laos and the factors that lead to limited resources in handling disaster risks. The disaster management cases, and analysis of Laos as developing countries are examined.

Chapter Three outlines the research methodology based on the philosophical assumptions of the study including ontology and epistemology. Then, the research provides the rationale for the research paradigm used to carry out this research. Next, the research method and how data was collected and analysed in this study is outlined. Overall, this chapter demonstrates the approach that is used to conduct the study together with data description and analysis techniques.

Chapter Four presents the findings of the secondary qualitative research. Two main themes and four subthemes emerge from four case studies by applying the thematic analysis process. The two main themes are pre-disaster management practice and post-disaster management practice. The subthemes are prevention, preparedness, response and recovery. These findings have been separated into eight disaster management practices that are drawn from the cases. These eight practices are: (1) Reinforce natural disaster risk education programmes. (2) Advanced warning systems. (3) Enhanced local community resilience capacities and improved self-management. (4) Fast emergency response. (5) Strong collaboration and relationships amongst organisations and all relevant agencies. (6) Transport route facilitation to reach disaster-affected areas. (7) Prompt response in setting up shelters for evacuees. (8) Increased security and quality in infrastructure building, such as housing programmes. This chapter identifies similar practices across the selected cases of recent events from developing countries such as China and Nepal as well as developed countries like New Zealand and Japan which occurred in the period 2011-2016, and these examples may offer possible practical strategies and methods for Laos to implement.

Chapter Five discusses the findings of this research in the context of the literature presented in Chapter Two. The discussion chapter sheds light on the key contributions to the existing literature. By doing so, this chapter highlights the importance of the research study.

Chapter Six summarises the research. In this chapter, concluding remarks are presented, and the limitations of the study are discussed along with future research areas.

## **Chapter 2: Literature Review**

The previous chapter provided the introduction to the research and its purpose. This research focuses on exploring appropriate disaster management for Laos as a resource-constrained economy. Even Laos has a disaster management structure and policies. However, Laos has experienced many challenges such as lack of education in disaster management in rural areas, difficulties in accessing many locations due to poor route infrastructure, and corruption related to development projects in Laos. All these factors have weakened the disaster management system in the country.

This chapter presents the framework of disaster management underpinning this research by reviewing other literature. The study specifies disaster types, features, and their impact as well as the importance of disaster management. The background and characteristics of Laos as a country are presented. Subsequently, the cases of disaster management in Laos, is provided in order to explore the systems in the least developed country. This chapter concludes by outlining the summary of the chapter and identifying the research gap.

### **2.1 Understanding natural risks**

Disasters can be considered as related to the risk process, since the risk process relates to conditions that create hazards or vulnerability to disasters; they can also refer to the flip side of this situation, which are inefficient measures to reduce the likelihood and costs of risks (Ahrens & Rudolph, 2006). Disasters generate many environmental, social, economic and human issues which disrupt societies, resulting in problems amongst the members of the community and affecting their access to these types of resources (Usman, Olorunfemi, Awotayo, Tunde, & Usman, 2013; World Bank, 2016). Disasters reduce resources and, in severe cases, prevent access in instances such as flooding (Ahrens & Rudolph, 2006).

Natural disaster events are caused by the earth's natural processes (Keller & DeVecchio, 2016). Various natural disasters have terrified societies and communities in an immense number of localities, regions, and nations throughout the world. These hazardous events have threatened human settlements and livelihoods from time to time (López-Carresi, Fordham, Wisner, Kelman & Gaillard, 2013). To mitigate or slow down these incidents the territory must develop emergency response plans and programmes to cope with these extreme events, with the proper strategies for specified types of inherent tragedies (UN, 2017). Affected communities need to apply appropriate disaster risk reduction programmes and policies to overcome the severe challenges they face.

#### **2.1.1 Disaster management classification**

According to the UNISDR (2017a), disaster management can be defined as the practical mechanism to assist regions and areas that have the potential to be affected by the risk of disasters

to prevent, prepare for, and minimise harm prior to and following hazard events. López-Carresi et al. (2013) state that the aim of disaster management is to provide the policy, programming and projects to lessen disaster risks. Similarly, Lin Moe and Pathranarakul (2006) note that disaster management develops the plans, structures, and arrangements for governments, voluntary and other related agencies to engage with and respond to emergencies in all-inclusive methods to provide a full array of necessities.

In addition, Masys (2016) defines disaster management as safety guidance in resilience engineering, which looks at both expected, and unexpected situations to make sure that, during the operations, the system is tracking the changes and disruptions. Masys (2016) supports the view that this process requires the skill sets to screen the situation, to acknowledge what happens, to determine what caused it, and to foresee what might be forthcoming. Further, the World Health Organization (WHO) (2007) indicates that disaster management is a primary strategy that has been used by humanitarians to respond to and relieve emergencies and crises over three decades. The purpose of these strategies is to assist in an urgent situation in order to fulfil the fundamental needs of the public (WHO, 2007).

### **2.1.2 Type of disaster risks and their impacts**

Several regions namely the Pacific islands, Asia and South East Asia have encountered different kinds of natural disasters. Natural disasters have increased in number and frequency (Easterling et al., 2000). As noted by K. Than (2005), there were approximately 100 natural disaster events annually between 1980 and 1999; however, this figure increased to more than 300 events per year from 2000. Guha-Sapir, Vos, Below and Ponserre (2012) report the average annual occurrence of natural events from 2002 to 2011 was 394 events.

There are three primary types of disaster risks comprising of (1) natural, (2) human-made, and (3) hybrid disasters (Shaluf, 2007).

(1) Natural disasters are the terrible events that happen suddenly, which cause significant damage to livelihoods and environments, and result in countless deaths (Guha-Sapir, Hargitt, & Hoyois, 2004). According to Guha-Sapir et al. (2004), natural disasters include geological disasters, flood-related disasters, drought-related disasters and windstorms:

- (a) Earthquakes, volcanic eruptions and tidal waves are the various types of geological hazards.
- (b) Floods, landslides, mudflows and avalanches are flood-related disasters.
- (c) Droughts, extreme temperatures, and wildfires are drought-related disasters.
- (d) Typhoons, cyclones, hurricanes, winter storms, tornadoes and tropical storms are the windstorm disaster type.

These events have damaged not only lives and living conditions but also economies and they have created vast amounts of poverty (World Bank, 2016). For instance, Bangladesh coastal locations were devastated by Cyclone Aila, which caused a 49% rise in the unemployment rate and a 22% increase in poverty in 2011 (World Bank, 2016).

Similarly, in 2013 around one million Filipinos suffered when Typhoon Haiyan came to the Philippines. The typhoon demolished more than a million residential properties and cost US\$12.9 billion in economic losses (World Bank, 2016). This shows that any time a natural disaster occurs; the communities that are affected by a disaster not only suffer from huge devastation but also must deal with a rise in poverty. For instance, a disaster incident destroys buildings, infrastructure, and agricultural production that must be rebuilt or recovered following these events, and this brings enormous costs to developing nations (World Bank, 2016).

(2) Human-made disasters are the activities or accidents created by human actions. Guha-Sapir et al. (2004) state these actions include technical system failures, dangerous chemical spills, fires, underground water pollution, transportation collisions, structure collapses and failures, mining accidents, explosions and the incidents created by terrorism. Human-made disasters come from human decisions which can have results in the immediate or more extended term (The International Federation of Red Cross and Red Crescent Societies, 2003). Shaluf (2007) states that sudden human-made disasters are related to building collapses, mining explosions, and structure failures within communities or organisations.

Harding (2007) indicates that human-made disasters have a significant impact on the infrastructure and economy of a nation which can lead to the failure of social networks and communities. An example is the Yangminton Bridge collapse in Harbin, northern China, which occurred after nine months of construction in 2012. This incident killed three people, five people were injured, and this event cost approximately US\$300 million. The factors that caused the bridge collapse arose from the low quality of materials used and poor building engineering (Bradsher, 2012).

Long-term human-made disasters can be determined as arising from conflicts in national or international activities (Shaluf, 2007). WHO (2007) adds that long-term human-made disasters are the events that are happening from time to time and emerge at a slow pace, taking some months or years to expand; these include insect infestations, and disease epidemics. The World Health Report (WHO, 2002) estimated one-fifth of diseases are associated with environmental risks generated from low standard sanitation and hygiene. These factors brought about 1.7 million premature deaths annually.

(3) The events arising from an amalgamation of both natural forces and human-made failures are known as hybrid disasters (Shaluf, 2007). An example is the soil erosion caused by

extensively clearing the jungle, followed subsequently by landslides caused by heavy rain (Shaluf, 2007). The physical characteristics of infrastructure, such as buildings, will remain in place where such disasters can be predicted accurately (Shaluf, 2007).

Even though hybrid disasters cannot be prevented, the damage can be minimised by building constructed items with quality features; Ofori (2002) concludes that when it comes to environmental assessments, this progress should be taken into consideration. By way of illustration, the dam collapse in Southern Laos in 2018 was caused by both natural disasters and human activities, with the rise in the quantity of rain in the monsoon season and the poor quality of dam construction (Hunt, 2018). In support of this analysis, Easterling et al. (2000) claim that this type of incident results from climate change and poor construction building.

Natural disasters such as flooding, flash floods, severe storms, monsoons and landslides frequently happen in Laos (Center for Excellence in Disaster Management and Humanitarian Assistance [CFE-DM], 2017). However, flood disasters were the most frequently occurring disasters in Laos during the period 1990-2014, accounting for 72% of total disaster risks. The mortality rate of flooding is 63%. The economic costs of the destruction caused by these events were estimated at 60.9% of government expenditure (CFE-DM, 2017). The impact of these events directly increased the economic losses and total social and economic costs across the country.

This flooding destroyed agricultural fields, contaminated water and land, devastated infrastructure, killed livestock and damaged the livelihood of farmers in many rural areas, especially in the most deprived locations (Ministry of Planning and Investment, 2009). Regarding the high number of flood-related incidents in Laos, the primary form of flooding disaster management will be the focus of this research. The research will look at the structures and policies of New Zealand and Japan governments in pre- and post-disaster management which may be observed for natural disasters such as earthquakes and flooding, cases that provide insight into the factors which drive an effective disaster management process.

## **2.2 Laos, resource constraints and disaster risks**

This section provides Laos's country background and the experiences of natural and human-made disaster risks, the country's characteristics, conditions and economic progress, and an overview of political systems. This information also gives insights into Laos as one of the countries that faces resource constraints in managing disaster risks.

### **2.2.1 Background of Laos**

Laos is a small land-locked country located in the South-East Asia region (Kanyasan et al., 2018) and has borders with Cambodia, China, Myanmar, Thailand and Vietnam. Laos has an estimated population of 6.8 million people (UN, 2015) and is ranked as one of the least developed

countries in the world (UN, 2015). However, it is eligible to shift from its status as a low income economy to a “lower-middle-income” nation because of its natural resources, which means that Laos has insufficient capabilities to generate additional output and employment (Kanyasan et al., (2018). In addition, Laos still needs to boost and transform its economy to ensure more stable development (UN, 2015).

According to Kanyasan et al. (2018), Laos has experienced a significant number of both natural and human-made disaster events and these disasters have impacted the people in several locations. From 1990 to 2012, both natural and human-made disasters have taken the lives of 380 people and cost approximately US\$849 million in economic damage, as reported by the Lao PDR National Assessment (Kanyasan et al., 2018). One of the significant factors contributing to Laos’s ineffectiveness in dealing with natural disasters is the fact that Laos lacks the infrastructure and human resources to effectively use its natural resources (Uitto, 2011).

In 2017, Laos ranked 137<sup>th</sup> of 189 countries that need to improve its human resources according to the Human Development Index (United Nations Development Programme, 2017). Within 139 districts in Laos, a total of 25 Lao districts have been titled as “poor”, 22 districts as “very poor”, and 47 districts with a population of around 1.2 million people, over one-sixth of the residents, are the poorest (Howe & Sims, 2011). This evidence shows that the public infrastructure development in Laos is still inadequate, vulnerability to natural disasters is still high, and limited management capability exists in several areas (Howe & Sims, 2011). These circumstances, in turn, have made Lao appear resource constrained.

### **2.2.2 Economic development of Laos**

To improve infrastructure development, from the middle of the 1980s, Laos has attempted to attract foreign investment to fund several development projects (M. Than & Tan, 1997). For example, hydro projects have attracted interest from many international investors. These projects have contributed significantly to economic development (Smits Bush, 2010), and many dam projects have been undertaken in recent years. The Lao government welcomes all kinds of investment in the country including aid from other governments and partnerships with the private sector (Investment Promotion Department, 2019). Such investment helps to improve infrastructure as well as to facilitate economic activities (Investment Promotion Department, 2019; Ministry of Planning and Investment, 2016), while the country still lacks human and financial resources.

An example of such cooperation between governments and private companies is apparent in one current infrastructure development project, the Laos-China railway, which will start from the Mohan-Boten border gate in the northern part of Laos and run to the capital,



Vientiane, and will be constructed using Chinese technology and equipment (Pongkhao, 2017; Radio Free Asia, 2017). Similar infrastructure projects include: the improvement of traffic capacity across the country, in cooperation with the Thai and Chinese governments and a public-private partnership group supported by World Bank Group (Viraphanth & Kurihara, 2019; Noeske & Gray, 2014; Open Development Laos, 2018); the protection of the environment along the Mekong River; and the development of the water supply system and urbanisation (Viraphanth & Kurihara, 2019).

Constructing hydropower dams are notable projects in Laos (Oraboune, 2008). The geography of the country offers the potential to produce electricity from hydropower which could attract more investors, become a regional source of electricity supply, and generate more income for the country (Oraboune, 2008). Currently, the hydropower projects have majority investments from Thai and Korean companies partnered with the Lao government (Oraboune, 2008; “South Korean Company Confers”, 2016). In the country, 89.6% of the population can now gain access to electricity (Ministry of Planning and Investment, 2016). Also, these development projects create job opportunities and improve local citizens’ livelihoods (Ministry of Planning and Investment, 2016; Serrato, 2018). The Lao poverty rate was 27% in 2007 and reduced to 23.2% in the 2012 fiscal year and is expected to decrease further (Ministry of Planning and Investment, 2016; Serrato, 2018).

### **2.2.3 Lao political system**

The Lao government, controlled by the Lao People’s Revolutionary Party (LPRP) since 1975, operates a communist country (Stuart-Fox, 2006). The top-most decisions of the state are assigned by the LPRP, which has led the government in a secure and stable position for years (Soukamneuth, 2006), despite some policy issues. For example, the main problem is that the open economy of foreign investment and administration policy in Lao is insubstantial compared to China and ASEAN, or with the United States, the European Union, Japan, and South Korea (CFE-DM, 2017). Another problem is limited transport; as Laos is a landlocked nation, this results in inconvenient infrastructure. In the process of development and implementation of laws and investment policies, corruption and the risk of expropriation is still pervasive in Laos (CFE-DM, 2017).

With a single party government, there is a strong possibility that decisions are made unilaterally. These unilateral decisions can limit the scope of benefits of these projects and may even have a detrimental impact on people not involved in the decision making. For example, the recent Lao dam collapse caused by a hydroelectric project under construction, created flash floods, which significantly damaged property, livestock, houses, and the environment, and killed many people (“UN Ready to Assist Rescue”, 2018). South Korean

companies were building this project with Thai and Lao partners (Kurtenbach & Lee, 2018), a project company solely approved by the government.

With projects being constructed in Laos, projects can be approved at almost any given time through a good relationship with government officials. Regardless of how complex a project may be, there are incentives for government officials to approve foreign ventures in LAO P.D.R. as long as there is some kind of “indirect” involvement with government. In other words, any project has a strong possibility of being approved regardless of the impact on the environment or the safety of people living around what is being built. “Corruption” is an important influence on the likelihood of disasters, their impact and the effectiveness of hazard mitigation.

Understanding how projects are actually being planned and approved gives insights into how disaster management is operated in the country. The best interest of the environment surrounding the project may be disregarded due to the fact that approval of foreign ventures may be beneficial to government officials both directly, in the form of bribes and indirectly in the completion of significant or prestigious projects. The likelihood of potentially hazardous projects may be reduced when responsibilities are designated to specific related government agencies such as “Ministry of Energy and Mines of Laos.” For example, if a foreign venture desires to operate their “Hydro Power” project in Laos, it is mandatory that risk management is taken care of by project managers with experience in hazard management within that sector.

The success of these projects requires knowledge of and careful planning to deal with effects on the river ecosystem, soil conditions, water quality, biodiversity as well as the relocation of the local population (Siciliano, Urban, Kim, & Lonn, 2015). This knowledge will affect the cost-benefit analysis of these projects. Nevertheless, the decisions for these large infrastructure projects are strongly affected by many complex and interrelated factors such as the country’s unique history and political system. Human-made disasters can be avoided through a well-planned project and good quality building of infrastructure under disaster conditions (Altay & Green, 2006). Altay and Green (2006) also claim that good infrastructure and buildings lead to better disaster management practice.

### **2.3 The importance of disaster management**

In this section, the discussion focuses on the factors that cause disaster risks as well as how the result of these events impact on developed and least-developed countries. In addition, the literature provides the reasons that make it necessary to seriously consider the importance of disaster management in all nations.

### **2.3.1 Causes of disaster risks**

Recently, the occurrence of natural disasters has dramatically increased, which may be due to climate change and pollution from human activities. Van Aalst (2006) points out that the shift in global climate results from the rise in the anthropogenic emission of sulphur dioxide; human activities have significantly impacted the status of the environment in the last two centuries. For example, the release of the greenhouse gas carbon dioxide (CO<sub>2</sub>) has been the result of heavy use of coal and oil since the industrial revolution. Another example would be the discharge of wastewater from farmland into the rivers. However, one of the main reasons for extreme natural disaster events derives from the alternation of weather conditions as well as climate variability (Van Aalst, 2006). Van Aalst (2006) also suggests that the change in these processes has a vastly negative impact on agricultural products, social vulnerabilities, infrastructure features, and ecological systems.

### **2.3.2 The effects of disaster risks in least developed and developed countries**

In the occurrence of either natural or human-made disasters, developing countries may be more at risk compared to the developed countries because of a lack of disaster management capabilities and of resources for recovery (Nakagawa & Shaw, 2004). Van Aalst (2006) emphasises that a lack of expert knowledge, advances in technology, and capacity in institutional and country capital can all be problematic for managing disasters. In addition, these developing countries require infrastructure development to strengthen economic growth (Démurger, 2001). For the improvement of the economy, these nations demand large projects that can contribute to expansion in several sectors. As shown above, Laos has been working hard on promoting hydropower dam projects for economic improvement (Oraboune, 2008). The implementation of development projects may contribute to human-made disasters (Nakagawa & Shaw, 2004; Twigg & Bhatt, 1999).

Physical, socio-political, economic and environmental factors affect the degree to which disasters will impact a society (Ahrens & Rudolph, 2006). With a physically damaging hazard, aspects such as a strong economy can help rebuild the affected areas quicker and more effectively and provide better financial access to resources for those areas than would be the case in less developed countries, and environmental factors are going to influence how much damage the disaster creates (Ahrens & Rudolph, 2006; Keller & DeVecchio, 2016). Socio-political factors refer to the policies in place during a disaster and how they are implemented by society (Ahrens & Rudolph, 2006). All these various factors can save lives and reduce disaster impact.

The resolving ability of the community is the ability to use existing resources to offset the effects of the disaster, therefore helping people cope (Norris, Stevens, Pfefferbaum, Wyche, & Pfefferbaum, 2008; Wisner, Blaikie, Cannon, & Davis, 2004). According to the research evidence, it is those in the least-developed countries who lack the physical, socio-political, economic and environmental factors. This means that while only 11% of people exposed to hazards are living in these countries of low development, these countries account for 53% of deaths from disasters (Ahrens & Rudolph, 2006). This evidence shows poor ability to manage disaster effects.

### **2.3.3 Disaster management influence**

As is well known, disasters have caused countless injuries to humans, wrecked property and buildings, and reduced the availability of goods and services, as well as requiring substantial capital for recovery (World Bank, 2016). Disaster management is critical as a tool to mitigate the adverse impacts (Brooks, Curnin, Bearman, Owen & Rainbird, 2016; Nakagawa & Shaw, 2004;). Disaster management helps to prevent and prepare for the risks before a disaster happens, and recover afterwards (Nakagawa, & Shaw, 2004). These strategies can assist the affected location in saving more lives and decreasing the detrimental impacts. Notwithstanding, the success of these strategies and policies may be dependent on the effectiveness and cooperation of all related stakeholders (UN, 2017; World Bank, 2016).

Ahrens and Rudolph (2006) claim that the performance of disaster management and risk reduction can be achieved successfully only in the context of an effective governance system. In the approval of development projects, the government needs to make transparent decisions including the possible solutions to disaster management that policymakers may consider (Ahrens & Rudolph, 2006), especially those that will impact the local administrative power and the community. This sort of decentralisation can be explained when political decision makers support and authorise the local community. This method can help to target the goals in disaster management efficiently. There is considerable research on disaster management occurring at the community level, those most affected by disasters (Joshi & Nishimura, 2016; Nakagawa & Shaw, 2004; Onuma, Shin & Managi, 2017; Twigg & Bhatt, 1999). In order to manage catastrophes practically, disaster management should be the result of cooperation between communities and the government (Nakagawa & Shaw, 2004; Twigg & Bhatt, 1999).

### **2.3.4 Disaster management approaches**

There are several levels of disaster community resilience (Dale, Ling, & Newman, 2010), including pre-disaster mitigation and post-disaster recovery tools. Pre-disaster mitigation tools

consist of risk assessment, prevention and preparedness, while the post-disaster recovery tools are search and rescue, rehabilitation, and reconstruction (Shaw & Okazaki, 2003). Pre-disaster programmes allow the community to facilitate social learning as well as social support (Cretney, 2016). Drabek (2012) also notes that the social determination factor plays an essential role in the pre-disaster structure and has smoothed the continuous processes of adaptive capacity skills for local people in the subsequent disaster event. Post-disaster management is crucial for the economy and for belonging in communities. Restructuring a society efficiently and quickly enables economic activity to resume sooner, and, for the local community, post-disaster management through timely reconstruction and rehabilitation creates a sense of belonging for members of the community through their satisfaction that, as a stakeholder, their well-being is of importance in the community (Orchiston, 2013).

For investors in development projects, it is important to include a disaster management plan as well as the risk assessment in the project proposals (Nakagawa & Shaw, 2004). This will help the community to understand the effects of a project on themselves, as well as the environment. According to the Asian Development Bank (2017), disaster risk assessment can determine the types of natural hazard events along with how intensive the situation might be and the possible incidents that might arise. As result, the evaluation of risk can provide knowledge to local communities, organisations, and governments to know how development projects are relevant to disaster resilience (Asian Development Bank, 2017).

Zsidisin, Panelli and Upton (2000) claim that risk assessments also prioritise the need for disaster management and the design of the appropriate plans and practices to cope with disasters. Jaafari (2001) adds that this basically means that parties must balance the uncertainty of the conditions with the variables of the project in order to meet the budget, as the uncertainty means decision making will need to become more prudent in order to reduce the uncertainty and planning will need to be more proactive to account for issues that may occur. If this can occur optimally, then the strategies are better able to meet the goals of the project stakeholders, and act in a way to exceed community expectations through a better ability to reduce the risks during the project development.

## **2.4 Disaster management and analysis of Laos**

As a result of the acceleration in natural disasters from 1980 where there were 100 per year to over a 300 a year post-2000 (K. Than, 2005), countries are gaining more significant experience to prepare and recover from the disasters. However, the limited resource in some countries such as Laos is strongly dependent on financial support and more efficient emergency response to mitigate disaster risks, so Laos does not run through its limited resources for

reconstruction purposes. Laos's disaster management case will be analysed to view how developing countries are managing disaster risks.

### **2.4.1 The case of Laos**

In the case of the recent incident in Laos, the Tropical Storm Son-Tinh (Vietnam) had affected many parts in the south of Laos through heavy monsoon rains in July 2018, which resulted in the significant rise in water levels (Henderson, 2018). The Xe Nam Noy hydropower dam project was built by four main partners: SK Engineering & Construction, Korea Western Power, Thailand's Ratchaburi Electricity Generating Holding PCL and Lao Holding State Enterprise, as reported by Lindsay (2018), and the project cost over US\$1 billion to build and was intended to generate around 410 MW annually. The dam was set to be completely functional in 2019, with the plan being to export more than 90% of the electricity to Thailand (Berlinger, Westcott, & Sidhu, 2018; Lindsay, 2018).

Unfortunately, the dam broke during the construction period. Henderson (2018) states the onset of heavy rainfall was the primary factor in causing the dam collapse. Interestingly, another factor that resulted in the failure of the dam was the poor quality of construction features (Olarn, Sidhu & Westcott, 2018). This dam collapse released 5 billion cubic metres of water downstream, instantaneously (Hunt, 2018). The flooding and mud buried homes and land and covered the roads and bridges in the region. This incident ruined 13 villages, over 16,000 people were affected, and 6,000 locals were homeless (Henderson, 2018; Hunt, 2018).

The dam collapse situation has raised many questions about the Lao government internationally, mainly the government's ability to provide protection for the communities and the companies involved in foreign investment (Promchertchoo, 2018). The government has demonstrated that the financial motivation provided by large company investments are a priority over the disaster risk these investments possess (Promchertchoo, 2018).

The Lao government established the National Disaster Management Committee (NDMC) after 1975 (CFE-DM, 2017). The policy of disaster management in Laos mainly works toward emergency relief, which means responding to the basic needs such as food, water and shelter (CFE-DM, 2017). Laos struggles with prevention methods to reduce the impact of the disaster before it takes place; rather, they focus attention on providing relief after the event. This means that much of the impact of the disaster has already taken place before the government steps in with a plan to start reducing damage.

The role of NDMC is to ensure that the coordination in every related department is efficiently managed in the cycle of these hazard events (Henderson, 2018). This form of management is involved with preparedness, prevention, mitigation, response as well as

recovery. Public awareness to mitigate disaster risks such as capacity building and training in disaster management for local communities is continuously promoted by the Lao government. A decade ago, Laos focused on post-disaster relief from a reactive approach and since then has focused intensively on the proactive approach. For example, the government provided disaster risk reduction training to Luang Prabang province (Northern Laos) Disaster Prevention and Control Communities after flooding. This approach aimed to increase community resilience. This strategy highlighted pre-disaster preparedness and early hazard prevention (Henderson, 2018).

In addition, this strategy has shifted the vital issue of sustainable development and disaster risk reduction (DRR). The NDMC has addressed disaster risks, provided better pre-disaster preparedness with community foundations in disaster risk management, and strengthened the coordination between communities and government at different levels (CFE-DM, 2017). However, according to INFORM, a global indicator to present risk assessment for disasters and humanitarian crises for 191 countries (INFORM, 2019), in hazard and exposure risk Laos scored only 3.3 out of 10, in vulnerability scored 3.8 out of 10, and in lack of coping capacity scored 6.1 out of 10 (INFORM, 2019). Further, the flooding rate is the highest for physical exposure (INFORM, 2019). This shows that Laos needs to enhance and improve the planning and policies for managing disaster risks, in order to help communities better cope with future disasters.

As a result, resource constraints can be seen in different areas in Laos. There is a lack of local knowledge at district and village levels where government puts emphasis on strengthening capacity building (Henderson, 2018). Faye, McArthur, Sachs and Snow (2004) also suggest the majority of infrastructure in remote areas of Laos is limited and is poorly constructed outside the capital, Vientiane. It is hard to access roads in the annual rainy season in rural areas. As a result, the disaster emergency response to the dam collapse in Southern Laos can be seen as an inadequate, considering the plans and policies for disaster management and the resource constraints as the significant factors. In the case of the dam collapse, the local community also had insufficient knowledge in flood preparedness and prevention (Lindsay, 2018).

Another issue is a technical matter: there was no warning system before the occurrence of the disaster (Hunt, 2018). After the disaster happened, it was hard to access the affected location; this created significant issues for the rescue process. The management after the disaster was not organised enough, for example, there was no proper team in charge of donations, so there was no transparency around whether the capital was used for aiding the victims. For a few days after the event, there was no one responding to what was happening in the early stages (Ives, 2018). Consequently, the government should prioritise the project proposal to ensure foreign direct investment projects can fully cover the extremes in future events. Ives (2018) also reported that

the local people in the development project area have not received enough benefits from the disaster relief efforts.

## 2.5 Summary and research gap

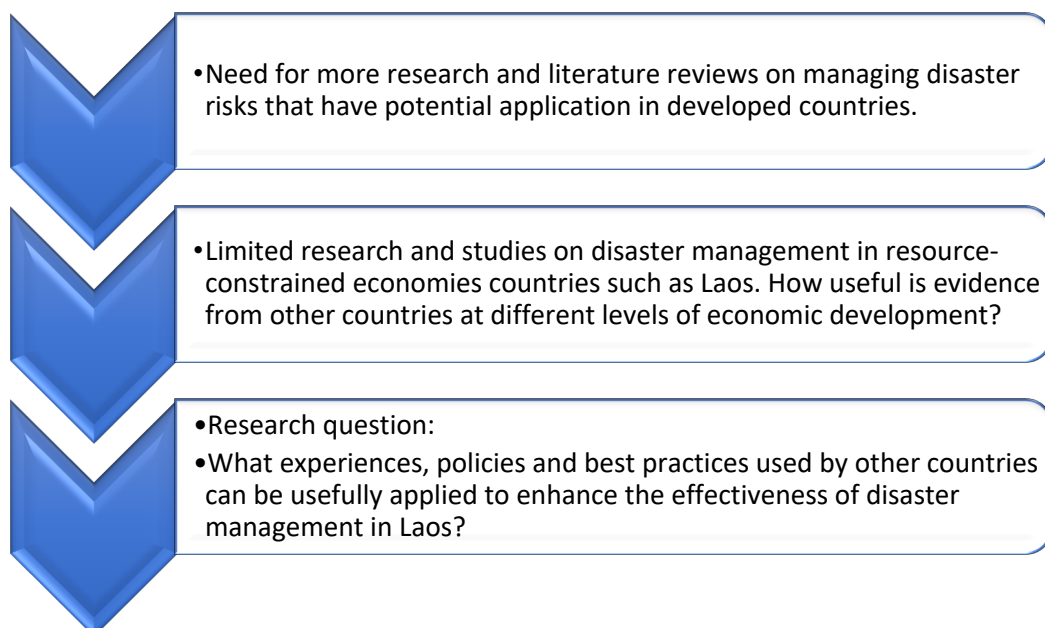
It is interesting to note that while there is a large amount of literature on disaster management and the mitigation of natural disasters in advanced economies, there is limited research on resource constraints in the least-developed countries, especially in terms of a more practical disaster management programme for these countries. Furthermore, the recent Laos dam collapse made clear the need for improvements in disaster management. Although there is a national disaster management plan, Laos has faced many difficulties during emergency responses. There is a research gap for effective disaster management in Laos as resources are constrained in the country and this affects disaster management practices. These issues have sparked an interest in a research question:

“What experiences, policies and best practices used by other countries can be usefully applied to enhance the effectiveness of disaster management in Laos?”

The answer to this research question will enable Laos to figure out what strategies and practices are available for Laos to adopt in managing risk associated with natural or human-made disasters. The purpose of this research is to draw from the lessons of effective disaster management practice in other countries such as Japan and New Zealand and examine their applicability to Laos.

The discussion in the literature review concludes with Figure 1, below:

Figure 1: Research gap





## **Chapter 3: Research Methodology**

In the previous chapter, the literature review outlined the definition, types and impacts of disaster management to provide a deeper understanding of disaster risks. The characteristics of limited resource countries such as Laos were presented in the above context, to give more details about the country's features and economy. Then, the significance of disaster management was discussed followed by a discussion of disaster management in Laos. An analysis of disaster management in Laos guided the research to find out the perspectives, and strategies and how a resource-constrained country faced challenges in the disaster management plans and programmes. Notably, the study highlights a gap in Laos's disaster management, as a resource-constrained economy, and the need to explore best practices, policies and experiences employed by other countries to enhance the effectiveness of disaster management in Laos. This chapter outlines the research methodology and methods that this study will apply to conduct the data and information collection and analysis in order to answer the research question stated at the end of the previous chapter.

The following sections outline the methodology and method of a secondary data qualitative review case study approach.

### **3.1 Philosophical assumptions**

At the beginning of the research process, the perspectives of ontology and epistemology are vital as they are the core layers of theories for research methods and methodology preferences (Crotty, 1998). As suggested by Grey (2018), ontology can be explained through understanding the nature of "what is". The realist ontology is used in this research as the research is based on discovering a reality within a certain realm of possibilities (Mertens, 2014). In a realist approach, reality can be derived from real-world disaster management practices and experiences (Chilisa & Kawulich, 2012). This research explores disaster management structures and programmes from New Zealand and Japan by observing how these effective policies and practices were applied in previous disaster events as well as exploring disaster management practice in developing countries such as China and Nepal. This realist ontology would allow Laos to explore various disaster management strategies and examine similar incidents to determine the practical approach that would benefit the Lao government.

Grey (2018) explains that epistemology describes attempts to perceive what it means to understand or determine how we get to know something. In this research, the disaster management

strategies from developed countries can be learnt in order to improve the system in Laos. By this procedure, Laos can understand existing disaster approaches, and how other governments respond to emergencies, enabling the Lao public sector to learn how to adapt and upgrade its own disaster management policy and plan.

### **3.2 Research paradigm**

Post-positivism is a paradigm wherein researchers are critical of reality, understand that their research is not free from error and therefore understand that the derived reality cannot be free from error. Thus, the post-positivist approach means we cannot be certain of our reality; hence theories can be altered (Trochim, 2006). In doing this, researchers bring a human dimension into the study (Ritchie, Lewis, Nicholls & Ormston, 2013). Post-positivist researchers aim to understand the different aspects of disaster management experiences in real situations (Mertens, 2014). The purpose of this research is to discover the events that determine how disaster management practice operates by observing the behaviours and solutions that can be predicted. Post-positivists believe that we can approach a perfect reality but cannot achieve it as a result of our research not being free from error (Chilisa & Kawulich, 2012).

It is essential, for this research to be successful, to learn from other countries' disaster management experiences to improve all aspect of disaster management in Laos. This research aims to mitigate the impacts of disasters by focusing on all aspects of previous disaster events which can be learned about (Thanh & Thanh, 2015). Therefore, by understanding the experiences countries have had under different disaster management strategies, this study can better understand how to manage disasters in Laos more efficiently.

Usually, a post-positivist will predominantly use qualitative methods of research; in this study this will be done to better answer how Laos can manage disaster risks more effectively. However, a further understanding of disaster management practices must be developed (Silverman, 2000). To understand the different effects of various management techniques, these techniques must be understood in terms of how they influenced the country's experience during a disaster. Secondary qualitative methods must be used to recognise the underlying reasons for particular management techniques, which would affect Laos's human experience during disaster management, in order to find the most effective techniques to create possible programmes for Laos's disaster management (Thanh & Thanh, 2015).

This research aims to suggest possible disaster management strategies and practices for Laos based on reviews of research articles from other researchers and some of their observations and perspectives around the effectiveness of different disaster management plans employed in other countries.

### **3.3 Research design**

Secondary data review is used in this dissertation. Secondary data analysis requires the use of qualitative data which has already been published in other research studies (Goodwin, 2012). Heaton (2008) clarifies that secondary data covers a broad range of sources as it can be taken from journal articles, books, government reports, UN reports, World Bank reports, official news, government websites and all related disaster management documents. Secondary research has two purposes; the first is to examine a research question and the second is to verify research (Heaton, 2008). Secondary data analysis is the most suitable type for this research topic because it looks at how other countries have effectively used strategies to manage disaster risks. Therefore, the focus is on information about policies that have already been practised in different disaster situations, and how the policies impacted upon the dangers of the disaster.

Secondary data analysis is also the most appropriate research method as the objective of the study is to look at the management strategies for other countries with similar disaster experiences to Laos which are successful in managing disaster risks. The way to do this is to look at research done on how those other countries have balanced infrastructure development and disaster risk, and the insight researchers have provided on the benefits and risks of their approaches.

Through the secondary data research method there is also the ability to compare the data from various countries on their strategies and management efforts to find which ones are most eligible and practical for use in Laos (Goodwin, 2012). Secondary data can help to answer the research question because the research already completed by other researchers provides insight into how these management strategies have succeeded and where their weaknesses are. This creates an impression of how these disaster management strategies will benefit Laos.

#### **3.3.1 Data collection**

This research aims to understand and review how the government in developing countries like China and Nepal managed disaster risk in two events, which are the China flood in 2016 and Nepal earthquake in 2015. Then, developed countries New Zealand and Japan and how their governments responded to and managed disaster risks in four events are examined. These events were the Christchurch earthquake 2011, the Kaikōura earthquake 2016, the Japan tsunami 2011 and the Kinugawa River flood 2015.

The research information on these six events was obtained via the AUT library database from available and reliable international journal articles, reports, documents, books and news which are all related to these specific cases. In addition, other sources of data originating from government websites or reports such as Beehive New Zealand and Ministry of Foreign Affairs of Japan. The full list of sources of information used in this research study is presented in Table 1, below.

**Table 1: Data collection criteria & sources**

<b>Source of Information</b>	<b>Type of source</b>	<b>No. sources</b>	<b>Date</b>	<b>Case</b>
2015 Nepal Earthquake Event Recap Report (AON Benfield)	Report	1	September 2015	Nepal earthquake 2015 case
Barriers to evidence-based disaster management in Nepal: a qualitative study (ScienceDirect)	Journal article	1	April 2016	Nepal earthquake 2015 case
Beehive New Zealand government official	Website	1	25 January, 2017	New Zealand case
Bulletin of Earthquake Engineering (SpringerLink)	Journal article	1	February 2013	Christchurch earthquake 2011
Bulletin of the New Zealand Society for Earthquake Engineering (University of Canterbury); (University of Canterbury); (University of Canterbury); (University of Canterbury);	Journal article	6	June 2017 June 2017 June 2017 June 2017	Christchurch Earthquake 2010-2011 and Kaikoura Earthquake 2016

<b>Source of Information</b>	<b>Type of source</b>	<b>No. sources</b>	<b>Date</b>	<b>Case</b>
(ResearchGate);  (UC Berkeley);			June 2017  01 June, 2017	
China floods: More than 150 killed and hundreds of thousands evacuated (BBC news)	News	1	23 July, 2016	China flooding 2018 case
Civil Defense New Zealand government	Review	1	29 June, 2012	New Zealand case
Council for Social Infrastructure Development (Ministry of Land, Infrastructure, Transport and Tourism)	Report	1	December 2015	New Zealand case
Counting the costs of floods in China (Asia & Pacific Policy Society)	News	1	21 July, 2016	China flooding 2016
Department of the Prime Minister and Cabinet	Report	1	November 2016	New Zealand case
Department of the Prime Minister and Cabinet & Ministry of Civil Defense & Emergency Management	Report	1	1 December, 2015	New Zealand case
Disaster Prevention and Management (Emerald Insight)	Journal article	1	February 2016	New Zealand case
Flooding in China (NASA)	Website	1	28 July, 2016	China flooding 2018

<b>Source of Information</b>	<b>Type of source</b>	<b>No. sources</b>	<b>Date</b>	<b>Case</b>
Institute of Geological and Nuclear Science	Report	1	April 2012	Japan Tsunami 2011
International Journal of Disaster Risk Reduction (ScienceDirect) (ScienceDirect) (ScienceDirect)	Journal article	3	December 2015 December 2015 June 2018	Christchurch Earthquake 2010 & 2011 Kaikoura Earthquake 2016
International Journal of Product Management (ScienceDirect)	Journal article	1	July 2017	Christchurch Earthquake 2011
Iranian Journal of Public Health	Review	1	June 2012	Japan Tsunami 2011
Japan evacuates 100,000 in floods sparked by rare torrential rains (Stuff New Zealand)	News	1	10 September, 2015	Kinugawa River Flood 2015
Japanese city of Joso flooded after Kinugawa river burst its banks (News Corp Australian Networks)	News	1	10 September, 2015	Kinugawa River Flood 2015
Joso disaster prompts ministry rethink of flood control, prediction policies (The Japan Times)	News	1	21 December, 2015	Kinugawa River Flood 2015

<b>Source of Information</b>	<b>Type of source</b>	<b>No. sources</b>	<b>Date</b>	<b>Case</b>
Journal of Geoscience and Environment Protection (Scientific Research Publishing)	Journal article	1	January 2017	Kinugawa River Flood 2015
Journal of Hydrology (ScienceDirect)	Journal article	1	October 2018	Kinugawa River Flood 2015
Major faults in New Zealand (GNS Science)	Website	1	n.d.	Christchurch Earthquake 2011
Mind the risk: a global ranking of cities under threat from natural disasters	Book	1	19 September, 2013	Japan Tsunami 2011
Ministry of Civil Defense & Emergency Management	Report	1	14 November, 2016	Kaikoura Earthquake 2016
Ministry of Foreign Affairs of Japan	Website	1	2014	Japan Tsunami 2011
Ministry of Home Affairs (Government of Nepal)	Report	1	2011	Japan Tsunami 2011
Natural Hazards Review (ASCE library)	Review	1	May 2017	Christchurch Earthquake 2010-2011
New Zealand History Government	Website	1	22 February, 2011	Christchurch Earthquake 2010

<b>Source of Information</b>	<b>Type of source</b>	<b>No. sources</b>	<b>Date</b>	<b>Case</b>
New Zealand Journal of Geology and Geophysics (Taylor & Francis Group)	Journal article	1	15 April, 2018	Kaikoura Earthquake 2016
New Zealand Journal of Social Sciences (Auckland University of Technology)	Journal article	1	2015	Christchurch Earthquake 2011
No more throw-away people: the co-production imperative	Book	1	2000	Christchurch Earthquake 2011
Psychiatry Research (ScienceDirect)	Journal article	1	January, 2019	Kinugawa River Flood 2015
Public Administration	Journal article	1	June 2016	Japan Tsunami 2011
The 2011 Japan Earthquake and Tsunami: Reconstruction and Restoration	Book	1	12 July, 2017	Japan Tsunami 2011
The 2015 Nepal earthquake disaster: lessons learned one year on (ScienceDirect)	Journal article	1	April 2017	Nepal Earthquake 2015
The Chinese government's incompetence causes flooding deaths in Hebei, villagers say (Quartz)	News	1	28 July, 2016	China Flooding 2016
The United Nations Office for the Coordination of Humanitarian Affairs (OCHA)	Report	1	1 April, 2011	Japan Tsunami 2011



<b>Source of Information</b>	<b>Type of source</b>	<b>No. sources</b>	<b>Date</b>	<b>Case</b>
Vulnerability Profile of Nepal (United Nations Committee for Development Policy)	Report	1	16 March, 2018	Nepal Earthquake 2015
World Bank Summary Report	Report	1	31 December, 2017	Kinugawa River Flood 2015
World Report (ScienceDirect)	Report	1	10 March, 2012	Japan Tsunami 2011

### **3.4 Research methods**

In this research, case study is the method used to address the research question. How the disaster management cases were selected for this research will be examined in this section, and how the data was analysed will also be discussed.

#### **3.4.1 Case study method**

A case study is an investigation of an event focused on finding out about developmental factors in relation to the circumstances of the case (Yin, 2014). Yin (2014) also claims that when a phenomenon is a broad research field, it is usually ideal to launch a case study with the goal of narrowing down that field into a smaller field of examples. The case study has five key components to its framework: the questions about the phenomenon; its propositions or proposals relating to the phenomenon; its measure of analysis; the reasoning for linking the data to the propositions; and, finally, the criteria for how the findings will be interpreted (Yin, 2014).

In case studies, this could be done by using multiple sources of data (Yin, 2014). However, an issue with case studies is their ability to create meaning about the phenomenon rather than for a local understanding of the phenomenon (Yin, 2014). For example, in solving for disaster management in Laos we must find the themes that take place in successful disaster management programmes. We can then link these themes to the environment in Laos. Since different countries are in different environments, we have to adapt their methods to fit the environment in Laos, but it is important that while we adapt them we keep the same theme to ensure that the underlying aspects of the strategy stay the same to ensure success in Laos's environment (Yin, 2014).

Disaster management in Laos is a broad topic as it investigates a huge array of information on strategies to manage various types of disaster. Through this research, there will be a disaster management case for Laos produced by linking the data analysed to the proposals. This research method applies to disaster management in Laos as this research aims to reduce a vast research field of various countries' disaster management strategies into a smaller field of examples that Laos could use in its disaster framework.

### **3.4.2 Case selections**

It is not only experience that provides the readiness conditions where countries have enough resources to contribute to disaster risk management but also the economic situation. This could offer lessons for Laos in the effective management of disaster risks. Developed countries with more resources as well as technology may be better at dealing with disasters than developing countries which face resource constraints even without disasters happening. The figures for GDP per capita from World Bank data may be one of the primary indicators to demonstrate the development of the countries (World Bank, 2019, January 13). Japan and New Zealand have much higher GDP per capita than developing countries, such as China and Nepal, for example, which may have a similar disaster incidence to Laos. In combination with the disaster management experience, Japan and New Zealand may provide more effective disaster management lessons for Laos than China and Nepal, which suffers from human and economic resource limitations (Mochizuki et al., 2015; Nguyen, Shaw & Prabhakar, 2012).

In disasters, there is a broad range of stakeholders' expectations in play and successful recovery from disasters in communities primarily revolves around meeting the various stakeholders' expectations (Morehouse, 2011). To create an efficient structure, different stakeholders' expectations must be managed most efficiently. The Christchurch earthquake in 2011 used alliances in organisations to help better meet these expectations. The article by Wilkinson, Chang-Richards, Sapeciay, and Costello (2016) explains that this works through aligning organisations' interests rather than having them compete for business. Having these techniques work in Laos requires a strong understanding of the reasons for making the alignment of interests so they can be altered to work in the different dynamics of Laos.

This research selects Christchurch earthquake 2011 and Kaikōura earthquake 2016 as examples of disaster events from New Zealand, and Japan Tsunami 2011 and Japan's Kinugawa River flood in 2015 as examples from Japan disaster management and are compared with the China flood 2016 and Nepal earthquake 2015 which offer developing country examples. The reasons for choosing these cases are: (1) these cases happened within a similar timeframe, that is, the period 2011-2016; (2) these events can provide comparisons of pre-disaster and post-disaster management practices in relation to how developing and developed countries manage disaster risks; and (3) since these six examples from developed and developing countries are important,

their disaster management would offer effective approaches to managing the disasters. The researcher believes that disaster management practices can contribute to answering the research question, so that Lao may draw lessons from these countries to develop disaster management in Laos.

### **3.4.3 Data analysis**

The research uses thematic analysis to analyse the data from the four case study countries, namely, China, Nepal, New Zealand and Japan. Thematic analysis is an investigative method which pays attention to the qualitative aspects of the data (Joffe & Yardley, 2004). The technique looks for themes or patterns in the data by analysing the data (Joffe & Yardley, 2004; J. A. Smith, 2015). According to Joffe and Yardley (2004), the themes may be manifested themes which are directly observable; however, they can also be latent themes where they are created through dialogue in the source creating a pattern. Braun and Clarke (2006) indicated that a theme in the data is a pattern in the data's response and, in this research, such patterns can help us associate specific techniques used to manage disaster risks with specific dynamics in particular countries. By identifying themes, the study can link events with particular failures or successes and make links to how they came about. This thematic analysis method will present Laos with an effective way to differentiate the most applicable disaster risk policies.

For example, since adopting methods of warning the public about disasters, whether it is through better education or greater transparency, there have been positive effects in New Zealand and Japan in reducing disaster risks. Therefore, one theme Laos can take is that more critical communicative abilities with the public are beneficial in mitigating the disaster risk. It is crucial to recognise such themes because of the financial situation in Laos, and other limitations, mean that finding themes can allow the ideas from the texts to be manipulated to better account for these situations from a Lao point of view. If the themes of the successful strategy implemented by New Zealand and Japan disaster management authorities are similar, then it is likely to see positive results in benefiting disaster risk management in Laos.

New Zealand and Japan face various disaster risks; some areas may be more prone to floods, while other areas may be more prone to earthquakes. This means that themes can help keep the base of the strategy the same while Lao disaster management authorities alter the strategy to face various events.

## **Chapter 4: Findings**

Chapter Two outlined a research gap on disaster management practices in resource-constrained economies countries like Laos. This research generated a question to lead the study of “What experiences, policies and best practices used by other countries can be usefully applied to enhance the effectiveness of disaster management in Laos?” The research explores two selected examples of resource constrained countries such as the Nepal and China as well as examples from developed countries, the Christchurch earthquake 2011 and the Kaikōura earthquake 2016 from New Zealand, and the Japan tsunami 2011, and the Japan Kinugawa River floods 2015. Secondary qualitative data review was used as the method to gather data and analyse and interpret the collected data.

The research findings are presented in this chapter. Thematic analysis has been applied to obtain the most appropriate themes as the findings of this research. The time frame that covers these findings in the study is the period 2011-2018.

Two main themes and four subthemes emerged from the data analysis. Pre-disaster management and post-disaster management practice are the primary themes. Pre-disaster management practice subthemes include prevention and preparedness. Post-disaster management practice subthemes involve response and recovery. These themes and subthemes draw from the four case countries. The findings obtained from the analysis of the literature on the disaster management of the Nepal earthquake 2015, China flood 2016, the Christchurch earthquake 2011, Kaikōura earthquake 2016, Japan tsunami 2011, and Japan Kinugawa River floods 2015 are presented in the following sections.

### **4.1 Nepal earthquake 2015 – history**

In 2015, Nepal was listed as one of the least developed countries due to its inability to meet the ‘graduation boundary’ of per capita income, since per capita income was only US\$659 per year (United Nations Committee for Development Policy, 2018). In term of disaster management, the Ministry Home Affairs of the Government of Nepal (2011) reported Nepal had limited resources to provide for natural disaster casualties and victims, especially reconstruction and recovery programmes. The Ministry of Home Affairs is the focal agency for immediate rescue and relief work (Chhetri, 2001). This ministry produces national policies and programmes and is responsible for data collection and distribution and for mobilising funds and resources (Sanderson & Ramalingam, 2015).

Nepal is one of the countries that is most frequently hit by disasters. Chhetri (2001) claimed that this is due to the country being located on the border between Indian and Eurasian tectonic plates in the Himalayas region, which is the driving force of vulnerability to disaster, including earthquakes. On 25 April 2005, one of the most robust earthquakes since the 1934 Nepal-Bihar earthquake happened in central Nepal with a magnitude of 7.8 (Aon Benfield, 2015). This disaster incident resulted in the death of 9,100 Nepalese residents and left approximately 25,000 people injured. The central region earthquake not only caused a massive loss of life, but also destroyed concrete buildings, houses, and properties, accounted for a total of 605,254 units throughout Kathmandu and the Kathmandu valley region (Aon Benfield, 2015). Apart from that, many significant historical buildings collapsed due to this incident. The entire economic costs for the Nepal earthquake was US\$5.1 billion with an additional cost of approximately US\$1.9 billion for economic damage related to business suspensions. The total value of economic losses was equivalent to over one-third of the entire GDP of Nepal.

#### **4.1.1 Nepal earthquake 2015 – disaster management**

As a resource-constrained country, Nepal is confronted with many challenges which include a deficiency in coordination amongst relevance disaster management agencies, a lack of technical human resource expertise, a lack of effective system leadership in reconstruction, and insufficient information, knowledge and capability in managing disaster risks (The Ministry Home Affairs of the Government of Nepal, 2011)

Nepal has a disaster management structure in place to cope with natural disasters but, like other developing nations, the country consistently comes across issues in executing that structure, as found during the 2015 earthquake incident, such as the lack of cooperation and coordination among the various disaster management agencies (Hall et al., 2017). These agencies also struggle with a lack of funding and resources and a lack of transportation and communication services (Hall et al., 2017). The warning systems are inefficient, technology is out-dated, and the rehabilitation programmes are set up poorly.

The strategies Nepal utilises to deal with their disaster-prone geophysical environment revolve around the Natural Disaster Relief Act 1982 (Chhetri, 2001). This act is critical for the disaster management agencies performing their duties efficiently and undertaking their responsibilities rather than trying to avoid them or shift them on to others (Sanderson & Ramalingam, 2015). However, there was confusion amongst agencies, made apparent through work being repeated, in the 2015 Nepal earthquake event, due to unclear roles, which reduced the rate at which the agencies work and led to increased

difficulties in minimising the effects of the disaster (Jones, Owen, Manyena & Aryal, 2014). Furthermore, Lee (2016) claimed that the disaster response in Nepal appeared to focus on the short term, due to coordination issues, and the roles and responsibilities amongst disaster management authorities and all related agencies were not clearly defined.

According to Lee (2016), community resilience is another issue throughout disaster practice in Nepal. During the earthquake, the victims were unable to help themselves and their neighbours, and simply waited for the rescue teams due to the lack of capacity in community resilience. This evidence demonstrated the scarcity of a community-focus in disaster preparedness and planning in the local community (Hall et al., 2017). There is a rather low literacy rate in Nepal and, therefore, a knowledge issue appeared in the course of disaster management. There is also an obstacle in training and providing public awareness of risk reduction in Nepal due to the limited human resources in the field (Lee, 2016). A further barrier is the lack of a mechanism to provide and spread the universal primary education and a sustainable development programme for public learning for all stakeholders.

The recovery and reconstruction processes have been a significant challenge for Nepal since the 2015 earthquake. Two to three months after the earthquake, there is a high priority on housing for victims as this event made a hundred thousand people homeless (Aon Benfield, 2015). This event resulted in a demand for building more earthquake-resistant houses. However, government reconstruction policies were criticised (Hall et al., 2017). For instance, the government only provided tents for evacuees rather than building proper houses with a more sustainable source of materials. Hall et al. (2017) added that government legislation should restrict rebuilding on roads and streets that could provide access for disabled people in order to provide health posts. However, it is difficult to enter some rural areas in Nepal, especially the mountain villages.

## **4.2 China flood 2016 – history**

China is a country prone to multiple types of disasters. The farming areas where there are lower levels of economic development also tend to be the regions' most prone to flooding, droughts and earthquakes (Chen, Zhou, Zhang, Du & Zhou, 2015). The socio-economic situation means that a significant number of human and economic resources are required to cover for the deficiencies in those areas. From July to August of 2016, China experienced one of the most severe flooding and typhoon periods encountered in the Yangtze River valley and North China, comparable to 1998 ("Flooding in China", 2016). This disaster incident originated from the seasonal monsoon rains that increased the massive quantity of rainfall day by day. Eleven provinces suffered from severe rainfall, and several cities experienced more than 200 millimetres of rain within 24 hours period, especially Hubei Province which faced 285 millimetres of rain per day ("Flooding in China", 2016).

In July 2016, this flooding and associated mudslide demolished 40,000 homes, devastated over 1.5 million hectares of harvests, and impacted on 11 provinces (“Flooding in China”, 2016). For example, the most extreme flash floods and mudslides hit Hebei and Henan Provinces, which caused the death of 114 citizens, with a further 111 people were missing (“China Floods: More Than 150 Killed”, 2016). According to International Disasters Database, the damage from China’s 2016 floods resulted in more than US\$22 billion of economic loss (“Flooding in China”, 2016). This flood disaster turned out to be the second most costly in natural catastrophe in Chinese history.

#### **4.2.1 China flood 2016 – disaster management**

China has altered its way of handling flooding risks since a series of disasters including the Great Chinese Famine in 1958-1961 and the Tangshan earthquake. These alterations have helped the country arrive at its current methodology for handling disaster risks (Sim & Yu, 2018). The first change was made in 1978, when the government looked to streamline disaster management laws and legislation to make handling disaster practices more efficient (Sim & Yu, 2018). Some of the specific legislation changed included laws to aid co-operation internationally, laws for systematic responses to emergencies and a disaster reduction plan.

This process also included China opening its doors to the international community in 1978, analysing previous mistakes the country had made in its handling of disasters, and substituting past practices with more scientific measures to better manage disasters by focusing more on research than traditional beliefs (Sim & Yu, 2018). When a country has legislation specific to disaster practices, it reduces the debates in dealing with legalities. This in turn speeds up legal processes, organises roles for disaster events to avoid confusion, and delivers better insights from a larger community on disaster management.

In response to the 2016 flood event, the government quickly provided a significant quantity of armed forces personnel to rescue and move evacuees from flooded areas to a safe place (“China Floods: More Than 150 Killed”, 2016). However, during disaster management practice, multiple challenges appeared across the affected provincial areas in China. The warning system was a critical issue in the Chinese government managing disaster risk in this flooding event. For instance, the city government of Daxian (in the impacted province) contended that officials ordered to evacuate people in the area at 1:40 AM on July 20, 2016. However, the Party Secretary of Daxian, Mr Zhang Zhan’ge reported in the Beijing news that he got a warning by call only in the early morning at 1:50 AM, when he ran in to tell his villagers (Huang & Huang, 2016). By that time, the flood was out of control and demolished

all the property and highways, which were covered by brown water (Huang & Huang, 2016). Also, other provinces besides Daxian suffered from ineffective warning systems. In Hebei, the locals complained there was a lack of warning of a flood disaster as well as an inefficient rescue system (“China Floods: More Than 150 Killed”, 2016). These pieces of evidence revealed the government’s inability to provide a fast and proper warning to local communities.

One of the critical problems for disaster management is the poor planning of the construction development projects that are taking place in China. Five decades ago, the Chinese government decided to approve many projects for urban development, and this is one of the major factors that caused the flood disaster. This is because improper planning for drainage systems across many cities resulted in a more significant flooding problem. For example, 40 lakes in Wuhan, the capital city of Hebei, have been used for years to keep the water away from construction and development projects during monsoon rains and the flooding season (Biswas & Tortajada, 2016). As a consequence of poor land use practices and construction activities, there has been a deterioration in storage ability from heavy sedimentation, which interrupted the natural draining system. This practice demonstrated that inappropriate development projects have a high potential to create a flood disaster. Disaster management policy in China was considered as another issue. As the government-built construction projects in flood-prone areas, cities were not very successful in managing construction operations as well as sustaining the storm drainage systems (Biswas & Tortajada, 2016). The use of land and planning and flood management continue to be issues in China.

### 4.3 Key themes from China and Nepal

The findings from China and Nepal disaster management practices are presented in this section. The research presented in the preceding sections provides the themes, subthemes, factors considered, and examples of disaster management drawn from the two cases. These two cases will be named as follows in order to identify each example explicitly:

Case 1: Nepal earthquake 2015

Case 2: China floods 2016

**Table 2a. Disaster management themes from resource-constrained economies**

Theme	Subthemes	Factors considered	Examples
	Prevention	Reinforce natural disaster	Case 1: Trouble appeared during disaster management training programmes due to the



<b>Theme</b>	<b>Subthemes</b>	<b>Factors considered</b>	<b>Examples</b>
Pre-disaster management practice		risk education programmes	low literacy rate as well as the culture of learning.  Case 1: There is limited promotion of public awareness, which resulted from a lack of support from the government.
		Advanced warning system	Case 2: There was a lack of a warning system during the flooding, and the Hebei local citizens complained there was no announcement from city government.
	Preparedness	Enhanced local community resilience capacities and improved self-management	Case 1: In the period of the earthquake, local people only relied on the rescue teams; they were not able to help themselves and their neighbours, which showed that there was a low capacity in community resilience.
Post-management practice	Response	Fast emergency announcement and response	Case 2: Hebei residents complained of inefficient rescue action.  Case 2: Daxian villagers received the warning too late, which caused the damaged to houses and highways from floodwaters.
		Strong collaboration and relationships amongst organisations and all related agencies	Case 1: The responsibilities and tasks amongst agencies were not assigned clearly, which left confusion and led to duplicated work.  Case 2: The city government of Daxian and the Party Secretary of Daxian reported information differently, which showed there was no collaboration between these actors. This practice created ineffective capability to respond to flooding.

Theme	Subthemes	Factors considered	Examples
		Transport route facilitation to reach disaster-affected areas	Case 1: Rescue teams and all related agencies had difficulties in accessing and providing assistance to local due to the impacted location being in the mountainous area.
		Prompt response on setting up shelters for evacuees	Case 1: A few months after the earthquake in Nepal, the government had only provided tents for victims rather than giving the people proper shelter.
	Recovery	Increased security and quality in infrastructure building, such as housing programmes.	Case 1: The Nepal government did not fulfil the promise of demanding of quality building to reduce the damage for future disaster.  Case 2: The construction projects for urban development in China did not have appropriate policy and plans to cope with flooding disasters.

#### 4.4 Christchurch earthquake 2011 – history

The South Island of New Zealand contains the Alpine fault as the main fault responsible for the Kaikōura earthquake, and many minor faults which rupture less frequently but were responsible for the Christchurch earthquakes (GNS Science, n.d.). The 2011 Christchurch earthquake happened on the February 22, around lunchtime, at a 6.3 magnitude, and took the lives of 185 people (N. Smith, 2017). A 7.3 magnitude earthquake hit Christchurch just one year earlier, in 2010; however, the origin of 6.3 was much closer to the surface. Therefore, it felt much more violent than 6.3 and was very comparable to the aggressive 7.3 which struck in 2010 (Potter, Becker, Johnston & Rossiter, 2015).

During the earthquake, the Canterbury Television building and the Pyne Gould Corporation buildings were both taken down by the quake (Wilkinson et al., 2013). Eight people were killed when two city buses were crushed between two walls (Potter et al., 2015). Compared

to the 2010 quake there was a higher degree of liquefaction where the water turned the saturated soil and sand beneath the surface into silt which shot up from beneath the surface, covering properties and streets (New Zealand History, 2019). The damage the earthquake caused led to the destruction of several thousand homes and many homes being deemed uninhabitable.

#### **4.4.1 Christchurch earthquake 2011 – disaster management**

The Mayor of the Christchurch City Council announced a local emergency within two hours of the earthquake, and this was followed by the Minister of Civil Defence officially stating a national emergency all over Christchurch City the next day (McLean, Oughton, Ellis, Wakelin, & Rubin, 2012). The initial response to the 2011 Christchurch earthquake was speedy. The Director of Civil Defence brought together the Christchurch City and Canterbury Civil Defense groups which worked together from the Christchurch Art Gallery for two months with 500 people working together at their peak (McLean et al., 2012).

Part of the reason the response was so fast, and that there was a seamless transition from response to recovery, was the experience gained from the 2010 earthquake (Porter et al., 2015). This quick action meant that relationships between organisations were already strong, creating more cooperation in their response to the disaster. During the catastrophe there was damage to the community's St John ambulance centre; therefore, the ambulance response was passed to Auckland and the police and fire services assisted with 111 calls (McLean et al., 2012). This practice is an example of how relationships and clear communication can help overcome adversity in a disaster.

One of the critical aspects of the successful response was the installation of a single person controller who had charge over the operation and used these powers effectively (Greater Christchurch Group, 2016). Having one person in charge of making decisions eliminates conflicting orders being given and speeds up decision making. Another aspect of the response that was learnt from the 2010 earthquake was that it is difficult to scale up disaster management, so it is best to prepare for the worst scenario and applying that framework to lesser and more frequent disasters makes for successful disaster management (McLean et al., 2012). The plan does not need to be scaled up or down to meet the level of disaster but trying to adapt to more significant disasters proved difficult in the February 2011 disaster.

There has been a massive demand placed on community resilience capacities to prepare for events like the Christchurch earthquake. Community resilience is the ability of the Christchurch community to use resources to overcome the effects of the earthquakes (Thornley, Ball, Signal, Lawson-Te Aho & Rawson, 2015). This process also helps with their adaptive capacity ability, which can be used to prevent further impacts of future events. In the circumstances of the Christchurch earthquake, a group called Project Lyttelton moved

from activities such as establishing a regular farmers' market to creating an alternative school for children (Cretney, 2016). This programme illustrates how they took advantage due to a change in circumstances, with several schools damaged, to cope in the current and future environment and the alternative schools provided children with the ability to continue an education despite the ongoing threat of earthquakes (Cretney, 2016). It also demonstrates the importance of building relationships in the community before a disaster so people can work together post-disaster.

Thornley et al. (2015) suggest that other important aspects of recovering post-disaster were to create elements of a resilient community by creating networks and connections to unite those in the crowd. Some examples of this are routine checks on the elderly, community projects such as the sewing project to brighten the fences surrounding rubble, and community gardens. Lyttelton has a somewhat isolated geographical position, and therefore the newfound unity in the community helped to create a sharing stall to centralise food distribution (Cretney, 2016). This presented a more reliable option of food distribution for this community.

Timebanking was also successfully brought in pre-disaster but altered to fit into the change of demands post-disaster. Timebanking is a system whereby trade is made through skills and time rather than money (Cahn, 2000). This allows different skills to be traded which can be useful for repairs, food distribution and preparation but also from a community relationship perspective as it operates on the assumption an hour of one form of work is worth an hour of any other form of work, therefore it can help give those participating and helping each other a sense of self-worth and builds relationships based on good deeds through trade (Thornley et al., 2015). Post-disaster jobs were more focused on helping those recovering from the earthquake, so perhaps they involved repairs on roofs or sharing food that had been grown.

For the 2011 earthquakes, a new public service department, The Canterbury Earthquake Recovery Authority, was created to lead and coordinate the recovery effort (McLean et al., 2012). New legislative powers were also needed to speed up the recovery process, which led to the introduction of the Canterbury Earthquake Recovery Act 2011 (Greater Christchurch Group, 2016). According to the Greater Christchurch Group (2016) report, the government decided on this approach due to the requirements for a timely and effective decision-making process, strong governance over this process, greater leadership and a higher level of coordination across agencies. Due to political risks and a more considerable Crown investment being required for the recovery efforts, strong governance and control were needed (Greater Christchurch Group, 2016). This issue means costs would be controlled better with quality and timeliness enhanced as the governance group would need to adhere to these expectations. The key lesson from the 2010 earthquakes was that a single entity coordinating the recovery with a high level of leadership would remove local confusion and provide greater certainty.

In the half-year after the Christchurch earthquake, the government appointed Stronger Christchurch Infrastructure Rebuild Team (SCIRT), an alliance working to help with reconstruction projects (Walker, de Vries & Nilakant, 2017). The benefits of the SCIRT model versus standard public or private models was the collaborative alliance aspect which reduced the competitive element of organisations. Where different organisations might both act in a way to compete with each other to achieve the same goal, thus digging into each other's resources, in this alliance scenario resources were shared, and there was a non-competitive environment which meant organisations could focus their attention on the task at hand (Walker et al., 2017).

In the Christchurch disaster management, the SCIRT system allowed stakeholders', businesses', local communities' and the local government's interests to be streamlined, which enabled better and more efficient reconstruction projects (Walker et al., 2017). Successful disaster recovery should create a feeling of involvement and acceptance from all stakeholders, and the success of that project should be measured in terms of that level of recognition: a highly successful project creates a high level of acceptance but an illegitimate programme does not succeed in creating acceptance amongst the community (Walker et al., 2017).

#### **4.5 Kaikōura earthquake 2016 – history**

On November 14, 2016, a 7.8 magnitude earthquake ripped through 150km of land along the North Canterbury to Marlborough faults (Woods et al., 2017). The quake was associated with Kaikōura because that was where it reached its maximum intensity of shaking. The natural incident was felt up to Wellington (Orchiston et al., 2018). This event triggered the most significant tsunami observed in New Zealand since 1947 at 7 metres (Woods et al., 2017). Thousands of people were affected by damage to transportation facilities. The Kaikōura earthquake resulted in two deaths, one from a house collapse and the other from a heart attack (Stevenson et al., 2017).

The response to the earthquake was immediate. At 00:02 the GeoNet seismic sensors detected the first movements associated with the Kaikōura earthquake and within six minutes they had confirmed initial characteristics of the earthquake being a 7.5 magnitude (the earthquake peaked at 7.8 in Kaikōura) at 15km depth, 15km northeast of Culverden (Woods et al., 2017). According to Beaven, Wilson, Johnston, Johnston and Smith (2016), the GeoNet data is immediately forwarded to the Ministry of Civil Defence and Emergency Management staff through a notification. This notice activates national emergency management response procedures (Beaven et al., 2016). Public information and volcanic duty officers' responses were to communicate and support the public and locate the aftershocks (Woods et al., 2017). GNS Science also created a process to assess the risk of landslide dam failure due to the weakening of sediment following the quake (Woods et al., 2017).

### **4.5.1 Kaikōura earthquake 2016 – disaster management**

The scientific response began two minutes after the quake finished shaking (Woods et al., 2017). The earthquake was covered from multiple angles scientifically with natural sciences, engineering and social sciences from numerous institutes including the Crown Research Institute, universities and consultancies in New Zealand taking part in responding to the event (Woods et al., 2017). Covering such a broad range of data from a large number of institutions provides the most in-depth understanding needed to respond to the disaster. The response was aimed at prioritising the welfare of humans; ensuring farmers were looking after each other, their communities, and animals; and restoring water supplies (Ministry of Civil Defence and Emergency Management [MCDEM], 2015). The hospitals in Kaikōura and Marlborough Districts were kept running through the earthquake response, as were aged care facilities, without evacuating the residents (Woods et al., 2017).

After the earthquake, the Takahanga Marae was used as a welfare centre to provide for 700 people on the night of November 13/14 and 200 people mostly made up of tourists on the night of November 14/15 (Stevenson et al., 2016). Reports from Civil Defence indicated that isolated communities had critical needs for necessities such as water, fuel and food. A few days after the earthquake, 1000 portable toilets and other items were delivered to Kaikōura from Christchurch (Stevenson et al., 2016). Within days of the earthquake, the Ministry of Business, Innovation and Employment team began looking in Christchurch for accommodation to house evacuees (Stevenson et al., 2016). Individual needs assessments followed during the week following the earthquake, and the Federated Farmers organisation helped authorities with contacting isolated rural households which were harder to access (Stevenson et al., 2016)

One of the ways New Zealand prepares for the onset of an emergency event is the Coordinating Incident Management System which was introduced in 2004 as a nested framework (MCDEM, 2015). The framework is used to bring relevant agencies together with providers of critical infrastructure, welfare, and emergency services. This framework can be used to provide a decision-making structure after events. The system is aimed at building networks both locally and across New Zealand.

The incident management system was introduced to move responsibility for risk to regional and local levels to increase networking at horizontal and vertical scales, through higher information on disaster risks being fed up the chain, but also horizontally feeding through to other regions with different risk findings (Woods et al., 2017). Two science liaison staff were deployed to the Canterbury and Marlborough emergency coordination centres (Morgan et al., 2015). For the duration of the response, they provided updates and briefings to emergency management staff and district governance as well as presented at meetings for affected communities.

This size of the event is a significant task to handle scientifically; this is why it is essential to ensure necessary frameworks are formed in preparation before the incident, to ease communication and roles during the event. It is also imperative that stronger relationships are formed. This structure was achieved through the decentralisation of the risk responsibility. Lastly, transparency and information coordination are critical, so everyone taking action is on the same page; this was the result of the science liaisons' work. It is also worth noting that the Ministry of Civil Defense and Emergency Management held a public education campaign in December 2016 (Carter & Kenney, 2018). The campaign focused on how to react to earthquakes and tsunami risks. This campaign was run to increase the reaction to the natural event rather than relying on waiting for the official warnings to take action (Carter & Kenney, 2018). This practice can help prevent loss of life during a shock as it enhances people's education on how to survive the initial shock.

According to the New Zealand Transport Agency (NZTA) (2017), KiwiRail and Transpower (the national electricity provider) have developed a shared resilience response framework. This framework is in sync with the 30-year New Zealand infrastructure plan 2015 (NZTA, 2017). They have used a consistent approach for better coordination and cooperation between networks. Davies et al. (2017) state that, in this case, resilience is being conscious of all human-made and natural disasters that could have an impact on their networks. The framework is centred around three legs: the first is prevention, mitigation and preparedness; the second is the response; and the third is restoration and rehabilitation (Davies et al., 2017).

According to Dellow et al. (2017), in the 100 days following the earthquake, the NZ Transport Agency continued with their resilience work through: identifying different routes that could be taken as alternatives to state highway links; creating a system to advise customers of events taking place and their options to cope with the impacts; and continuing with updating their policy with components that would benefit them in a seismic environment; rock fall and bridge scour alleviation programmes; a weather monitoring programme; working to reduce ice on the road; and updating structures to the modern building standards (Dellow et al., 2017).

The recent State Highway Resilience National Programme Business Case identified highways as an area needing improvement (NZTA, 2017), for example alternative routes needed to be recorded and upgraded to be suitable for use (Davies et al., 2017). Risk assessment processes were also ensured to be systematically consistent across regions. A few days into recovery army convoys travelled through Kaikōura dropping essential supplies at the request of the emergency operation centre in Kaikōura and Canterbury (Davies et al., 2017). Because of the dependencies of multiple cross-networks on each other, there was continued transport of goods from the first day of the networking, so Civil Defence could prioritise isolated areas (MCDEM, 2016).

Every 300 years the Alpine Fault ruptures, causing a magnitude 8+ earthquake affecting most of the South Island. The last time this happened was 1717; therefore, Project AF8 is in place to counteract the current possibility of this earthquake (Orchiston et al., 2018). Project AF8 has launched the South Island Alpine Fault Earthquake Response (SAFER) framework through the funding of the Ministry of Civil Defence and Emergency Management and the leadership of Emergency Management Southland. The SAFER structure provides the framework for a coordinated response across the six South Island Civil Defence Emergency Management groups and their partner groups over the first seven-day response (Orchiston et al., 2018). The framework, however, is not supposed to replace the existing strategies between agencies but rather paint a picture for how the response would be coordinated across the South Island.

#### **4.6 Japan tsunami 2011 – history**

Located along the most active seismic belt in the world known as the Pacific Ring of Fire, Japan is one of the world's most disaster-prone countries (Swiss Re, 2013). The country has learned from decades of being affected by natural disasters and hence is generally considered well-prepared to cope. Japan is known as a pioneer in crisis management, and the country has a comprehensive plan for preparing against disasters and their aftermaths; the 2011 Great East Japan earthquake is one such (Zaré & Afrouz, 2012).

On Friday March 11, 2011, a magnitude 9.0 earthquake followed by a destructive tsunami with 40-metre waves hit Japan's northeast region of Tohoku. An estimated 20,000 people were killed, and hundreds of thousands left homeless or stranded by this catastrophe, the most significant toll in the post-war era (McCurry, 2012). The Japanese National Agency reported that 125,000 buildings were destroyed, and millions of people faced blackouts and were left without fresh water for days (Zaré & Afrouz, 2012). Moreover, the main quake triggered an explosion and large fires, with the Fukushima Daichii Nuclear Reactor accident being a clear example as the earthquake and tsunami shut down its cooling systems (Aldrich, 2016), resulting in almost 80,000 people being forced to flee the town and thousands more being evacuated to avoid the high level of radiation exposure. Those many disasters plunged the country into the most severe crisis in its post-war history.

Countermeasures against disasters in Japan can be broadly classified into five acts (Ministry of Foreign Affairs of Japan, 2014). First, research into the scientific and technical aspects of disaster prevention. Second, the reinforcement of the disaster prevention system, its facilities and equipment, and other preventive measures. Third, construction projects designed to enhance the country's ability to defend against disasters. Fourth, emergency measures and recovery operations. Fifth, the improvement of information and communication systems.



#### **4.6.1 Japan tsunami 2011 – disaster management**

In the prevention of disaster, the government of Japan (GOJ) has adopted a crisis management system that consists of a set of cohesive rules for an immediate response to all unexpected incidents, an advanced research system, and extensive public education about disasters (Zaré & Afrouz, 2012). These comprehensive plans were heavily promoted by the GOJ to the people, government officials and rescue departments so that, in the case of an accident, each party is aware of the plan and knows what to do once the alarm is sounded.

In addition, the government has set up the most advanced earthquake and tsunami early warning system in the world which was built and installed in four years starting in 2003. The media, such as the NHK channel and Japan's mobile networks, have also contributed to the disaster prevention process. The early warning system was broadcast to the people of Japan through the news and mobile phone networks. This system had an essential role in reducing casualties and saving lives in the Tohoku 2011 earthquake (Zaré & Afrouz, 2012).

As a subsection of earthquake countermeasures, tsunami preparedness in Japan is addressed in a plan report from the Cabinet Office called the Basic Disaster Plan (Fraser et al., 2012). The plan provides guidelines for the creation of tsunami hazard maps and the designation of tsunami evacuation buildings. This national-level plan was later adopted at the level of prefecture and municipality governments, which formulate and implement local disaster management plans.

Furthermore, Japan has prioritised education and evacuation exercises (Fraser, Leonard, Matsuo, & Murakami, 2012). The drills are conducted regularly in every prefecture and involve large-scale decision-making simulations while disaster prevention activities are carried out by local groups. Additionally, Japan follows the philosophy of tsunami tendeko, which trusts that every person in the community has self-evacuation knowledge, so they can act without relying on other people's help or waiting for others. This practice has successfully raised disaster prevention awareness as well as preparedness.

In the aftermath of the enormous devastation of the 2011 earthquake and tsunami, the GOJ responded to manage the crisis (Zaré & Afrouz, 2012). The government declared an emergency in the affected area and dispatched the Self Defense Forces for rescue operations. All ministries and departments were involved in this response. The Ministry of Health, for instance, was in charge of preparing suitable vehicles for supplying water and assigning hospitals for the treatment of casualties and people who had been exposed to radiation. At the same time, food, portable toilets, blankets, radios, gas oil, torches, dry ice and other essential things were provided by the Ministry of Agriculture, Forestry and Fisheries along with the Ministry of Finance.

The GOJ also concentrated on the infrastructure, The Japanese Ministry of Land, Infrastructure, and Transportation (MLIT) was in charge with opening the region's mainland, sea and air routes for humanitarian aid (OCHA, 2011). They made sure that roads that were previously blocked with debris were accessible for the delivery of assistance to evacuation centres.

In initial relief operations and temporary housing, the Japanese Red Crescent Society (JRC) had a substantial role in deploying its teams (Zaré & Afrouz, 2012). They were responsible for the accommodation of refugees and evacuees in schools, public buildings, and shelters. During the construction of temporary housing, all other rescue organisations and NGOs were also involved; this was expected to be ready within a month.

As the emergency response phase ended, the authorities were paying more attention to mental health issues (McCurry, 2012). The Health Ministry dispatched medical aides, therapists and social workers to the affected zone (Zaré & Afrouz, 2012). Additionally, the ministry performed the required actions in order to control and inhibit infectious diseases and encouraged people to use masks.

The Tohoku recovery process also focused on providing permanent housing that is secure from future threats, as mentioned in the Recovery Policy Framework provided by GOJ (Santiago-Fandiño, Sato, Maki, & Iuchi, 2017). Additionally, MLIT suggested tsunami-protection strategies differentiated to each level of tsunami, namely the L1 tsunami, which is defined as an event occurring once every 10–100 years, and the L2 tsunami, which is an event occurring once in several hundred years.

In the protection strategy against L1 tsunamis, MLIT suggested that human lives and property should be protected by structural measures, such as the construction of levees, whereas for L2 tsunamis, which the 2011 tsunami was classified as, a combination of structural and non-structural measures are necessary to protect human lives and property against that magnitude of the tsunami (Santiago-Fandiño et al., 2017). Thus, to address the Tohoku 2011 tsunami, the Reconstruction Agency proposed a package of recovery programmes, as follows:

1. The collective relocation programme, which aims to influence residents to move to a safer inland area.
2. The land readjustment and raising programme, which aims to reallocate land parcels to elevated areas that are higher than tsunamis that might overtop the levees.
3. The special tsunami recovery-zone act that funds the redevelopment of the basic urban system in devastated localities.

4. The public-housing programme for disaster victims that is intended to provide housing for tsunami survivors who do not have the financial capacity to reconstruct their houses in the relocated or raised land.

Moreover, according to Zaré and Afrouz (2012), in the management of the March 11 2011 crisis, one of the main contributing factors was social capital. The people of Japan have followed commands cautiously, and such behaviour has a significant role in the recovery phase, promoted solidarity among casualties, and prevented chaos in the search for aid during the 2011 Great East Japan earthquake and tsunami.

## **4.7 Kinugawa River flood 2015 – history**

Joso city is 55km from Tokyo in the south-western prefecture of Japan and has a population of 65,000 people (“Japanese City of Joso Flooded”, 2015). On September 10 and 11, 2015, the tropical storm Etau took place and, as a result of the intense rainfall, the Kinugawa River floods occurred (“Japan Evacuates 100,000”, 2015). During the intense 551mm of rainfall over 24 hours, the riverbank collapsed and flooded the eastern part of Joso city, killing two people and injuring 40, destroying 5,000 houses and requiring authorities to rescue 4,300 residents including airlifting hundreds (Otake, 2015). This damage led to a prompt response to the flood.

### **4.7.1 Kinugawa River flood 2015 – disaster management**

In order to respond to a flood, there must be an immediate transfer of information to authorities. ALOS-2/PALSAR-2 was the first satellite to record the flooded area of Japan (Rimba & Miura, 2017). The satellite is designed to monitor disaster-prone areas of the Asia-Pacific region following disasters. The PALSAR shows many angles and monitors flood areas. Rimba and Miura (2017) state this system allows authorities to identify needs and opportunities to help save flood victims. In Joso, the response happened at 2.43am, a few hours after the flood occurred. The satellite gave quick access so that authorities could scope the situation and plan rescues (Rimba & Miura, 2017).

One of the significant issues which resulted in a lot of the devastation caused by the floods was the authorities in the city being late to evacuate people, and having to use boats and helicopters to rescue 4,200 trapped residents (Lebowitz et al., 2019). Early evacuations keep people out of harm’s way and allow authorities to focus more on reducing infrastructure damage rather than saving people (Lebowitz et al., 2019).

One of the initial responses was an attempt to fight the flood; however, due to the intensity of the downpour resulting from such heavy rainfall, these were unsuccessful early

on. The number of leakages, overtoppings and submergences made the task complex from the start, especially given that evacuation guidance needed to take place to get residents out of dangerous areas (Council for Social Infrastructure Development, 2015). The late evacuations put intense pressure on neighbouring cities with the demand for accommodation for evacuees, since flooding had put many evacuation centres out of use. In Joso city, 51 pump vehicles worked day and night to drain public areas and facilities. This action took about ten days (Council for Social Infrastructure Development, 2015).

Emergency construction was started by building a temporary levee created through surplus materials on hand. This programme resulted in rapid construction over five days and a reinforcement project created over two weeks. The permanent levee construction took place from November 2015 to May 2016. The MLIT established the Kinugawa River levee investigation committee to understand the causes and investigate methods of improvement to ensure this type of disaster does not happen again in the future. This inquiry has resulted in US\$530 million being invested by the Japanese government, Ibaraki Prefecture and other cities to launch the Kinugawa River Emergency Response Project (Council for Social Infrastructure Development, 2015). The project contains structural and non-structural improvements. These plans are aimed at improving the river's safety, and also improving how thoroughly the evacuation process is planned with training taking place for evacuation orders, joint inspections of hazard sites with officials to gain a more thorough professional opinion than one organisation could, flood-fighting response teams, and, for residents, publication of disaster maps and the development for the ability for a successful wide-scale evacuation with the involvement of relevant institutions (Newman, Siercke, & Jain, 2017).

Otake (2015) reported that after the Kinugawa flood incident the Minister of Land, Infrastructure, Transport and Tourism released new flooding policies on December 11, 2015. In the past, the Japanese government built dams, dredged riverbeds and constructed levees. Now they are looking to fortify banks to withstand downpours, cover the top layer of embankments with asphalt and reinforcing the bottom section of the bank with concrete blocks so that they are less prone to ruptures (Otake, 2015). They are also aiming to enhance coordination between officials and share real-time information with residents, and are looking to establish regional councils made up of representatives from the river management agencies, cities and regions to coordinate emergency responses (Otake, 2015).

According to Itsukushima (2018), there are also changes being made to adapt to climate change such as levee improvement work designed to stop floods from spreading. River work to increase drainage and improve the utilisation of farming also has also taken place (Itsukushima, 2018). By increasing the offload of the river through continuous levees the flood risk decreases;

however, this also needs to be backed up with continuously expanding education of the community on flood risks to reduce the damage caused by floods (Itsukushima, 2018).

#### 4.8 Key themes from New Zealand and Japan

The research presented in the preceding sections provides the themes, subthemes, factors considered and examples of disaster management that withdraw from four cases. These four cases will be named as follows in order to identify each example explicitly:

Case 1: Christchurch earthquake 2011

Case 2: Kaikōura earthquake 2016

Case 3: Japan Tsunami 2011

Case 4: Kinugawa River flooding 2015

**Table 2b. Disaster management themes of four events**

Theme	Subthemes	Factors considered	Examples
Pre-disaster management practice	Prevention	Reinforce natural disaster risk education programmes	<p>Case 2: In December 2016, MCDEM provided an education campaign to improve the skills for people how to deal with earthquakes and tsunami dangers.</p> <p>Case 3: Government of Japan created a crisis management system for disaster risk prevention. This system has a full and ready set of regulations that can be implemented to respond to disaster risk directly, a modern research system, and public education in managing risks.</p> <p>Case 4: The Japanese government provided evacuation training programmes for residents, flood-fighting teams, and publication of disaster maps to achieve a large scale of evacuation for all related institutions.</p>

Theme	Subthemes	Factors considered	Examples
			<p>Case 4: The local community continuously increased education on flood management to increase awareness of this kind of natural event, to lessen the damage caused by the flood.</p>
		Advanced warning system	<p>Case 2: SAFER model was introduced by AF8 project and funded by MCDEM. This project is aimed to coordinate CDEM groups and their partners to respond to disaster as quickly as possible.</p> <p>Case 3: In 2003, government created the most technologically advanced system to warn people early when earthquakes and tsunamis occur. For example, the warning system broadcasts via TV channels, such as NHK, and mobiles.</p> <p>Case 4: The Japanese satellite ALOS-2/PALSAR-2 first reported the flooding location; this programme enables authorities to recognise needs of victims of flood incidents.</p>
	Preparedness	Enhanced local community resilience capacities and improved self-management	<p>Case 1: Project Lyttelton built connections and relations amongst local people and farmers through activities like a sewing project. This programme helps strengthen the unity so that people set up a place to share food when the disaster happened and helped each other.</p> <p>Case 1: Timebanking allowed people to exchange their skills, for example, repair and preparation skills. This programme helps</p>

Theme	Subthemes	Factors considered	Examples
			<p>people to improve their skills as well as enhancing the group relationship.</p> <p>Case 3: Japanese people give serious priority to practice on disaster education and disaster prevention programmes performed by the local community. The philosophy of self-evacuation is practiced in Japan where everyone has to rely on themselves.</p>
Post-disaster management practice	Response	Fast emergency announcement and response	<p>Case 1: Local emergency was announced less than two hours after Christchurch earthquake 2011.</p> <p>Case 2: When the officers of MCDEM received the data from GeoNet seismic sensors, they immediately responded and activated national emergency needs.</p>
		Strong collaboration and relationships amongst organisations and all related agencies	<p>Case 1: The police worked together with fire department in assisting with the emergency calls while the ambulance service rescued people from affected locations.</p> <p>Case 2: Science institutes and departments gathered all data to understand the disaster risks deeply, in order to provide efficient practice to ensure residential safety.</p> <p>Case 2: New Zealand has had the Coordinating Incident Management System since 2014. This system brought all agencies together to provide practical disaster management as well as connecting local and all related emergency divisions.</p> <p>Case 3: To respond to this natural crisis, whole ministries and departments in Japan</p>

Theme	Subthemes	Factors considered	Examples
			<p>were engaged. For example, food was supplied by the Ministry of Agriculture.</p>
		<p>Transport route facilitation to reach disaster-affected areas</p>	<p>Case 2: New Zealand transport agencies created a system to assist soldiers and all agencies in supplying food in the affected disaster location. Also, the system provided up-to-date information on safe routes to citizens.</p> <p>Case 3: the MLIT opened the region's mainland, sea and air routes to assist the people who needed help.</p>
		<p>Prompt response on setting up shelters for evacuees</p>	<p>Case 2: The Takahanga Marae was used as a home for 700 victims on the night of November 13/14 after the incident.</p> <p>Case 3: Japanese Red Crescent Society (JRC) looked after evacuees' accommodation during the construction of temporary housing which was expected to be finished in a month.</p>
	<p>Recovery</p>	<p>Increased security and quality in infrastructure building, such as housing programmes</p>	<p>Case 1: A particular project, the Stronger Christchurch Infrastructure Rebuild, was created for reconstruction projects and plans. Besides, this plan is aimed to provide safer building for more security for people's lives and to reduce the losses from damage from future risks.</p> <p>Case 3: The Recovery-Policy Framework which was provided by the Japanese government concentrated on giving permanent housing to those residents who could not afford to buy houses. These houses</p>



Theme	Subthemes	Factors considered	Examples
			<p>are built to be more secure for preventing future incidents.</p> <p>Case 4: The government of Japan immediately invested in the Kinugawa River Levee Committee in order to study the causes of the disaster and find out the best method to prevent this type of disaster in the near future.</p>

## 4.9 Summary

The secondary data collected resulted in the findings presented in this chapter in order to answer the research question “What experiences, policies and best practices used by other countries can be usefully applied to enhance the effectiveness of disaster management in Laos?” From the China and Nepal cases as resource-constrained countries disaster management practice compared with New Zealand and Japan as developed countries disaster management practice, the findings are based on two primary themes, namely pre-disaster management practice and post-disaster management practice. In each theme there are two subthemes. For the pre-disaster management theme, the subthemes consist of prevention and preparedness, while respond and recovery subthemes sit under the post-disaster management theme.

By applying thematic analysis, the similar practices applied during managing disaster risks have been found from these four cases, which categorised them in eight significant factors, as follows:

- (1) reinforce natural disaster risk education programmes,
- (2) advanced warning system,
- (3) enhanced local community resilience capacities and improved self-management,
- (4) fast emergency announcement and response,
- (5) strong collaboration and relationships amongst organisations and all related agencies,
- (6) transport route facilitation to reach disaster-affected areas,
- (7) prompt response on setting up shelters for evacuees, and
- (8) increased security and quality in infrastructure building, such as housing programmes.

These factors were applied before and after the disaster events, and these programmes and plans can provide possible useful examples for Laos to improve disaster management.

However, some difficulties occurred during disaster management, such as the heavy rain in the Kinugawa River 2015 event which kept falling, thus causing plenty of leakages, overtopping and submergences and making it hard to carry out the evacuation process to rescue people in the dangerous zone (Council for Social Infrastructure Development, 2015). Also, the limitations found during practices in China and Nepal examples can be lessons for Laos to consider what could be possibly done to develop disaster management in a resource-constrained country by comparing the disaster management in developed economies such as Japan and New Zealand.

## **Chapter 5: Discussion**

The previous chapter examined the findings of this research. The findings presented the disaster management practices of developing and developed nations by observing eight factors that drew from pre-disaster management and post-disaster management themes. This discussion chapter considers the key findings of this research in light of the literature provided in Chapter Two. Also, this study highlights the differences in and critical areas of the disaster management practices of Nepal and China as compared to Japan and New Zealand. By comparing the disaster management systems based on the themes, subthemes and factors considered for these selected countries, these examples can allow Lao to explore better practices, policies and programmes. The eight factors considered under pre-disaster management practice and post-disaster management practice are discussed.

### **5.1 Reinforcing natural disaster risk education programmes**

Reinforcing natural disaster risk education programmes refers to the need to encourage the education of the community in strategies that can reduce the likelihood of natural disasters. These strategies can be used by all members of the community to help them play their role in the prevention of hazards. Japan is an example of a developed country that has prioritised practice scenarios and education systems for disasters in every prefecture (Fraser et al., 2012). These are done through large-scale decision-making simulations, while disaster prevention activities are carried out by local groups. This can be done in the case of an evacuation training programme involving residents, flood fighting teams and the publication of disaster maps to achieve a large-scale evacuation with all the relevant institutions involved.

In less developed countries such as the case of Nepal, efforts to prepare for the 2015 earthquake were hampered by the low literacy rate and the culture of learning, causing difficulty in executing training programmes. This was the result of an inability to communicate in a disaster situation.

In the case of Laos, Faye et al. (2004) argued there is a lack of infrastructure in remote areas of the country. This is combined with inadequate preparedness and prevention in the local community seen in the most recent flooding in Laos (Lindsay, 2018). In 2015 Laos had a literacy rate of 85% versus Nepal's 60% (World Bank, 2019, June 24) which is positive in terms of being able to provide education on natural disasters to the community. In order to minimise Laos's disaster management risks, there would need to be long-term goals to increase

the literacy rate further. The research shows a clear correlation between the implementation of disaster management training programmes and efficiency when acting in large scale decision-making situations in real disasters. Thus, Laos should be focusing on acting out large-scale decision-making simulations to enhance their ability to work with the resources they have. Lao is then able to increase the level of preparedness through familiarising itself with disaster management strategies for flooding and other types of disaster. In order to cater to the scale of the population that is illiterate, information could be passed on through multiple forms of communication such as both audio and visual formats, with demonstrations taking place to increase understanding.

## **5.2 Advanced warning system**

An advanced warning system is a system that warns those in the community in a timely fashion of the risk of a disaster, so they can act accordingly by preparing for natural or human-made disaster accidents. Having time to prepare provides those in the community with a higher chance of survival but can also reduce damage to infrastructure in some cases. Since 2003 the Japanese government has set up the most advanced warning system for earthquakes and tsunamis. The news and the mobile networks in Japan also play an essential role as they provide an early warning system for the people for various disasters. The advantage of this system could be seen in the 2011 Tohoku earthquake, where Japan's warning systems played a vital role in preparing the community for the earthquake and resulted in saved lives (Zaré & Afrouz, 2012).

In developing countries such as China in the 2016 flooding, the local citizens of Hebei complained about the lack of announcements from the city government ("China Floods: More Than 150 Killed", 2016). This disaster resulted in 114 deaths ("China Floods: More Than 150 Killed", 2016) and over US\$22 billion worth of economic loss ("Flooding in China", 2016). Part of the reason for this was the inability to prepare as a result of the lack of a warning system.

In the case of Laos, there is no warning system (Hunt, 2018). Accompanying this issue is that fact that, in many locations in Laos, there are complications in accessing affected sites, making rescues difficult. Consequently, in order to avoid this issue, advanced warning systems are critical to evacuate people early or help them prepare in the event of a disaster, to reduce the number of rescues that must take place. Due to the lack of resources in Laos, there would not be an expectation of the country being able to set up a warning system to the same level as Japan. However, a greater level of transparency with a degree of timeliness from those in government in acting around the probability of a disaster would enable the public to prepare in a way that would reduce the effects of a disaster event.

### **5.3 Enhanced local community resilience capacities and improved self-management**

Enhanced local community resilience capacity and improved self-management is a reference to a community's ability to unify and work together in response to events such as disasters, but also refers to the abilities of individuals to look after themselves and enhance their skills. This skill is important in disaster circumstances as people are required to work together to overcome potential issues such as a scarcity of food, but in order to survive people must be able to rely on themselves as well since there is no certainty that their neighbour will be able to provide the help they require.

This study observed the "Lyttelton" project, where there is the practice of time banking. This project is where skills are traded rather than money (Cahn, 2000). For example, a person may do an hour of roofing work in exchange for an hour of plumbing, and the system operates under the assumption an hour is worth an hour. This programme helps people to improve their skills as well as enhancing group relationships through community interaction as well improving individuals' self-worth through their ability to be able to offer required skills (Thornley et al., 2015).

In studying the Nepal earthquake in 2015, the research explored a lack of ability of individuals to help themselves and a heavy reliance on the rescue teams (Lee, 2016). This evidence illustrates a low capacity for community resilience. Much like Laos, there is a lower literacy rate in Nepal and, therefore, it is hard to inform people about and build their knowledge on the course of disaster management. In Nepal, there is an obstacle to providing the training and resources to reduce disaster risks due to the lack of resources in the field (Lee, 2016).

In Laos, time banking could be a practice which fits the demographic well due to the lack of infrastructure and human resources effectively using the country's natural resources, which results in an ineffectiveness in dealing with natural disasters (Uitto, 2011). By encouraging more productivity from human resources through time banking, Laos would better be able to exploit their natural resources as people would be encouraged to find work in order to involve themselves in a time bank system, hence increasing the attractiveness of jobs exploiting natural resources due to an increase in the demand for employment as a whole. Regardless, there is a need in Laos to boost the ability to manage resources and the community's resilience. Time banking is a method that fits the bill as it helps the community to better utilise the natural resources which Laos has access to although it lacks the human resources needed to exploit them. This system would encourage the better use of those natural resources.

## 5.4 Fast emergency announcement and response

A fast emergency response is essential in successful rescue efforts, and this means that all the community involved, especially the institutions, must have an immediate response to the disaster and implement the strategies which have been practised and refined. The key benefit of a speedy response is that it enables the community to react before further damage takes place, and help is given to those who need it before situation worsens.

Upon the occurrence of the Kaikōura earthquake, the officer of MCDEM received the data from GeoNet seismic sensors. They immediately responded and activated national emergency needs (Beaven et al., 2016). Despite being a 7.5 magnitude earthquake, there were only two casualties, partly due to a fast emergency response in dealing with this disaster. Important to note for the case of Laos is that, in Kaikōura, there are many rural areas which were harder for authorities to access. In this scenario the Federated Farmers organisation helped authorities with contacting isolated rural households which sped up the emergency response through reducing the time needed to approach these harder to reach places (Stevenson et al., 2016).

In China, in the 2016 flooding, there were complaints from Hebei residents about inefficient rescue action taking place (“China Floods: More Than 150 Killed”, 2016). Part of this could be regarded as a result of ineffective warnings beforehand which has led to a need for locals to do too much in too little time to make up for the ground they lost being unable to prepare for the floods.

In the case of Laos, there are complications similar to those seen in the case of Kaikōura in the difficulties in accessing the affected locations in some rural areas. In the dam collapse, there was difficulty accessing roads during the rainy season in rural areas, making rescues difficult. Therefore, the strategy used in the Kaikōura earthquake to contact harder to reach places through the use of an organisation like Federated Farmers (Federated Farmers of New Zealand, 2018). could be practiced in Laos in the event of a disaster.

In Laos’s case, a fast emergency response would reduce the need to use their limited financial resources to pay for repairs, as a fast emergency response improves a community’s ability to mitigate disaster risks, therefore reducing the need for post-disaster repairs. Lastly, the lack of organisation in Laos following the dam collapse event was poor; according to Ives (2018) even a few days after the incident, there had still been no response to the disaster in some areas. To improve this there needs to be a better flow of information between the emergency services and those gathering data on the event. In the Kaikōura quake there was an immediate transfer of information to the relevant departments and then a response from those departments. In Laos, a heightened level of communication would speed up this process.

## **5.5 Strong collaboration and relationships amongst organisations and all related agencies**

Strong collaboration and relationships amongst organisations and all related agencies are crucial in acting efficiently in a disaster response situation. Through strong relationships and effective collaboration, the process of reacting to the disaster becomes more efficient, and therefore it saves much needed time and allows more rescues to occur in a shorter space of time. They also reduce wastage of resources since better communication means less confusion between organisations.

During the Christchurch earthquake in 2011, there was a seamless transition from response to recovery (Potter et al., 2015). This was due to strong relationships having developed from an earthquake in 2010. This cooperation assisted when, in unforeseen circumstances, there was damage to the central St John's Ambulance Station, and thus the ambulance response was passed to Auckland and the police and fire services supported with emergency calls (McLean et al., 2012).

In Laos's case, there is a lack of organisation surrounding post-disaster activities. An example of this was there was no team leading the management of donations. As a result, there is no transparency around how the capital has been used to aid the victims. Even a few days following the dam collapse event, there was no response to the incidents that had occurred in earlier stages (Ives, 2018). This presented a clear correlation between the differences in the level of collaboration between the organisations and the success of transitions through the different disaster response stages, and the control of the events. In the case of Christchurch despite unforeseen damage to the St John's Ambulance Station, events still ran smoothly due to the relationships and the communication between organisations.

In Nepal, during the 2015 earthquake, roles were not assigned clearly. The disorganisation led to confusion and duplicated work (Jones et al., 2014). This also meant that less work was achieved over time, and this inefficiency resulted in more damage and wastage of resources. This lack of relationship amongst the organisations meant there was a greater amount of money spent but less actual work being achieved by organisations. Therefore, it is vital for less developed nations to understand the importance of assigning clear roles.

In Laos, there is a lack of transparency and poor control of donations since there has been a failure in communication to affirm an organisation to control disaster management processes. In Laos, there needs to be more responsibility issued both to individual people in organisations and to organisations in general. There needs to be accountability for organisations to meet these responsibilities. In emergency services in Christchurch we see accountability outside their roles to cover for unforeseen events. By making organisations accountable for their actions, there is a

greater incentive to collaborate to get the job done since there are consequences for a positive or negative performance, and organisational performance will be reviewed and assessed if they are negative. This should be achieved through performance reports for emergency events so that performance can be assessed and, if standards are not met, action needs to take place based upon the nature of the failure.

## **5.6 Transport route facilitation to reach disaster-affected areas**

During a disaster, it is essential that the relevant authorities can reach affected areas to be able to provide resources and necessities to those affected, in order to increase the chance of survival and mitigate the damage. In the case of the Nepal earthquake, the related agencies had difficulties in accessing and aiding locals during the event because the disaster impacted a mountain area that was difficult to access. In Laos, we see a similar dynamic since, outside the capital Vientiane, it is hard to use the roads in rural areas in the rainy season (Faye et al., 2004).

In New Zealand, a more developed country, during the Kaikōura earthquake, transport agencies created a system to assist soldiers and all agencies in supplying food in the disaster-affected area. There were also updates to citizens on safe routes to travel. In addition, when dealing with the citizens caught in hard-to-access rural areas, the authority used the Federated Farmers organisation to communicate with rural people to ensure everyone was okay. This level of communication and strategy saved resources being tied up in hard-to-access areas and ensured citizens were safe.

Applying these scenarios to Laos, one of the main issues is a lack of infrastructure and roads outside the capital, which makes areas hard to access. This could be a situation which requires the government to build a relationship with some of these people to be able to communicate with them during a disaster event, much as the study explores in Kaikōura. This would potentially free up resources, or allow government to manage resources going into disaster-affected areas to ensure more efficiency in reacting to the disaster, as they would be able to provide a higher level of judgement. Other aspects they could improve upon could be an information feed where disaster management teams update safe routes for citizens during a disaster event, so the citizens can help themselves where possible, thereby freeing up disaster management teams. This would then help Laos's disaster management teams which suffer from a lack of organisation and resources, as they would be better able to target resource use through a more structured plan and with more responsibility being taken by community members.



## **5.7 Prompt response on setting up shelters for evacuees**

During the disaster, much of the community becomes displaced, dependent on the quality of construction and the scale of the disaster, and there can be extensive damage to homes and whole areas. Therefore, there is significant importance in setting up a shelter for evacuees quickly, so they have a place to regroup and acquire support from other members of the community.

In the case of the Nepal earthquake of 2015, a few months after the quake the government had only provided tents for victims rather than giving them proper shelters. Tents provide some degree of accommodation but still expose people to the conditions and would not be suitable for families or ideal for a community trying to move forward from such an event. In contrast, during the Japanese tsunami of 2011, the Japanese Red Crescent Society (JRC) looked after evacuees' accommodation during the construction of temporary housing which was expected to be finished in a month. This provided families and those displaced with a place to regroup from the tsunami and allowed them a better environment to recover from the event.

In the case of Laos and other developing nations, there is a lack of disaster management capabilities (Nakagawa & Shaw, 2004). There is also a poorly constructed infrastructure outside the capital (Faye et al., 2004). In order to provide for the victims of disasters, the Lao government should be looking at some form of disaster accommodation that has a high level of construction, so it is well fortified against disasters, and is centrally located in a community so refugees can access it. This would provide victims of disasters with a secure place to help regroup and support each other through the tragedy and would also benefit the government by giving breathing room to decide how they will respond to the damage caused by a disaster event.

## **5.8 Increased security and quality in infrastructure building, such as housing programmes**

In order to recover from a disaster, a disciplined housing programme must be put in place to help people in the community get back on their feet and improve the quality of the infrastructure which suffered in the event. One of the differences the study explores between developing and developed nations in these events is the quality of the infrastructure, and there is seemingly a correlation between the status of countries as developing nations and the more significant amounts of damage occurring during disaster incidents as well as a higher likelihood of human-made events due to the faultier infrastructure in these places.

Five decades ago, the Chinese government were approving projects for urban development. However, as part of these projects, there were improper plans for a drainage system across multiple cities. This has resulted in a significant flooding problem in these areas. An example of this is in Wuhan, the capital city of Hebei, where there are 40 lakes

which have been used for years to keep water away from construction and development projects during monsoon rains and the flooding season (Biswas & Tortajada, 2016). This construction plan has shown that developments without the necessary infrastructure requirements are likely to enhance the risk of disaster.

In a more developed nation, such as Japan in the case of the Kinugawa river flooding event, the government invested in the Kinugawa River Levee Committee immediately to understand the causes of the event and investigate methods of improvement to find the best way to prevent future occurrences of this type of disaster. This led to a US\$530 million investment from Ibaraki Prefecture and other cities to launch the Kinugawa River Emergency Response Project (Council for Social Infrastructure Development, 2015).

This dissertation does not address the issue of the quality or engineering robustness of infrastructure development projects in Laos. If public or public-private infrastructure development is inadequate, this increases both the risk and vulnerability to natural disasters. There is limited technical and management capability in several areas (Howe & Sims, 2011) so that oversight of projects is difficult. Laos is an underdeveloped, resource constraint economy, which lacks the financial capacity needed to fund the development of adequate infrastructure compared to developed countries like Japan and New Zealand. (Howe & Sims, 2011). The government of Laos could possibly invest in higher quality infrastructure development such as roads, bridges in areas of sizeable economic value to reduce the economic damage to them in the case of any disaster events. There would also be benefits from a more open and transparent process of tendering for projects and possible oversight from an organisation such as the Asian Development Bank. These issues, while important, are outside the scope of this dissertation.

## **Chapter 6: Conclusion**

The research findings on disaster management practices in resource-constrained countries and developed countries were discussed in the previous chapter in light of the disaster management strategies presented in Chapter Two. In this final chapter, concluding statements are presented, limitations to the research identified, and fields of the future study discussed.

### **6.1 Dissertation summary**

Chapter Two of this research outlined the disaster classification, and the importance of disaster management, the Lao background, Lao disaster management practice and, finally the research gap on resourced-constrained economies in managing disaster risks were presented. In the conclusion to Chapter Two, a research question and the related rationale were outlined. In Chapter Three, the research methodology, the methods applied in this research, and how data was collected and analysed were presented. In Chapter Four, the study outlined the different themes namely pre-disaster management and post-disaster management practices that were observed in developed versus developing nations, and then a comparison of their practices in relation to various factors was considered in selected examples. In Chapter Five, the research discussed the differences in disaster management practices in developed versus developing nations and, under each key theme, summarised the lessons that can be learned by resource-constrained countries such as Laos.

### **6.2 Research contribution**

This study contributes to improve disaster management practice for resource-constrained economies countries in the following ways.

#### **6.2.1 Contribution to disaster management practice**

Undoubtedly, most of the countries in the world have their disaster management frameworks or policy and plans. This research presented the different practices on managing disaster risks from developing economies as compared with resource-constrained economies. By exploring examples of disaster events in these countries, this research showed the various methods that may be able to be applied in some developed and developing nations to improve disaster management. In addition, other nations can observe what practices should be employed or should not be employed, as seen in the examples provided in the research discussion, in order to enhance disaster management in their countries.

### **6.2.2 Contribution to policy**

Many challenges faced in both developed and developing nations were presented. These discussions may highlight some critical issues which policymakers in several countries might not have considered carefully enough. For this reason, the explorations of this study may help some governments to recognise poor policies which result in huge damage to people's lives, property, and their country's economy, and may inspire the public to increase resilience programmes for more efficient disaster management action. Also, different regions confront different challenges due to resource limitations. Therefore, to improve disaster management policy, policymakers have to find out what regulations or plans are appropriate to particular disaster risks, so as to achieve the best results for all stakeholders.

### **6.3 Research limitations**

Similar to most academic research, this research encountered several limitations. The main limitation of this dissertation is that this research is a secondary literature review, which means this research did not collect primary data. The second limitation is that this research is a qualitative piece of work. If the researcher is able to pursue a PhD later on this topic, then the researcher can consider the mixed methods approach where the research can circulate surveys or collect quantitative data. Applying these mixed methods approach to the study would enable the analysis of research to have more informed results. The third restriction is that the focus of this research is only on one country, Laos, whereas the study could have looked for other countries such as Vietnam or Cambodia as these are developing countries as well as underdeveloped economies. These countries might have similar issues in disaster management practice because they are also resource-constrained countries. Overall, however, as far as the present research is concerned, this dissertation work has been completed in a very narrow timespan. The research timeframe for this study is only six months from the start until the end. As a result, the research focus has to be very limited.

### **6.4 Future research area**

This research highlights disaster management practice in the developed countries of Japan and New Zealand as well as analysing examples of developing countries' disaster management practice in Nepal and China. However, future research could observe other developing countries that have good practices in disaster management. The research could extend the study to investigate other countries in the region that have similar economies to Laos, and observe and compare them to Laos. For instance, comparing Laos to Cambodia or Vietnam and exploring how these countries are managing disaster risks could possibly provide more in-depth insights and improvements for disaster management in resource-constrained countries.

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